



**FACULTY OF ECONOMICS
AND ADMINISTRATION**

Masaryk University

**PROCEEDINGS OF THE 13TH INTERNATIONAL
SCIENTIFIC CONFERENCE**

EUROPEAN FINANCIAL SYSTEMS 2016



**Brno, Czech Republic
June 27-28, 2016**



IFT | INSTITUTE FOR
FINANCIAL
MARKET

**Masaryk University
Faculty of Economics and Administration
Department of Finance
and
Institute for Financial Market**

European Financial Systems 2016

**Proceedings
of the 13th International
Scientific Conference**

June 27-28, 2016

Brno, Czech Republic

Suggested citation:

AUTHOR, A. Title of the paper. In: *European Financial Systems 2016. Proceedings of the 13th International Scientific Conference*, Brno: Masaryk University, 2016, pp. xx-xx. ISBN 978-80-210-8308-0 (for print version Proceeding), or ISBN 978-80-210-8309-7 (for on-line version Proceeding).

Editors:

Jan Krajíček
Josef Nešleha
Karel Urbanovský

All rights reserved. No part of this e-book may be reproduced or transmitted in any form or by any means without prior written permission of copyright administrator which can be contacted at Masaryk University Press, Žerotínovo náměstí 9, 601 77 Brno.

© 2016 Masarykova univerzita
ISBN 978-80-210-8308-0
ISBN 978-80-210-8309-7 (online : pdf)

All published papers have been reviewed before publishing. The proceedings have not been amended or proofread. Editors are not responsible for the language used in the papers.

Program Committee of the Conference

Chair:

Ing. Petr Valouch, Ph.D. (Masaryk University)

Members:

Prof. Dr. Ing. Dana Dluhošová (VŠB – Technical University of Ostrava)

Prof. Ing. Eva Horvátová, CSc. (University of Economics in Bratislava)

Prof. Ing. Juraj Němec, CSc. (Matej Bel University)

Assoc. Prof. Ing. Petr Dvořák, Ph.D. (University of Economics, Prague)

Assoc. Prof. Mag. Dr. Peter R. Haiss, MBA (Vienna University of Economics and Business)

Assoc. Prof. Ing. Peter Krištofík, Ph.D. (Matej Bel University)

Assoc. Prof. Ing. Danuše Nerudová, Ph.D. (Mendel University Brno)

Assoc. Prof. Ing. Erika Pastoráková, Ph.D. (University of Economics in Bratislava)

Assoc. Prof. Antonin Rusek, Ph.D. (Susquehanna University, USA)

Assoc. Prof. Ing. Jaroslav Sedláček, CSc. (Masaryk University)

Assoc. Prof. Ing. Jitka Veselá, Ph.D. (University of Economics, Prague)

Assoc. Prof. Ing. Eva Vávrová, Ph.D. (Mendel University Brno)

Assoc. Prof. Ing. Jana Vodáková, Ph.D. (University of Defense Brno)

Dr. Piotr Tworek (University of Economics in Katowice)

Organizing Committee of the Conference

Chair:

Dr. Jan Krajíček

Members:

Dr. Veronika Kajurová

Ms. Bohuslava Doláková

Ms. Hana Florianová

Mr. Josef Nešleha

Mr. Tomáš Plíhal

Ms. Martina Sponerová

Mr. Karel Urbanovský

Conference website: www.efs.econ.muni.cz

PREFACE

Dear readers,

It is my pleasure to introduce you a collection of papers from the 13th annual international scientific conference, European Financial Systems 2016, organized annually by the Department of Finance of the Faculty of Economics and Administration, Masaryk University in Brno, Czech Republic. This year has been famous for various areas of topics, ranging from most common topics, such as accounting, taxation, financial markets, financial literacy, financial education, corporate finance, public finance, banks and insurance companies to more specific areas, such as application of econometrics models, foreign investments and current trends related to economics, data processing and state policies.

As the collection of papers presents the latest scientific knowledge in a number of areas, I believe you will get a number of new insights usable both for your scientific, and educational or practical activities. It is also my pleasant duty to invite you for the 14th year of this conference, held in Brno, Czech Republic, in 2017.

I wish you a pleasant reading

Petr Valouch

Chairman of the Program Committee

CONTENTS

Luděk Benada, Dagmar Linnertová	
HEDGING OF NATURAL GAS ON SELECTED MARKETS	15
Karina Benetti	
BANKRUPTCIES OF COMPANIES IN THE CZECH REPUBLIC AFTER NEW FINANCIAL CRISIS	21
Miloš Bikár, Katarína Vavrová, Mariana Sedliačiková	
WOULD THE RUSSIAN ECONOMY TURN INTO A LOST DECADE?.....	26
Gábor Bóta, Mihály Ormos	
OIL PRICE AND EUROPEAN STOCK MARKETS.....	34
Roman Brauner	
SPECIFIC FACTORS OF THE CONTEMPORARY DEVELOPMENT OF THE CZECH REAL ESTATE MARKET	43
Zuzana Brokešová, Erika Pastoráková, Tomáš Ondruška	
TESTING FOR INFORMATION ASYMMETRY IN AUTOMOBILE INSURANCE: SAMPLE FROM SLOVAK REPUBLIC.....	50
Emilia Brozyna, Grzegorz Michalski, Guenter Blendinger, Ahmed Ahmidat	
THE LIMITATIONS OF E-COMMERCE DEVELOPMENT IN FULL OPERATING CYCLE FIRMS: V4 COUNTRIES CASE	57
Emil Burak, Juraj Nemec	
OPTIMISING THE SLOVAK TAX POLICY AND TAX SYSTEM PERFORMANCE	65
Liběna Černožorská	
COMPARISON OF THE EFFICIENCY OF SELECTED EUROPEAN BANKING SECTORS	72
Karolina Daszyńska-Żygadło, Tomasz Słoński, Magdalena Ligus	
INVESTMENT IN RENEWABLE ENERGY TECHNOLOGIES FROM THE PERSPECTIVE OF POLISH VENTURE CAPITAL FUNDS	79
Karolina Daszyńska-Żygadło	
SUSTAINABLE VALUE CREATION - PERFORMANCE OF EUROPEAN MANUFACTURING COMPANIES.....	86
Oleg Deev, Martin Hodula	
SYSTEMIC RISK INDICATORS IN THE EUROZONE: AN EMPIRICAL EVALUATION ...	94
Oleg Deev, Vlad Morosan	
THE IMPACT OF CONTINGENT CONVERTIBLE BOND ISSUANCE ON BANK CREDIT RISK	102

Jaroslava Dittrichová, Libuše Svobodová, Ivan Soukal	
HEDGING CASE STUDY IN THE EXCHANGE RATE COMMITMENT REGIME ENVIRONMENT	111
Bohuslava Doláková, Jan Krajiček	
INFLUENCES ON CONSUMER RATIONALITY	119
Nadiya Dubrovina, Jana Peliova, Erika Neubauerova	
ANALYSIS OF THE RELATIONSHIP BETWEEN TAXES AND SOCIAL BENEFITS AND TRANSFERS IN THE EU.....	125
Eva Ducháčková	
THE ROLE OF LIFE INSURANCE IN THE CONTEXT OF COVER THE NEEDS OF THE PEOPLE IN THE CZECH REPUBLIC	133
Vlastimil Farkašovský, Ľubomír Pinter	
QUALITY AND EFFICIENCY OF BANK BRANCH SERVICES	141
Luboš Fleischmann	
THE ACCESS TO INSTRUMENT OF COUNTERCYCLICAL CAPITAL RESERVES IN THE EUROPEAN UNION AND THE USA	149
Hana Florianová, Tomáš Dráb	
HEDGING OF PORTFOLIOS AND TRANSACTION COSTS.....	157
Frunza Irina	
COMPARATIVE STUDY OF BANKING SECTOR IN REPUBLIC OF MOLDOVA AND CZECH REPUBLIC	166
Beáta Gavurová, Tatiana Vagašová, Viliam Kováč	
COMPETITIVENESS ASSESSMENT OF SLOVAK REPUBLIC REGIONS	175
Maria Ginzburg, Nadezhda Yashina, Elena Ivanova	
KEYNESIAN MODEL IN SMALL AND MEDIUM ENTERPRISES DEVELOPMENT: PUZZLING CASE OF RUSSIAN REGIONS.....	183
Ján Gogola, Ondřej Slaviček	
PENSION-RELATED APPLICATION OF THE COHORT LIFE TABLE.....	191
Eva Grmanová, Peter Hošťák	
INFLUENCE OF SELECTED ENVIRONMENTAL FACTORS ON THE EFFICIENCY OF COMMERCIAL INSURERS	199
Vladimír Gvozdják, Božena Chovancová	
HOLDINGS OF GOVERNMENT BONDS BY COMMERCIAL BANKS DURING THE FINANCIAL AND DEBT CRISIS IN EUROPE.....	207

Peter Haiss, Franz Binder, Kushtrim Hajzeri, Wadim Kalmykov	
FOREIGN TRADE FINANCE: WHAT IS THE IMPACT OF THE GLOBAL FINANCIAL CRISIS OF 2007-2009?	214
Tat'ána Hajdíková	
THE INFLUENCE OF THE SIZE OF THE REGION ON THE FINANCIAL SITUATION OF HOSPITALS.....	222
Eva Hamplová, Jaroslav Kovárník, Pavel Jedlička	
ANALYSIS OF VARIOUS ENTREPRENEURIAL ACTIVITIES AND THEIR DEVELOPMENT IN THE CZECH REPUBLIC FROM 2008 TO 2015.....	227
Martina Hedvicakova, Libuse Svobodova	
DEVELOPMENT AND THE CURRENT SITUATION OF THE MORTGAGES FOR THE CZECH HOUSEHOLDS.....	234
Irena Honková	
THE PROCESS OF HARMONIZATION OF ACCOUNTING IN THE CZECH REPUBLIC.	242
Juraj Hruška, Oleg Deev	
HIGH-FREQUENCY TRADING AND PRICE VOLATILITY IN THE PARIS EURONEXT STOCK MARKET	249
Jana Hvozdenska	
THE PREDICTION OF ECONOMIC ACTIVITY GROWTH BY SOVEREIGN BOND SPREAD IN FRANCE, GERMANY AND GREAT BRITAIN	256
Barbora Chmelíková, Martin Svoboda	
DIFFERENCE IN FINANCIAL KNOWLEDGE OF FINANCE STUDENTS IN THE CZECH REPUBLIC	262
Věra Jančurová, Petra Formánková	
THE USE OF FINANCIAL ADVISORY IN CZECH REPUBLIC: SELF-CONFIDENCE.....	267
Magdalena Jasiniak	
FACE NOMINAL EFFECT ON CAPITAL MARKET TRANSACTIONS. THE CASE OF POLAND	272
Anna Jędrzychowska, Ewa Poprawska	
COMPENSATION FOR INCOME LOST – LONG-TERM EFFECTS ON THE VICTIM'S PERSONAL FINANCE	278
Monika Kaczała	
CROP INSURANCE AS THE INSTRUMENT FOR RISK FINANCING IN POLISH FARMS	286
Silvie Kafková, Dagmar Linnertová	
THE INFLUENCE OF A LOW INTEREST RATE ON LIFE INSURANCE COMPANIES ...	294

František Kalouda	
IMPACT OF THE REPO RATE ON COMMERCIAL RATES IN THE CZECH REPUBLIC	
.....	300
Özcan Karahan	
THE INTERACTION BETWEEN VENTURE CAPITAL AND INNOVATION IN EUROPE	
.....	306
Mária Klimiková, Martina Muchová	
PREVENTING CRISES IN THE BANKING SECTOR	
AND THE ROLE OF INTERNAL AUDIT IN CORPORATE GOVERNANCE.....	314
Monika Klimontowicz, Karolina Derwicz	
MOBILE TECHNOLOGY ON THE RETAIL BANKING MARKET	322
Magdalena Kludacz-Alessandri	
THE ROLE OF ACCOUNTING POLICY IN MANAGEMENT OF POLISH HOSPITALS ...	331
Kristína Kočíšová	
REVENUE EFFICIENCY IN EUROPEAN BANKING	339
Michal Kolář	
IMPACT OF TRANSFER PRICING REGULATION ON MNES' BEHAVIOUR.....	349
Eva Kolářová, Eva Podolská	
THE ELECTRONIC RECORD OF SALES AND IMPACT ON THE REDUCTION OF TAX	
EVASION.....	357
Jaroslav Kovárník, Pavel Jedlička, Eva Hamplová	
THE COMPARISON OF THE SELECTED ASPECTS OF TAXATION IN VISEGRAD FOUR	
COUNTRIES	365
Patrycja Kowalczyk-Rólczyńska, Tomasz Rólczyński	
ALTERNATIVE INVESTMENTS IN VOLUNTARY PENSION SECURITY	373
Jan Krajíček, Bohuslava Doláková	
IMPACT OF THE INTEREST RATES IN THE ECONOMY, THE BANKING AND	
FINANCIAL SYSTEM	380
Miroslav Krč, Vladimír Golik, Jana Vodáková	
ACCRUAL ACCOUNTING IN THE ARMY OF GREAT BRITAIN - CLARITY,	
TRANSPARENCY, AND ACCOUNTING DATA ANALYSIS OPTIONS	385
Michaela Krejčová, Milena Otavová, Jana Gläserová	
THE IMPACTS OF THE DIRECTIVE NO. 2013/34 / EU TRANSPOSITION INTO	
NATIONAL ACCOUNTING MODIFICATIONS IN THE CZECH AND SLOVAK REPUBLIC	
.....	392

Zuzana Křížová	
CURRENT ISSUES OF ACCOUNTING FOR INTANGIBLES IN VARIOUS REPORTING SYSTEMS	400
Zuzana Kubaščíková, Zuzana Juhászová	
ANALYSIS OF FINANCIAL STATEMENTS FOCUSING ON DETECTION OF PONZI SCHEMES USING XBRL	408
Michal Kuběnka	
THE SUCCESS OF BUSINESS FAILURE PREDICTION USING FINANCIAL CREDITWORTHY MODELS	413
Lumír Kulhánek	
STOCK MARKET VOLATILITY IN THE EUROPEAN EMERGING AND FRONTIER MARKETS.....	420
Dušan Litva	
PERSPECTIVE OF SUSTAINABILITY OF FISCAL POLICY IN CZECH REPUBLIC	428
Marina Malkina	
INTERRELATION BETWEEN CONCENTRATION IN BANKING SECTOR AND ITS MAIN PERFORMANCE INDICATORS: CASE OF RUSSIA	436
Marina Malkina, Rodion Balakin	
RISKS AND EFFICIENCY OF TAX SYSTEM AT DIFFERENT BUDGET SYSTEM LEVELS: REVENUE FORMATION AND SHARING IN THE RUSSIAN FEDERATION REGIONS .	444
Anton Marci, Zuzana Juhászová	
ANALYSIS OF THE RELATIONSHIP BETWEEN ADOPTING AND USING XBRL AS A REPORTING LANGUAGE FOR SMALL AND MEDIUM SIZED ENTITIES AND THE DEVELOPMENT STATUS OF THE COUNTRY AND THE EXISTENCE OF XBRL JURISDICTION.....	451
Slavomíra Martinková, Jakub Danko	
CORPORATE TAX REVENUES OF SELECTED EUROPEAN COUNTRIES USING DYNAMIC CONDITIONAL CORRELATION APPROACH.....	459
Peter Mokrička	
THE CHARACTERISTICS OF THE INVESTMENT THROUGH THE AIRBAG CERTIFICATES	467
László Nagy, Mihály Ormos	
FRIENDSHIP OF STOCK INDICES	473
Danuše Nerudová, Veronika Solilová	
CCTB AND CCCTB IMPLEMENTATION AND ITS IMPACT ON THE TAX BASES ALLOCATED IN THE SLOVAK REPUBLIC.....	481

Josef Nesleha, Karel Urbanovsky	
STUDY OF FINANCIAL LITERACY IN THE FIELD OF INSURANCE PRODUCTS	490
Tetyana Nestorenko, Nadiya Dubrovina, Jana Péliová	
LOCAL ECONOMIC IMPACT OF DOMESTIC AND INTERNATIONAL STUDENTS: CASE OF UNIVERSITY OF ECONOMICS IN BRATISLAVA	496
Inka Neumaierová, Ivan Neumaier	
THE PERFORMANCE RANKING OF CHOSEN MANUFACTURING DIVISION	502
Thi Anh Nhu Nguyen	
THE IMPACT OF DEMOGRAPHIC CHARACTERISTICS ON FINANCIAL LITERACY: AN EMPIRICAL STUDY IN COMMERCIAL BANKS' CUSTOMERS	508
Magdalena Osak	
PRIVATE HEALTH INSURANCE AND MEDICAL SUBSCRIPTIONS – TWO FACES OF THE PRIVATE PRE-PAID FUNDING OF HEALTH CARE IN POLAND	517
Gabriela Oškrdalová	
PAYMENT CARD FRAUDS WITH A HIDDEN CAMERA, TOUCH SENSORS AND A COUNTERFEIT PAYMENT CARD AND PROTECTION TECHNIQUES AGAINST THESE TYPES OF FRAUDS	526
Viera Pacáková, Pavla Jindrová, David Zapletal	
COMPARISON OF HEALTH CARE RESULTS IN PUBLIC HEALTH SYSTEMS OF EUROPEAN COUNTRIES	534
Dalibor Pánek	
THE POLICY OF MONETARY EASING OF CENTRAL BANKS	542
Mário Papík	
COMPOSITION OF PENSION FUNDS' INVESTMENT PORTFOLIO AND ITS IMPACT ON PROFIT	547
Erika Pastoráková, Zuzana Brokešová, Tomáš Ondruška, Eleonóra Zsapková	
CONTRIBUTION TO THE RESEARCH FOR ADEQUATE AND SUSTAINABLE PENSIONS – THE STUDY OF THE SLOVAK REPUBLIC AND THE CZECH REPUBLIC	556
Jan Pěta, Mária Režňáková	
ECONOMIES OF SCALE IN M&A IN THE MANUFACTURING INDUSTRY IN THE CZECH REPUBLIC	564
Sergey Petrov, Oksana Kashina, Roman Murashkin	
EXAMINATION OF STOCK MARKET “TEMPERATURE” USING PRICE-DIVIDEND DEPENDENCE FOR EUROPEAN SHARES	572
Marlena Piekut	
PERSONAL FINANCE IN TERMS OF INCOME AND EXPENDITURE ASPECTS.....	581

Sylwia Pieńkowska-Kamieniecka, Damian Walczak	
WILLINGNESS OF POLISH HOUSEHOLDS TO SAVE FOR RETIREMENT	588
Michal Plaček, Milan Půček, František Ochrana, Milan Křápek	
APPLICATION OF DEA METHODS FOR EVALUATING EFFICIENCY IN MUSEUMS, GALLERIES, AND MONUMENTS IN THE CZECH REPUBLIC	596
Michal Plaček, Martin Schmidt, František Ochrana, Milan Půček	
THE IMPACT OF USING AN EXTERNAL AUTHORITY ON THE QUALITY OF PUBLIC PROCUREMENT	602
Tomáš Plíhal	
FORECASTING EXCHANGE RATE VOLATILITY: SUGGESTIONS FOR FURTHER RESEARCH	609
Lenka Přečková	
FUNCTIONING OF BANCASSURANCE IN SELECTED COUNTRIES IN WHICH THE FINANCIAL GROUP ERSTE GROUP BANK OPERATES.....	614
David Procházka	
FINANCIAL PERFORMANCE OF CZECH SUBSIDIARIES UNDER CONTROL OF THE EU LISTED COMPANIES.....	623
Zuzana Rakovská, Martin Svoboda	
PRACTICAL APPLICATION OF SENTIMENT INDICATORS IN FINANCIAL ANALYSIS: BEHAVIORAL FINANCE APPROACH.....	630
Monika Raulinajtys-Grzybek, Katarzyna Frankowska, Wojciech Matuszewicz	
THE IMPACT OF THE FEATURES OF HEALTHCARE PROVIDERS IN POLAND ON THEIR COSTS IN THE ACCOUNTING SYSTEM.....	638
Oldřich Rejnuš	
PREDICTION OF FUTURE DEVELOPMENT OF THE WORLD ECONOMY UNDER CONDITIONS OF NEGATIVE INTEREST RATES	646
Tomasz Rólczyński, Tomasz Kopyściański	
ECONOMIC CONDITION OF THE EUROPEAN UNION COUNTRIES AND LEVEL OF RATING	654
Katarína Rentková, Monika Roštárová	
USING OF VENTURE AND EQUITY CAPITAL IN FINANCING OF SMES IN THE SLOVAK REPUBLIC	661
Petr Sed'a, Juan Antonio Jimber del Río	
TESTING THE WEAK FORM OF EFFICIENCY ON CHINESE STOCK MARKET	669
Jaroslav Sedláček	
FINANCIAL STATEMENTS IN THE FINANCIAL DECISION MAKING	678

Kateřina Seinerov	
FINANCIAL LITERACY OF ELEMENTARY SCHOOL PUPILS IN PARDUBICE	686
Eugenia Schmitt	
STRESS-TESTING MODEL FOR STRUCTURAL LIQUIDITY RISK.....	692
Elena řir, Katarna Radvansk, Zuzana Granaiov	
FACTORS INFLUENCING CLIENTS IN SELECTION OF INSURANCE COMPANY	700
Martin řircek, Karel řima	
THE OPTIMIZED INDICATORS OF TECHNICAL ANALYSIS BY ANTICYCLIC ASSETS	708
Ladislav řiřka	
BUDGETARY GAMING BEHAVIOR AND ITS DETERMINANTS.....	715
Ludomr řlahor, Daniela Majerakov, Mria Bartekov	
IMPLICATIONS OF LOW/NEGATIVE INTEREST RATES FOR BANKS' ASSET AND LIABILITY MANAGEMENT – AN EXAMPLE	721
Veronika Solilov, Danuře Nerudov, Hana Bohuřov, Patrik Svoboda	
THE RECOMMENDATION OF SAFE HAVEN INTEREST RATES IN THE BEPS CONTEXT	728
Miroslav Sponer, Martina Sponerov	
FOREIGN EXCHANGE INTERVENTION BY THE CZECH NATIONAL BANK AND ITS CONSEQUENCES.....	737
Martina Sponerov, Miroslav Sponer	
NEXUS OF BANK RISK-TAKING AND INTEREST RATES	745
Tomř řtofa, Martin Zoriak	
SELECTED SUCCESS FACTORS OF CROWDFUNDING PROJECTS.....	752
Petr Suchnek, Maria Krlov	
REFLECTION OF CUSTOMER SATISFACTION IN SELECTED PERFORMANCE INDICATORS OF FOOD ENTERPRISES	760
Veronika řulikov, Marianna Siniakov, Ľubica řtiblrov, Slavomra řulikov	
EVALUATION OF THE BUSINESS CYCLE SYNCHRONISATION IN EUROPE.....	768
Veronika Svatořov, Zuzana Svobodov	
DETERMINATION OF FINANCIAL STRATEGY OF SELECTED COMPANY AND ITS IMPORTANCE FOR OTHER BUSINESS DEVELOPMENT – CASE STUDY.....	776
Milan Svoboda, Pavla řhov	
ALGORITHMIC TRADING USING MARKOV CHAINS: COMPARING EMPIRICAL AND THEORETICAL YIELDS	787

Libuše Svobodová, Martina Hedvičáková	
COMPARISON OF BUILDING SAVINGS BANKS ON THE CZECH MARKET	794
Łukasz Szewczyk	
CO-OPERATIVE BANKS IN POLAND, CURRENT ISSUES.....	802
Aleksandra Szpulak, Tomasz Michael	
JOINT DETERMINISTIC AND STOCHASTIC APPROACH TO CASH BALANCE MODELLING: A CASH MODEL SPECIFICATION AND VERIFICATION.....	808
Dariusz Urban	
SOVEREIGN WEALTH FUND OWNERSHIP AND FINANCIAL PERFORMANCE OF COMPANIES LISTED ON THE WARSAW STOCK EXCHANGE.....	816
Tomáš Urbanovský	
CONNECTION BETWEEN EXCHANGE RATE AND BALANCE OF PAYMENTS ACCOUNTS: THE CASE OF THE CZECH REPUBLIC	824
Lukáš Vartiak	
COMPARING FINANCIAL PERFORMANCE OF SLOVAK EXCELLENT COMPANIES... 	832
Eva Vávrová, Svatopluk Nečas	
THE EVALUATION OF FINANCIAL HEALTH OF THE INSURANCE SECTOR IN THE WORLD'S INSURANCE CENTERS	839
Jana Vodáková, Nela Sglundová	
EXPENSES AND REVENUE CLASSIFICATIONS FOR MANAGERIAL PURPOSES IN THE CZECH STATE ADMINISTRATION UNITS	848
Radosław Witzak	
THE INCORRECTNESS OF ESTIMATING OF TAX BASE IN INCOME TAXES IN THE VERDICTS OF SUPREME ADMINISTRATIVE COURT IN 2014 IN POLAND	856
Agnieszka Wojtasiak-Terech	
TYOLOGY OF THE MUNICIPAL BONDS RISK – APPLICATION FOR POLISH ORGANIZED BONDS MARKET	863
Nadezhda Yashina, Maria Ginzburg, Louisa Chesnokova	
FISCAL FEDERALISM AND REDISTRIBUTIVE POLITICS FOR INCOME TAX: CASE OF RUSSIA'S REGIONS	872
Alexander Zureck, Julius Reiter, Martin Svoboda	
CROSS-GENERATIONAL INVESTMENT BEHAVIOR AND THE IMPACT ON PERSONAL FINANCE.....	881

Hedging of Natural Gas on Selected Markets

Luděk Benada¹, Dagmar Linnertová²

1 Masaryk University
Faculty of Economics and Administration
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: benada@mail.muni.cz

2 Masaryk University
Faculty of Economics and Administration
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: dagmar.linnertova@mail.muni.cz

Abstract: *The following study focuses on one of the key primary energy commodities in the modern society. Two independent and different regional markets for natural gas are compared from the hedging point of view. The market of considered commodity is unique in its characteristics. In the paper will be examined the possibility of price risk hedging on two different markets with distinct level of market maturity and characteristics. One of markets is represented by the system of endogenous price mechanism while the other one is based on price indexed mechanism. The analysis will be carried out on US and European market of natural gas. In both cases, the methodology will be focused the short hedge position.*

Keywords: hedging, hedge ratio, spot, futures, forward

JEL codes: C58, G11

1 Introduction

The paper focuses on a hedging strategy of natural gas. The object of hedging is the spot price. Our research is restricted to financial hedging. Physical hedging is complex due to diverse duration of assets (portfolio), Grammatikos et al. (1986). Thus, we focus our analysis only on prices. We will examine short hedging, that means we will hedge the commodity of the owner perspective.

Hydrocarbons as an energy source are part of everyday life in the western world. The lack of fuels and consequently the lack of energy would lead to a breakdown of the social order to which modern man is accustomed.

Growing volume and importance of NG stimulate the importance of market development.

The commodity is regionally bound. On that account the different processing costs and the complete environment create a heterogeneous market structure. From this perspective, only one price of NG does not exist. At the very beginning the transactions of natural gas were limited in bilateral contracts. Later on, the market of the commodity was found due to liberalization. The formation of market is inextricably linked to the USA, Prmia (2007).

The price of natural gas is mostly based on two different price mechanisms. Either the price is derived from the price of crude oil or the price is mediated through the supply-demand interaction. The former mechanism is also known as Oil Indexation, Roye (1997). This price mechanism is typical for Asia and Europe. Second aforementioned mechanism is referred as Gas on Gas competition. The Gas on Gas trading has tradition in the United States, Victor et al. (2006). Europe is recently trying to "correct" prices toward Gas on Gas competition, Ekins (2005).

A disproportionality of a demand and a supply has caused considerable price uncertainty. Substantial price volatility has stimulated the emergence of the derivatives products such as futures and forwards. The initial issue of term contracts was hedging, albeit nowadays there are other incentives for their use. We will use derivatives for the purpose of risk reduction in spot on the markets with different price mechanism. We assume that the

market with Gas on Gas competition will exhibit greater risk. Hence, the application of hedging on this market should be more beneficial in comparison to Oil Indexed market. Further, we assume that the hedge effectiveness based on the methodology of hedge ratio will provide a higher reduction of risk rather than a simple naive portfolio.

2 Methodology and Data

The purpose of a hedging strategy is to lock the position, i.e. minimize risk deviance from expected value. In the other words, fluctuations in held asset should be compensated with a reverse spike of hedging instrument. That is an optimal situation, but because the assets are random variables with no same characteristics, it could not be assumed that for hedging only naive portfolio will be sufficient. Thus, the number of assets in the long position would match the number of hedging instruments in short position, Alexander (2007).

There are several optimization techniques according to the objective function. It is common to use principles of portfolio optimization. The pioneer stabilizing the hedging ratio was the minimum variance approach, Johnson (1960). The ratio could be found using the tangential portfolio based on Sharpe ratio, Chen et al. (2013). If there is a problem with risk free rate or the rate is zero, Sharpe ratio reduces to minimum variance approach. One of the implied ways is application of OLS on spot and futures, Benning et al. (1984). However, the problem with dynamic volatility could occur, Miffre (2004). For this reason more sophisticated models like GARCH are applied, Baillie et al. (1991). Further, Gini coefficient or extended Gini coefficient is applied, respectively, Lerman (1984).

Futures are considered being suitable instruments for hedging purposes because of their features. In the case of an asset or a portfolio it is necessary to find an asset or a portfolio with extreme value of correlation coefficients. In our analysis the futures or forward prices correspond with that of underlying. Then, we expect high correlation between them. The prerequisite of applicability is the stable mutual coverage of percentage change of assets in portfolio. Since the analysis is based on historical data, this assumption cannot be guaranteed.

We use daily closing prices of spot, future and forward for the analysis. Future contracts are set one month ahead. The same time conditions will be considered for the forward contracts. The validation of hedging will be set at 10, 20, 30, 40, 50 and 60 days. As a representative market of Gas on Gas competition we use Henry Hub (HH) and futures related to the terminal traded in NYMEX. Index Title Transfer Facility (TTF) was chosen as a representative of Oil Indexed price. Due to availability for TTF we use forward contract. The analysis is based on the period from September 2014 to December 2015. Subsequent validation is carried out on data from the following three month.

Initially, we validate hedging effectiveness based on hedging ratio from optimization criteria. Subsequently, a comparison with the results of a naive portfolio will be provided.

Model Specification

In our study we focus solely on short hedging. Thus, we act as seller of natural gas. Some authors highlight the hedging asymmetry in the meaning of the short and long position, Cotter et al. (2012). We analyze only one optimization approach represented by the calculation of hedge ratio of futures/forward to the spot. The ratio will be determined on the basis of optimization criteria. The objective function is expressed as variance of portfolio consisting of two assets (spot and futures/forward). Equation for portfolio variance is:

$$\sigma_p^2 = \sigma_s^2 + h^2 * \sigma_f^2 + 2 * h * \sigma_{sf} \quad (1)$$

σ_p^2 variance of portfolio

σ_s^2 variance of spot

h amount of hedging instrument (futures/forward)

σ_f^2 variance of futures/forward

σ_{sf} covariance spot, futures/forward

Unlike classical Markowitz optimization there is no restrictions on weights. On the contrary, it is assumed one unit of the undelaying. Thus the weights are 1 for spot and h for hedging instrument. The solution for h is to find an extreme of the objective function, i.e. derivation with respect to h :

$$\frac{\partial \sigma_p^2}{\partial h} = 2 * h * \sigma_f^2 + 2 * \sigma_{sf} \quad (2)$$

Then the hedge ratio comes in the form:

$$h^* = -\frac{\sigma_{sf}}{\sigma_f^2} \quad (3)$$

The negative sign in the equation signals a closing transaction. If we are in long position of natural gas, then we have to sell futures. Conversely, in the case of long hedging we have to buy futures. Now we can test the conditions if the solution is a really global minimum:

$$\frac{\partial^2 \sigma_p^2}{\partial h \partial h} = 2 * \sigma_f^2 > 0 \quad (4)$$

Hedging efficiency is a measure of whether it is worth or not to provide hedging. We will not consider the costs of hedging, but we will assess its effect. Specifically, we measure the reduction in variance. It will be utilized in accordance with established methodology, Ederington (1979):

$$HE = \frac{\sigma_{pun}^2 - \sigma_{phe}^2}{\sigma_{pun}^2} \quad (5)$$

HE stands for hedging effectiveness, σ_{pun}^2 is the variance of the spot (unhedged portfolio) and σ_{phe}^2 is the variance of the hedged portfolio. The greater the compensation due to joint percentage change, the closer the result will be to one. Since futures/forward will enter into short position we have to express the variance of portfolio in the following form:

$$\sigma_p^2 = \sigma_s^2 + h^2 * \sigma_f^2 - 2 * h * \sigma_{sf} \quad (6)$$

The second moments and the covariance are obtained by the difference of the natural logarithm of closing prices. Afterward we compare the effectiveness of hedge ratio with the naive portfolio.

3 Results and Discussion

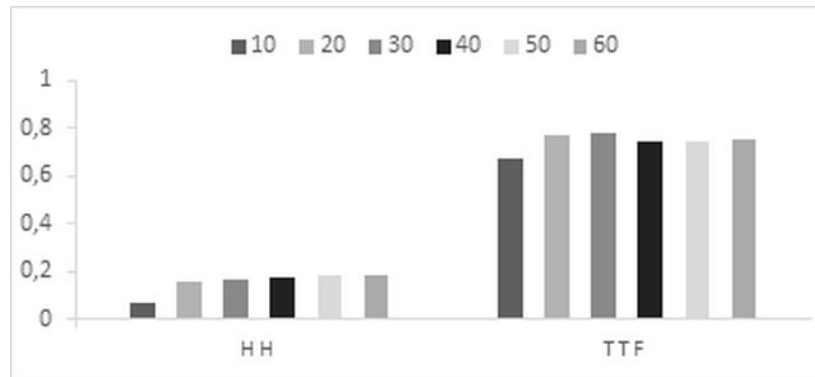
In accordance with the methodology used in literature, we have to determine the hedge ration based on percentage change in the closing price of spot and futures/forward. The analysis results identify a very small proportion of hedging instruments in the situation of gas on gas competition. The ratio was 0.278 in HH to 0.513 in TTF. The measurement of hedging effectiveness was applied to six scenarios - 10, 20, 30, 40, 50 and 60 days. The results of risk reduction in percentage are express in the following table.

Table 1 Hedging Effectiveness – Henry Hub, TTF (ln_returns)

Market/Days	10	20	30	40	50	60
HH	0.066588	0.16188625	0.165092	0.174023	0.182594	0.180732
TTF	0.672532	0.770394749	0.782857	0.743612	0.743678	0.752222

Source: Based on data EIA, Bloomberg

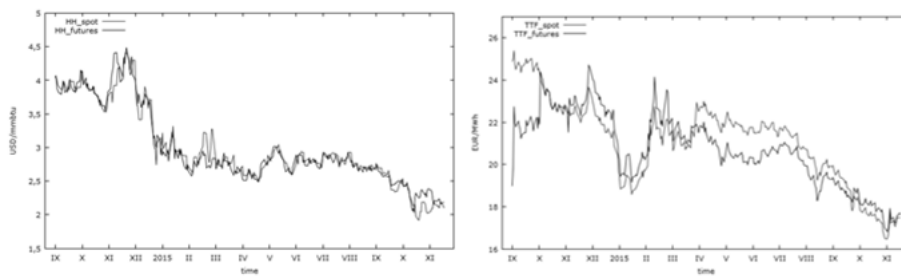
Figure 1 Hedging Effectiveness with Hedging Ratio



Source: Based on data from EIA, Bloomberg

As it was possible to estimate the suitability of hedging in both markets, the US market does not show perfect options for a reduction of systematic risk. Conversely, the European market reached good results. It is rather surprising finding, because in the case of US futures the market was more accurate to spot price. More details are shown in the Figure 2.

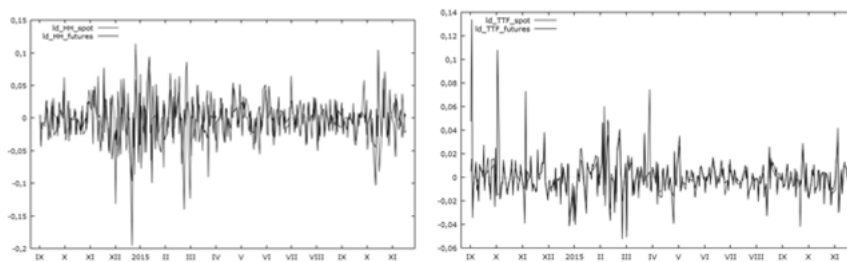
Figure 2 Closing Prices of Spot and Futures/Forward in HH and TTF



Source: Based on data from EIA, Bloomberg

The correlation of the spot HH and futures was 0.97. In the case of spot TTF and forward was only 0.82. But if we use returns the results change significantly. Thus, the TTF market decreased in correlation to 0.71. But even more dramatic change has occurred in HH, where the correlation dropped to 0.24. The situation shows following charts.

Figure 3 Returns of spot and futures (forward) HH and TTF.



Source: Based on data from EIA, Bloomberg

From the preceding figures could be identified an assumption for hedging results. The risk of the price change is for TTF higher compared with HH, but if we consider the returns it is just the opposite. Moreover, it is possible to identify different level of risk between the spot and the futures or the forward. The hedging instrument compared with spot is more risky on the TTF market. The standard deviation was 0.018325 for the forward and 0.013259 for the spot. On the HH the standard deviation was 0.0284 for the futures and 0.0328 for the spot.

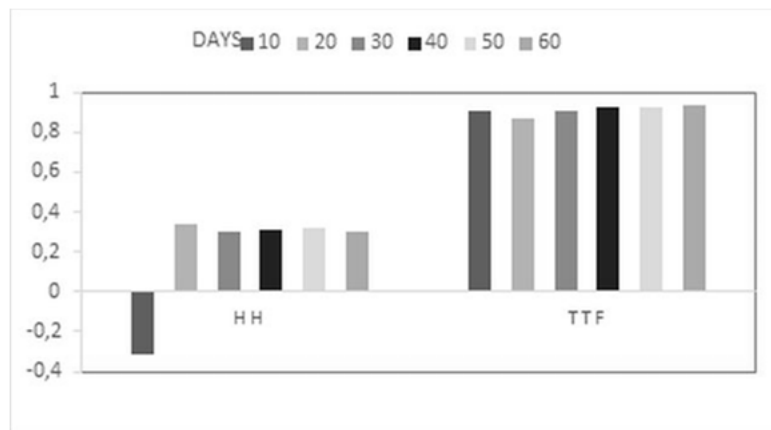
Finally, we measure the hedging effectiveness using naive portfolio. This strategy better reflects the relation between the spot and the hedging instrument, which corresponds more to the tighter movement of closing prices. Following table and chart show the details.

Table 2 Hedging Effectiveness – Henry Hub, TTF (Naive portfolio)

Market/Days	10	20	30	40	50	60
HH	-0.3442	0.342523643	0.300956	0.308332	0.319771	0.300736
TTF	0.910612	0.849081236	0.894785	0.922918	0.920413	0.925488

Source: Based on data EIA, Bloomberg

Figure 4 Hedging Effectiveness with Naive Portfolio



Source: Base on data from EIA, Bloomberg

The naive portfolio has worse outcome only in one case in comparison to the approach, which is based on hedge ratio. It is the hedging strategy for 10 days on the HH. In this period the hedging with the naive portfolio is inefficient, because the variance of the portfolio is higher than the variance of spot. The results of naive portfolio overcomes all remaining scenarios compared with the results of hedge ratio. However, it was not possible to reach the results obtained on the European market, where the naive portfolio produced better performance to the previous results, as well.

There is a wide field for further investigation. It would be interesting to compare the pipeline markets with LNG. Furthermore, compare the homogeneity markets in Europe with each other. From the methodological point of view it would be worth to use a comparison of different models for time series analysis. The models based on dynamic volatility, cointegration, wavelet decomposition or copula approach could be appropriate.

4 Conclusions

In our paper we investigated the problems of natural gas hedging. We examined two different markets. Each market has specific mechanism determining the price. The US market represented by Henry Hub was based on Gas on Gas competition. The European market was covered by Title Transfer Facility with the price derived from crude oil.

The analyzed data for hedge ratio covering daily closing prices from September 2014 to December 2015. Afterwards, validation were applied on daily prices from January to March 2016.

The assumption of higher risk on the US market was confirmed. However, two further assumptions were falsified. The hedging effectiveness was not higher on the Henry Hub market. The European market was more suitable for hedging purposes. The part of explanation could lie in the effect of financialization. Thus, a large part of the trade's

volume in finance derivatives is not used for hedging purposes. Moreover the results of naive portfolio led to unforeseen conclusion. The strategy of naïve portfolio was more efficient on both markets than the methodology based on hedge ratio.

Nevertheless, to determine the unambiguous conclusion it is necessary to examine the issue in more details.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development is gratefully acknowledged.

References

- Alexander, C., Barbosa, A. (2007). Effectiveness of minimum-variance hedging. *Journal of Portfolio Management*, vol. 33(2), pp. 46-59.
- Baillie, R. T., Myers, R. J. (1991). Bivariate GARCH estimation of the optimal commodity futures hedge. *Journal of Applied Econometrics*, vol. 6 (2), pp. 109-124.
- Benninga, S., Eldor, R., Zilcha, I. (1984). The optimal hedge ratio in unbiased futures markets. *Journal of futures markets*, vol. 4(2), pp. 155-159.
- Chen, S.-S., Lee, C. F., Shrestha, K. (2013). Futures hedge ratios: a review. *Encyclopedia of Finance*, pp. 871-890.
- Cotter, J., Hanly, J.(2012). Hedging effectiveness under conditions of asymmetry. *The European Journal of Finance*, vol. 18 (2), pp. 135-147.
- Ederington, L. H. (1979). The hedging performance of the new futures markets. *The Journal of Finance*, vol. 34(1), pp. 157-170.
- Ekins, P., Bradshaw, M., Watson, J. (2015). *Global Energy: Issues, Potentials, and Policy Implications*, 1 st ed. Oxford: Oxford University Press.
- Grammatikos, T., Saunders, A. (1986). Futures price variability: A test of maturity and volume effects, *Journal of Business*, pp. 319-330.
- Johnson, L. L. (1960). The theory of hedging and speculation in commodity futures. *The Review of Economic Studies*, vol. 27(3), pp. 139-151.
- Miffre, J. (2004). Conditional OLS minimum variance hedge ratios, *Journal of Futures Markets*, vol. 24(10), pp. 945-964.
- Prmia, P. (2007). *Guide to the Energy Markets: Introduction to Natural Gas Trading*, 1st ed. McGraw-Hill Education.
- Rojey A., J., C. (1997). *Natural Gas: Production, Process*, 1st ed. Paris: Transport Editions Technip.
- Roncoroni, A., Fusai, G., Cummins, M. (2015). *Handbook of Multi-Commodity Markets and Products: Structuring, Trading and Risk Management*, 1st ed. Wiley.
- Taverne, B. (2008). *Petroleum, industry, and governments: a study of the involvement of industry and governments in the production, and use of petroleum*, 1st ed. Kluwer Law International.
- TechReport (2015). *Wholesale Gas Price Survey: A global review of price formation mechanism 2005 – 2014*, International Gas Union.
- Victor, D., Jaffe, A., Hayes, M. (2006). *Natural Gas and Geopolitics: From 1970 to 2040*, 1st ed. Cambridge: Cambridge University Press.

Bankruptcies of Companies in the Czech Republic after New Financial Crisis

Karina Benetti¹

¹ ŠKODA AUTO VYSOKÁ ŠKOLA o.p.s.
Department of Finance and Accounting
Na Karmeli 1457, 293 01 Mladá Boleslav, Czech Republic
E-mail: karina.benetti@savs.cz

Abstract: *In 2006 was published a law no. 182/2006 Coll., On Bankruptcy and Its Resolution (Insolvency Act), which came into effect from January 1st, 2008. This law came into effect just at a time when the new financial crisis started getting stronger. This crisis meant for bankruptcies of companies is an important milestone, not only with regard to the number of bankrupt companies, but especially to the emergence of new ISO standards dealing with much needed risk management in business practice. The value of bankrupt companies was according to statistics since the beginning of the recent financial crisis until the end of 2008 in the amount of US \$ 14.5 trillion, which is more than 145 times the amount for the Marshall Plan to rebuild Europe after World War II. In the Czech Republic from 2008 to 2012 to increase the number of corporate bankruptcies by 288%, but their numbers began from 2012 to decline. The aim of this paper is to analyze the number of corporate insolvency proposals and corporate audits in the Czech Republic since the beginning of the recent financial crisis until the present (i.e. the last eight years).*

Keywords: corporate insolvency proposals, corporate audits, dependence analysis, financial health, ISO standards

JEL codes: C10, C39, G01, G31, G33

1 Introduction

The effects of the recent financial crisis can be divided into positive and negative effects. The negative effects have already been published many scientific but also non-scientific works. One of the negative effects of the recent financial crisis, the number of bankruptcies, not only personal, but also corporate. In the Czech Republic published analysis results of personal bankruptcies in recent years Bokšová et al (2014), Hospodka et al (2015) and Maixner et al (2014). According to a study Pittman & Ivry (2009) the total value of bankrupt companies at the end of 2008, in amount of 14.5 trillion USD. The predominant reason for these bankruptcies Barbulescu et al (2015) was the absence of risk management in interim management or its poor quality. Application of quality risk management into internal enterprise policy can mean early detection of financial problems of these companies. In this view are very important bankruptcy models (Čámská, 2012) and basic characteristics of enterprises which are in insolvency (Čámská, 2013). Detailed analysis of corporate insolvency during the crisis years (with data analysis from 2008 to 2013) published Kislíngrová and Schoenfeld (2014) and forecasts of corporate insolvencies for the period 2013-2017 published in 2013 Kislíngrová. Absence of quality risk management was one of the main reasons to the creation of ISO 31000 (2009) for risk management in business practice, which can be considered a positive effect of the recent financial crisis. With regard to the reasons for the changes in risk management in corporate practice, this paper will focus precisely analyzing the number of corporate insolvency proposals and corporate audits in the Czech Republic after the crisis period. The research questions are: "How are monitored variables develops over time?" and "Is there dependence between these two variables?". To answer these questions, it is necessary to analyze: the development of proposals of corporate insolvencies and corporate audits in the Czech Republic for the period January 2008 to December 2015 and do the dependence analysis.

2 Methodology and Data

In the research were particular used scientific methods: induction, comparative analysis, synthesis of partial knowledge, elementary statistical analysis and dependence analysis.

For elementary statistical analysis was used the following selected three indicators (Hindls, et al, 2000):

- the first difference (absolute gain, ${}_1\Delta_t \text{ IN}$ – for corporate insolvencies and ${}_1\Delta_t \text{ AU}$ – for corporate auditions) (1)

$${}_1\Delta_t = \Delta_t - \Delta_{t-1} \quad (1)$$

- the average absolute gain (2) and

$${}_1\bar{\Delta} = \frac{\sum_{t=2}^n {}_1\Delta_t}{n-1} = \frac{y_n - y_1}{n-1}, \quad (2)$$

- the average growth coefficient (3)

$$k = \sqrt[n-1]{\frac{y_n}{y_1}} \quad (3)$$

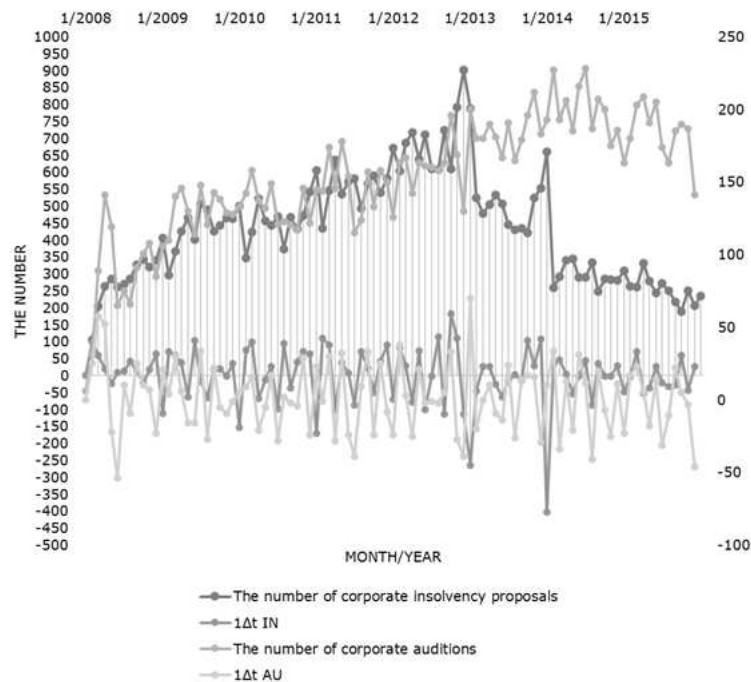
where n is the number of values (in this paper $n = 96$).

For the dependence analysis was used software STATGRAPHICS Centurion XVI. For the analysis was used secondary data from Creditreform (2016).

3 Results and Discussion

The results of elementary statistical analysis, by selected three characteristics, of development of number of corporate insolvency proposals and corporate auditions are given below. The basic development of number of corporate insolvency proposals and corporate auditions with development of its first difference illustrated Figure 1.

Figure 1 Development of Number of Corporate Insolvency Proposals and Corporate Auditions with Development of its First Difference



Source: Own from Creditreform (2016)

According to the development of the values specified in Figure 1 can be deduced that the observed characteristics were examined over a period of very fluctuating development. For this reason, does not make sense to describe the examined values other statistical characteristics (such as e.g. coefficient growth, growth rate and increase rate). For a basic overview of the development of the examined values sufficient to indicate the results of absolute average gain and average growth coefficient.

The result of average absolute gain is for corporate insolvencies proposals 1.37 and for corporate audits 1.42.

The results of average growth coefficient are for corporate insolvencies proposals 1.008416 (which corresponds to 0.841 %). and for corporate audits 1.03379 (which corresponds to 3.379 %).

For dependence analysis will be used monthly data. Firstly, was conducted multiple variable analysis, summary statistics illustrated Table 1, results from correlations shows Table 2 and Figure 2.

Table 1 The Summary Statistics from Multiple Variable Analysis

	The Number of Corporate Insolvencies Proposals	The Number of Corporate Auditions
Count	96	96
Average	437.198	152.354
Standard deviation	158.31	40.95
Coefficient of variation	36.2102%	26.8782%
Minimum	106.0	6.0
Maximum	903.0	228.0
Range	797.0	222.0
Standard skewness	1.71433	-3.20719
Standard kurtosis	-0.474946	2.47394

Source: Own elaboration

The table 1 shows summary statistics for each of the selected data variables. It includes measures of central tendency, measures of variability, and measures of shape. Of particular interest here are the standardized skewness and standardized kurtosis, which can be used to determine whether the sample comes from a normal distribution. Values of these statistics outside the range of -2 to +2 indicate significant departures from normality, which would tend to invalidate many of the statistical procedures normally applied to this data.

Table 2 Correlation

	The Number of Corporate Insolvencies Proposals	The Number of Corporate Auditions
The Number of Corporate Insolvencies Proposals		0.1002 (Correlation) (96) (Sample Size) 0.3312 (P-Value)
The Number of Corporate Auditions	0.1002 (Correlation) (96) 0.3312	

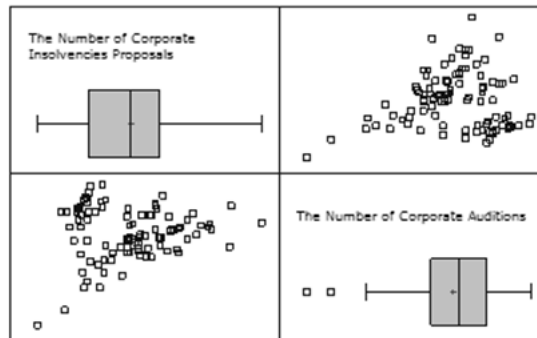
Source: Own elaboration

The table 2 shows Pearson product moment correlations between each pair of variables. In this case is Pearson product moment correlation 0.1002. Pearson product moment correlation coefficients range between -1 and +1 and measure the strength of the linear relationship between the variables. Also shown in parentheses is the number of pairs

of data values used to compute each coefficient. The third number in each location of the table is a P-value which tests the statistical significance of the estimated correlations. P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level. None from the analyzed pairs of variables have P-values below 0.05. This is the reason, why is for this case the Pearson product moment correlations indicator not correct, we must use for example Spearman correlation coefficient.

However, the results shown in Table 2 cannot be properly assessed without visualization - see Figure 2.

Figure 2 Scatterplot Matrix



Source: Own elaboration

From the results in the Figure 1 it is evident that between variables is no correlation. Certainty as to whether between variables is or is not correlation will bring a result of the Spearman rank correlation, the results are given in Table 3.

Table 3 Spearman Rank Correlations

	The Number of Corporate Insolvencies Proposals	The Number of Corporate Auditions
The Number of Corporate Insolvencies Proposals		-0.0259 (Correlation)
		(96) (Sample Size)
		0.8006 (P-Value)
The Number of Corporate Auditions	-0.0259 (Correlation)	
	(96) (Sample Size)	
	0.8006 (P-Value)	

Source: Own elaboration

This table shows Spearman rank correlations between each pair of variables. These correlation coefficients range between -1 and +1 and measure the strength of the association between the variables. In contrast to the more common Pearson correlations, the Spearman coefficients are computed from the ranks of the data values rather than from the values themselves. Consequently, they are less sensitive to outliers than the Pearson coefficients. Also shown in parentheses is the number of pairs of data values used to compute each coefficient. The third number in each location of the table is a P-value which tests the statistical significance of the estimated correlations. P-values below 0.05 indicate statistically significant non-zero correlations at the 95.0% confidence level. None from the analyzed pairs of variables have P-values below 0.05.

From the above analysis results, it is clear that it has not been proved dependence between the number of corporate insolvencies proposals and the number of corporate auditions.

4 Conclusions

This paper had as objective: firstly, to describe the development of the number of corporate insolvencies proposals and the number of corporate audits in the Czech Republic since the beginning of the recent financial crisis until the present. Secondly, analyze the dependence between these examined variables. From the results of the analysis, it is clear that the development of the examined variables during the monitored period was highly variable (fluctuating). Dependence between examined variables could not be prove.

For further research is recommended detailed analysis of corporate insolvencies proposals and corporate audits by region and then also in terms of business sectors.

Acknowledgments

This paper was created with the support of specific research in ŠAVŠ o.p.s.

References

- Barbulescu, M., Hagiú, A., Vasilica, R. (2015). The Insolvent Company: Bankruptcy Difficulties. *Euro and the European Banking System: Evolutions and Challenges*, pp. 591-601.
- Bokšová, J., Randáková, M., Hospodka, J., Maixner, J. (2014). Personal bankruptcies of individuals in the Czech Republic in relation to different groups of creditors. *Managing and Modelling of Financial Risks: 7th International Scientific Conference, PTS I-III*, pp. 80-86.
- Čámská, D. (2012). National View of Bankruptcy Models. *6th International Days of Statistics and Economics*, pp. 268-278.
- Čámská, D. (2013). Basic Characteristics of Enterprises in Insolvency. *Mezinárodní Vedecká Konference: Hradecké Ekonomické Dny 2013 - Ekonomický Rozvoj A Management Regionu, Part I*, pp. 83-88.
- Creditreform.cz (2016). Vývoj insolvenčí v České republice.
- Hinds, R., Hronová, S., Novák, I. (2000). *Metody statistické analýzy pro ekonomy*. Praha: Management Press.
- Hospodka, J., Buben, O., Randáková, M., Bokšová, J. (n.d.). Personal Bankruptcy in the Capital City Region and South Bohemian Region in the Czech Republic. *16th Annual Conference on Finance and Accounting, ACFA Prague 2015, 25*, pp. 41-52.
- ISO 31000:2009 Risk Management – Principles and guidelines (with supporting standard IEC 31010:2009 – Risk Management – Risk assessment techniques)
- Kislíngerová, E. (2013). Estimated development of the number of filings for insolvency and declared bankruptcies in the Czech Republic between 2013 and 2017. *Financial Management of Firms and Financial Institutions: 9th International Scientific Conference Proceedings, PTS I-III*, pp. 356-366.
- Kislíngerová, E., Schoenfeld, J. (2014). The development of insolvency in the entrepreneurial sphere in the Czech Republic during the crisis years. *Managing and Modelling of Financial Risks: 7th International Scientific Conference, PTS I-III*, pp. 367-378.
- Maixner, J., Hospodka, J., Randáková, M., Bokšová, J. (2014). Personal Bankruptcy in The South Bohemian Region in The Czech Republic. *International Conference on Accounting, Auditing, and Taxation (ICAAT 2014)*, pp. 105-111.
- Pittman, M., Ivry, B. (2009). U.S. Taxpayers Risk \$9.7 Trillion on Bailout Programs.

Would the Russian Economy Turn into a Lost Decade?

Miloš Bikár¹, Katarína Vavrová², Mariana Sedliáčiková³

¹ University of Economics in Bratislava
Faculty of Business Management, Corporate Finance Department
Dolnozemská cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: milos.bikar@gmail.com

¹ University of Economics in Bratislava
Faculty of Business Management, Corporate Finance Department
Dolnozemská cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: katarina.vavrov10@gmail.com

³ Technical University in Zvolen
Faculty of Wood Sciences and Technology, Department of Business Economics
Ul. T.G.Masaryka 24, 960 53 Zvolen, Slovak Republic
E-mail: sedliacikova@tuzvo.sk

Abstract: *During the last couple of years the Russian economy was marked by a severe problems, those could turn into a quite long-lasting recession. The economic sanctions and low commodity prices caused significant damage and economic turmoil. The corporate and state-controlled investment into Russia significantly fell jointly with sharp rubble depreciation against major currencies. The paper deals with the analyses and predictions of the Russian economy development and the main factors influencing the current and future economy and the structure of GDP. The objective of this article is to analyse the time-varying nature among Russian GDP, oil prices and some major macroeconomic variables. The results of the carried out research reflected that the oil prices has played a key role and has indeed changed the nature of correlation relationship between analysed variables. The paper highlights the monetary policy including currency prediction, public debts, inflation levels, as well as commodity export dependency.*

Keywords: fiscal and monetary policy, commodity prices, exchange rate volatility, currency movements, public finances

JEL codes: F34, G15, G18, H60

1 Introduction

More than ten years ago, the Russia economy was on a good track, driven by foreign direct investment inflow, growing consumption, productivity and economic output, low public debt, raising commodity prices and stable public finances. The global financial crises starting in 2008 in USA, expanded to the rest of the world in 2009-2010, caused significant revision of potential growth in most advanced economies and has been particularly sharp in countries most exposed to commodity price developments. As stated in the World Bank (2014) report, frail domestic demand with zero investment growth dragged the Russian economy close to stagnation. The economic sanctions in Russia pulled down the potential growth further and jointly with low oil prices and persistently weak demand, resulted to a recession, which could turn in a pessimistic scenario to a lost decade.

The Russia economy have drawn the attention of investors, policy makers and research academics across the world. Several studies have focused on the correlation between the commodity prices and the Russia economic output, dependency of oil prices and state budget development, the general economic environment and foreign direct investment and currency volatility and reactions to different shock scenarios.

Conceptual views on the Russia economic development are similar and point out on the one hand, an inevitable structural reforms across all economy and industry sectors and on the second hand, strong correlation between input commodity prices and achieved

economic results (Bikár, 2013). As confirmed by the study of Gaddy and Ickes (2010), Russia's oil and gas give an unmatched source for generating wealth. The problem is, how those source are used, mainly how inefficient sector and companies as addictive are laying claims to an inordinate share of the rents, and how to restrain the addiction to the ensuing rents. The problem for Russia is how to move away from addiction within the confines of the rent management system that Putin has created. Kudrin and Gurvich (2015) found out that commodity markets substantially accelerated output growth allowed record increases in incomes (wages for all sectors of the economy, including the public sector, pensions, etc.) and improved macroeconomic stability. However, significant resources aimed at modernizing the economy failed to produce tangible results, as Russia's international competitiveness has not fundamentally improved. This casts doubt on the possibility that a resource approach can foster conditions for long-term economic growth. They came to a conclusion that even if oil prices suddenly recover rapidly, the Russia model based on imported growth would still fail to ensure economic growth. Bogetic and Olusi (2013) carried out the research study analysing the divers of firm-level productivity in Russia's manufacturing sector using Cobb-Douglas production function. They found out, that productivity grew steadily between 2003 and 2008, with an annual growth rate averaging 4% over the period, showing no signs of a slowdown from the previous period after the 1998 crisis. González et al. (2013) applied a model searching up factors influencing the Russian volatility. They proved that Russian manufacturing output growth is characterized by a higher volatility than other comparator countries. Higher volatility is mostly driven by the presence of more numerous, deeper and longer slumps and is mostly associated with aggregate slumps with yearly effects. In addition, as shown by study of Sharafutdinova and Kisunko (2014) and Reisinger and Moraski (2013), the Russia is characterized by close informal ties between the authorities and business. In means, that the regional diversity in business climate - regional location was found to be significantly correlated with firms' perceptions of administrative burden, corruption, and state capture indicators.

In a more recent study, Deev and Hodula (2016) investigated the interdependence of the sovereign default risk and banking system fragility in Russia, using credit default swaps as a proxy for default risk. The typical feature is that the biggest state-owned universal banks in emerging markets are closely managed by the government. But the fragility of those banks does not directly affect the state of public finances. However, in cases where state-owned banks directly participate in large governmental projects, banking fragility may result in the deterioration of state funds, while raising the risk of sovereign default. Mau (2016) analysed an anti-crisis measures and effect of the external shocks for the key Russian export products and claims, that there were serious structural problems that have reduced growth potential since the middle of the past decade, and have caused stagnation in the Russian economy. Another aspect of the economy is connected with the Russia's defense spending. According to study of Oxenstierna (2016), behind the rise in the defense budget was the new state armament program 2011–2020, with the ambition, that by 2020, 70% of the Armed Forces' arms were to be modern. However, the failure to modernize the economy and make it less dependent on hydrocarbons and more innovative led to weak growth after 2009, which means that rising defense spending has become more costly to the economy. The substance of the Russian economy in a near future, would still be heavily dependent on the oil prices (Kudrin, 2013). As confirmed by the study of Jacks (2013), greater volatility is a slightly more certain prospect for real commodity prices in the future. He assumes, that anything can be done to mitigate this volatility in a coordinated fashion either through market or policy mechanisms, this volatility will certainly continue to affect the growth prospects of nations, particularly those which are commodity exporters and which have relatively low levels of financial development.

The paper deals with the analyses and predictions of the Russian economy development and the main factors influencing the current and future economy and the structure of GDP. The objective of this article is to analyse the time-varying nature among Russian GDP, oil prices and some major macroeconomic variables.

2 Methodology and Data

To suggest the regression model, it was required a use of methods of summary, synthesis and analogy of the knowledge and creation of a short literature review. Second, it was done a data collection. In our model there were used yearly data and our time series range from 1996 to 2016 (21 observations). While similar studies generally use quarterly data, we decided to work on a yearly frequency due to the difficulty of capturing the precise quarterly data. It were used the time series from the QUANDL DataStream. To capture the dynamics of our model, it was used as a dependant variable GDP output, as a measure of economic activity. Next, it was used Brent crude oil prices (Europe quotes) and consumer price index to include the inflation trend (CPI including regulated prices). Further, the real effective RUB/EUR exchange rate was used to incorporate the monetary policy shock (currency depreciation) into our framework. Last, we incorporated into model the government yearly budget debt and the cumulative debt to GDP to analyse the influence on public finances. All variables are in percentage change over the same period in the previous year except an exchange rates. The selected parts of data series are plotted in a Figures 1-3. Regarding the methodology, we were used a method of multiple regression in order to explain the relationship among the independent variables to the dependent variable, according the formula (Hair et al., 2010):

$$Y = a + b_1x_1 + b_2x_2 + \dots + b_x x_x \quad (1)$$

where Y is the value of the Dependent variable (Y), a (Alpha) is the Constant or intercept, and b_1 is the slope (Beta coefficient) for x_1 , x_1 first independent variable that is explaining the variance in Y, b_2 is the slope (Beta coefficient) for x_2 , x_2 second independent variable that is explaining the variance in Y, and so on. The computations were completed in Eviews. Table 1 reports the data, mnemonics, descriptions, sources and specifications.

Table 1 Dataset Description

Variable	Description	Source	Specification
BRENT	Crude Oil Price: Brent Europe	Quandl	annualized, SA
INFLATION	Consumer price index	Quandl	percent, SA
RUB_EUR	Real effective exchange rate RUB/EUR	Quandl	annualized, SA
BUDGET_DEBT	Government Yearly Budget Debt to GDP	Quandl	percent, SA
CUMM_DEBT	Cumulative Debt to GDP	Quandl	percent, SA

Note: SA=seasonally adjusted
Source: Own production, 2016

3 Results and Discussion

In this section, the multiple regression estimates for the Russia GDP and chosen independent variables – Brent crude oil, consumer price index, real effective exchange rate RUB/EUR, Government Yearly Budget Debt to GDP and finally Cumulative Debt to GDP. The output from the model confirmed the negative correlation among three selective variables (crude oil, exchange rate and cumulative debt), while two other variables (inflation and government yearly budget debt) show the positive contribution to the economic output.

Experienced have showed that external shocks should be addressed with monetary and fiscal consolidation. Cash injection in such a situation would lead to increasing inflation and undermine, rather than stimulate, investment activity. This was confirmed by Russia as well, when the inflation jumped to a double digit level in 2015, followed by reduction trend in this fiscal year (see Fig.1). A healthy expansion of budget funding is also very

difficult due to the sharp declines in budget revenues, as the demand for military funding is increasing.

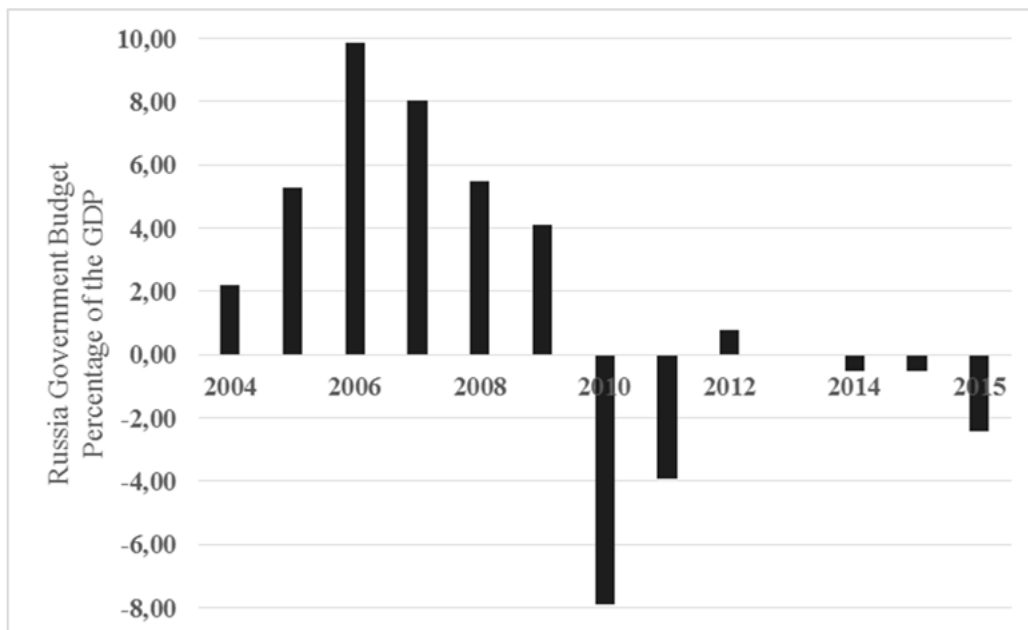
Figure 1 Russia GDP Growth Annual Rate and Monthly Inflation Rate



Source: Quandl, 2016.

Russia tend to have a surplus of government budget up to 2009, being able to generate extra sovereign fund, driven mainly by high export commodity prices. But since the global financial crises, the Russia GDP annual growth significantly suffer, and after rapid decline of crude oil prices (since end of 2014 reaching a bottom in February 2016) turned to a negative numbers. The generally weak global demand supported by lower China GDP growth cause low levels of commodity prices, what was immediately reflected in a gap of export revenues and deficit public finances (see Fig. 2).

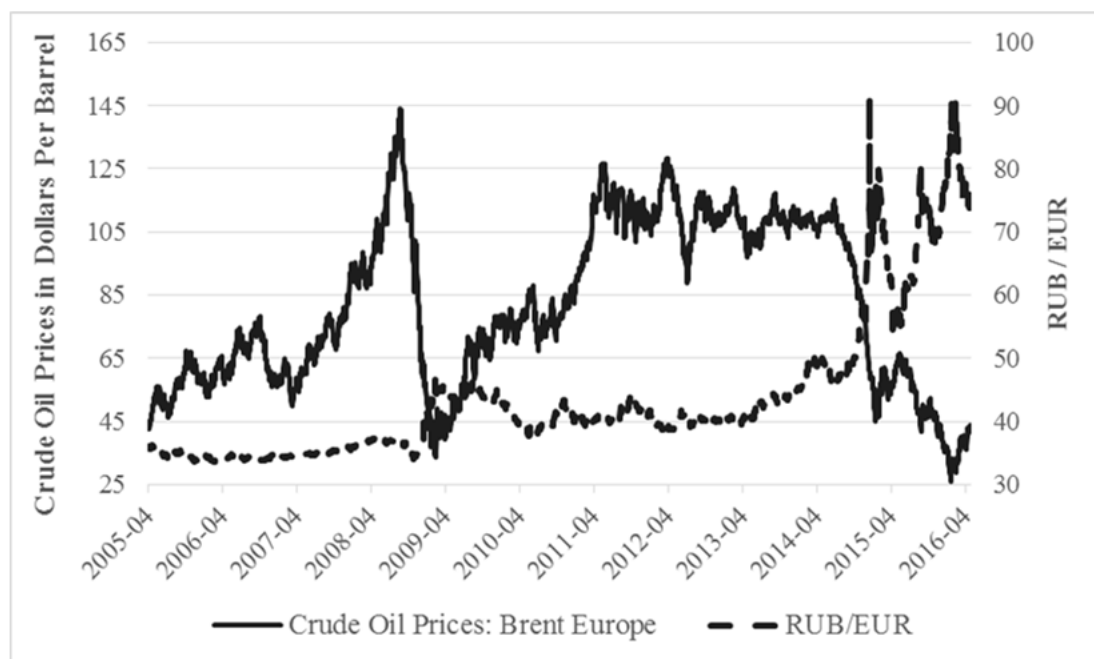
Figure 2 Russia Government Budget as a % of the GDP



Source: Quandl, 2016

The government debt to GDP in Russia averaged 26.1% from 1999 until 2014, reaching an all time high of 99% in 1999 and a record low of 7.9% in 2008. The trend changed rapidly in a last couple of years, as the Russia recorded a cumulative government debt to GDP of 17.9% in 2014, respectively 25.3% in 2015 and forecasted 35% in 2016 (The Central Bank of the Russian Federation, 2016). The ruble fell rapidly following the imposition of external sanctions and the decline of oil prices (see Fig.3), and monetary authorities opted to hold the reserves, rather than spending them to maintain the national currency. The dynamics of the real exchange rate were largely shaped by changes in the terms of trade for the Russian economy.

Figure 3 Correlation between Crude Oil Prices Brent and Exchange Rate RUB/EUR



Source: Quandl, 2016

The next table below summarises the model output including the regression equation.

Table 2 Model Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2226.29	2340.27	-0.9881	0.3490
Brent	-0.1079	0.0904	-1.1907	0.2535
Inflation	0.0248	0.0623	0.3979	0.6966
Rub_EUR	-0.4591	0.3125	-1.4690	0.1639
Budget_Debt	0.4767	0.2662	1.7907	0.0949
Cummulat_Debt	-0.0412	0.0580	-0.7101	0.4892
R-squared	0.5969	Mean dependent var.		2.9704
Adjusted R-squared	0.4242	S.D.dependent var.		4.9607
S.E. of regression	3.7641	Akaike info criterion		5.7501
Sum squared resid	198.3645	Schwarz criterion		6.0983
Log likelihood	-53.3763	Hannan-Quinn crit.		5.8256
F-statistic	3.4561	Durbin-Watson stat		2.1890

Source: Own calculation (Eviews), 2016

Regression equation:

$$\text{GDP} = -2267.29269162 - 0.107649652183 \cdot \text{BRENT} + 0.0248209780198 \cdot \text{INFLATION} - 0.459163220786 \cdot \text{RUB_EUR} + 0.476754797483 \cdot \text{BUDGET_DEBT} - 0.0412225505577 \cdot \text{CUMMULATIVE_DEBT}$$

Further we analyse covariance coefficient and correlations among selective variables. There are positive relations among crude oil prices, inflation and an exchange rate movement, while negative correlations are among budget debt and cumulative debt against all other variables (Table 3). The result confirm the strong dependence of the Russia economy on oil prices. The lower the oil prices, the higher budged debt and cumulative debt as well.

Table 3 Coefficient Covariance Matrix

	BRENT	INFLATION	RUB_EUR	BUDGET_DEBT	CUMM_DEBT
BRENT	0.0081	0.0006	0.0254	-0.0108	-0.0026
INFLATION	0.0006	0.0038	0.0024	-0.0024	-0.0012
RUB_EUR	0.0254	0.0021	0.9760	-0.0403	-0.0117
BUDGET_DEBT	-	-0.0024	-0.0403	0.0708	0.0107
CUMM_DEBT	0.0108	-	-0.0117	0.0107	0.0033
	-	-0.0012	-	-	-
	0.0026				

Source: Own calculation (Eviews), 2016

The results confirmed the strong dependence of the Russia economy on oil prices. The lower the oil prices, the higher budged debt and cumulative debt as well (Tuzova and Quayum, 2016). Second, the Russian government debt is less sensitive to FX shocks, and in spite of the Russia cut off from the international markets, the balance of payment gap was primary finance through sufficient FX reserves. The Central Bank of Russia is still able to help the Russian businesses with liquidity in order to roll over their debt.

The Russian economy need to solve the structural problem via the diversification from the heavy reliance on the export of oil and hydrocarbons, improve the business climate for small and medium-sized businesses and suppress the corruption (Gurvich, 2013). The modernization program launched in 2009 addressed mentioned problems, but it was too much of a challenge for the ruling political elites and never materialized. It is evident that firms' geographical location matters and that regional variation in business environment might potentially be an important factor for explaining differences in firms' entry, growth and productivity and, consequently, regional economic development and prosperity (Frijters, Nemanja, 2016).

Regarding the prediction of the Russia economy the GDP in 2016 should amount -1.8% with a return to a positive growth of 0.8% in 2017 (The Central Bank of the Russian Federation, 2016). Weak domestic demand will be the main factor behind the inflation decline in 2016-2017. Slower consumer price growth will also be based on cuts in producer costs, moderate global food price dynamics and tentative decline in inflation expectations. The Bank of Russia's monetary policy may remain moderately tight over a longer period of time than expected. Besides, the key rate level will be determined given the influence of decreasing structural liquidity deficit and possible transition to a structural liquidity surplus as a result of massive Reserve fund expenditures in order to cover the budget deficit.

4 Conclusions

This paper investigated the link between the Russia GDP and selected independent variables (Brent crude oil, consumer price index, real effective exchange rate RUB/EUR, government yearly budget debt to GDP and cumulative debt to GDP). We relied on the multiple regression method to establish whether the correlation among dependent and independent variables would capture their mutual relation. Our main findings can be

summarized as follows. The selected variables imbedded into model describe the dependent variable for almost 60%. Generally this number should be higher, but in a case of Russia, the other, mainly non-measurable qualitative factors amounts for remaining 40% of the GDP development. The output from the model confirmed, that the key role in a direction of Russia GDP play oil and commodity prices, their recovery would immediately help to stabilize the state budget and export revenues.

The other aspect of GDP growth (not captured by our model) is connected with the specific feature of the Russia economy. Despite the change of system from a command economy to a market economy, the institutions that normally support market allocation are weak, and in many ways they are overruled by the informal institutions surviving from the Soviet era. That Russia's institutions are deficient is reflected in the Worldwide Governance Indicators (WGI, 2014). The WGI project constructs aggregate indicators of six broad dimensions of governance: political stability and absence of violence/terrorism; voice and accountability; government effectiveness; regulatory quality; rule of law; and control of corruption. When these indicators are studied over time, it is found that in Russia they have generally been low, that they improved up to the early 2000s, but that since 2004 there has been a marked deterioration in vital institutions (Oxenstierna, 2016). Weak institutions create scope for manual management of economic matters, which is also a reason why institutions need to be kept weak – so that political goals rather than economic goals can be pursued.

Business activity indicators in the global economy remained mixed in the absence of clear points of growth. As before, the greatest concerns were evoked by the growth prospects of the Chinese economy and other EMEs. The economic activity indicators for several large developed countries in particular in the euro area, which is Russia's key trading partner, were more stable and remained relatively high in comparison with recent years, what gives a chance for soon recovery of the Russian economy and return to stabilize economic environment.

Acknowledgments

The presented working paper is the output of the scientific grants VEGA n. 1/0007/16 The impact of the global economic developments and trends in the direction of the euro area economy on financial management of business entities in Slovakia.

References

- Bikár, M. (2013). The trends of the development of the Russian economy. *International journal of Science, Commerce and Humanities*, Vol. 1, No. 7, pp. 102-111.
- Bogetic, Z., Olusi, O. (2013). Drivers of firm-level productivity in Russia's manufacturing sector. *World Bank Policy Research Working Paper 6572*, pp. 29.
- Deed, O., Hodula, M. (2016). Sovereign default risk and state-owned bank fragility in emerging markets: evidence from China and Russia, *Post-Communist Economies*, Vol. 28 (2), pp. 232-248.
- Frijters, P., Nemanja, A. (2016). Can collapsing business network explain economic downturns? *Economic modelling*, Vol. 54, pp. 289-308.
- Gaddy, C., G., W. Ickes, B., W. (2010). Russia after the Global Financial Crisis. *Eurasian Geography and Economics*, Vol. 51, No. 3, pp. 281-311.
- González, A., Iacovone, L., Subhash, H. (2013). Russian volatility: Obstacle to firm survival and diversification. *World Bank Policy Research Working Paper 6605*, pp. 36.
- Gurvich, E. (2013). Долгосрочные перспективы российской экономики. Экономическая политика № 3, С. 7-32. Long-term development prospects for the Russian economy. *Ekonomicheskaya Politika* No. 3, pp. 7-32.
- Hair, J.F., Black, W.C, Babin, B.J., Anderson, R.E. (2010). *Multivariate Data Analysis*, 7th Edition. New Jersey: Pearson Education, USA. ISBN: 9780138132637.

Jacks, D. (2013). From Boom to Bust: A Typology of Real Commodity Prices in the Long Run. *NBER Working Paper No. 18874*. pp. 62. Retrieved from: [http://www.sfu.ca/~djacks/papers/workingpapers/w18874%20\(typology\).pdf](http://www.sfu.ca/~djacks/papers/workingpapers/w18874%20(typology).pdf).

Kudrin, A. (2013). Влияние доходов от экспорта нефтегазовых ресурсов на денежно-кредитную политику России. *Вопросы экономики*. № 3. С. 4–19. The Influence of Oil and Gas Exports on Russia's Monetary Policy. *Voprosy Ekonomiki* No. 3, pp. 4–19.

Kudrin, A., Gurvich, E. (2015). A new growth model for the Russian economy. *BOFIT Policy Brief*, No. 1, Bank of Finland, Institute for Economies in Transition, pp. 1-35. Retrieved from: [http://www.eeg.ru/files/lib/Kudrin-Gurvich%20\(BOFIT-2015\).pdf](http://www.eeg.ru/files/lib/Kudrin-Gurvich%20(BOFIT-2015).pdf).

Mau, V. (2016). Anti-crisis measures or structural reforms: Russian economic policy in 2015. *The Russian Journal of Economics*, Vol. 2, pp. 1–22.

Oxenstierna, S. (2016). Russia's defense spending and the economic decline. *Journal of Eurasian Studies*, Vol. 7, Issue 1, pp. 60–70.

Reisinger, W., Moraski, B. (2013). Deference or Governance? A Survival Analysis of Russia's Governors under Presidential Control. In: *Russia's Regions and Comparative Subnational Politics*, W. Reisinger (ed.), London: Routledge, pp. 40–62.

Sharafutdinova, G., Kisunko, G. (2014). Governors and governing institutions: A comparative study of state-business relations in Russia's regions. *World Bank Policy Research Working Paper 7038*, pp. 46.

The Central Bank of the Russian Federation (2016). *Monetary policy report*. Moscow, March 2016, pp-58. Retrieved from: http://www.cbr.ru/Eng/publ/ddcp/2016_01_ddcp_e.pdf.

Tuzova, Y., Quayum, F. (2016). Global oil glut and sanctions: The impact on Putin's Russia. *Energy Policy*, Vol. 90, pp. 140-151.

World Bank (2014). Confidence Crisis Exposes Economic Weakness. *Russia Economic Report No. 31*. Washington D.C., pp. 60.

World Bank (2014). Worldwide Governance Indicators. *Country Data Report for Russian Federation, 1996-2014*. Retrieved from: <http://info.worldbank.org/governance/wgi/index.aspx#countryReports>.

Quandl (2016). Russia GDP Growth Annual Rate and Monthly Inflation Rate. Russia Government Budget as a % of the GDP. Crude Oil Prices Brent and Exchange rate RUB/EUR. Retrieved from: https://www.quandl.com/data/OECD/NAAG_RUS_GDPG-Russia-Gross-Domestic-Product-Gdp-Volume-Annual-Growth-Rates-Percentage, https://www.quandl.com/data/RATEINF/INFLATION_RUS-Inflation-YOY-Russia, <https://www.quandl.com/data/FRED/DCOILBRETEU-Crude-Oil-Prices-Brent-Europe>, <https://www.quandl.com/data/ECB/EURRUB-EUR-vs-RUB-Foreign-Exchange-Reference-Rate>.

Oil Price and European Stock Markets

Gábor Bóta¹, Mihály Ormos²

¹ Budapest University of Technology and Economics, Department of Finance
Magyar tudósok krt. 2., 1117 Budapest, Hungary
E-mail: bota@finance.bme.hu

² Budapest University of Technology and Economics, Department of Finance
Magyar tudósok krt. 2., 1117 Budapest, Hungary
E-mail: ormos@finance.bme.hu

Abstract: *In this paper we investigate the effects of oil price changes on European stock returns. We run regressions for extended versions of different market equilibrium models: (standard CAPM, Fama-French 3 factor model, Carhart four-factor model) incorporating oil price changes. We also separate different market situations based on the oil price. Our results suggest that from among the investigated European industry indexes oil and gas companies have higher exposure to oil price changes than other companies from other industries. When examining the broad oil and gas industry on a sub-sector level we can detect some significant differences.*

Keywords: asset pricing, oil price

JEL codes: G12, G15

1 Introduction

The economic effects of oil price changes have been investigated extensively in the past decades. One direction of research (e.g.: Hamilton 1983, Mork 1989, Jones et al. 2004) concentrates on the macroeconomic consequences of oil price shocks. Other papers (e.g.: Chen, Roll and Ross 1986, Basher and Sadorsky 2006, Nandha and Hammoudeh 2007, Fang and You 2014) focus the relationship between oil prices and stock market returns and the results are highly dependent on the countries, regions, industries and even periods examined. Aloui et al. (2013) show positive (however varying) dependence between oil price changes and returns of Central and Eastern European stock market indexes. Asteriou and Bashmakova (2013) find that the reaction of CEE stock returns to oil price changes is more significant when oil prices are low. Articles examining stock returns on sectoral level find that oil and gas industry of Australia (Faff and Brailsford 1999), Canada (Boyer and Fillion 2007), Europe (Arouri and Nguyen 2010) and the UK (El Sharif et al 2005) has all significant sensitivity to oil price changes. Nandha and Faff (2008) detect a negative impact of oil price increases on returns for all of the examined 35 global sectors except mining, and oil and gas industries. Ramos and Veiga (2011) show that oil price has a positive impact on global oil and gas industry returns, however oil price is a more important factor in developed countries than in emerging markets. Nandha and Brooks (2009) also document substantial differences in the role of oil price changes in determining transport sector returns between developed and emerging countries. Oberndorfer (2009) shows that oil price changes positively related to returns of oil and gas stock returns in the Eurozone. Mohanty et al. (2010) find no significant relation between oil prices and returns of CEE oil and gas companies. Narayan and Sharma (2011) not only find positive relation between oil price changes and returns of US energy and transportation companies but they report adverse effects for stock returns of companies representing other sectors.

We examine the effects of oil price changes on returns of European sectoral stock indexes. As the examined period ends in April 2016 we can detect the effects of latest developments in oil prices, especially the decline from mid-2014 to early-2016. By distinguishing the bullish and bearish oil market sub-periods our results help to understand not just the general effects of oil price changes on the return generating process of various European industries (and sub-sectors of the broad oil and gas industry), but to detect the differences in distinct oil market conditions.

2 Methodology and Data

We apply different equilibrium models to capture the excess returns of the examined indexes and to calculate the explanatory power of the different models. We run ordinary least squares regressions with different set of explanatory variables.

The first equilibrium model we use is the standard Capital Asset Pricing Model (CAPM) proposed by Sharpe (1964), Treynor (1961), Lintner (1965), and Mossin (1966), and is in the following form, where r_i represents the return of the index; α represents the constant term of the regression, i.e., the abnormal return; β a relevant risk parameter that is estimated as the independent variable of the regression; r_M represents the market return; and ε represents the error term of the regression:

$$r_i = \alpha + \beta r_M + \varepsilon \quad (1)$$

The second equilibrium model is the Fama and French (1992, 1993, 1996) three-factor model. The authors extend the explanatory variable using the *SMB* (small minus big) and *HML* (high minus low) factors respectively, to capture the size premium and the value over growth premium. The model is written as follows, where the β variables represent the regression coefficients and r_M , *SMB* and *HML* are the market, size, and value premiums, respectively:

$$r_i = \alpha + \beta_M r_M + \beta_{SMB} SMB + \beta_{HML} HML + \varepsilon \quad (2)$$

Carhart (1997) extends the three-factor model using a momentum (*MOM*) parameter that measures the tendency for the share price to continue increasing if it was previously increasing and its tendency to continue decreasing if it was previously decreasing. Therefore, the model can be written in the following form, where β_{MOM} captures the excess return gained by the persistency of the previous month's return and *MOM* stands for the momentum factor:

$$r_i = \alpha + \beta_M r_M + \beta_{SMB} SMB + \beta_{HML} HML + \beta_{MOM} MOM + \varepsilon \quad (3)$$

Table 1 Descriptive Statistics of the Indexes and Oil and Market Proxies

Name	Code	Obs.	Avg. return	SD	Skew.	Kurt.	JB-prob.
CRSP Europe	Mkt-rf	310	0.005	0.050	-0.598	1.591	0.000
Oil price	Oil	310	0.003	0.106	-0.258	1.414	0.000
Oil and Gas (103)	OILGS	310	0.007	0.062	-0.434	1.148	0.000
Oil and Gas Producers (62)	OILGP	310	0.007	0.062	-0.353	0.896	0.000
Exploration and Production (27)	OILEP	310	0.009	0.081	-0.471	3.041	0.003
Integrated Oil and Gas (35)	OILIN	310	0.007	0.061	-0.329	0.802	0.000
Oil Equip. Services and Distrib. (30)	OILES	310	0.002	0.093	-0.891	3.050	0.000
Oil Equipment and Services (25)	OILSV	310	0.002	0.093	-0.880	2.976	0.000
Pipelines (5)	PIPEL	254	0.006	0.085	-1.177	4.611	0.000
Alternative Energy (11)	ALTEN	216	0.013	0.123	-0.727	2.131	0.000
Renewable Energy Equipment (9)	RENEE	216	0.012	0.125	-0.730	2.110	0.000
Alternative Fuels (2)	ALTFL	115	-0.005	0.107	0.234	0.282	0.000
Basic Materials (154)	BMATR	310	0.006	0.070	-1.028	4.591	0.000
Industrials (566)	INDUS	310	0.006	0.063	-0.870	2.292	0.000
Consumer Goods (330)	CNSMG	310	0.007	0.058	-0.752	1.525	0.000
Health Care (149)	HLTHC	310	0.008	0.041	-0.454	1.326	0.000
Consumer Services (318)	CNSMS	310	0.006	0.054	-0.617	1.574	0.000
Telecommunications (54)	TELCM	310	0.006	0.063	-0.397	1.471	0.000
Utilities (87)	UTILS	310	0.007	0.053	-0.586	1.410	0.000
Financials (556)	FINAN	310	0.005	0.067	-0.846	4.240	0.000
Technology (142)	TECNO	310	0.007	0.086	-0.344	1.605	0.000

Source: Based on data from Thomson Reuters

We use monthly total return data (in USD) of European Datastream equity indexes of different industries for the period July 1990 – April 2016 provided by Thomson Reuters. There are ten top-level sector Europe-Datastream indexes taken into consideration as well nine sub-sector indexes of the oil and gas industry. The descriptive statistics of the monthly returns of the market proxy, oil price and the indexes are summarized in Table 1. (The number of constituents of the examined indexes are in brackets). The oil price is represented by the Brent USD per barrel price (also from Thomson Reuters). The market (CRSP Europe Value Weighted Return Premium), size, value and momentum factors are the European factors from Kenneth R. French's data library. In order to separate different oil market conditions we use an oil price dummy variable which equals 1 when the oil price return of the given month is above the mean return of the whole investigated period and equals 0 when it is below the mean.

3 Results

We run the equilibrium linear regression models for the monthly returns of the sample period of 1990-2015. The main focus of our investigation is the oil and gas sector; thus we collect the different models in two distinct array: Table 2 presents the parameter estimations for the Oil and Gas sector with its constituent subsectors and Table 3 presents the results of the broad industry sectors. For this full period the standard CAPM beta, thus the sensitivity for the market proxy is significant for all industrial segments and for the oil and gas sub-segments as well. The average determination coefficient is 0.547. The two smallest indexes: Pipelines and Alternative fuel sub-industries represent the lowest R^2 s with 0.135 and 0.245 with five and two constituents respectively. We find the two broadest industry sectors with R^2 s above 0.8; the Industrials and Financials with 0.844 and 0.813 respectively. The average R^2 s of the Oil and Gas sector is 0.406 that is significantly lower than for the remaining broad indexes which represents an average 0.684 determination coefficient in the standard CAPM frame work. The average parameter estimations for the oil and gas sector and for the other broad indexes are not significantly different with 0.98 and 1.03 respectively. The oil and gas industry subsectors bearing the highest risk are Alternative Energy and Renewable Energy Equipment with a beta value of 1.51 and 1.50 respectively. This result suggests that the most advanced and sustainable energy sectors are still are handled with caution by the investors and they require higher risk premium to invest into these companies. On the other hand Pipelines bearing the lowest risk with 0.62 beta that suggest investors expects pipeline industry is not heavily exposed to exogenous shocks affect the capital markets. The standard oil and gas production (OILGP) exhibit 0.936 of beta; thus, it follows the market evenly, while Oil Equipment, Services and Distribution has higher risk of 1.28.

Adding the oil returns to the standard CAPM generates 10.1% higher R^2 s for the Oil and gas index; however, it gives only a slight increase (0.3% on average) in the case of the broader indexes. This result shows that the oil and gas companies have much higher exposure to oil prices than the other industries. The oil beta is significant at 1% in the case of all the oil and gas sub-industry indexes but the pipelines only at 5% and it is an interesting fact that the alternative fuel industry exhibit no significant sensitivity to oil prices. The other broader industries exhibit low sensitivity to oil prices as only the Basic materials index has a 1%, Healthcare has a 5% and Telecommunication a 10% significant sensitivity and to oil and all remaining industries are not significant on any usual levels. The market betas are still significant in all cases, and they are decreased by 0.115 in all oil industry segment. In the Fama and French (1996) equilibrium framework we find only a slight increase in the R^2 s compared to the standard CAPM and these are remarkably lower than that of the CAPM+oil model. However, one can find significant SMB and HML parameters in many cases. It is an interesting fact that on the one hand the oil and gas sector as a whole exhibits significant HML and non-significant SMB parameter. On the other hand most of the oil and gas subsectors are significantly sensitive to the SMB factor suggesting positive size premium. HML is positive and significant in all cases but for Alternative Energy (Renewable Energy Equipment and

Alternative Fuels). Thus; on the one hand most of the oil companies behaves like small firms but exhibit high book value compared to their market value. We measure mixed results in the cases of the remaining indexes; both the sign of the parameter estimation and the significance level is changing from sector to sector.

Table 2 Equilibrium Models and Their Oil Extended Version for the Oil and Gas Industry and Its Sub-sector Indexes.

	Alpha	Beta M	Beta SMB	Beta HML	Beta MOM	Beta Oil	R ²
OILGS	-0.0289	0.9633***					0.5752
	0.0130	0.8484***				0.2014***	0.6765
	-0.1103	0.9426***	0.1003	0.2840***			0.5849
	-0.0600	0.8045***	-0.1410	0.2834***		0.2102***	0.6887
	-0.0871	0.9383***	0.1013	0.2763**	-0.0200		0.5837
OILGP	-0.0253	0.7980***	-0.1398	0.2719**	-0.0299	0.2104***	0.6880
	-0.0105	0.9361***					0.5542
	0.0309	0.8224***				0.1992***	0.6553
	-0.0911	0.9136***	0.0768	0.2833***			0.5635
	-0.0410	0.7762***	-0.1634*	0.2827***		0.2093***	0.6685
OILEP	-0.0685	0.9094***	0.0778	0.2758**	-0.0196		0.5622
	-0.0069	0.7698***	-0.1622*	0.2714**	-0.0294	0.2095***	0.6677
	0.1391	1.0399***					0.3947
	0.1965	0.8825***				0.2758***	0.5065
	0.0141	1.0625***	0.7967***	0.3750**			0.4490
OILIN	0.0732	0.9004***	0.5134***	0.3743***		0.2468***	0.5328
	0.0838	1.0496***	0.7996***	0.3518**	-0.0602		0.4479
	0.1565	0.8847***	0.5162***	0.3466**	-0.0719	0.2473***	0.5323
	-0.0378	0.9236***					0.5448
	0.0029	0.8120***				0.1955***	0.6432
OILES	-0.1164	0.8976***	0.0268	0.2812***			0.5535
	-0.0665	0.7607***	-0.2125**	0.2806***		0.2085***	0.6587
	-0.0995	0.8945***	0.0275	0.2755**	-0.0146		0.5521
	-0.0381	0.7554***	-0.2115**	0.2711**	-0.0245	0.2086***	0.6577
	-0.6385	1.2849***					0.4660
OILSV	-0.5849	1.1380***				0.2574***	0.5408
	-0.7546**	1.3078***	0.7638***	0.3460**			0.5032
	-0.6997**	1.1574***	0.5007***	0.3454**		0.2291***	0.5586
	-0.5659	1.2731***	0.7717***	0.2833*	-0.1629		0.5059
	-0.4982	1.1195***	0.5077***	0.2784*	-0.1738*	0.2304***	0.5621
PIPEL	-0.6596*	1.2924***					0.4624
	-0.6046*	1.1415***				0.2643***	0.5397
	-0.7794**	1.3136***	0.7594***	0.3598**			0.4990
	-0.7228**	1.1581***	0.4876***	0.3592**		0.2368***	0.5570
	-0.5913	1.2790***	0.7673***	0.2973*	-0.1624		0.5015
ALTEN	-0.5214	1.1202***	0.4945***	0.2923*	-0.1737*	0.2381***	0.5604
	0.0800	0.6161***					0.1349
	0.0736	0.5531***				0.1046**	0.1473
	-0.1305	0.5980***	0.5420**	0.5969***			0.1762
	-0.1286	0.5399***	0.4465**	0.5993***		0.0838*	0.1824
RENEE	-0.0348	0.5789***	0.5469**	0.5673**	-0.0779		0.1742
	-0.0339	0.5212***	0.4515**	0.5701**	-0.0770	0.0836*	0.1804
	0.5400	1.4968***					0.4310
	0.4906	1.3936***				0.1657***	0.4486
	0.3962	1.5371***	0.7674***	0.0282			0.4459
ALTFL	0.3866	1.4467***	0.5983**	0.0314		0.1294**	0.4547
	0.4701	1.5188***	0.7787***	0.0021	-0.0676		0.4438
	0.4537	1.4304***	0.6091**	0.0077	-0.0614	0.1289**	0.4525
	0.5252	1.5069***					0.4221
	0.4757	1.4037***				0.1657***	0.4390
RENEE	0.3733	1.5464***	0.7844***	0.0456			0.4371
	0.3637	1.4567***	0.6166**	0.0487		0.1284**	0.4453
	0.4460	1.5285***	0.7955***	0.0199	-0.0665		0.4349
	0.4297	1.4407***	0.6272**	0.0254	-0.0603	0.1280**	0.4431
	-0.8494	0.8953***					0.2447
ALTFL	-0.8046	0.8163***				0.0899	0.2437
	-0.8392	0.8559***	0.5161	0.2160			0.2416
	-0.7858	0.7862***	0.4328	0.2466		0.0699	0.2379
	-1.0198	0.9028***	0.5597	0.4057	0.2702		0.2421
	-0.9664	0.8331***	0.4766	0.4361	0.2700	0.0698	0.2383

Source: Based on data from Thomson Reuters

Table 3 Equilibrium Models and Their Oil Extended Versions for the Broader Industry indexes.

	Alpha	Beta M	Beta SMB	Beta HML	Beta MOM	Beta Oil	R ²
OILGS	-0.0289	0.9633***					0.5752
	0.0130	0.8484***				0.2014***	0.6765
	-0.1103	0.9426***	0.1003	0.2840***			0.5849
	-0.0600	0.8045***	-0.1410	0.2834***		0.2102***	0.6887
	-0.0871	0.9383***	0.1013	0.2763***	-0.0200		0.5837
-0.0253	0.7980***	-0.1398	0.2719***	-0.0299	0.2104***	0.6880	
-0.2057	1.2180***					0.7399	
-0.1870	1.1668***				0.0898***	0.7555	
-0.2902	1.2020***	0.1692	* 0.2886***			0.7504	
-0.2696	1.1453***	0.0701	0.2884***		0.0864***	0.7638	
-0.2480	1.1942***	0.1710	* 0.2746***	-0.0364		0.7499	
-0.2226	1.1365***	0.0717	0.2728***	-0.0405	0.0866***	0.7635	
-0.1398	1.1638***					0.8443	
-0.1366	1.1550***				0.0154	0.8444	
-0.1270	1.1779***	0.1116	* -0.0571			0.8455	
-0.1247	1.1717***	0.1008	-0.0571		0.0094	0.8451	
-0.0249	1.1591***	0.1159	* -0.0910	-0.0881**		0.8477	
-0.0219	1.1524***	0.1043	-0.0912	-0.0886**	0.0101	0.8475	
0.0429	0.9592***					0.6933	
0.0429	0.9592***				0.0000	0.6923	
0.0285	0.9455***	-0.1004	0.0613			0.6936	
0.0300	0.9413***	-0.1077	0.0613		0.0064	0.6927	
0.1355	0.9258***	-0.0960	0.0257	-0.0924*		0.6962	
0.1376	0.9211***	-0.1040	0.0256	-0.0927*	0.0070	0.6954	
0.3270**	0.5948***					0.5163	
0.3186**	0.6177***				-0.0402**	0.5244	
0.3123**	0.5624***	-0.3196	*** 0.0834			0.5470	
0.3068*	0.5776***	-0.2932	*** 0.0834		-0.0231	0.5485	
0.1596	0.5906***	-0.3260	*** 0.1342**	0.1319***		0.5602	
0.1525	0.6066***	-0.2985	*** 0.1347**	0.1330***	-0.0240	0.5620	
-0.0972	0.9851***					0.8147	
-0.0964	0.9830***				0.0038	0.8142	
-0.0266	1.0195***	0.1060	* -0.2648***			0.8295	
-0.0273	1.0216***	0.1096	* -0.2648***		-0.0031	0.8289	
0.0102	1.0127***	0.1075	* -0.2771***	-0.0317		0.8294	
0.0093	1.0147***	0.1109	* -0.2770***	-0.0316	-0.0029	0.8288	
-0.0172	0.9229***					0.5183	
-0.0261	0.9474***				-0.0429*	0.5212	
0.1901	0.9582***	-0.4628	*** -0.7039***			0.6086	
0.1856	0.9706***	-0.4412	*** -0.7039***		-0.0188	0.6081	
0.1171	0.9717***	-0.4658	*** -0.6796***	0.0631		0.6087	
0.1114	0.9845***	-0.4437	*** -0.6792***	0.0640	-0.0193	0.6083	
0.0404	0.8542***					0.6379	
0.0404	0.8544***				-0.0004	0.6367	
-0.0507	0.8207***	-0.0080	0.3296***			0.6575	
-0.0505	0.8202***	-0.0090	0.3296***		0.0008	0.6564	
-0.1630	0.8414***	-0.0127	0.3670***	0.0970**		0.6612	
-0.1630	0.8413***	-0.0129	0.3670***	0.0970**	0.0001	0.6600	
-0.3540**	1.2226***					0.8131	
-0.3594**	1.2375***				-0.0261	0.8140	
-0.4852**	1.1550***	-0.2417	*** 0.4963***			0.8505	
-0.4880**	1.1627***	-0.2282	*** 0.4963***		-0.0118	0.8503	
-0.2960*	1.1202***	-0.2338	*** 0.4333***	-0.1634***		0.8584	
-0.2991*	1.1272***	-0.2216	*** 0.4336***	-0.1629***	-0.0106	0.8582	
-0.2030	1.3353***					0.5804	
-0.2077	1.3483***				-0.0228	0.5797	
0.0883	1.4107***	-0.3458	*** -1.0180***			0.6618	
0.0870	1.4142***	-0.3396	** -1.0180***		-0.0054	0.6608	
0.3410	1.3641***	-0.3353	*** -1.1020***	-0.2182***		0.6697	
0.3398	1.3667***	-0.3309	** -1.1019***	-0.2180***	-0.0038	0.6686	

Source: Based on data from Thomson Reuters

In the next step we add the oil factor to the Fama and French three-factor model. Again we find only a slight increase compared to the CAPM+oil setup and a large increase compared to the standard three-factor model. The increase was moderate in the case of

Pipelines and Alternative Energy sector and was considerably high in the case of the broader Oil and gas index with the Oil Equipment and Services, Oil and Gas Producers and Exploration and Production. The alternative fuel industry still exhibits no significant sensitivity to oil prices. Concerning the broader indexes we find that the oil significance disappears in the case of Healthcare and it plays a significant role only on Basic materials.

We also add the momentum factor to the standard and oil extended Fama and French three-factor model to get the Carhart (1998) model and its extended version. The momentum factors are not significant in any of the oil and gas sector constituent indexes and thus adds no increase to the explanatory power of the model in the standard Carhart framework. By adding the oil to the Carhart model the Oil Equipment, Services and Distribution sector shows 0.174 significant MOM beta factor at 10%, and we find no more change. The broader other industry indexes exhibit mixed sensitivity to the momentum factor: the momentum factor cannot explain the Consumer Services, Telecommunications and Utilities indexes, it has positive and significant effect on Healthcare and Utilities, while significant negative effect on Industrials, Consumer Goods Financials and Technology. Altogether we find that the momentum factor does not add any information to the previous models.

Table 4 Equilibrium Models Extended with Oil Prices and Oil Trend Dummy for the Oil and Gas Industry and Its Sub-sector Indexes.

	Oil alpha	Oil dummy	Beta Beta M	Beta SMB	Beta HML	Beta mom	Beta oil	Oil D x Oil DxM	Oil D x SMB	Oil D x HML	Oil D x MOM	Oil D x Oil	R ²
	-0.352	-0.007	0.881				0.141	-0.065				0.194***	0.684
OILGS	-0.466	-0.007	0.861	0.017	0.234		0.136	-0.140	-0.358*	0.112		0.223***	0.699
	-0.430	-0.007	0.851	0.020	0.223	-0.052	0.136	-0.126	-0.361*	0.131	0.067	0.225***	0.698
	-0.383	-0.007	0.845				0.135	-0.043				0.198***	0.663
OILGP	-0.492	-0.006	0.822	-0.019	0.237		0.133	-0.115	-0.324*	0.104		0.225***	0.678
	-0.448	-0.007	0.810	-0.016	0.224	-0.064	0.132	-0.096	-0.327*	0.130	0.087	0.228***	0.677
	0.927	-0.016	0.947				0.318	-0.128				0.043	0.507
OILEP	0.674	-0.014	0.956	0.605	0.304		0.275	-0.125	-0.234	0.132		0.060	0.530
	0.896	-0.019	0.893	0.620	0.239	-0.320	0.271	-0.034	-0.252	0.256	0.426**	0.075	0.537
	-0.476	-0.007	0.832				0.125	-0.036				0.211***	0.652
OILIN	-0.579	-0.006	0.807	-0.057	0.239		0.125	-0.115	-0.346*	0.096		0.240***	0.670
	-0.553	-0.007	0.799	-0.055	0.232	-0.037	0.125	-0.104	-0.348*	0.113	0.054	0.242***	0.668
	1.027	-0.018	1.141				0.405	0.008				-0.182	0.545
OILES	0.804	-0.016	1.164	0.698	0.206		0.357	-0.024	-0.428	0.253		-0.154	0.563
	1.073	-0.018	1.087	0.716	0.127	-0.388	0.353	0.046	-0.445	0.317	0.360*	-0.152	0.569
	1.009	-0.017	1.141				0.413	0.015				-0.187*	0.544
OILSV	0.774	-0.016	1.161	0.681	0.236		0.365	-0.014	-0.418	0.221		-0.159	0.561
	1.047	-0.018	1.083	0.699	0.156	-0.393	0.361	0.057	-0.435	0.286	0.366*	-0.157	0.567
	0.368	-0.011	0.669				0.099	-0.232				0.106	0.145
PIPEL	0.242	-0.011	0.654	0.106	0.213		0.090	-0.197	0.687	0.793**		0.058	0.191
	0.210	-0.008	0.664	0.102	0.223	0.047	0.092	-0.237	0.693	0.731*	-0.143	0.045	0.186
	0.656	-0.010	1.655				0.119	-0.533**				0.181	0.455
ALTEN	0.352	-0.008	1.628	0.417	0.386		0.090	-0.370	0.184	-		0.175	0.461
	0.435	-0.008	1.590	0.446	0.357	-0.151	0.086	-0.352	0.162	-	0.090	0.172	0.456
	0.666	-0.010	1.674				0.121	-0.551**				0.177	0.446
RENEE	0.356	-0.008	1.646	0.430	0.390		0.091	-0.388	0.190	-		0.170	0.450
	0.438	-0.008	1.609	0.458	0.362	-0.149	0.087	-0.370	0.168	-	0.089	0.168	0.446
	-2.175	0.003	0.923				-0.078	-0.215				0.392	0.237
ALTFL	-2.139	0.003	0.783	0.362	0.560		-0.085	0.043	0.103	-		0.340	0.220
	-2.695	0.008	0.850	0.355	1.138	0.936	-0.051	-0.006	0.140	-	-0.884	0.305	0.227

Source: Based on data from Thomson Reuters

In order to separate different market conditions based on the monthly oil price change we also run the equilibrium models extended with oil price trend dummy. If we compare the determination coefficients of the models using the oil price dummy with the previous ones there is only a slight increase for most of the oil and gas sub-sectors and model settings (and even a minimum decrease in some cases), so the separation of the oil

market conditions does not result in models with higher explaining power. In order to detect the differences of the distinct oil market conditions we run the regressions using the product of the oil price dummy and the other factors. For market, SMB, HML and MOM factors there are very few cases when the product of the given factor and the oil price dummy is significant, thus these factors do not behave differently when oil prices increasing or decreasing. The product of oil price dummy and oil price factor is significant (at 1%) for the broad oil and gas industry index, for oil and gas producers and for integrated oil and gas companies for all (CAPM+oil, 3 factor+oil and 4 factor+oil) model settings so the oil price changes have a significant effect on the return generating process of these companies. For other sub-sectors of the oil and gas industry no significant effects can be detected for any model settings.

4 Conclusions

The regression results for the standard CAPM-model and its extended version with the oil price factor show that for the oil and gas industry and all of its sub-sectors the explanatory power significantly increases when the oil price is taken into consideration, while for other sectors there is only a slight difference in the R^2 s. Oil beta is significant at 1% for all but two of the oil and gas sub-sector indexes, for pipelines oil price is significant only at 5%, while alternative fuel industry exhibit no significant sensitivity to oil prices. From among the other top-level industry indexes only Basic materials (at 1%), Healthcare (at 5%) and Telecommunication (at 10%) exhibit sensitivity to oil prices. These results suggest that not surprisingly oil and gas companies have higher exposure to oil price changes than other industries. In the three-factor model settings we can measure higher R^2 s than in the standard CAPM, however lower than in the CAPM+oil model. The oil and gas industry as a whole exhibits non-significant SMB parameter, while its sub-sectors are significantly sensitive to the size factor. HML is significant for the broad oil and gas industry index and for all its sub-sector indexes (except Alternative Energy and its components). These results suggest that most of the oil companies behave like small firms but exhibit high book value compared to their market value. By adding the oil factor to the three-factor model we get a substantial increase in the explaining power of our regressions for the oil and gas sector and most of its sub-sectors (but the R^2 s are only slightly higher than in the CAPM+oil model settings). The only exception is the alternative fuel industry exhibits no significant sensitivity to oil prices. From among other industries oil is a significant factor only for Basic materials. Momentum factor is significant only for one sub-sector (Oil Equipment, Services and Distribution) at 10%, and there is no change in the in the explanatory power of the models compared to the previous versions. After separating the oil market conditions by adding a dummy variable we can see that the effects of the market, SMB, HML and MOM factors is the same with no regard of the oil price change of the given month, while the impact of the oil price factor is different based on the oil market conditions for the companies of the broad oil and gas industry, for oil and gas producers and for integrated oil and gas companies.

Acknowledgments

The authors would like to thank Dusán Timotity for his research assistance. Mihály Ormos acknowledges the support by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences.

References

- Aloui, R., Hammoudeh, S., Nguyen, D.K. (2013). A time-varying copula approach to oil and stock market dependence: The case of transition economies, *Energy Economics*, vol. 39, pp. 208-221.
- Arouri, H.M.E., Nguyen, K.D. (2010). Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade. *Energy Policy*, vol. 38(8), pp. 4528-4539.

- Asteriou, D., Bashmakova, Y. (2013). Assessing the impact of oil returns on emerging stock markets: A panel data approach for ten Central and Eastern European Countries. *Energy Economics*, vol. 38, pp. 204–211.
- Basher, S. A., Sadorsky, P. (2006). Oil price risk and emerging stock markets, *Global Finance Journal*, vol. 17(2), pp. 224-251.
- Boyer, M. M., Filion, D. (2007). Common and fundamental factors in stock returns of Canadian oil and gas companies. *Energy Economics*, vol. 29(3), pp. 428-453.
- Carhart, M. M. (1997). On persistence in mutual fund performance. *Journal of finance*, vol. 52(1), pp. 57-82.
- Chen, N. F., Roll, R., Ross, S.A. (1986). Economic forces and the stock market, *Journal of Business*, vol. 59, pp. 383–403.
- El-Sharif, I., Brown, D. Burton, B. Nixon, B. Russell, A. (2005). Evidence on the nature and extent of the relationship between oil prices and equity values in the UK, *Energy Economics*, vol. 27(6), pp. 819–830.
- Faff, R., Brailsford, T. (1999). Oil price risk and the Australian stock market, *Journal of Energy Finance & Development*, vol. 4, pp. 69–87.
- Fama, E. F., French, K. R. (1992). The cross-section of expected stock returns. *Journal of Finance*, vol. 47(2), pp. 427-465.
- Fama, E. F., French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics*, vol. 33(1), pp. 3-56.
- Fama, E. F., French, K. R. (1996). Multifactor explanations of asset pricing anomalies. *Journal of Finance*, vol. 51(1), pp. 55-84.
- Fang, C. R., You, S. Y. (2014). The impact of oil price shocks on the large emerging countries' stock prices: Evidence from China, India and Russia. *International Review of Economics and Finance*, vol. 29, pp. 330-338.
- Hamilton, J. D. (1983). Oil and the macroeconomy since World War II. *Journal of Political Economy*, vol. 91, pp. 228–248.
- Jones, D. W., Leiby, P. N., Paik, I. K. (2004). Oil Price Shocks and the Macroeconomy: What Has Been Learned Since 1996, *The Energy Journal*, vol. 25(2), pp. 1-32.
- Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *The review of economics and statistics*, 13-37.
- Mohanty, S., Nandha, M., Bota, G. (2010). Oil shocks and stock returns: The case of the Central and Eastern European (CEE) oil and gas sectors, *Emerging Markets Review*, vol. 11(4), pp. 358-372.
- Mork, K. A. (1989). Oil and the macroeconomy when prices go up and down: an extension of Hamilton's results, *Journal of Political Economy*, vol. 97, pp. 740–744.
- Mossin, J. (1966). Equilibrium in a Capital Asset Market, *Econometrica*, vol. 34(4), pp. 468-483.
- Nandha, M, Brooks, R. (2009). Oil prices and transport sector returns: an international analysis. *Review of Quantitative Finance and Accounting*, vol. 33(4), pp. 393–409
- Nandha, M., Faff, R. (2008). Does oil move equity prices? A global view, *Energy Economics*, vol. 30(3), pp. 986-997.
- Nandha, M., Hammoudeh, S. (2007). Systematic risk, and oil price and exchange rate sensitivities in Asia-Pacific stock markets, *Research in International Business and Finance*, vol. 21(2), pp. 326-341.
- Narayan, P.K, Sharma, S.S. (2011). New evidence on oil price and firm returns, *Journal of Banking and Finance*, vol. 35(12), pp. 3253-3262.

Oberndorfer, U. (2009). Energy prices, volatility, and the stock market: Evidence from the Eurozone, *Energy Policy*, vol. 37(12), pp. 5787–5795.

Ramos, S.B., Veiga, H. (2011). Risk factors in oil and gas industry returns: International evidence. *Energy Economics*, vol. 33(3), pp. 525-542.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, vol. 19(3), pp. 425-442.

Treynor, J. L. (1962). Toward a Theory of Market Value of Risky Assets. Unpublished manuscript. Subsequently published in Korajczyk, R. A. (1999). *Asset Pricing and Portfolio Performance: Models, Strategy and Performance Metrics*, Risk Books pp. 15-22.

Specific Factors of the Contemporary Development of the Czech Real Estate Market

Roman Brauner

University of Technology
Faculty of Business and Management, Department of Economics
Kolejní 2906/4, 612 00 Brno, Czech Republic
E-mail: brauner@fbm.vutbr.cz

Abstract: *The paper deals with the problems of the present development of the Czech real estate market in the conditions of long-term artificial under-valuation of the Czech koruna by the Czech National Bank. Primarily it analyzes the Czech real estate market development during the past 10 years, and investigates specific factors which influenced it in the course of that period. An integral part of the subject is also comparison of the Czech real estate market with other markets in the Czech Republic, mainly the stock and bond markets. Further, dependence of interest rates is analysed. In conclusion the paper predicts a future development based on the reached results, which would occur in case the artificial under-valuation of the Czech koruna continues over the long term.*

Keywords: financial system, interest rate, real estate market, central banks, inflation

JEL codes: E42, E43, E58, G15

1 Introduction

The effort to support economic growth changes certain factors which then may impact standard values of different markets depending on them. Already since 2008, when the whole world was hit by an economic crisis, all economies have been trying to encourage growth through standard as well as non-standard instruments. Their implementation leads to the change in consumers' behaviour and consequently to price adjustment. One of the instruments of influencing consumption growth is the reduction of interest rates, or possibly foreign exchange market intervention towards own currency. If consumers are pushed by different interventions to not save their assets for later use, they look for alternatives of their utilization. One of them is purchase of properties, for purposes of both getting a home for oneself and as possible investment of financial assets.

2 Methodologies and Data

Mainly the secondary data from the Czech National Bank database and the Czech Statistical Office were used in the analyses and examined with a focus on interdependencies and mutual relations. The analysis results are then used to predict a possible future development of prices on the real estate market. The data was processed within a MS Excel 2007 programme. The examined data was from the period starting at the end of 2006 until the first quarter of 2016.

The used methodology combines the qualitative and quantitative analysis. The qualitative component of the completed research draws on the findings of economic theory and their subsequent comparison with the current way of management of the world's largest economies. Regarding economics the following theoretical approaches are used: "Classical theory of interest rates", "Liquidity preference theory of interest rates", "The loanable funds theory", and "The rational expectations theory of interest rates", while monetary economics is also represented, namely by "Fisher's quantity theory of money". As for the quantitative component, it is based on economic data taken over from the Eurostat database, US department of the Treasury and Trading Economics.

3 Results and Discussion

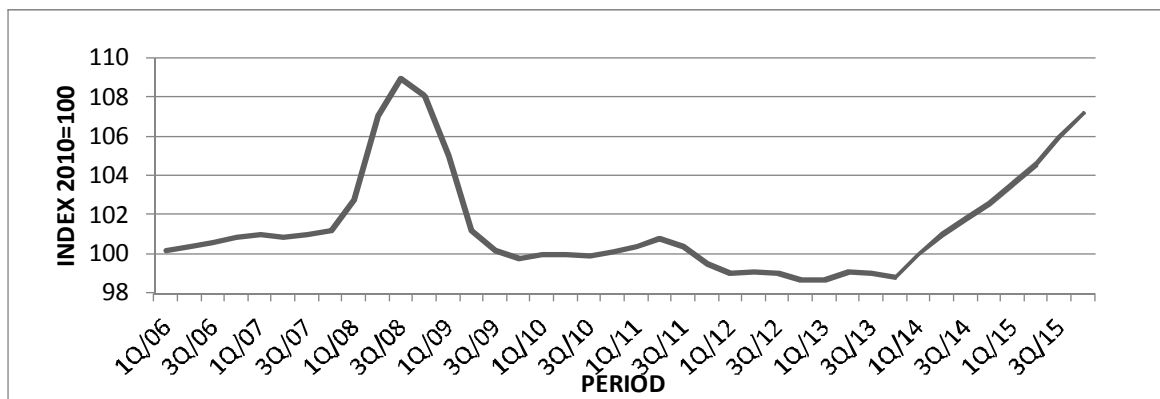
Investment in real estate is a long-term form of financial capital placement. With regard to many consumers undertaking this form of investment once or twice in a lifetime, it is

appropriate to consider relevant parameters affecting its changes. To enable the prediction of future development we will analyze the relations between the values of real estate market prices and the development of inflation rates, PRIBOR interbank interest rate announced by the Czech National Bank, which impact the interest rates of commercial mortgage banks, and the term account interest rates. Or possibly further important factors with an impact on the other variables such as ČNB foreign exchange intervention.

Analysis of development of real estate prices

Investments in real estate are made by a whole range of subjects. First of all they may be end users (households), who buy a property for their own needs, i.e. housing. An integral part of the real estate market are small and big investors or companies who place their assets in real estate with regard to both preserving their value and income from rent. Investment in real estate should be a type of long-term stable investment, however also in this segment significant and sometimes even unexpected fluctuations in terms of its immediate value can be encountered.

Figure 1 Price Index of Real Estate 2010=100



Source: Czech national bank

Based on the analysis and Chart 1 it can be stated that if extreme situations such as the year 2008 and the current period of 2015-2016 are omitted, the real estate value with regard to certain fluctuations is constant. When examining the causes of these extreme situations we can subsequently predict whether this "constant" level will move to a different level to where it is now. Up until 2007 we could observe slow though continuous growth in the real estate market. However the beginning of 2008 saw a sudden increase in real estate prices. In the third quarter of 2008 this rapid increase changed into a deep slump which lasted until the beginning of 2010. After this hectic period the real estate market somewhat stabilized and until the beginning of 2014 it rather slowly decreased. Since 2014 the real estate prices have continued to increase and they tend to approach the levels existing in the extreme situation in 2008, while this increase is slower but it has continued for three years now.

Real estate prices are to a large extent influenced by demand. Although the investment in real estate requires large amounts of financial resources, in large part these operations are financed from loans, particularly from mortgage loans. Therefore interest rates are among the major factors influencing the mood in the real estate market.

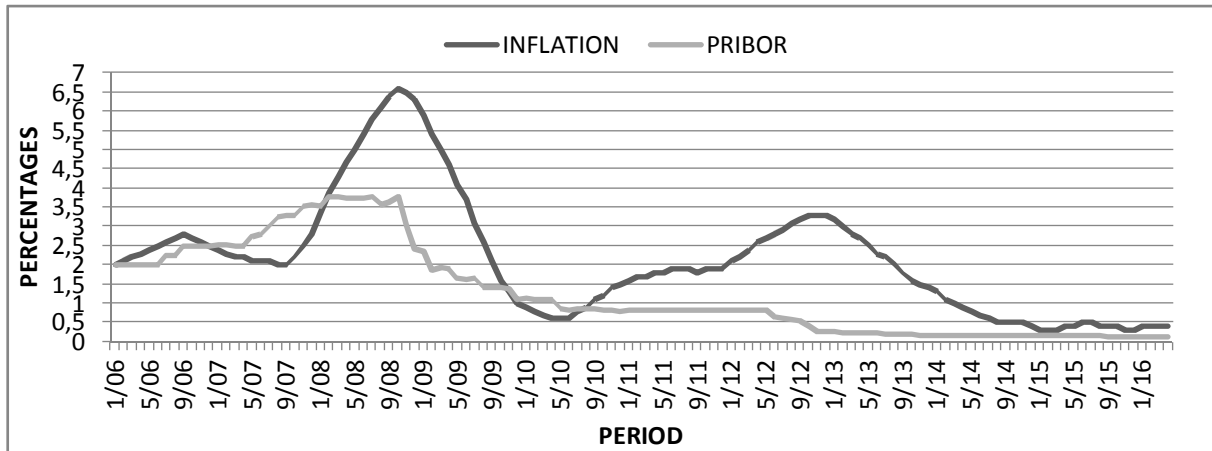
The interest rate levels, especially those for mortgage loans, are in large part impacted by an interbank reference interest rate announced by ČNB.

Analysis of development of interbank interest rates and inflation

The level of Prague Interbank Offered Rate (PRIBOR) which is used as a price source for establishing interest rates and yields from different financial products such as bonds, financial derivatives, mortgage loans and suchlike, is also used as an instrument for

inflation control, therefore the examined area analyzes the relation between the development of inflation and interest rate adjustments responding to it.

Figure 2 Development of Inflation and PRIBOR Interest Rate in the Period of 2006-2016

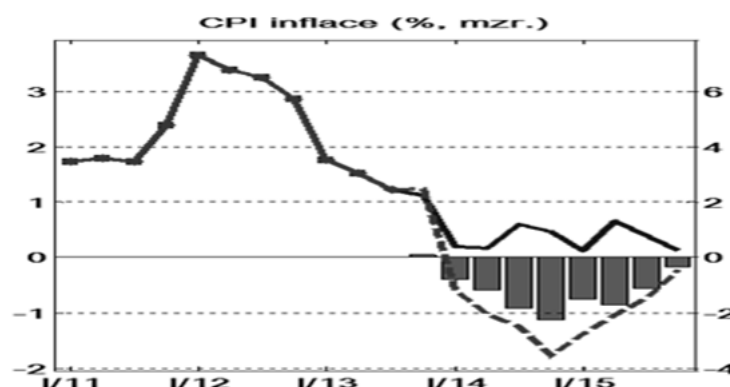


The Czech National Bank establishes a level between 2-4% as a safe inflation target over a long period of time. If this level is exceeded it starts to employ available methods to reduce it. As the chart shows, inflation began to rise disproportionately in 2008, when it surpassed all predictions by both domestic and foreign analysts. This rise was due to more than one factor, e.g. the expected increase of value added tax from 5% to 9% that traders “included” in their prices even before its introduction, and primarily the direct and indirect effects of the past surge in energy and food prices at the global level. Moreover, the labour cost increase sped up in the past quarters as indicated by some signals, in contrast to the slowing growth of productivity of work in the same period, and resulted in the sharp increase in unit labourcosts. (Tomšík 2016) Czech national bank responded by employing one of the most widely used instruments, i.e. by reducing interest rates which it started applying in November 2008. Through this regulator ČNB intends to attain increased consumption of all subjects and thereby the rise of inflation. This increase occurred at the end of 2012, when the trend turned around and inflation plummeted to the very bottom.

Since ČNB had already “exhausted” to some extent the room for regulation by means of interest rate reduction, which in that period neared a zero level, on 7 November 2013 the Bank Board decided to start using the foreign exchange rate as another instrument for easing currency conditions. This decision said that “in the case of need” the Bank would intervene in the foreign exchange market with the aim of weakening the Czech koruna to maintain the exchange rate of the Czech koruna against the Euro “close” to 27 CZK/EUR. ČNB adopted this commitment unilaterally, justifying it as the measure to prevent excessive strengthening of the koruna exchange rate below the set level through its interventions i.e. selling and purchasing of foreign currencies. On the other hand, the weakening above this level leaves the offer and demand in the foreign exchange market to development (Tomšík 2016).

The measure resulted in the accelerated weakening of the exchange rate of the Czech koruna above the set limit, which then remained slightly above it and approached the limit of 27 CZK/EUR as late as July 2015. That is why ČNB did not directly intervene into the exchange rate development during this interval. Subsequently, after the exchange rate value settled at the set limit, ČNB launched an automatic process of interventions from 17 July 2015 to January 2016, in a volume of over EUR 11 bn. As for economic growth in that period, it lagged behind expectations according to ČNB at the end of 2015, because of a slower growth of investments (both public and private) and the government consumption. For this year, the slowing of growth is expected due to decline in governmental investments with only a slow start of the new period of EU funds. (Tomšík 2016).

Figure 3 Inflation with and without Foreign Exchange Rate



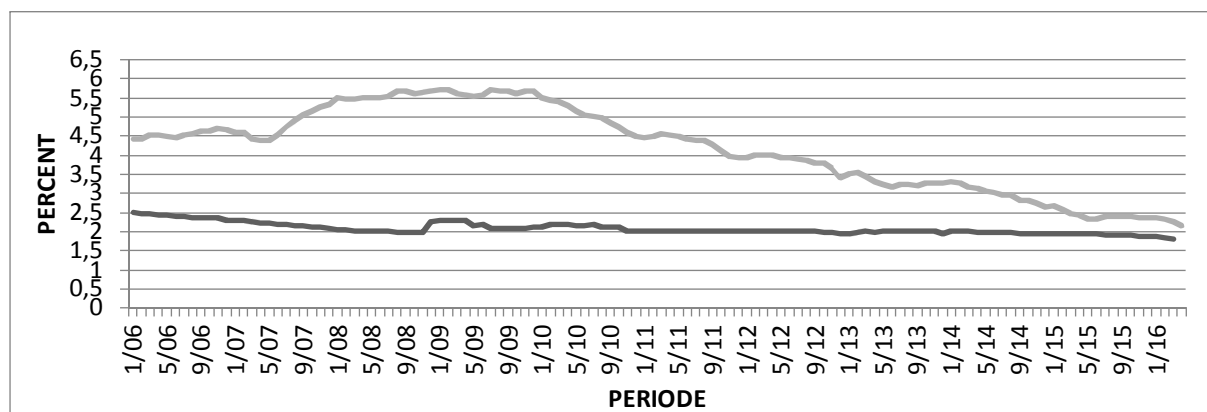
Source Czech national bank

According to ČNB, inflation would likely fall into negative territory and economic growth could slow down even more without the exchange rate commitment. This measure further had an impact on the growth of wages in the business sphere: in the 4th quarter of 2015 it lagged behind the ČNB prediction, but since 2013 it has increasingly sped up, which trend is expected to continue by ČNB also in 2016. The volume of wages has increased in real terms by almost 10% in Czech crowns since the adoption of the exchange rate commitment and by approximately 5% in Euros as well.

Analysis of development of interest rates for mortgage loans and term accounts

Given the fact that the Prague Interbank Offered Rate PRIBOR is one of the key factors influencing the interest rates of commercial banks providing both consumer or mortgage loans, as well as possibilities of depositing surplus resources e.g. in savings and term accounts, the decrease was also reflected in these.

Figure 4 Development of Interest Rate of Saving Accounts up to 3 Years (Light Lines) and PRIBOR Interest Rate (Dark Lines) in the Period of 2006-2016



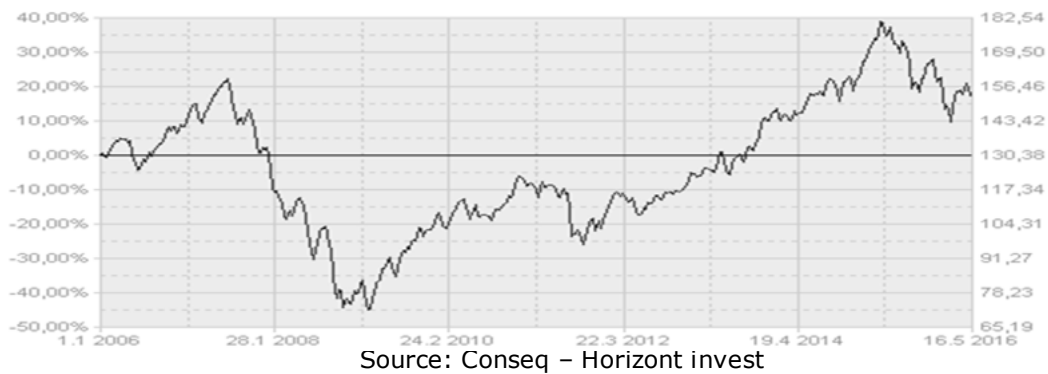
Source: Czech national bank

The trend of declining interest rates in savings accounts led to seeking alternatives to depositing surplus capital, or alternative forms of saving. As for saving, it is recommendable to consider also other possibilities such as investment in equity, bond or real estate funds, or possibly their combination in mixed funds.

Analysis of the funds development

The factors of alternative investment i.e. investments in different types of funds also need to be included in examining the impacts of price development on the real estate market and subject them to analysis.

Figure 5 Development of the Balanced Funds



We see considerable fluctuations also here over the followed period - from 2006 to July 2007 we observe an intriguing growth. However this peak is followed by a significant decline by up to 60%, which only stops in November 2008.

After that a moderate growth is revived which reaches the values from 2007 as late as August 2014, when equity and bond markets begin to record significant weakening again. However these markets are affected by the developments worldwide. For example the sharp drops in stock markets in August were caused by a single "responsible agent", namely China, whose economy slowed to a 7% growth, which for this country can be defined as economic recession.

Despite the effort of the Chinese government which among other initiatives undertakes a massive expansion policy in order to prevent collapse of its economy and stock markets. These steps, however, have their negative effects on a global scale. China has had an impact on the decrease concerning almost all equity funds currently offered in the Czech Republic. Only a very small proportion recorded a decrease by less than 1% at present and their growth was even smaller.

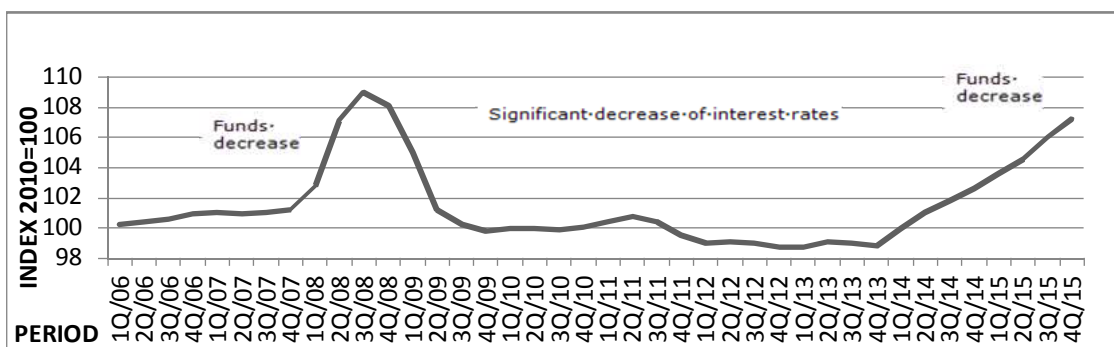
Analysis of factors influencing the real estate market

As the real estate market is influenced by various factors, in order to evaluate the effect on real estate prices, all the above mentioned factors are plotted in one chart.

Analysis of summarized factors influencing the real estate market

As the real estate market is influenced by various factors, in order to evaluate the effect on real estate prices all the above mentioned factors are plotted in one chart.

Figure 6 Price Index of Real Estate 2010=100 Impact Factors



Source: Czech national bank

We can deduce from the examined factors plotted in Figure 4 that the price of a property is the most significantly influenced by two factors, the sentiment on financial markets, in particular of a longer-term character, and equity funds and the level of interest rates for mortgage loans and term accounts which is influenced by its instruments for inflation rate control by Czech national bank.

Therefore, when at the close of 2007 we had seen a sharp decline especially in equity funds and the general sentiment about economy was positive, consumers were looking for different alternatives of placing their assets, and the investment in real estate was one of the most widely used options. Therefore the prices on the real estate market started to rapidly rise and continued to rise until the middle of 2008, when the financial markets had hit the bottom and started to recover and grow again, however due to the onset of economic recession and significant slowing-down of economy, as well as the fall of the level of inflation and consequently decrease in purchasing power, the real estate prices recorded a sharp fall which was not stopped even by significant lowering of interest rates as the ČNB measure to prevent the decline in GDP and inflation.

Despite the continued interventions of ČNB by means of lowering interest rates, the endeavour to stimulate economy was only partially successful, when in 2013 inflation rate reached almost 3%, but after that it took a downward course again, even though economy was performing better. Given the fact that ČNB had already lowered interest rates to a minimum, it took another step in the form of exchange rate commitment.

Toward the end of 2014 the real estate market saw a similar scenario to the one at the end of 2007, when the most funds began to decrease sharply, along with the favourable development of the population's purchasing power, however with the difference that, as opposed to the year 2007, when interest rates reached almost 6%p.a., now they dropped to a minimum limit, below the value of 2.5%p.a. Therefore not only investors, but also households and companies started to transfer their assets into real estates. This extreme demand has almost "sold out" the whole real estate market and started to massively push the real estate sale prices upwards. This state lasts until now.

Prediction of the development of prices in the real estate market

Therefore, in order to be able to predict a possible development in the real estate market, we must focus on the other relating predictions of development, in particular inflation and economic growth which impacts interest rates and purchasing power of the population. The ČNB forecast anticipates stability of market interest rates at the existing very low level and use of exchange rate as the instrument of monetary policy until the end of 2016. In 2017 market interest rates are expected to rise according to ČNB, in keeping with the forecast. According to the current prediction inflation will rise and reach the two-percent target at the monetary policy horizon. Afterwards its level will rise mildly above the target. In order to fulfil the objective in a sustainable manner, which is a precondition for the return to the standard regime of the monetary policy, this will happen according to the forecast during the first half of 2017.

The forecast expects the growth of the Czech economy will noticeably slow down this year, as a result of temporary decline in gross capital generation, which will be primarily due to the slump in the government investments financed from the EU funds.

As ČNB announced, postponement of the expected return of inflation in the Czech Republic to 2% is closely connected with permanent re-evaluation of PPI outlook in the effective Eurozone based on Consensus Forecasts downward (in the past period of over one year also because of the slump in oil prices). At the beginning of this year the development of inflation downwards was surprising mainly because of food prices, but to a smaller degree also because of lower core inflation. Inflation is going to rise as predicted by ČNB, but will reach the 2% target only in the course of the first half of 2016. The counter-inflation pressure from abroad will gradually go away and the domestic economy will continue to push toward the increase in price levels.

The question is, to what extent the ČNB forecasts will be fulfilled and how the market for equity or possibly mixed funds will develop. If the trend adhered to the current values, then given the growing purchasing power of the population, one of the most likely choices to be made when it comes to equity placement, would be just real estate, and with interest rates being so low also households will tend to buy homes for themselves; therefore there is not a significant change expected in the trend of price development in the real estate market, but the rise in the prices should not be so sharp. (Tomšík 2016).

In the case the ČNB forecasts began to break and the bank would not be forced to carry on with such radical interventions, along with the emerging increase in interest rates the real estate market might see a considerable continued growth before its subsequent decrease due to the reduced demand, and also because many consumers, as a result of increased interest rates and their income remaining the same, will not qualify for the needed loan amount. And should we anticipate the development in the more distant future, then owing to the increased interest rates and accomplishment of the "fixation" of loans already drawn, when it will increase by a step from the current low rate, a reverse effect may occur in the form of sell-off in the real-estate market which would result in massive increase in the real estate offer, and in turn would bring about a dramatic fall in prices in the real estate market.

Conclusions

It follows from the analyses of the examined factors that the real estate prices are considerably affected by a combination of interest rates, purchasing power of businesses and individuals, inflation and development in financial markets. Although we have to include the buyer's emotional relationship to the property of interest in the decision-making parameter, where e.g. a geographical location of the property, technical parameters and suchlike play a role, we can ever more frequently encounter investors who "only" take into account the economic advantage and performance. Therefore when the factors of positive economic growth, low interest rates and decreasing tendency of financial markets - in particular stock markets - meet, the demand for real estate is very likely to grow and thereby their price as well. It must be borne in mind, however, that such investments may be very hazardous as they involve larger financial amounts, and a favourable transaction in the positive period may change into a nightmare in the period of crisis: since interest rates may rise above the level affordable for the investor while at the same time the property value can significantly drop and even its possible sale may not cover all the obligations following from its purchase.

References

- Conseq (2016). "*Horizont Invest*". Retrieved from: <https://www.conseq.cz/page.asp?page=171>.
- Česká národní banka (2003-2016). "*Fondy smíšené*". Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.PARAMETRY_SESTAVY?p_sestuid=43789&p_strid=BFG&p_lang=CS.
- Česká národní banka (2003-2016). "*Cenybytů*". Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=ACBHB&p_sestuid=&p_lang=CS.
- Česká národní banka (2003-2016). "*Úrokové sazby*". Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.PARAMETRY_SESTAVY?p_sestuid=12864&p_strid=AAABAA&p_lang=CS.
- Český statistický úřad (2016). "*Inflace - druhy, definice, tabulky*". Retrieved from: https://www.czso.cz/csu/czso/mira_inflace.
- Lízal, L. (2015). "*Kurzový závazek ČNB, záporné úrokové sazby a aktuální mix měnové a fiskální politiky v ČR*". Retrieved from: http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/verejnost/pro_media/konference_projevy/vystoupeni_projevy/download/tomsi_k_20160520_newton_college.pdf.
- LUMMER, T. (2014). *Prognóza finančních trhů: psychologie úspěšného investování*. 2nd ed. Brno: BizBooks.
- Rejnuš, O. (2014). *Finanční trhy*, 4th ed. Praha: Grada.
- Tomšík, V. (2016). "*Kurzový závazek a jeho vliv na ekonomiku*". Retrieved from: http://www.cnb.cz/miranda2/export/sites/www.cnb.cz/cs/verejnost/pro_media/konference_projevy/vystoupeni_projevy/download/lizal_20151010_forex.p.

Testing for Information Asymmetry in Automobile Insurance: Sample from Slovak Republic

Zuzana Brokešová¹, Erika Pastoráková², Tomáš Ondruška³

¹ University of Economics in Bratislava
Faculty of National Economy, Department of Insurance
Dolnozemska cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: zuzana.brokesova@euba.sk

² University of Economics in Bratislava
Faculty of National Economy, Department of Insurance
Dolnozemska cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: erika.pastorakova@euba.sk

³ University of Economics in Bratislava
Faculty of National Economy, Department of Insurance
Dolnozemska cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: tomas.ondruska@euba.sk

Abstract: *Neoclassical economics assume perfect information to all market participants about prices and quality of goods and services offered in the market. However, in many cases individuals remain only partially informed, resulting in state where some market participants have more information than the others. Importance of information balance increases significantly, especially, in the case of services with no immediate outcome, such as financial products, and particularly insurance. The paper focuses on the information asymmetry in insurance market. We use the micro-data about automobile insurance from Slovak insurance company to verify presence of information asymmetry in insured-insurer relation. Based on the results of the empirical data analysis, we have not find any correlation between coverage and loss in our dataset. This result does not prove absence of information asymmetry in the insurance market and it could imply that private information of individuals affects this analysis.*

Keywords: moral hazard, adverse selection, insurance, motor insurance

JEL codes: G22

1 Introduction

Neoclassical economics assumes perfect information to all market participants. According to theory, consumers, as well as, producers are perfectly informed about prices and quality of goods and services offered in the market. However, in many cases the costs of obtaining information are not sufficiently low. Rational individuals accommodate to lower information awareness (on the level of equality marginal costs for obtaining information and expected returns obtained by this information). Individuals remain only partially informed, resulting in state, where some market participants have more information than the others (Tumpach and Baštinová, 2014). Information imbalances occur in every market and could be amplified by the regulation (Finkelstein and Poterba, 2014). Importance of information balance increases significantly, especially, in the case of services with no immediate outcome, such as financial products, and particularly insurance (Daňhel, 2002). In addition, information imbalance on both sides of insurer-insured relationship may cause of inefficient outcomes and market failure (Dionne et al., 2013; Zavadil, 2015).

According to Dionne et al. (2013), adverse selection can be a significant resource allocation problem in many markets, e.g. in automobile insurance market, where risk classification is explained by adverse selection; or in life insurance, where insurers by the medical screening tries to justified information imbalances between the insurer and the insured. However, many insurance markets have not been analyzed yet (Spindler, 2012).

The main aim of the paper is to empirically verify presence of information asymmetry in insured-insurer relation. We use the individual data about automobile insurance from Slovak insurance company.

Literature review and theoretical background

In the last two decades of the twentieth century, research of information asymmetry in insurance market overcomes significant expansion. Seminal papers by Arrow (1963), Pauly (1968, 1974) and the most famous work by Rothschild and Stiglitz (1976) theoretically modelled existence of information imbalances in competitive insurance market. Empirical papers follow theoretical works with lag, as theoretical models use simplified frameworks hardly transposed to real situations (Zavadil, 2015; Chiappori et al., 2006). For example, Rothschild and Stiglitz's model assumes that the probabilities of accident are exogenous, there is only one loss and agents have same preferences perfectly known by the insurer. At the turn of the millennium, substantial amount of papers analyzing this phenomenon empirically appeared (see Chiappori and Salanie, 2003 or Cohen and Siegelman, 2010 for literature review). However, their results are not clear, till these days. There is no general answer, if asymmetric information is present in insurance markets or not. Some authors conclude that effect of information asymmetry is irrelevant in insurance market. For example, according to Chiappori et al. (2006), in a perfectly competitive market, competitive price includes all information about the buyer's willingness to pay and it will not bring a benefit to seller, as well as, the information about technology will not bring any benefit to buyer. According to Spinnewijn (2012), individual's risk type is not driver of individual's demand for insurance. In addition, estimated welfare cost of inefficient pricing due to adverse selection is very small (Cohen and Einav, 2007, Einav et al., 2010a, Einav et al., 2010b). Other authors find out that it is important to differentiate based on the various insurance markets.

Information asymmetry in insurance market includes two specific phenomena: moral hazard and adverse selection. Moral hazard is a result of the principal-agent problem as insured does not have the same incentives as the insurer to prevent loss occurrence (Weisburd, 2015). Moral hazard means that risk of loss and insurance coverage are positively correlated, which means that insured with more insurance coverage are more likely experience a loss (Spindler, 2012). For insured, the incentives for loss prevention behavior decrease with insurance, and therefore, expected insurance loss increase, for insurer. Moral hazard affects ex post, as it changes the behavior of insured after signing insurance contract. Second phenomena, adverse selection works ex ante. It means that insured knows his risk type before signing the insurance contract and this affect his demand for insurance (Spindler, 2012). Insurance is heterogeneous with respect to his expected loss and his risk type is understood as endogenous variable (Dionne et al. 2013). Insured has more information about his risk type than the insurer (Dionne et al. 2013) and "high-risk" (i.e. individual with high accident probability) has higher demand for insurance as the individual who are less accident prone. "High-risk" individual has a higher marginal utility of insurance at a specific price and he has no incentive to reveal his risk type (Spindler, 2012; Weisburd, 2015). For insurer, it is costly to observe insured risk type (Dionne et al., 2013). In addition, according to Spinnewijn (2012), adverse selection is considered as a main reason for governmental intervention in insurance markets as it increases insurance premium and displace lower risk types out of the market (Akerlof 1970).

2 Methodology and Data

Empirical analysis of the presence of information asymmetry in automobile insurance is based on the individual customers' data about automobile insurance from insurance company operating in the Slovak insurance industry. Insurance company ask authors to stay anonymous. Mico-data covered valid insurance contract in year 2014 and include 166 observations randomly chosen from the internal insurance company database. All included individuals have a Motor third-party liability insurance (MTPL) that is in Slovak republic mandatory for all owners of automobiles. MTPL covers liability of the insured for

losses on life, health or property caused to third party. From these 166 observations, 98 individuals have also Casco insurance that covers losses on insured property. In further analysis, we work with these 98 observations. Available data included four specific groups of information (1) information about insured, (2) information about automobile, (3) information about MTPL insurance, (4) information about Casco insurance. As previous studies have shown that personal characteristics of insured (e.g. age, gender, and region), as well as, insured car characteristics (e.g. construction year, engine volume, and model) may have an impact on driver's behavior (Cohen and Einav, 2005; Peltzman, 1975), we included this information in our analysis. Detailed information about data are specified in Table 1.

Table 1 Individual Customers' Data about Automobile Insurance

(1) Information about insured	Age
	Gender
	Region
(2) Information about automobile	Brand
	Year of construction
	Size
(3) Information about motor third party liability insurance	Starting date
	Number of claims
(4) Information about Casco insurance	Starting date
	Number of claims
	Insurance sum

Source: Insurance company internal database

Three approaches are usually used in literature to empirically test information asymmetry: (1) positive correlation test, (2) test of unused observables, and (3) finite mixture models (Spindler, 2012).

In our analysis, we use standard procedure introduced by Chiappori and Salanie (2000), positive correlation test. This test has been widely used in the literature (for review see Cutler and Zeckhauser, 2000; or Cohen and Siegelman, 2010). In latter text, we are going to discuss this approach more closely. Discussion and specification of the other two approaches could be find in Spindler (2012).

The theory of asymmetric information predicts a positive correlation between insured risk and insurance coverage conditional on all exogenous observables used for risk classification and pricing by the insurer. Therefore, this test rejects the null hypothesis about the symmetric information in insured-insurer relation when there is a positive correlation between insurance purchases and risk occurrence, conditional on the buyer characteristics that are used to set insurance prices (Finkelstein and Poterba, 2014).

According to Finkelstein and Poterba (2014) and Spindler (2012), in order to test if there is positive correlation one has to estimate two reduced-form econometric models, one for the insurance coverage (C) and one for the loss (L). The explanatory variables (X) denote the exogenous variables, which are used for risk classification by insurer. For simplicity, we use linear models:

$$C_i = X_i * \beta + \varepsilon_i \quad (1)$$

and

$$L_i = X_i * \gamma + \mu_i \quad (2)$$

Under the null hypothesis of symmetric information, residuals of both equations ε_i and μ_i should be uncorrelated. A statistically significant positive correlation between the two residuals points to presence of asymmetric information.

From the econometric point of view, there are mainly two procedures that can be used for testing this conditional and positive correlation: two probits or a bivariate probit model (Spindler, 2012).

Based on our data, we used bivariate probit model, in which ε_i and μ_i are distributed as bivariate normal with correlation coefficient ρ , which had to be estimated, and then we tested whether $\rho = 0$ or not. In order to test this hypothesis, we used the Wald-test. In our model, insurance coverage (C) represents a binary variable equals 1 if the insurance sum in Casco insurance is higher than threshold sum 15,000€ and 0, if the insurance sum is lower. We divided insurance sum to "low" and "high" insurance sum. Loss (L) represents a binary variable equals 1 if the one had more than one claim in Casco insurance and 0 if he had only one claim. As all of our subjects suffered at least one claim in Casco insurance, we adopted this approach which allowed us to differentiate two groups of individuals, with one claim and with more than one claims. We expected that if information asymmetry is present in our dataset those with higher insurance sum are more prone to more than one claims. Vector X_i denotes the covariates of individual i . In our model, we used personal characteristics of insured (age, gender, and region), insured car characteristics (construction year, model, and engine volume) and we included also binary variable equals 1 if the one had at least 1 claim in MTPL and 0 if not. It is important to notice, that some of our independent variables are correlated. As multicollinearity reduce the calculation of individual predictors not the predictive power of the model as a whole, we do not understand multicollinearity as a problem. We were not interested in individual estimations. Similar approach was adopted by Zavadil (2015).

A positive correlation between the insurance coverage and risk of accident in automobile insurance could happened ex ante when people with a higher risk of accidents self-select into insurance (i.e. adverse selection), or ex post when insurance coverage change of driver's behavior (i.e. moral hazard). Observed positive correlation can be the result of both moral hazard and adverse selection and it is complicated to empirically differentiate the contribution of each factor (Weisburd, 2015).

3 Results and Discussion

Our dataset consists of information about individual clients of insurance company operating in Slovak insurance market. Data covered valid insurance contracts in year 2014 and we included 98 individuals who has Casco insurance. Summary statistics are shown in Table 2.

Regarding insured characteristics, average age of individuals included in our data is 47.66 years and we have 30.61% of males, in our sample. Our individuals are from all 8 regions in Slovakia, while the majority is from Bratislava region, i.e. 22.45%. Regarding insured automobiles, in the dataset, we have 22 different brands included, where the majority represent brand Skoda with 37.76%. Automobiles are quite young where 76.53% of insured automobiles is younger than 2007, i.e. 7 years old as data are form 2014. Majority of the cars have small or medium engine volume 90.82% (only 52.04% is small and 38.78% is medium). All individuals have MTPL insurance and Casco insurance. Average insurance sum in Casco insurance is 21,980€. In our sample, individuals have on average 1.66 claims in MTPL insurance and 1.77 claims in Casco insurance. MTPL insurance claims included all claims also before buying Casco insurance while Casco insurance included only claims within the current Casco contract.

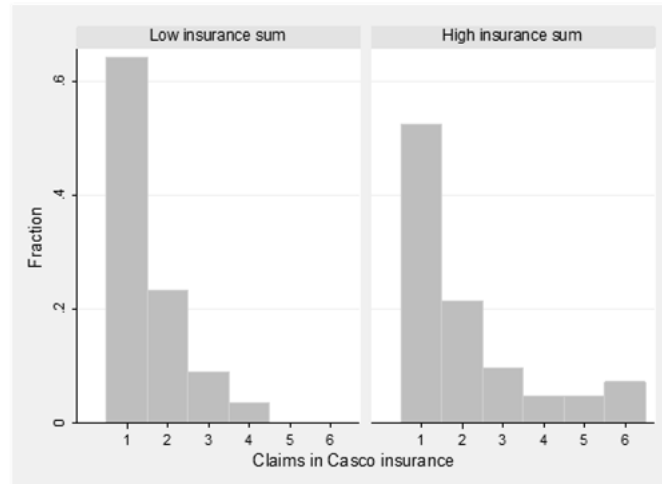
Table 2 Summary Statistics

Category	Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Insured	Age	98	47.66	12.42	26	75
	Male	98	.3061	.4633	0	1
	Region	98	4.20	2.51	1	8
Automobile	Brand	98	19.76	9.00	1	22
	Construction year	98	2007.8	3.30	1997	2013
	Engine volume	98	2.3878	.6522	1	4
Insurance	Insurance sum in Casco	98	21,980.6	25,143.41	3950	150,000
	Number of MTPL claims	98	1.66	1.07	1	6
	Number of Casco claims	98	1.77	1.22	1	6

Source: Authors' own calculations

Based on the graphical analysis (see Figure 1), we can see a difference in amount of insurance claims in Casco insurance. Average number of claims in Casco insurance is 2.10 (N=42, st. dev.=1.5588, min.=1, max.=6) for contracts with high insurance sum (i.e. insurance sum higher than 15,000€) and 1.52 (N=56, st. dev.=.8088, min.=1, max.=4) for contracts with low insurance sum (i.e. insurance sum higher than 15,000€).

Figure 1 Number of Claims in Casco by Threshold Insurance Sum



Source: Authors' own calculations

These results are not significant that is proven by the bivariate probit analysis and Wald test. Detailed results of bivariate probit analysis with robust standard errors are shown in Table 3.

Table 3 Bivariate Probit Regression Results

Dependent variable	Coefficient	Std. Err.	t	P> t	95% Coef. Interval	
Insurance sum						
Claims in MTPL	.3102	.4186	0.74	0.459	-.5101 1.1305	
Age	.0106	.0146	0.72	0.469	-.0181 .0393	
Gender	.8468	.3639	2.33	0.020	.1336 1.5610	
Region	-.1091	.0659	-1.66	0.098	-.2383 .0201	
Brand	.03895	.0189	2.6	0.040	.0019 .07604	
Construction year	-.1075	.0535	-2.01	0.044	-.2124 -.0027	
Engine volume	-1.8307	.4060	-4.51	0.000	-2.6265 -1.0348	
_cons	219.39	107.13	2.5	0.041	9.43 429.35	
Claims in Casco						
Claims in MTPL	.6116	.3174	1.93	0.054	-.0106 1.2337	
Age	-.0086	.0114	-0.76	0.449	-.0310 .0137	
Gender	.2325	.2957	0.79	0.432	-.3469 .8120	
Region	-.0124	.0570	-0.22	0.828	-.1241 .0993	
Brand	-.0127	.0148	-0.86	0.389	-.0417 .0162	
Construction year	-.0098	.0404	-0.24	0.809	-.0888 .0693	
Engine volume	.1076	.1961	0.55	0.583	-.2767 .4919	
_cons	19.60	80.99	0.24	0.809	-139.15 178.34	
/athrho	-.1132	.1951	-0.58	0.562	-.4955 .2691	
rho	-.1127	.1926			-.4586 .2628	

Source: Authors' own calculations

We failed to reject hypothesis that correlation between insurance sum and number of claims in Casco insurance equals 0 ($\chi^2=.3369$, $df = 1$, p -value =.5616). In the

regression, we controlled for two groups of characteristics used for risk type categorization as well as pricing by insurer, i.e. age, gender, region, automobile year of construction, automobile brand engine volume and MTPL claims.

Our result is in line with a stream of previous research concluding that the relation between coverage and the number (as well as size) of claims is significantly influenced by the driver's and car's characteristics (Zavadil, 2015). According to Spindler (2012), the absence of a correlation between coverage and risk can be consistent with the presence of asymmetric information. This reasoning is applicable when individuals have private information not only about their risk but also about their risk aversion (DeMeza and Webb, 2001). Risk aversion is not simply observable for insurer, as this concept is complex and risk aversion could vary under different state of the art (Péliová, 2014). On the other hand, our result is also in line with Chiappori and Salanie (2000), Dionne et al. (2001), and Chiappori et al. (2006) who found that insurance coverage and insurance risk occurrence are not correlated.

4 Conclusions

The paper focuses on the information asymmetry in the insurance market. We use the micro-data about automobile insurance from Slovak insurance company to verify presence of information asymmetry in insurance relation. Based on the results of the empirical data analysis, we conclude that we have not find any correlation between coverage and loss in our dataset of Casco insurance. This result does not prove absence of information asymmetry in the insurance market and it could imply that private information of individuals affects this analysis.

Our study has few limitations. The most important is the size of our sample that could affect the results of our analysis. However, we understand this study as a first draft and we would like to replicate our estimations on bigger sample. Also application of Test with Unused Observables could increase reliability of our results. Test with Unused Observables predict existence of a characteristic that is known to insured, but unknown or not used by the insurer and this characteristic is positively correlated with coverage and loss (Finkelstein and Poterba, 2006). Further research is needed in this area.

Acknowledgments

This paper is part of a research grant No. 1/0849/15 entitled 'Economic and social aspects of the information asymmetry in the insurance market' and research grant No. 1/0431/14 entitled 'Insurance Relationship as a Key Element of the Insurance Sector Operation in the Context of Socio-economic Changes' provided by the Ministry of Education, Science, Research and Sport of the Slovak Republic.

References

- Cohen, A., Einav, L. (2007). Estimating Risk Preferences from Deductible Choice. *The American Economic Review*, vol. 97(3), pp. 745–88.
- Arrow, K. J. (1963). Uncertainty and the welfare economics of medical care. *The American economic review*, vol. 53(5), pp. 941-973.
- Chiappori, P. A., Salanie, B. (2000). Testing for asymmetric information in insurance markets. *Journal of political Economy*, vol. 108(1), pp. 56-78.
- Chiappori, P. A., Salanié, B. (2003). Testing Contract Theory: A Survey of Some Recent Work. In: Dewatripont, M., Hansen, L., and Turnovsky, S. eds., *Advances in Economics and Econometrics*, Cambridge University Press.
- Chiappori, P. A., Jullien, B., Salanié, B., Salanie, F. (2006). Asymmetric information in insurance: General testable implications. *The RAND Journal of Economics*, vol. 37(4), pp. 783-798.

- Cohen, A., Siegelman, P. (2010). Testing for adverse selection in insurance markets. *Journal of Risk and Insurance*, vol. 77(1), pp. 39-84.
- Cutler, D. M., Zeckhauser, R. J. (2000). The anatomy of health insurance. In: Arrow, K. J. ed., *Handbook of health economics*, vol. 1, Elsevier, pp. 563-643.
- De Meza, D., Webb, D. C. (2001). Advantageous selection in insurance markets. *RAND Journal of Economics*, vol. 32(2), pp. 249-262.
- Daňhel, J. (2002). K problému asymetrie informace v pojišťovnictví. *Politická ekonomie*, vol. 50(6), pp. 809-813.
- Dionne, G., Fombaron, N., Doherty, N. (2013). Adverse selection in insurance contracting. In: Dionne, C. ed., *Handbook of Insurance*. New York: Springer, pp. 231-280.
- Dionne, G., Gouriéroux, C., Vanasse, C. (2001). Testing for evidence of adverse selection in the automobile insurance market: A comment. *Journal of Political Economy*, vol. 109(2), pp. 444-453.
- Einav, L., Finkelstein, A., Schrimpf, P. (2010). Optimal mandates and the welfare cost of asymmetric information: Evidence from the UK annuity market. *Econometrica*, vol. 78(3), pp. 1031-1092.
- Finkelstein, A., Poterba, J. (2014). Testing for asymmetric information using "unused observables" in insurance markets: Evidence from the UK annuity market. *Journal of Risk and Insurance*, vol. 81(4), pp. 709-734.
- Pauly, M. V. (1968). The economics of moral hazard: comment. *The American Economic Review*, vol. 58(3), pp. 531-537.
- Pauly, M. V. (1974). Overinsurance and public provision of insurance: The roles of moral hazard and adverse selection. *The Quarterly Journal of Economics*, vol. 88(1), pp. 44-62.
- Péliová, J. (2014). How do the risk free investment options change our decisions under risk? In: Deev, O., Kajurová, V., Krajíček, J., eds., *European Financial Systems 2014: proceedings of the 11th International Scientific Conference*. Brno, Czech Republic: Masaryk University, pp. 469-474.
- Rothschild, M., Stiglitz, J. (1976). *Equilibrium in competitive insurance markets: An essay on the economics of imperfect information*. Netherlands: Springer.
- Spindler, M. (2012). Asymmetric information and unobserved heterogeneity in the accident insurance. *MEA Working paper*.
- Spinnewijn, J. (2012). Heterogeneity, demand for insurance and adverse selection. *Working paper*.
- Tumpach, M., Baštinová, A. (2014). Cost and Benefit of Accounting Information in Slovakia: Do We Need to Redefine Relevance? In: Deev, O., Kajurová, V., Krajíček, J., eds., *European Financial Systems 2014: proceedings of the 11th International Scientific Conference*. Brno, Czech Republic: Masaryk University, pp. 655-676.
- Weisburd, S. (2015). Identifying Moral Hazard in Car Insurance Contracts. *Review of Economics and Statistics*, vol. 97(2), pp. 301-313.
- Zavadil, T. (2015). Do the better insured cause more damage? Testing for asymmetric information in car insurance. *Journal of Risk and Insurance*, vol. 82(4), pp. 865-889.

The Limitations of E-commerce Development in Full Operating Cycle Firms: V4 Countries Case

Emilia Brozyna¹, Grzegorz Michalski², Guenter Blendinger³, Ahmed Ahmidat⁴

^{1,2} Wroclaw University of Economics
Faculty of Engineering and Economics, Department of Corporate Finance Management
Komandorska 118, PL53345 Wroclaw, Poland
E-mail: Grzegorz.Michalski@ue.wroc.pl, Emilia.Brozyna@ue.wroc.pl

^{3,4} Technical University of Kosice
Faculty of Economics
Bozeny Nemcovej 26/32, 040 01 Kosice-Sever, Slovakia
E-mail: guenter.blendinger@hs-heilbronn.de, ahmed.ahmidat@gmail.com,

Abstract: *Financial efficiency of an entities operating in full operating cycle conditions is influenced by environmental characteristics. That paper analyzes one of the financial results measured by cash tied in inventories in e-commerce full operating cycle financially constrained V4 entities. In recent decades, the countries of Central and Eastern Europe there are significant changes in national economies. Many of them joined the European Union in 2004. Among the EU Member States noteworthy is the largest group of countries of Central and Eastern Europe: Czechia, Poland, Slovakia and Hungary. On 15 February 1991 they have concluded an agreement on the formation of the Visegrad Group. It was aimed at expanding cooperation between these countries and in the initial phase of accession to the European Union and NATO. Analysis of the changes that have taken place in companies using online sales in the countries of the Visegrad Group is the subject of this article.*

Keywords: *financing e-commerce, financial analysis, financial performance, V4 financial reality, financial liquidity management*

JEL codes: *C58, G02, G32, O16, P43*

1 Introduction

Financial treasury and cash management influence financial performance of e-commerce entities. The main purpose of the paper is a scientific discussion about the influence of inventories levels in enterprises selling online. The research includes companies from the countries of the Visegrad Group, called in brief V4. In the initial stage, these countries were of a similar economic conditions (Jasova et al., 2016), (Tkacova, Sinicakova, 2015), (Soltes, Gavurova, 2014), (Michalski, 2016b), (Reznakova, Karas, 2015), (Raisova et. al., 2014).

Name of the Visegrad Group was formed during the meeting of the presidents of Czechoslovakia and the Polish and Hungarian Prime Minister. This meeting took place at the castle in the Hungarian town of Visegrad. It has been planned exactly in this group, because these countries have not only convergent main foreign policy goals, but also enjoy the possibility of its implementation (Novotna, Luhan, 2012). Visegrad Group established International Visegrad Fund.

These countries from the beginning of political transformation build their competitive potential. Giving priorities for investment in the industrial sector industries that rely on local raw materials, and private industries that are based on the production of the chemical industry and petrochemical, As well as expansion in some industries based on agriculture products and marine resources sector in order to reduce dependence on the raw material sector. V4 countries were concentrated on the possibility of creating some of the devices and the institutions that support export activity physically and morally. They focused on domestic production to cover domestic demand and reduce dependence on imports and restrict the goods and products that the local economy is unable to produce them locally (Ahmidat, 2016), (Michalski, 2016a), (Michalski, 2015c), (Merickova et. al., 2015), (Horvatova et al., 2014), (Cheben et al., 2015), (Gavurova, Soltes, 2016),

(Gavurova, Soltes, 2014), (Brozyna et al., 2015), (Bem et al., 2015b), (Michalski, 2015b), (Soltes, Gavurova, 2015). They do this in order to meet the competitive forces in quite the single European market and the global markets (Zielinska-Glebocka and Gawlikowska-Hueckel, 2013). Even for rather small economies, such type of cooperation can be of great significance (Pavlicek, Kristoufek, 2015), (Michalski, 2015a), (Bem et al., 2014b), (Bem, Michalski, 2016), (Bartak, Gavurova, 2015), (Szczygiel et al., 2015).

Visegrad countries were different from the other countries of the former communist bloc. In other countries, internal changes were generally much less advanced, and strive for EU membership much longer or as was the case in Slovenia, the road was much shorter. At present, all countries of the Visegrad Group are the members of the European Union (Krajicek, 2013), (Michalski, 2008), (Galas et al., 2015), (Michalski, 2010), (Bem et al., 2015c), (Bem et al., 2014a).

Electronic commerce (e-commerce, e-commerce) as defined by the Polish Central Statistical Office includes the transactions carried out by the network. They can be based on IP or other computer networks. Goods and services are ordered over those networks, but the payment and the ultimate delivery of the ordered goods can be made in or outside the network. Literature describes the internet and e-commerce as an indispensable element of the development process (Lawrence, 2013), (Michalski, 2008).

This is some of the attributes associated with the e-commerce revolution (Brozyna et al., 2015), (Bem et al., 2015a) that has brought about a fundamental change in the conceptualization of commercial transactions: economic cost, convenience, sustainable value creation and product diversity (Michalski, 2008).

Definition of an objective and measurable financial criteria of what is considered sustainable value creation for corporations is key to understand full operating cycle firm position and direct firms in the right strategic direction for financial success. Analyzing corporate annual reports unveil different approaches to measure the financial value creation of a firm (Blendinger, 2016), (Michalski, Brozyna, Soroczynska, 2015). For this paper we deliberately looked at the so called Value Added. It's supposed to quantify the financial value which is added during a given fiscal year taking into account the capital invested to provide the operational assets. For fiscal year 2015 Daimler for instance stated the value add to be 5675 T€ increasing from 4416 T€ in 2014. Looking at the factors in the formula used to calculate Value Added, it becomes obvious that inventory levels are an important element which shows the high relevance of it for this paper. The formula takes net profit and deducts net assets multiplied by cost of capital as percentage. In a long lasting manufacturing firm, property, plant and equipment besides inventory is the key factor of the net asset value. In a typical young e-commerce firm, however, property, plant and equipment are often low, hence, inventory levels become the crucial component in this Value Added consideration. It also shows that this value add calculation and the logic behind makes fully sense, especially when looking at it from the key objective of good corporate governance which is to create sustainable value for a company. The formula and calculation can be seen as a basis to compare value adds of different companies allowing to benchmark and subsequently develop the best in class approach for financially proper comparisons (Blendinger, 2016).

E-commerce is associated production and sale of goods by modern information and communication technologies (Sedlacek, Valouch, 2009), (Szopinski, 2013). Each transaction conducted over the internet is the result of steps: search, order, payment and delivery. According to Kraska e-commerce is commercial transactions via telecommunication networks, coupled with making payments for goods and services. This takes place without direct contact between the parties (Kraska, 2004).

During the past years steadily increasing the number of internet users has created a possibility to get to know the advantages and benefits offered by electronic commerce (Kim et al., 2011), (Io Storto, 2013).

2 Methodology and Data

The test procedure is based on the method of multiple case studies. The research will be companies implementing online sales in countries belongs to the Visegrad Group. The project will be mainly used methods of descriptive statistics and financial analysis. Empirical data are derived from the financial statements of companies operating in V4 countries. Selected research units will differ from each other in terms of market offer and the number of employees.

An in-depth financial analysis reports will focus in particular on measuring the effectiveness of activities. In addition, literature studies and analysis of extensive statistical data will allow for the emergence of strategic factors affecting the competitiveness of enterprises operating in the field of internet commerce. This will allow to assess the impact of factors specific to the investigated company on the relationship between the use of modern forms of sales and competitive advantage.

The study began by calculating the index Inventories rotation in days. It indicates how many days the company renews its levels of inventories to realize sales. The formula to calculate the index can be presented as follows:

$$\text{Inventories rotation in days} = (((S_1 + S_0) \div 2) \times 365) \div S_A \quad (1)$$

where: INV_1 – levels of inventories in current year; INV_0 – levels of inventories in previous year; S_A – sale in current year.

3 Results and Discussion

Modern concepts of inventory management are focused on maximum reduction of differences between the intensity of use of the levels of inventories and the rate of supply, in order to obtain the continuity of material flows with minimal inventories. The most important goal for the organization becomes an increase in the worth of the business successfully applying competitive means. Modern organizations are forced to seek alternative means for resolving business problems.

Companies can no longer afford to lose their money in e-business initiatives without developing and using suitable means to support the appropriate level of inventories. Inventories rotation in days for each of the countries of the V4 are presented in Table 1.

Table 1 Inventories Rotation in Days

	2009	2010	increase 2010	2011	increase 2011	2012	increase 2012	2013	increase 2013
Czechia	331	54	62%	102	91%	42	-59%	46	8%
Hungary	158	91	-42%	70	-24%	493	606%	99	-80%
Poland	189	108	-43%	1175	985%	35	-97%	137	293%
Slovakia	1964	1476	-25%	120	-92%	481	300%	506	5%

Source: Own study based on data from e-commerce firms reported in Database Amadeus product of Bureau van Dijk, [date: 2016 MAY 10]

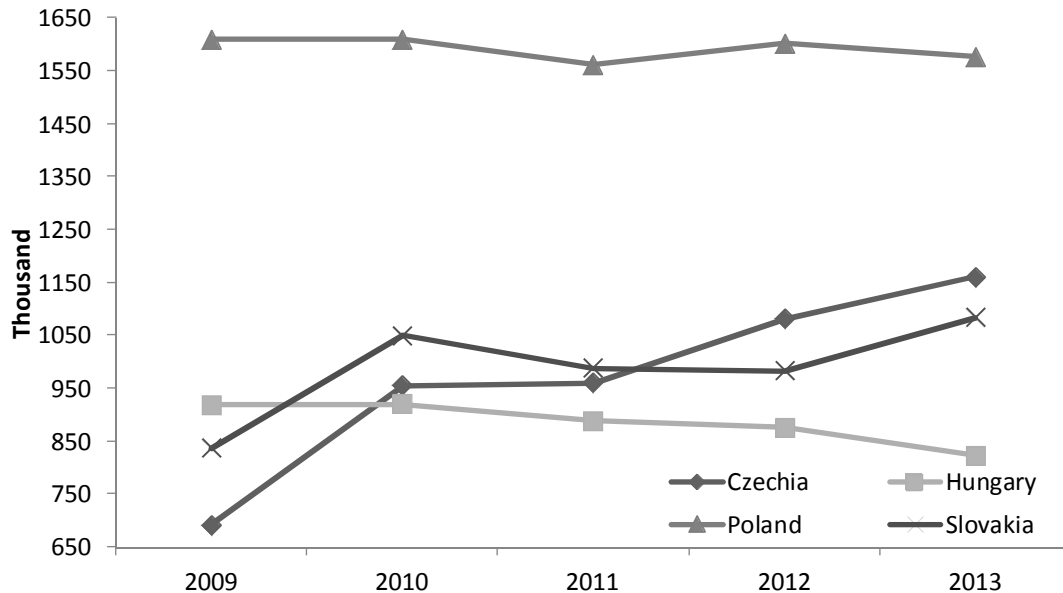
Inventories rotation in days in Czechia rise between year 2009 and 2011. In 2012 it fell from 102,36 to 42,33. In last examined year in Czechia inventories rotation increase by 8,06%.

In Hungary we can see decrease in every year, beside 2012. In this year inventories rotation reach the value of 492,94 days. In Poland the value rise sharply in 2011 by 984,82%. Slovakia reach a peak in 2009 year with value 1964,28 days.

Country with the biggest money levels tied in inventories is Poland. Average value of inventories in Poland is 1600 thousand euro. Other countries have the money levels tied in inventories between 600 and 1200 thousand euro.

The next stage of the study was examined the money levels tied in inventories in comparison to each country. There was conducted Student t-test to examine whether these values differ from each other statistically. The results for Czechia compared to each country are presented in a separate table.

Figure 1 Levels of Inventories in E-commerce Companies in V4 Countries



Source: Own study based on data from e-commerce firms reported in Database Amadeus product of Bureau van Dijk, [date: 2016 MAY 10]

Table 2 T-student Test for E-commerce Companies in Czechia and Hungary

	Average CZ	Average HU	T	Df	p	St. Dev. CZ	St. Dev. HU
Inv. rotation 2013	45,7	98,6	0,922	1734	0,357	81,3	935
Inv. rotation 2012	42,3	492,9	0,481	1588	0,631	63	15348
Inv. rotation 2011	102,4	69,8	0,894	1463	0,371	1059	320
Inv. rotation 2010	53,7	91,4	0,801	1440	0,423	280	725
Inv. rotation 2009	33,1	157,6	0,701	1112	0,483	40	2582

Source: Own study based on data from e-commerce firms reported in Database Amadeus product of Bureau van Dijk, [date: 2016 MAY 10]

In any of the tested years p-value is lower than 0,05. In enterprises selling online in Czechia we cannot find the relationship between enterprises selling online in Hungary.

The same as in Hungary case in any of the tested years p-value is lower than 0,05. We cannot find the relationship between enterprises selling online in Hungary and enterprises selling online in Czechia.

Table 3 T-student Test for E-commerce Companies in Czechia and Poland

	Average CZ	Average PL	T	df	p	St. Dev. CZ	St. Dev. PL
Inventories rotation 2013	48	137	-0,806	656	0,421	81,3	1857
Inventories rotation 2012	42	35	1,342	639	0,180	63	73
Inventories rotation 2011	102	1175	-0,831	607	0,406	1059	20795
Inventories rotation 2010	54	108	-0,584	559	0,560	280	1444
Inventories rotation 2009	33	158	-0,701	1112	0,483	40	2582

Source: Own study based on data from e-commerce firms reported in Database Amadeus product of Bureau van Dijk, [date: 2016 MAY 10]

Table 4 T-student Test for E-commerce Companies in Czechia and Slovakia

	Average CZ	Average SK	T	df	P	St. Dev. CZ	St. Dev. SK
Inventories rotation 2013	46	505	-1,346	490	0,179	81,3	5583
Inventories rotation 2012	42	481	-1,676	488	0,094	63	4287
Inventories rotation 2011	102	120	-0,217	476	0,828	1059	669
Inventories rotation 2010	54	1476	-1,159	451	0,247	280	19218
Inventories rotation 2009	33	1964	-1,156	372	0,249	40	24341

Source: Own study based on data from e-commerce firms reported in Database Amadeus product of Bureau van Dijk, [date: 2016 MAY 10]

The last table shows that there is no relationship between inventories rotation in e-commerce companies in Czechia and Slovakia.

4 Conclusions

Problems in the development of e-commerce may be due to the characteristics typical of the post-socialist backwardness constraints. The economic reforms associated with the transition to a market economy resulted in rising unemployment and general impoverishment of the population. The European Union currently consists of many countries, and some of them are countries of the former Eastern bloc. Europe's center of gravity shifts. The process of enlargement of the European Union not only drives the changes in the new countries, but also leads to a change of the whole of Europe.

Acknowledgments

The presented work and results is part of monothematic cycle realized as part of grant titled: Cash management in small and medium enterprises that use full operating cycle. The work is supported by National Science Centre, and financed from the Polish budget resources in the years 2015-2018 as the research project DEC-2014/13/B/HS4/00192. The presented work and results is also part of monothematic cycle realized as part of grant titled: Determinants of capital structure in nonprofit organizations. The work is supported by National Science Centre, and financed from the Polish budget resources in the years 2016-2019 as the research project DEC-DEC-2015/19/B/HS4/01686.

References

- Ahmidat, A. (2016). Oil impact on production rates in the Libyan economy (analytical study during the period 1995-2008), *unpublished material*.
- Bartak, M., Gavurova, B. (2015). Economics and social aspects of long-term care in the context of the Czech republic and the Slovak republic EU membership, *Proceedings of 12th International Scientific Conference: Economic Policy in The European Union Member Countries*, pp. 35-44.
- Bem, A., Michalski, G. (2016). Hospital profitability vs. selected healthcare system indicators. *CEFE 2015 – Central European Conference in Finance and Economics*. Technical University of Kosice, Kosice, pp. 52-61.
- Bem, A., Predkiewicz, K., Predkiewicz, P., Ucieklak-Jez, P. (2014b). Hospital's Size as the Determinant of Financial Liquidity. *Proceedings of the 11th International Scientific Conference European Financial Systems 2014*, pp. 41-48.
- Bem, A., Predkiewicz, K., Predkiewicz, P., Ucieklak-Jez, P. (2014a). Determinants of Hospital's Financial Liquidity. *Procedia Economics and Finance*, no. 12, pp. 27-36.
- Bem, A., Predkiewicz, P., Ucieklak-Jez, P., Siedlecki, R. (2015a). Profitability versus Debt in Hospital Industry. *European Financial Systems 2015. Proceedings of the 12th International Scientific Conference*, pp. 20-27.
- Bem, A., Predkiewicz, P., Ucieklak-Jez, P., Siedlecki, R. (2015c). Impact of hospital's profitability on structure of its liabilities, *Strategica 2015 Proceedings*, pp. 657-665.
- Bem, A., Siedlecki, R., Predkiewicz, P., Ucieklak-Jez, P., Hajdikova, T. (2015b). Hospital's financial health assessment. Gradient method's application. *Enterprise and Competitive Environment. Conference Proceedings*, pp. 76-85.
- Bledinger, G. (2016). Best in class approach and finetune the formula to allow financially proper comparisons, *unpublished material*.
- Brozyna E., Michalski, G., Soroczynska, J. (2015). E-commerce as a Factor Supporting the Competitiveness of Small and Medium-Sized Manufacturing Enterprises. *Central European Conference in Finance and Economics (CEFE2015)*, Technical University of Kosice, 2015, pp. 80-90.
- Cheben, J., Lancaric, D., Savov, R., Toth, M., Tluchor, J. (2015). Towards Sustainable Marketing: Strategy in Slovak Companies. *Amfiteatru Economic*, 17(40), pp. 855.

- Galas, S., Galas, A., Zelenakova, M., Zvijakova, L., Fialova, J., Kubickova, H. (2015). Environmental impact assessment in the visegrad group countries. *Environmental Impact Assessment Review*, 55, pp. 11-20.
- Gavurova, B., Soltes, M. (2016). System of day surgery in Slovakia: analysis of pediatric day surgery discrepancies in the regions and their importance in strategy of its development, *E & M EKONOMIE A MANAGEMENT*, vol. 19, no. 1.
- Gavurova, B., Soltes, V. (2014). Importance of day surgery clinics specialization to the financing on health care. In *SGEM2014 Conference on Psychology and Psychiatry, Sociology and Healthcare, Education*, vol. 2, pp. 399-408.
- Horvatova, E., Schwarzova, M., Horvat, J. (2014). Theoretical and practical aspects of liquidity measurement and Basel III. *Proceedings of the 8-th International Conference on Currency, Banking and International Finance*, pp. 111-120.
- Jasova, E., Cermakova, K., Kaderabkova, B., Prochazka, P. (2016). Influence of institutional factors on structural and cyclical unemployment in the countries of the visegrad group. *Politicka Ekonomie*, vol. 64(1), pp. 34-50.
- Kim, M., Chung, N., Lee, C. (2011). The effect of perceived trust on electronic commerce: Shopping online for tourism products and services in South Korea. *Tourism Management*, vol. 32(2), pp. 256-265.
- Krajicek, J. (2013). Cash Management in Practice. *European Financial Systems 2013*, pp. 176-180.
- Kraska, M. (2004). Elektroniczna Gospodarka w Polsce – Raport 2004, *Instytut Logistyki i Magazynowania*, Poznan, pp. 1-10.
- Lawrence, J. (2013). Barriers hindering ecommerce adoption: A case study of kurdistan region of Iraq. *Technology diffusion and adoption: Global complexity, global innovation*, pp. 152-165.
- Io Storto, C. (2013). Evaluating ecommerce websites cognitive efficiency: An integrative framework based on data envelopment analysis. *Applied ergonomics*, vol. 44(6), pp. 1004-1014.
- Merickova, B. M., Nemeč, J., Svidronova, M. (2015). Co-creation in Local Public Services Delivery Innovation: Slovak Experience. *Lex Localis*, vol. 13(3), pp. 521.
- Merkevicius, J., Davidaviciene, V., Raudeliuniene, J., Buleca, J. (2015). Virtual organization: specifics of creation of personnel management system. *E+ M Ekonomie a Management*, vol. 4, pp. 200-211.
- Michalski, G. (2010). Planning optimal from the firm value creation perspective. levels of operating cash investments, *Romanian Journal of Economic Forecasting*, vol. 13(1).
- Michalski, G. (2015a). Agency Costs in Small and Medium Wood Industry Enterprises with Full Operating Cycle and Cash Levels. *Procedia Economics and Finance*, vol. 34, pp. 461-468.
- Michalski, G. (2015b). Full operating cycle and its influence on enterprise characteristics: V4 food and beverages processing firms case. *18th International Scientific Conference Enterprise and the Competitive Environment*, Brno, pp. 559-568.
- Michalski, G. (2015c). Relation Between Cash Levels and Debt in Small and Medium Wood and Furniture Industry Enterprises with Full Operating Cycle. *Procedia Economics and Finance*, vol. 34, pp. 469-476.
- Michalski, G. (2016). Risk pressure and inventories levels. Influence of risk sensitivity on working capital levels. *Economic Computation and Economic Cybernetics Studies and Research*, vol. 50(1).

- Michalski, G. (2016b). Full operating cycle influence on the food and beverages processing firms characteristics, *Agricultural Economics-Zemledska Ekonomika*, vol. 62(2).
- Novotna, V., Luhan, J. (2012). Dynamical model of e-commerce using differential equations with delay, *Innovation Vision 2020: Sustainable growth, Entrepreneurship, and Economic Development, Proceedings of the 19th International Business Information Management Association Conference*, vol. 1, 2012, pp. 473-481.
- Pavlicek, J., Kristoufek, L. (2015). Nowcasting unemployment rates with google searches: Evidence from the visegrad group countries. *PLoS ONE*, vol. 10(5).
- Raisova, M., Buleca, J., Michalski, G. (2014). Food processing firms inventory levels in hard times. 2004-2012 Slovak, Czech and Polish enterprises case. *Procedia Economics and Finance*, vol. 12, pp. 557-564.
- Reznakova, M., Karas, M. (2015). The Prediction Capabilities of Bankruptcy Models in a Different Environment: An example of the Altman Model under the Conditions in the Visegrad Group Countries. *Ekonomicky Casopis*, vol. 63(6), pp. 617-633.
- Sedlacek, J., Valouch, P. (2009). Fair Value in the Price Regulation of Natural Monopoly. *E & M EKONOMIE A MANAGEMENT*, vol. 12(2), pp. 6-14.
- Soltes, M., Gavurova, B. (2015). Quantification and comparison of avoidable mortality-causal relations and modification of concepts. *Technological and Economic Development of Economy*, vol. 21(6), pp. 917-938.
- Soltes, V., Gavurova, B. (2014). Innovation policy as the main accelerator of increasing the competitiveness of small and medium-sized enterprises in Slovakia. *Procedia Economics and Finance*, vol. 15, pp. 1478-1485.
- Szczygiel, N., Rutkowska-Podolska, M., Michalski, G. (2015). Information and Communication Technologies in Healthcare: Still Innovation or Reality? Innovative and Entrepreneurial Value - creating Approach in Healthcare Management, *5th Central European Conference in Regional Science Conference Proceedings*, pp. 1020-1029.
- Szopinski, T. (2013). Czynniki determinujace korzystanie z handlu elektronicznego przez konsumentow, *Handel Wewnetrzny*, vol. 6(347), pp. 32-42.
- Tkacova, A., Sinicakova, M. (2015). New composite leading indicator of the Hungarian business cycle. *Acta Oeconomica*, vol. 65(3), pp. 479-501.
- Zielinska-Glebocka, A., Gawlikowska-Hueckel, K. (2013). Konkurencyjnosc miedzynarodowa i regionalna panstw Grupy Wyszehradzkiej. *Wydawnictwo Uniwersytetu Gdanskiego*, pp. 10-62.

Optimising the Slovak Tax Policy and Tax System Performance

Emil Burak¹, Juraj Nemec²

1 School of Economics and Management of Public Administration
Furdekova 3240/16, 851 04 Bratislava, Slovak Republic
E-mail: burak@nexta.sk

2 Masaryk University
2 Faculty of Economics and Administration, Department of Public Economics
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: juraj.nemec@econ.muni.cz

Abstract: *There is a rich body of general scientific research dealing with issues such as optimum tax systems and optimum tax policies; however, there is limited scientific research focused on these issues specifically in Slovakia. To help fill this gap, our paper defines and discusses the most significant elements of the future optimisation of the Slovak tax system. The paper is based on primary and secondary data; it combines qualitative and quantitative research methods. The paper's main basis is the comparison of perceived needs by tax officials, collected in the course of our research, with existing evidence. The most frequent responses (simplify tax collection, decrease tax bureaucracy, provide better information about the tax system to businesses and citizens, increase the level of risk connected with tax evasion, and improve tax administration services) are very much in line with the positions of existing scientific and professional literature. However, the second most frequent answer, to decrease the tax burden, indicates a level of tax illusion even at the level of tax administration professionals.*

Keywords: tax administration, Slovakia, optimizing, opinion of tax officials

JEL codes: H20, H26, D04

1 Introduction

There is a rich body of general scientific research dealing with issues such as optimum tax systems and optimum tax policies; however, there is limited scientific research focused on these issues specifically in Slovakia. Considering that there are several university programmes dealing with tax policy, the fact of recent massive tax administration reforms in Slovakia, and the very negative findings by recent academic studies concerning the levels of administrative and compliance costs of taxation in Slovakia (Pompura, 2012 and Cizmarik, 2013), this situation is rather surprising.

The goal of our paper is to define and to discuss the most important questions connected with the future optimisation of the Slovak tax system. The paper is based on primary and secondary data; it combines qualitative and quantitative research methods. It is based mainly on a comparison between the perceived needs by tax officials and the existing evidence. This comparison serves as the basis for the paper's conclusions and policy proposals.

Literature review

The first integrated concept of how to construct tax systems was presented by Smith (2005), whose principles of taxation, involved in the canons of taxation, formed the starting point for the study of the theory and practice of tax administration. Justice, certainty, convenience, and efficiency are principles that informed the development of contemporary taxation theory.

The most frequently investigated issue is efficiency, something that appears to be a constant problem in tax administration. The high numbers and low productivity of tax officers and the huge costs for taxpayers to comply with tax system requirements have always been a real problem in tax administration.

The costs of taxation may vary over time and place, and they may be analysed in either of two ways. The first group of authors uses the term 'administrative costs of taxation' only to cover the expenses of the public sector (Sandford et al., 1989). The second group of authors, most notably Stiglitz (1989), divides the costs into administrative costs of taxation and the indirect expenses of the private sector (the incurred compliance expenses of taxation). Authors adhering to this theory of administrative costs in Slovakia include Hamernikova and Kubatova (2000) and Pekova (2002).

There have been many important international studies about this topic (Alm, 1996, Evans, 2003, Chittenden et al, 2005, Lignier and Evans, 2012, Malmer, 1995, Mirrlees, 1971, Sandford, 1989 and 1995, Slemrod and Sorum, 1984, Susila and Pope, 2012, Tran Nam et al, 2000, Vaillancourt, 1987). There have also been some studies in the Central European region (Bayer, 2013, Jilková and Pavel, 2006, Klun 2004, Klun and Blazic, 2005, Pavel and Vitek, 2012, Vitek, 2008, Teperová and Kubantová, 2013).

Other dimensions of the tax system are less frequently investigated, even in international literature, and there is a near-absence of scientific articles in Central Europe. The few books on taxation including issues connected with optimisation of the tax system include Kubatova, Vybihal et al., 2004 and Kubatova, 2009.

2 Methodology and Data

Our primary research was conducted between February 2013 and February 2016. During this period, we interviewed 282 executive tax officials participating in training at the tax school of the Slovak Financial Office (the requirement for inclusion in the sample was a minimum of four years of practice in tax administration). Our request was rather simple: 'Try to define the most significant elements of the possible optimisation of the Slovak tax system.' All written responses were processed and summarised by the authors.

In the following text, we first highlight the responses with the highest frequency (Table 1). We next compare the most frequent suggestions provided by the respondents to existing data about the Slovak tax system. This comparison serves as the basis for the final part of this paper: conclusions and recommendations.

Table 1: Selected Responses of Tax Officials

Most frequent responses – suggestions	Frequency
Simplify tax collection, decrease tax bureaucracy	158
Decrease the tax burden	145
Provide better information about the tax system to businesses and citizens	110
Increase the level of risk connected with tax evasion	86
It is difficult to optimise the tax policy and the tax system, because there is no optimum model available	80
Prevent the transfer of Slovak firms to tax havens by lowering the direct and indirect tax burden	43
Utilise existing international good practices	33
Educate taxpayers – taxes are not the worst issue in the world	31
Be administratively simple, using low and stable tax rates and providing effective tax administration services	27
Improve tax administration services	26
Important but infrequent response	Frequency
Create a whistle-blowing system for reporting tax evasion	4

Source: Own research

3 Results and Discussion

In this section, we comment on the main expressed opinions of the interviewed tax officials. We support or criticise their perceived priorities using existing data and research.

Simplify tax collection, decrease tax bureaucracy (+ improve tax administration services)

The fact that tax officials perceive the Slovak tax system as complicated and not customer friendly, generating significant tax administration and tax compliance costs, can be evaluated as a positive finding. Current academic studies have documented a critical situation. Pompura (2012) calculated the administrative costs of taxation in Slovakia and estimated them using standard approaches employed by other scientists (see: Vitek, 2008, Vitkova & Vitek, 2012). The results are shown in Table 2.

Table 2: Administrative Costs as a Percentage of Tax Revenues, by Specified Tax

	%							
	2004	2005	2006	2007	2008	2009	2010	2011
Income tax of individuals – Employees	x	1.77	1.96	1.64	1.48	1.62	1.81	1.65
Income tax of individuals – Entrepreneurs	1.98	5.86	7.64	7.92	7.04	7.92	30.76	25.51
Corporate income tax	2.99	1.62	1.52	1.37	1.23	1.18	2.11	1.65
Income tax – lump sum form	1.33	2.43	2.01	1.19	1.45	1.61	2.04	2.25
Property tax	0.53	1.82	1.81	19.32	14.80	14.61	13.42	31.80
VAT	3.63	1.32	1.28	1.41	1.47	1.52	1.52	1.59
Road Tax	4.10	1.97	1.72	1.16	1.52	1.00	1.26	1.12

Source: Pompura, 2012

These data document that tax administration in Slovakia is among the most expensive in the world – see Table 3.

Table 3: Taxation Level and Administrative Costs of Taxation: Selected Countries

Countries according to their administrative costs of taxation (%)	Countries according to their tax revenues to GDP			
	< 20%	20-30%	30-40%	Over 40%
- 0.60		USA		Sweden
0.61 - 0.80		Korea	Ireland, Spain, New Zealand	Austria, Denmark, Finland, Germany, Norway
0.81 - 1.00	Mexico	Turkey		France
1.01 - 1.20			Hungary, Netherlands, UK	Luxembourg
1.21 - 1.40			Canada	Belgium, Czech Republic
1.40 +		Japan	Poland, Portugal, Slovakia	

Source: OECD, 2011.

The existence of high administrative costs has been reflected in the actions of the Slovak government, which in 2012 undertook the large scale tax system reform called UNITAS. The main goals of UNITAS are to improve the flow and use of information and to merge the collection of all taxes and social contributions under one administration. According to the official data collected on the basis of OECD country reports, the administrative costs

of taxation were decreased through UNITAS reform by about 50%; however, such data are hard to believe.

Cizmarik (2013) estimated the compliance costs of taxation. Because his first calculations were really negative, he tried to provide other possible alternative calculations. However, for even the most optimistic calculation, the costs incurred to taxpayers are really high; see Table 4.

Table 4: Alternative Calculations of Compliance Costs of Income Taxation in Slovakia

Alternative	CC to tax revenues total	CC to tax revenues physical persons	CC to tax revenues legal persons
Original results	73.37 %	839.02 %	47.13 %
Alternative A	53.11 %	242.29 %	35.98 %
Alternative B	62.36 %	713.17 %	40.06 %
Alternative C	40.12 %	637.04 %	19.67 %
Alternative D	61.36 %	734.61 %	38.29 %
Alternative E	62.99 %	599.71 %	44.59 %
Alternative A+B+C	24.69 %	156.37 %	12.76 %

Source: Cizmarik, 2013

Customer service is an element that is almost missing from Slovak tax administration. One specific step forward would be creating a 'customer friendly' tax administration system that would provide taxpayers with better information and increase their trust in the tax system. This would include several necessary and important improvements. For example, it should reflect the fact that there is no system for really effective and binding tax advice from tax offices. The 'tax case law precedents list' may be, but is not necessarily, fully respected by tax authorities and especially court decisions. Because of this, the decisions of tax officials exerting tax control may differ even with similar cases (Burak and Mazary, 2012). This situation creates important levels of critical uncertainty. Another issue is too-frequent changes in tax legislation, complicating life and increasing tax compliance costs.

Decrease the tax burden

This suggested improvement is connected with a frequent criticism of the Slovak tax system as a system creating excessive tax burdens on taxpayers. However, it is only partially compatible with reality. When looking only at income taxes, Slovakia is one of the European countries with really low tax rates. The revenues from income taxation in Slovakia are among the lowest in the European Union. According to official Eurostat data, Slovak income (direct) tax revenues in 2012 represented only 5.6 % of the GDP (one of the three lowest), even though more countries have lower implicit tax rates for income taxation (we will return to this finding later in the text). The issue of a high tax burden can be associated with social contributions, increasing labour costs.

Provide better information about the tax system to businesses and citizens

This response occurred rather frequently, but we do not feel that the situation is so critical in terms of the scope and scale of information provided by the tax system to taxpayers. Unfortunately, Slovakia did not provide data for benchmarking the communication strategies and channels of the national tax administration for the report produced by the Intra-European Organisation of Tax Administrations (IOTA, 2013), thus we are not able to provide exact data.

However, this opinion by tax officials might be connected with the fact that the level of fiscal and tax literacy of taxpayers is frequently evaluated as low – as documented for example by Cizmarik (2013) and Solilova and Nerudova (2013). Their data confirm the

existence of tax illusions. During the research on compliance costs, Cizmarik (2013) asked respondents their opinion about the level of the compliance costs of taxation. The responses were rather surprising – 8% of respondents felt that compliance costs were marginal, and 31% felt that their level was fully acceptable. Their views of the payroll system were not so positive, but even so 46% of respondents felt that its costs were acceptable.

Increase the level of risk connected with tax evasion

Taking into the account information provided above – that tax rates are moderate, but tax revenues are very 'small' – the issue of tax evasion and its costs and benefits should be more frequently mentioned by tax officials. Tax evasion in Slovakia is estimated to be really high (official data estimate approximately three billion EUR yearly).

Orviska and Hudson (2003) clearly indicate that tax evasion is a common approach in Slovak business, in part perhaps because the risk of punishment is low. For example, Slovakia is the only EU country to apply the principle of 'effective regret'. Even taxpayers caught by the tax office for evasion can retrospectively pay their tax assessments, plus a 10% surcharge, and remain 'clean', provided they pay up before the final court decision.

The tax officials who responded to our survey did not see tax evasion as a core issue, and very few of them provided suggestions for how to cope with it, such as education or whistle blowing.

4 Conclusions

The main source for this paper is the responses of tax officials regarding their opinions about the most significant possibilities for optimising the Slovak tax policy and administration. The answers indicate that these tax officials have an imperfect picture about the pros and cons of the current situation.

Some of the most frequent responses, especially to simplify tax collection, to decrease tax bureaucracy, to provide better information about the tax system to businesses and citizens, and to improve tax administration services, are very much in line with the positions of existing scientific and professional literature. However, the second most frequent answer, to decrease the tax burden, indicates some level of tax illusion even at the level of tax administration professionals.

The specific issue is the relatively low frequency of the response 'increase the level of risk connected with tax evasion'. All of the existing data indicate that the level of tax evasion in Slovakia is rather high, with several important factors behind this situation. One of the most significant factors is low level of risk connected with tax evasion – few cases are discovered and penalised, and moreover Slovakia seems to be the only EU country to apply the principle of 'effective regret'. Even taxpayers caught by the tax office for evasion can retrospectively pay their tax assessments, plus a 10% surcharge, and remain 'clean', provided they pay up before the final court decision.

The responses of the tax officials and the critical data-based evaluation of those responses provide simple tax policy advice. Future tax reforms should focus on structural changes (UNITAS reform contents) and especially on decreasing the scope of tax bureaucracy, providing better tax administration services to taxpayers (this is now accomplished mainly by the gradual improvement of e-government services). The ultimate goal should include increasing the tax fraud risk level.

Acknowledgments

This research was completed with support from the research project 'Performance Management in Public Administration: Theory and Practice in the Czech Republic and Other CEE Countries', ID (CEP) GA16-13119S.

References

- Alm, J. (1996). What is an "Optimal" Tax System? *National Tax Journal*, vol. 49(1), pp. 117-133.
- Bayer, O. (2013). Research of Estimates of Tax Revenue: An Overview. *European Financial and Accounting Journal*, vol. 2013(3), pp. 59-73.
- IEOTA (2013). *Benchmarking: Pilot Exercise*. Retrieved from: <https://www.iota-tax.org/publication/iota-booklet-2012-2013>.
- Burak, M., Mazary, M. (2012). Tax Optimisation: Selected Issues. *Tax Tribune*, issue 28, pp. 207-211.
- Cizmarik, P. (2013). *Vyvolane náklady zdanenia*. Brno: ESF MU.
- Evans, C. (2003). Studying the Studies: An overview of recent research into taxation operating costs. *eJournal of Tax Research*, vol. 1(1), pp. 64-82.
- Hamernikova, B., Kubatova, K. (2000). *Verejné finance*. Praha: Eurolex Bohemia.
- Hasseldine, J., Hansford, A. (2002). The Compliance Burden of the VAT. Further Evidence from the UK. *Australian Tax Forum*, issue 17, pp. 369-388.
- Chittenden, F., Kausar, S., Poutziouris, P. (2005). PAYE-NIC compliance costs: empirical evidence from the UK SME economy. *International Small Business Journal*, vol. 23(6), pp. 635-656.
- Jilkova, J., Pavel, J. (2006). *Hodnoceni efektivnosti verejnych vydaju na ochranu zivotniho prostredi*. Praha: IREAS.
- Klun, M. (2004). Compliance costs for personal income tax in a transition country: the case of Slovenia. *Fiscal Studies* vol. 25(1), pp. 93-104.
- Klun, M., Blazic, H. (2005). Tax compliance costs for companies in Slovenia and Croatia. *Finanzarchiv*, vol. 61(3), pp. 418-437.
- Kubatova, K. (2009). *Danova teorie*. Praha: ASPI Publishing.
- Kubatova, K., Vybihal, V. (2004). *Optimalizace danoveho systemu CR*. Praha: EUROLEX.
- Lignier, P., Evans, C. (2012). The Rise and Rise of Tax Compliance Costs for the Small Business Sector in Australia. *Australian Tax Forum*, vol. 27(3), pp. 615-672.
- Malmer, H. (1995). The Swedish Tax Reform in 1990-91 and Tax Compliance Costs in Sweden. In: Sandford, C. (ed.) *Tax Compliance Costs. Measurement and policy*. Bath: Fiscal Publications, pp. 226-262.
- Mirrlees, J. A. (1971). An Exploration in the Theory of Optimum Income Taxation. *The Review of Economic Studies*, vol. 38(2), pp. 175-208.
- OECD (2011). *Tax Administration in OECD and Selected non-OECD countries: Comparative Information Series*. Paris: Organization for Economic Co-operation and Development.
- Pavel, J., Vítek, L. (2012). Transaction Costs of Environmental Taxation: the Administrative Burden. In: Milne, J. E. - Andersen, M. S. (eds.). *Handbook of Research on Environmental Taxation*. Cheltenham: Edward Elgar, pp. 273-282.
- Pavel, J., Vittek, L. (2015) Vyvolane naklady danoveho systemu v ČR. *Politicka ekonomie*, vol. 63(3), pp. 317-330.
- Pekova, J. (2002). *Verejne finance – uvod do problematiky*. Praha: ASPI.
- Pompura, L. (2012). *Hodnotenie a meranie výkonnosti daňovej správy: administratívne náklady zdanenia*. Brno: ESF MU.
- Sandford, C. (1989). *Administrative and Compliance Costs of Taxation*. London: Fiscal Publications.

- Sandford, C. (1995). *Tax Compliance Costs. Measurement and policy*. Bath: Fiscal Publications.
- Slemrod, J. R., Sorum, N. (1984). The Compliance Cost of the U.S. Individual Income Tax System. *The National Tax Journal*, vol. 37(4), pp. 461-474.
- Smith, A. (2005). *Inquiry into the Nature and Causes of the Wealth of Nations*. Philadelphia: The Pennsylvania State University.
- Stiglitz, J. E. (1989). *Economics of the Public Sector*. New York: Norton.
- Susila, B., Pope, J. (2012). The Tax Compliance Costs of Large Corporate Taxpayers in Indonesia. *Australian Tax Forum*, vol. 27(4), pp. 719-772.
- Solilova, V., Nerudova, D. (2013). Transfer pricing: General Model for Tax Planning. *Ekonomicky casopis*, vol. 61(6), pp. 597-617.
- Teperova, J., Kubantova, K. (2013). Omezeni a moznosti jednoho inkasniho mista v Ceské republice. *Cesky financni a ucetni casopis*, vol. 2013(1), pp. 61-76.
- Tran-Nam, B., Evans, C., Walpole, M., Ritchie, K. (2000). Tax Compliance Costs: Research Methodology and Empirical Evidence from Australia. *National Tax Journal*, vol. 53(2), pp. 229-252.
- Vaillancourt, F. (1987). The Compliance Cost of Taxes on Business and Individuals: A Review of the Evidence. *Public Finance*, vol. 42(3), pp. 395-414.
- Vitek, L. (2008). *Ekonomicka analyza zdaneni prijmu*. Praha: IREAS.
- Vitkova, J., Vitek, L. (2012). Spolocenske vyvolane naklady zdaneni. *Acta Oeconomica Pragensia*, vol. 2012(1), pp. 15-30.

Comparison of the Efficiency of Selected European Banking Sectors

Liběna Černohorská¹

¹ University of Pardubice
Faculty of Economics and Administration, Institute of Economics Science
Studentská 95, 532 10 Pardubice, Czech Republic
E-mail: libena.cernohorska@upce.cz

Abstract: *There is no generally accepted concept of efficiency nor is there a uniform system of indicators for measuring bank efficiency. It is even possible to use the method of financial analysis to measure bank efficiency. In this paper, the following ratios are used for measuring bank efficiency: ROA, ROE, total assets, nonperforming loans/total loans, quick liquid assets/total assets, quick liquid assets/short-term liabilities, loans/deposits, and capital adequacy. The goal of this paper is to assess the efficiency of Czech banks using cluster analysis on the basis of selected ratios and to conduct a comparison with bank efficiency in Poland, Austria, Greece, Portugal, France, and Slovakia. The collective ratios for the entire banking sector will be compared for the selected countries for the years 2010–2014. The cluster analysis demonstrates that the Czech banking sector is the most similar to the Slovakian sector. According to a combination of selected ratios, it is possible to designate the cluster composed of the Czech and Slovak banking sectors as being the cluster with the highest banking sector efficiency. It differs extensively from the cluster of Greece and Portugal.*

Keywords: *bank, banking sector, banks efficiency, cluster analysis, the Principal Components Analysis*

JEL codes: *G14, G21, C38*

1 Introduction

The banking system has become an important component in the economic sector of each country. Like other industries, the banking industry has its own unique characteristics and specifics that adapt by internal and external influences economic sector. Each state is required for the proper functioning of the economy needs a reliable a stable banking system, because the problems in the banking sector may have an impact on the entire financial sector. Each banking system of each country has its own specifics that influence global globalization. It operates on banking systems around the world. Each state receives it but in different ways. Some states retain more of their traditional banking features that arose during the development of the system, in turn, take some elements of the globalized economy.

Banks are an inseparable part of life for all economical subjects (Hedvičková and Svobodová, 2015). The bank stability and efficiency is an important assumption for function the financial markets (Teplý et al., 2010 or Černohorský, 2014). For qualified analysis, it is necessary to work with a time series of ratios and monitor the trends of their development over past periods of time (Tokarčíková et. al., 2014 or Svobodová, 2013). The aim of the article is to undertake a cluster analysis of efficiency of chosen banking sectors in the countries of Eupean Union – Slovak, Poland, Austria, Czech Republic, France, Portugal and Greece. The selected countries are countries represented in the European Union, which have variously developed financial markets and banking sectors. Based on a cluster analysis, the creation of clusters would result, in which individual banking sectors will exhibit similar values in the selected criteria.

Based on current research literature on the efficiency of banks, it is evident that in terms of evaluating the efficiency of banks, that there is a wide range of views and measuring the efficiency is therefore very difficult. There are numerous methods of measuring efficiency and the fundamental question is what indicators we can use to measure that efficiency.

Efficiency is often understood in the same sense as performance and profitability (such as Atemnkeng and Nzongang, 2006 or Molyneux and Thornton, 1992). Where banks are run efficiently, the operational costs are reduced, leading to an increase in profits realised by the banks. The authors Richard, Devinney, et al. (2009) found an analysis of more than 213 articles in leading international journals which use particular indicators based on accounting data to measure efficiency; these indicators mainly include cash flow, financial results, revenues and their growth and asset profitability indicators .

In measuring the efficiency of banks, profitability was used, for example, by Altunbas (1998), Bonin and Hasan (2005), Abbasoglu, Aysan and Günes (2007) and Berger et al. (1993). These authors evaluate the profitability of banks using return on assets (ROA) or return on equity (ROE). Bonin and Hasan (2005) also monitored the amount of total deposits, total assets, loans and liquid assets. The size of a bank is judged by its total assets (Dabla-Norris and Floerkemeier (2007), Fuentes and Vergara (2003)). Indicators of total assets, loans, and total loans/total deposits are used to assess the efficiency of banks, in addition to ROE and ROA, as well as Berger et al. (1993). Groenveled and de Vries (2009) use the capital ratio when measuring the efficiency of banks. Very often the efficiency of banks is evaluated by means of their ownership structure (Fuentes and Vergara (2003), Bonin and Hasan (2005), Mester (1993)). Some authors take into account the cost of labour when measuring the efficiency of banks (Stavárek (2013), Tulekns (2006), Berger et al. (1993)) and the cost of capital (Berger et al. (1993)). Another factor influencing the efficiency of banks is the interest margin (Stavárek (2013) or Dabla-Norris and Floerkemeier (2007)). These last authors also use the indicator of quickly nonperforming loans/total loans, liquid assets/total assets and quick liquid assets/short-term liabilities.

2 Methodology and Data

Evaluating bank efficiency is a relatively complicated analytical problem. There is no generally accepted concept of efficiency nor is there a uniform system of indicators for measuring bank efficiency. It is even possible to use the method of financial analysis to measure bank efficiency. The goal of financial analysis is to evaluate the financial ratios for efficiency and competitiveness that were achieved in prior periods of time. In this paper, the following ratios are used for measuring bank efficiency: ROA, ROE, total assets, nonperforming loans/total loans, quick liquid assets/total assets, quick liquid assets/short-term liabilities, loans/deposits, and capital adequacy. The collective ratios for the entire banking sector will be compared for the selected countries for the years 2010–2014. The necessary data were obtained from the Bankscope database and were chosen with regard to the specifics of the selected banking sectors, international accounting standards and information requirements for the banks. A comparison was made of the average values of the selected indicators in individual banking sectors. Further scientific study could use a longer time series of selected indicators of selected banking sectors for a more detailed analysis. It would be possible to monitor factors which affect the efficiency of banking sectors (such as the period before the financial crisis, the impact of the financial crisis on selected criteria and subsequently track the clusters created, etc.).

The peer analysis allows make a comparison of the financial variables according to the tables and graphs. For this peer analysis will used the traditional methods of multiple statistical analysis, especially cluster analysis and principal components analysis. The method of cluster analysis was used to compare the efficiency of the Czech banking sector with the banking sectors of the other selected European countries. Cluster analysis divides the selected countries into clusters according to similarity. Using the method of principal component analysis, it was determined that there are two main components that jointly explain nearly three-quarters of the variability.

Cluster analysis

The primary access for determining the similarity of quantitative variables is the factor analysis. It is based on principal component analysis, which is used to reduce the size of

the job (instead of many variables for further calculations determined by a small number of principal components, which can be expressed as linear combinations of the original variables).

The Principal components analysis is computed by the Singular Value Decomposition of X. (Friedman et al. (2013)) The general formula (2) is:

$$X = UDW^T \quad (2)$$

where

D ... diagonal matrix consisting of the set of all eigenvalues of C along its principal diagonal, and 0 for all other elements

U ... an n-by-n matrix, the columns of which are orthogonal unit vectors of length n called the left singular vectors of X;

W ... a p-by-p whose columns is orthogonal unit vectors of length p and called the right singular vectors of X.

In the Principal Components Analysis (PCA), the data are summarized as a linear combination of an orthonormal set of the vectors. The first principal component accounts for as much of the variability in the data as possible, and each successive component represents as much of the remaining variability as possible (Zou (2006)). Components accounting for maximal variance are retained while other components accounting for a trivial amount of variance are not retained. These techniques are typically used to analyse groups of correlated variables representing one or more common domains. The result of PCA enters into the factor analysis. It is aim to assess the structure and relationships of selected indicators to see if allowed by their division into groups, in which the indicators chosen from the same groups together more than correlated variables from different groups.

Cluster analysis is a collective term covering a wide variety of techniques for delineating natural groups or clusters in data sets. The article will be used hierarchical agglomerative clustering.

Hierarchical agglomerative clustering start at the bottom and at each level recursively merges a selected pair of clusters into single clusters. This produces a grouping at the next higher level with one less cluster. Algorithm of hierarchical agglomerative clustering begins with every observation representing a singleton cluster. At each of the N-1 steps the closest two (least dissimilar) clusters are merged into a single cluster, producing one less cluster at the next higher level. (Friedman et al., 2013)

In the first phase clustering calculated the relative distances of objects and writes them into a matrix. This leads to a square symmetric matrix $\mathbf{D} = \{d(R, S)\}$ which has zeros on the main diagonal. It used for calculating the metric distance matrix is normally used and it called a Euclidean method. It is based on the geometric model (Klímek, 2005). The objects characterized by p characters are assigned to the points p-dimensional Euclidean space E_p , then two dots (R, S) it is defined by the Euclidean distance given by general formula (3):

$$d(R, S) = \sqrt{\sum_{i=1}^p (x_{ri} - x_{si})^2} . \quad (3)$$

On the basis of the distance matrix can be launched the second phase calculations, also clustering. Clustering method was used furthest neighbour (called too complete linkage). Complete linkage agglomerative clustering takes the intergroup dissimilarity to be that of the furthest (most dissimilar) pair according to formula (4):

$$d(R, S) = \max_{\substack{O_i \in R \\ O_j \in S}} \{d(O_i, O_j)\} \text{ for } R \neq S \quad (4)$$

where

R, S ... represent two such groups

$d(R, S)$... represent dissimilarity between R and S in computed from the set of pairwise observation dissimilarities $d(O_i, O_j)$, where one member of the pair O_i is in R, and the other O_j is in S.

Methods of clustering is selected based on the degree of credibility, and it cophenetic correlation coefficient "CC". The higher the value of the correlation coefficient cophenetic (a value close to 1), the greater the credibility and the choice of a suitable model cluster. (Friedman et al. (2013), Romesburg (2004))

The result is graphical figure called a dendrogram with provided a highly interpretable complete description of the hierarchical agglomerative clustering.

3 Results and Discussion

The basic condition for performing cluster analysis is rejected claim that the data are affected by multicollinearity. Multicollinearity could very significantly affect the final quality of the clustering and classification of the individual elements in the resulting clusters. It is necessary to establish the correlation matrix. Then eliminate those criteria in assessing the relationship reaching the correlation coefficient higher than 0.7. If left criterion which the correlation coefficient is above 0.7. It is necessary to provide a justification for its further occurrence of cluster analysis. For more information see Friedman et al. (2013).

Based on the results of the correlation matrix, the ratio of nonperforming loans/total loans was removed from the analysis. This indicator showed very high levels of correlation with ROE, as well as the proportion of quick liquid assets/short-term liabilities, which is highly correlated with ROA.

To obtain information on the impact of these indicators, the principal components method was applied followed by a factor analysis. Both methods are used for visualising data and obtaining input information.

Visualization of data using factor analysis

The principal component method determined that there are two main components which together explain nearly three quarters of variability (Table 1).

The first principal component depletes approximately 47.96% of the total variability in the data, the second approximately 25.81%. The results of the factor analysis bring Table 1 and Figure 1. Table 1 shows which criteria are important for further exploration in terms of classification into certain objects, respectively clusters (bold face type).

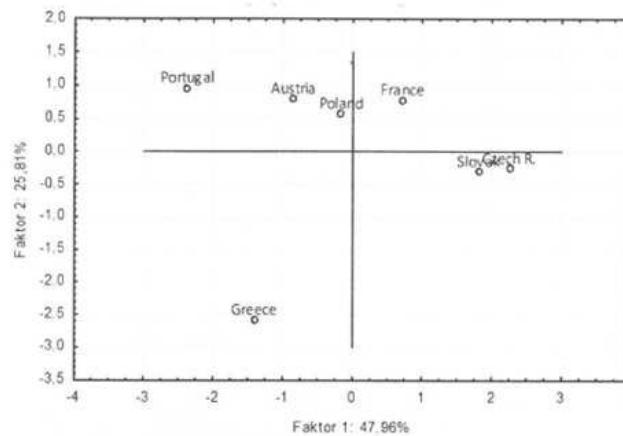
Table 1 The Result of the Factor Analysis – Two Main Components

	First principal component 1	Second principal component 2
Total assets	0.39	0.80
Liquid assets/total assets	0.77	0.26
Loans/Deposits	0.60	0.04
Capital adequacy	0.62	0.64
ROA	0.91	-0.12
ROE	-0.19	0.97

Source: Own calculation

Graphic representation of the data visualisation from the factor analysis assumes the possible creation of approximately four relevant clusters (Figure 1).

Figure 1 Factor Analysis – Number of Clusters



Source: Own calculation

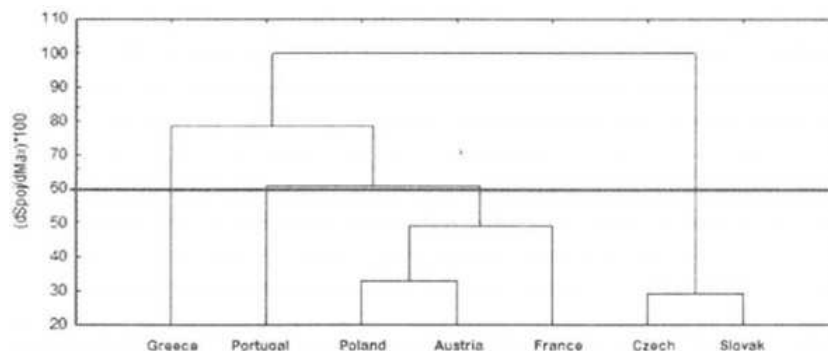
Result of cluster analysis

The cluster analysis method was used in comparing selected banking sectors. This analysis divides the selected countries into clusters according to their similarities. To perform a cluster analysis, we have assumed an agglomerative hierarchical clustering. For more information see Romesburg (2004). It was followed by selecting the clustering procedures, namely, a clustering method (the furthest neighbour method, or complete linkage clustering using statistical software), and the distance calculation method (Euclidean distance). The clustering method was selected based on the degree of credibility, namely, a correlation coefficient. The degree of credibility, or closeness degree, has been verified by the correlation coefficient. The higher the value (i.e., approaching 1), the greater the credibility and the choice of a suitable cluster model. The correlation coefficient was chosen on the basis of achieving a value approaching 1 with the furthest neighbour method. A prerequisite to performing the cluster analysis is that the data is not affected by multicollinearity.

Determining the relevant number of clusters was started from the clustering schedule, which determined the degree of distance of approximately 60%. Below this level, the relevant number of clusters was determined (Figure 2). The division of the countries into four clusters with the values of the individual indicators can be seen in Table 2.

Determining the relevant number of clusters was started from the clustering schedule, which determined the degree of distance of approximately 60%. Below this level, the relevant number of clusters was determined (Figure 2). The division of the countries into four clusters with the values of the individual indicators can be seen in Table 2.

Figure 2 The Dendrogram - Wards Method



Source: Own calculation

Table 2 Average Values of Chosen Indicators (in %)

		Change in total assets	Liquid ass./Tot. ass.	Loans/ Deposits	Capit. adeq.	ROA	ROE
First cluster	Slovak	1.4	36.2	110	17.93	1.3	9.1
	Czech R.	8.9	33.8	132	17.08	1.27	16.2
Second cluster	France	9.6	39.1	81	15.03	0.5	8.4
	Austria	-5.8	24.5	87	15.83	0.1	5.5
	Poland	4	21.4	90	14.91	1.1	14
Third cluster	Portugal	-7.7	16.9	117	13.20	-0.7	-11
Fourth cluster	Greece	-10.8	29.9	89	13.50	1.4	-169
	Average total	-0.06	26.44	88.14	15.35	0.71	-18.1

Source: Own calculation by Bankscope

4 Conclusions

Based on the cluster analysis, four clusters were created. From the point of view of the efficiency of the banking sectors using selected indicators with the first principal component, which explains almost 48% of the variability of the investigated group, the greatest correlations were the ratio of liquid assets to total assets and ROA. In the ratio of liquid assets to total assets, the best values were achieved by France, the Czech Republic and Slovakia. The Czech Republic and Slovakia faultlessly exceeded the average ROA limit, but not France. The average ROA value was also exceeded by Poland, but which does not record comparable results to those countries in the ratio of liquid assets/total assets. The first cluster is formed by the Czech Republic and Slovakia. Because France and Poland lag behind in one or the other indicators, they are clustered into another cluster together with Austria. The third cluster consists of only one country - Portugal. Portugal achieved the worst results in both indicators listed above. The Greek banking sector achieved better results than Portugal, but because it achieved very low levels in the indicator corresponding to the second part of the component, it forms a separate cluster. Especially in terms of ROE, it achieved high negative values, which prevents it from being compared to other countries, and thus Greece and forms the fourth separate cluster.

Depending on the combination of selected indicators, the cluster composed of the Czech Republic and Slovakia can be qualified as a cluster with the highest possible efficiency in the banking sector. The first cluster achieves significantly better values of the indicators monitored than other banking sectors. These two banking sectors were not impacted by the global financial crisis (compared to Greece and Portugal, and to some extent, France). The average values of the monitored indicators of the first cluster are significantly above the average for all the markers in the selected banking sectors.

Acknowledgments

The paper has been created with the financial support of The Czech Science Foundation (project GACR No. 14-02108S - The nexus between sovereign and bank crises).

References

- Altunbas, Y., Chakravarty, S. P. (1998). Efficiency measures and the banking structure in Europe. *Economics Letters*, vol. 60(2), pp. 205-208.
- Atemkeng, T., Nzongang, J. (2006). Market structure and profitability performance in the banking industry of CFA Countries: the case of commercial banks in Cameroon. *Journal of Sustainable Development in Africa*, vol. 8(2), pp. 1-14.
- Abbasoglu, O. F., Aysan, A. F., Günes, A. (2007). Concentration, competition, efficiency and profitability of the Turkish banking sector in the post-crisis period. *Banks and Bank Systems*, vol 2(3), pp. 106.

- Bankscope. (2014). *World banking information source*. Bureau van Dijk.
- Berger, A. N., Hancock, D., & Humphrey, D. B. (1993). Bank efficiency derived from the profit function. *Journal of Banking & Finance*, vol. 17(2), pp. 317-347.
- Bonin, J. P., Hasan, I., Wachtel, P. (2005). Bank performance, efficiency and ownership in transition countries. *Journal of banking & finance*, vol. 29(1), pp. 31-53.
- Černohorský, J. (2014). The Integration of Credit Markets. In *Proceedings of 7th International Scientific Conference on Managing and Modelling of Financial Risks*, pp. 127-135.
- Dabla-Norris, E., Floerkemeier, H. (2007). Bank efficiency and market structure: what determines banking spreads in Armenia?. *IMF Working Papers*, pp. 1-28.
- Friedman, J., Hastie, T., Tibshirani, R. (2001). *The elements of statistical learning*, 1st ed. Berlin: Springer series in statistics.
- Fuentes, R., Vergara, M. (2003). Explaining bank efficiency: bank size or ownership structure?. In *Proceedings of the VIII Meeting of the Research Network of Central Banks of the Americas*, pp. 12-14.
- Groeneveld, J. M., de Vries, B. (2009). European co-operative banks: first lessons of the subprime crisis. *The International Journal of Cooperative Management*, vol. 4, pp. 8-21.
- Hedvičáková, M., Svobodová, L. (2015). Analysis of Banking Fees and Clients' Needs. In *Proceedings of the 12th International Scientific Conference on European Financial Systems 2015*. Brno: Masarykova Univerzita, pp. 181-188.
- Klímek, P. (2005). Data mining a jeho využití. *E+M Ekonomie a Management*, vol. 8 (3), pp. 128 - 135.
- Mester, L. J. (1993). Efficiency in the savings and loan industry. *Journal of Banking & Finance*, vol. 17(2), pp. 267-286.
- Molyneux, P., Thornton, J. (1992). Determinants of European bank profitability: A note. *Journal of banking & Finance*, vol. 16(6), pp. 1173-1178.
- Richard, P. J., Devinney, T. M., Yip, G. S., Johnson, G. (2009). Measuring organizational performance: Towards methodological best practice. *Journal of management*, vol. 35(3), pp. 718-804.
- Romesburg, Ch. (2004). *Cluster Analysis for Researchers*. North Carolina: Lulu Press.
- Serdarevic, G., Teplý, P. (2011). The Efficiency of EU Merger Control During the Period 1990-2008*. *Finance a Uver*, vol. 61(3), pp. 252-276.
- Stavárek, D., Řepková, I. (2013). Efficiency in the Czech banking industry: A non-parametric approach. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, vol. 60(2), pp. 357-366.
- Svobodová, L. (2013). Trends in the number of bankruptcies in the Czech Republic. In *Proceedings of International Conference, Hradec economics days 2013*, Hradec Králové: Univerzita Hradec Králové, pp. 393-399.
- Tokarčíková, E., Ponisciakova, O., Litvaj, I. (2014). Key Performance Indicators and their Exploitation in Decision-Making Process. In *Proceedings of 18th International Conference. Transport means 2014*, Kaunas: Kaunas University of Technology, pp. 372-375.
- Tulkens, H. (2006). On FDH efficiency analysis: some methodological issues and applications to retail banking, courts and urban transit. In *Public goods, environmental externalities and fiscal competition*, pp. 311-342.
- Zou, H., Hastie, T., Tibshirani, R. (2006). Sparse principal component analysis. In *Journal of computational and Graphical Statistics*. vol. 15(2), pp. 265-280.

Investment in Renewable Energy Technologies from the Perspective of Polish Venture Capital Funds

Karolina Daszyńska-Żygadło¹, Tomasz Słoński², Magdalena Ligus³

¹ Wrocław University of Economics
Faculty of Management, Computer Sciences and Finance, Institute of Financial Management
Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: karolina.zygadlo@ue.wroc.pl

² Wrocław University of Economics
Faculty of Management, Computer Sciences and Finance, Institute of Financial Management
Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: tomasz.slonski@ue.wroc.pl

³ Wrocław University of Economics
Faculty of Management, Computer Sciences and Finance, Institute of Financial Management
Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: magdalena.ligus@ue.wroc.pl

Abstract: *In the recent years ambitious targets to increase the share of renewable energy and reduce greenhouse gas emissions have been adopted by governments around the world. Variety of policies have been introduced. The question is what is the business potential and market response to that. This article adds a new perspective to the debate of business potential of investments in renewable energy sector. The aim of the paper is to focus on the venture capitalist interested in the new clean technology development and its diffusion. We analyze venture capitalists' perception of investing in projects from that sector, possibilities of financing and barriers that they meet in the process. We conducted survey and field study with managers of private equity funds from Poland. Our research results show that in the overall business history of the surveyed entities 67% of funds invested in projects related to renewable energy sector. In order to assure specific competencies for investing in renewable energy sector they were using external experts in most cases or past experience. If they specialize in the RE sector investments they were likely to employ their own experts in the investment department While main reason for not investing in that sector was lack of competence, but also unstable situation in the sector.*

Keywords: renewable energy, venture capital, environmental innovation, environmental policies

JEL codes: Q55, Q58, G24

1 Introduction

The growth potential for renewable energy investments attracts attention of private equity investors. Over next 25 years renewables will account for two thirds of total energy production. The New Energy Outlook for 2015 (Bloomberg 2016) finds that some \$12.2 trillion will be invested in global power generation between 2015 and 2040. However, the majority of investments will take place in emerging market, the 22% will take place in OECD countries.

In European perspective is particularly important since many countries had positioned themselves as a global leader in renewables investment. The peak of European investments of \$132BN in 2011 has not been exceeded and recent sharp reversal of investment deviates the upward trend. The Bloomberg New Energy Fund (Bloomberg 2016) attributed this to fear over "the survival of the Euro, mistakes by policymakers, and some lingering effects from the global financial crisis".

The existing literature underlines the importance of government support mechanism for renewable energy policies (Bürer, Wüstenhagen 2009; Hoffman, Huisman 2012). Determined by the governments and the market regulators the investment climate is

shaped by different policies like: technology performance standards, tax credits or certificate trading etc. Policies are supported by the financial mechanisms which enhance investor to choose eco-efficient investments by increasing their returns on capital invested.

Venture Capital and Private Equity (VC/PE) play important role in the sector. Focused on earning high returns the high risk capital is present in the beginning phase of technology development as well as in the last phase of mergers and acquisitions. Recent statistics draws an optimistic picture, since in 2015 venture capital and private equity investors invested \$5.6bn into renewable energy sector, up 17% on the 2014 total but still far below the \$12.2bn peak of 2008. However, it is worth to mention that the biggest VC/PE deal of last year was \$500m in a well-established Chinese electric vehicle company NextEV. Our particular interest is the beginning stage of technology development, where the VC funds spend ca. \$4.0bn (Bloomberg, 2016), 12% of global investments at this stage. Comparing to VC the other groups of early stage investors, Government R&D and Corporate Ventures, share different characteristics (Jackson, 2011).

Since the technology adoption is responsible for at least a quarter of the cross-country variation of per capita income differences (Comin and Hobijn, 2006) we think country specific factors of technology development strongly influence the VC fund performance. This is the reason we focus on the VC fund which originate from single country, namely Poland, categorized by IMF as Emerging Europe (IMF 2016).

Our objective is to focus on the venture capitalist interested in the new clean technology development and its diffusion. We would like to scrutiny the perception of development barriers and drivers of VC operations in renewable energy sector. Our research task is to identify the VC funds which declare the ability and readiness for investment in renewable energy sector. The survey by the questionnaire allows to collect information from Polish venture capital funds.

Literature overview

Early literature focuses on development constraints showing the main barriers (including financials) to possible growth opportunities of the renewable energy sector and measures to overcome them (Painuly, 2001). Although some of the barriers still exists, the rapid market expansion and changes in institutional landscape has altered the investment environment.

Grubb (2004) presents the way the policies influence the renewable energy investment in the context of technology development cycle. The policies can be divided into the technology-push (early stage) and market-pull policies (late stage). Although appointed to different stages of technology development the policies are interconnected, since the technology-push policies are responsible for the "supply" of new technologies, whereas market-pull policies create a "demand" for new technologies. The pivotal moment in technology development cycle which, in fact, separates these two groups of policies is the successful introduction of the new technology to the market (Bürer and Wüstenhagen, 2009). The VC funds manage to bridge the gap between two groups of policies, which enables to provide high returns while facing: (1) relatively high attrition rate for projects within portfolio together with (2) large exposure to the market risk factors.

The role of VC funds is not only to provide the capital for the most difficult stage of technology innovation called the cash flow "valley of death" (Murphy and Edwards, 2003) but also expertise and network to support entities. In order to do so, VC are able to find rapidly growing niche markets for technology with rapid growth opportunities, scalable ventures, and high returns (Hargadon and Kenney, 2014). In many cases, VC funds require relatively little capital for initial investments in the renewable energy sector, exploring the synergies with governmental support mechanisms.

Ghosh, Nanda (2010) identified set of clean technologies with high-risk, low-capital characteristic perfectly suitable for Venture Capitalists. Majority of them originate from

renewable energy sector: energy efficiency software, electric drive trains, fuel cells/power storage, wind and solar components of unproved technologies.

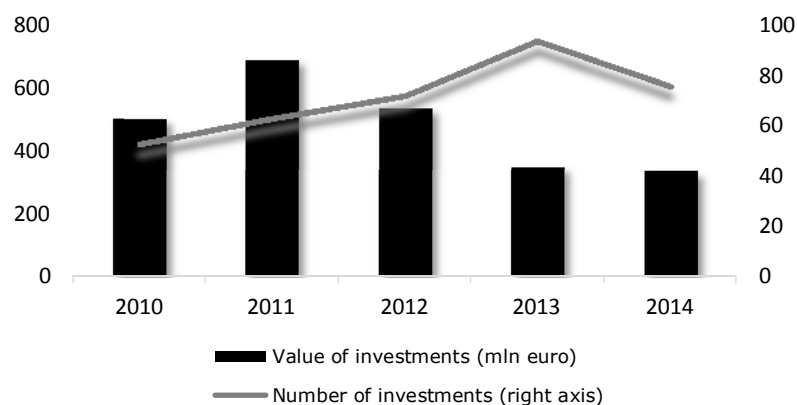
Renewable energy technologies are particularly challenging for VC since it takes longer for market acceptance than in traditionally safer VC investments like Internet technologies. With renewable energy sector, some technologies will take years to achieve market acceptance, and capital is needed for the duration (Tierney, 2011).

Some surveys measure venture capitalists preferences to different policies of government support mechanisms. Regulatory risk is perceived as important role of market risk. The results of Bürer and Wüstenhagen (2009) show that VC fund managers prefer market-pull policies, while feed-in tariff policy is perceived as the most popular. However recent studies show marginally decreasing returns from investments supported by these policies (Criscuolo and Manon, 2015). A study of Hofman and Rusiman (2012) performed after the financial crisis shows decrease in popularity of many policies, especially for a trade based policies (i.e. certificate and CO2 emission trading). That research was conducted on the sample of companies among which 35% represented early stage investments (4% of companies cover all investment stages), however the detailed statistics for smaller subsamples were not provided. Chassot et al. (2014) confirm that venture capitalist do not typically invest in the late stages of development and exhibit rather policy risk aversion. As a consequence they avoid investments if regulatory risk is perceived as high. On the other hand, they are willing to take some of the regulatory risk, especially if they worldviews accept government intervention over the "free market" attitude. An interesting recent research results confirm the positive correlation between perception of environmental policy stability and patenting applications in environmental technologies (Johnstone et al., 2010; Criscuolo and Manon, 2015).

Polish market of Private Equity funds (PE) despite its dynamic growth, still finds itself at the early stage of development. In 2012, the ratio of PE investments to GDP amounted to 0.13%, a level much lower than the one recorded in more developed markets, such as Sweden (0.66%) and the UK (0.56%) According to the organization of the European Private Equity & Venture Capital Association (EVCA), Poland is a leader in the region of Central and Eastern Europe in terms of a number of companies financed (in 2014 there were 76 entities). Despite the development of the market, what is manifested by an increase in the number of funds and funded entities, the value of funds invested in recent years, recorded a decrease, which can be seen in figure 1.

In accordance with the presented data, the share of venture capital funds in the private equity market in 2014 amounted to 7.7%, showing an increase of 1.3 percentage points in relation to the previous year 1.

Figure 1 The Value of Investments in the PE Market in Poland and the Number of Financed Entities



Source: Central and Eastern Europe Statistics 2014, EVCA

As for the sector specialization of funds, the results of the survey presented in the KPMG report show that in 2004-2013 the most popular sectors for PE investors operating in Poland were information technology, media and communication (19%), industrial production (18%), medical industry (13%) and retail trade (12%). These sectors amounted to 62% of all investments in the period considered. However, in the case of energy industry, this share was about 4%.

2 Methodology and Data

Survey was conducted on the sample of Venture Capital funds operating in Poland, data was collected on the basis of the questionnaire. Potential sample was constructed by excluding funds appearing in several groups, inactive funds and those not carrying out the recruitment for new investments from the overall population of Polish Venture Capital funds. Next step was to verify their investment policy. Attention was paid mainly to the preferred stage of implementation readiness for the ongoing investments and their compliance with the assumptions of Venture Capital investment (seed, start-up and early expansion). Additionally funds with clearly defined industry specification, which did not deal with renewable energy investments were excluded.

Contact sample included 104 funds. In this group, there were several players who have been identified in the past as investors in the market of renewable energy (including Bełchatów Kleszczów Industrial and Technological Park, Spinnaker Innovation - Incubator BonusCard, IdeaLab Centre for Innovation and Entrepreneurship), and also one fund that specializes in this industry – Skystone Capital. Surveyed players gained the capital from public funds, EU programs or from private investors, having assets under management in the value ranging from 2,5 up to 12 million EUR, operating on the market for over 2 years and having accomplished 10 to 30 capital entries.

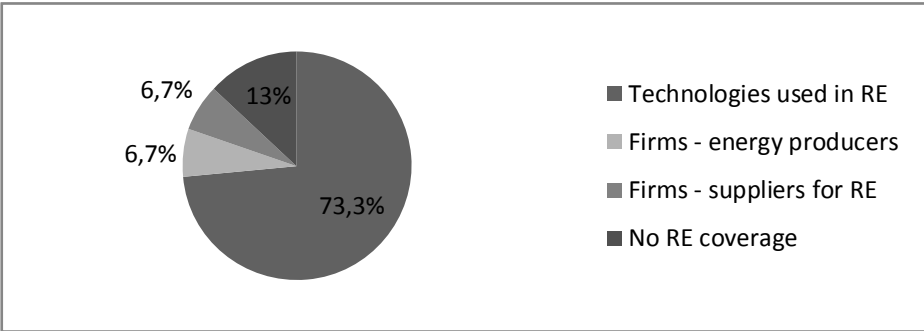
The survey was completely anonymous and consisted of 12 questions, as single-, multiple-choice and open question options. The answers were successfully obtained from 15 funds, resulting in the response rate of 23.4%.

3 Results and Discussion

Survey results showed that 60% of the funds include in its investment policy sectoral or industrial specialization, with dominant sectors (most frequently mentioned by respondents) being: IT, energy, renewable energy (RE) and medicine.

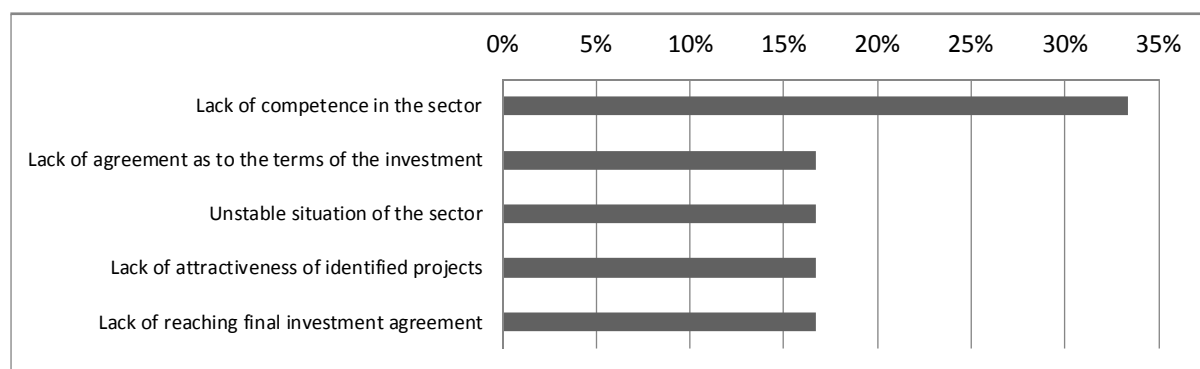
Due to the selection carried out on the contact sample, up to 87% of the surveyed funds indicated that their investment policy includes investments in the sector of renewable energy (RE), while 73.3% claims direct investments in the technologies of renewable energy, including 6.7% of energy producers and the same percentage of manufacturers or service providers for the RE sector (figure 2).

Figure 2 "Does the Investment Policy of the Fund Include Investments in the Sector of Renewable Energy? If so, Identify in What Form."- Respondents' Answers



Source: Own elaboration.

Figure 3 "If the Fund Did not to Invest in Projects in the RE Sector, Select the Reason" - Respondents' Answers



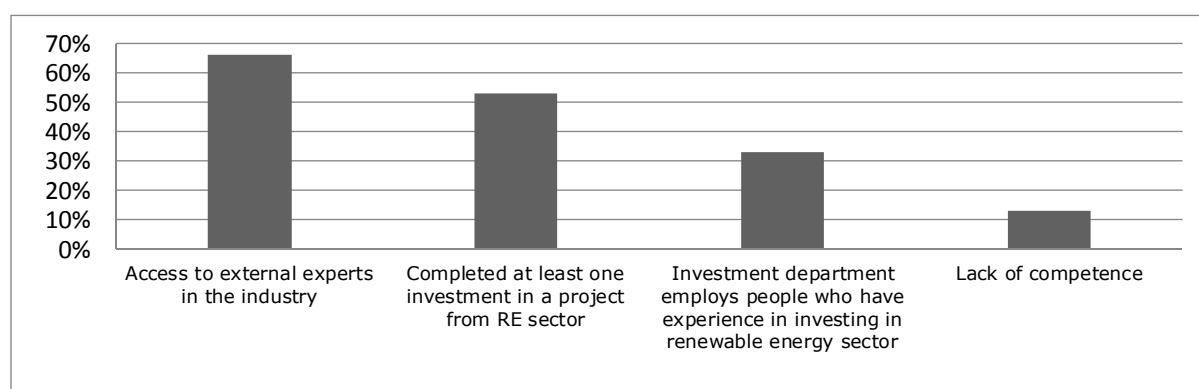
Source: Own elaboration.

In the overall business history of the surveyed entities 67% of funds invested in projects related to RE sector. In case of not investing in renewable energy sector, the reasons given to justify that were (figure 3): lack of competence in the sector (33%), lack of agreement as to the terms of the investment (17%), unstable situation of the sector (17%), lack of attractiveness of identified projects (17%), lack of reaching final investment agreement (17%). None of the analyzed funds did not carry more than five capital entries at the researched market.

Study on sample of Polish VC funds to some extent confirms the earlier findings of Bürer and Wüstenhagen (2009) that regulatory risk is perceived as important market risk factor in the sector, due to the fact that unstable situation in the Polish RE sector results from regulatory environment uncertainty and government policies changes and discontinuities. Other reasons for not undertaking RE investments could also be connected with the findings of Chassot et al. (2014).

Funds surveyed were asked to identify the specific competencies required to invest in the renewable energy sector (it was possible to select multiple answers). The results indicate that the majority (67%) of the funds have access to external experts in the industry, more than half of the funds has already completed at least one investment in a project from RE sector, while 33% of the fund's investment department employs people who have experience in investing in renewable energy sector. 13% of the funds did not prove the competence to invest in renewable energy. Results are presented in figure 4.

Figure 4 "Does the Fund Have Specific Competence to Invest in Renewable Energy Sources (You Can Choose More than One)?" - Respondents' Answers



Source: Own elaboration.

It can be noticed that VC funds in Poland are willing to undertake projects from RE sector especially if they have proper competences to do so. They are using external experts in

most cases or past experience. If they specialize in the RE sector investments they are likely to employ their own experts in the investment department.

Among the introductory questions there was one about the financial sources that VC fund uses to invest in its projects. It was multiple-choice of answer question, so funds could choose more than one answer. Out of 12 questioned funds 11 (92%) used public funds and EU sources. Half of them used private investor funds and just 1 used capital sources at the stock exchange. Therefore it indicates high correlation between policy supported sector investments (RE) with particular funding strategies which stays in line with results of previous studies of Grubb (2004) and Chassot et al. (2014).

4 Conclusions

Our research extends the up to date studies about VC funds' investments in RE sector by the issues of reasons for not undertaking these types of investments as well as required competencies used in order to do so. It also confirms previous studies findings in the field of high dependency of VC investment in RE sector with their prefunding by public or EU sources. It also supports the argument about high regulatory risk connected with RE investments that causes instability of the sector and unwillingness to invest in it by Polish VC funds.

In our study large part (60%) of Venture Capital funds in its investment policy assumes sectoral specialization, while the selection of sectors indicates a diversification of investment portfolios. Among the dominant industries are: medicine, IT, energy and renewable energy. Most venture capital funds (87%) places in its investment policy projects in the renewable energy sector. This characteristic, to a certain extent, results from selection of the contact sample, which included the specification of investment policy of entities.

The dominant area for investment in this market are the technologies used in renewable energy sector. Smaller interest is given to investment in energy producers (one response), manufacturers and service providers in the sector of renewable energy (one response), and separate installations (no responses). It may result from a bigger development potential perceived by funds in technological solutions in comparison with investments in companies or installations. That confirms the general findings about VC funds investment preferences (Hargadon and Kenney, 2014) and Ghosh and Nanda (2010) findings about type of clean-tech investments attractive to VC funds.

33% of the surveyed funds did not report in their history any investment in renewable energy sector. The main reason was the lack of competence of the fund in this sector. This could be due to the lack of access to external industry experts, lack of experience in the inputs of capital in the market or the lack of skilled employees in the investment departments of funds.

Currently, lack of competence in the renewable energy sector is shown by less than half of the funds, that is only 13%, which may signify a considerable increase in interest in this sector. None of the surveyed funds reported more than 5 investments in RE sector. The reason for such a condition could be lack of sufficient number of attractive investment opportunities in this sector, as well as relatively high risk associated with it.

Even though the sample of Polish VC funds engaged in RE sector investment might seem not representative conclusions drawn on the basis of the survey stay in line with the previous finds adding some novelty related to the competencies of VC funds in the RE sector as well as showing the reasons for not undertaking investments in it.

Future research should be dedicated to risk assessment and perception of VC funds as well as analysis of rates of returns expected and obtained from investments in RE sector. That could shed light on the specifics of preferences of Polish VC funds and their risk acceptance level.

Acknowledgements

This paper was prepared as part of the research projects "Value based management of investments in renewable energy sources" [UMO-2011/01/D/HS4/05925] and "Evaluation of the environmental effects in a cost-benefit analysis of the investments in low-emission energy sources" [UMO-2011/01/B/HS4/02322], executed by the Wrocław University of Economics and financed by the National Science Centre, Poland.

References

- Baum, J.A.C., Silverman, B.S. (2004). Picking winners or building them? Alliance, intellectual, and human capital as selection criteria in venture financing and performance of biotechnology start-ups. *Journal of Business Venturing* 19, pp. 411–436.
- Bürer, M. J., Wüstenhagen, R. (2009). Which renewable energy policy is a venture capitalist's best friend? Empirical evidence from a survey of international clean tech investors, *Energy Policy*, vol. 37, pp. 4997–5006.
- Comin, D. A., Hobijn, B. (2006), An Exploration of Technology Diffusion, *NBER Working Paper Series*, Working Paper 12314.
- Chassot, S., Hampl, N., Wüstenhagen, R. (2014). When energy policy meets free market capitalists: The moderating influence of worldviews on risk perception and renewable energy decisions, *Energy Research & Social Science*, vol. 3, pp. 143-151.
- Criscuolo, C., Menon, C. (2015). Environmental policies and risk finance in the green sector: Cross-country evidence. *Energy Policy*, vol. 83, pp. 38-56.
- Ghosh, S., Nanda, R. (2010). Venture capital investment in the clean energy sector. *Harvard Business School Entrepreneurial Management Working Paper*, (11-020).
- Gorman, M., Sahlman, W. A. (1989). What do venture capitalists do? *Journal of Business Venturing*, vol. 4, issue 4, pp. 231-248.
- Grubb, M. (2004). Technology Innovation and Climate Change Policy: An Overview of Issues and Options. *Keio economic studies*, vol. 41, no 2, pp. 103-132.
- Hargadon, A. B., Kenney, M. (2012). Misguided Policy? Following Venture Capital into Clean Technology, *California Management Review*, vol. 54, no. 2, winter, pp. 118 -139.
- Jackson, F. (2011). Corporates' ventures, *Renewable Energy Focus*, September/October, pp. 30-33.
- Johnstone, N., Haščič, I., Popp, D. (2010). Renewable energy policies and technological innovation: evidence based on patent counts. *Environmental and resource economics*, vol. 45, no 1, pp.133-155.
- Murphy, L.M., Edwards, P.L., (2003). *Bridging the valley of death: transitioning from public to private sector financing*.
- Painuly, J.P. (2001). Barriers to renewable energy penetration: a framework for analysis, *Renewable Energy*, vol. 24, pp. 73–89.
- Tierney, S. (2011). Venture Capital And Cleantech Symbiosis, *The Industrial Geographer*, vol. 8, Issue 2, pp. 63-85.
- Unruh, G. C. (2000). Understanding carbon lock-in. *Energy Policy*, vol. 28, pp. 817–30.
- Wüstenhagen, R., Teppo, T. (2006). *Do venture capitalists really invest in good industries? Risk-return perceptions and path dependence in the emerging European energy VC*.

Sustainable Value Creation - performance of European Manufacturing Companies

Karolina Daszyńska-Żygadło¹

¹ Wrocław University of Economics
Faculty of Management, Computer Sciences and Finance, Institute of Financial Management
Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: karolina.zygadlo@ue.wroc.pl

Abstract: *The research problem of this paper is how to measure the impact of corporate sustainability performance on company's value. Its aim is to show this impact in monetary terms, using opportunity costs based approach. Sustainable Value method presented and tested in this paper integrates environmental, social and economic factors. It measures the value created or destroyed by the company with the usage of particular set of resources, the value is referenced to the benchmark's value creation that could potentially be realized with the same set of resources. Research was conducted on manufacturing companies from EU-15 countries. It analyzes the prospects and advancement in sustainable value creation as well as mitigation of negative environmental impact in reference to value created by companies examined in the research of Figge, Hahn and coauthors in ADVANCE project (2006). Results show that majority of companies which were creating sustainable value in the period of 2001-2003 continued to obtain positive values in the period of 2004-2012, the same applied to value destructing companies.*

Keywords: sustainability, value creation, opportunity cost

JEL codes: Q01, Q55, G32

1 Introduction

Nowadays, global community is challenged by climate change issues. Businesses are also challenged to show how sustainable they are. From the corporate finance perspective, companies should be focused on wealth maximization while not being distracted by additionally imposed goals (Aupperle et al., 1985; Shleifer, 2004). Among theorists of the subject matter there is also a group that claims and proves that introducing social, environmental and governance goals into business conduct might be economically beneficial by improvement of: employees' efficiency due to higher job satisfaction; relations with clients and suppliers leading to better reputation, loyalty and favorable contracts' conditions (Guenster et al., 2010; Godfrey and Hatch, 2007). All that might have positive impact on financial performance of the companies leading to increase created value. Vast majority of researches aim at showing immediate or long term impact of performance related to sustainability on companies' financial results proving whether there exist a significant relationship between these two. Immediate effect is analyzed by event studies showing reaction of investors on the information disclosure about company being included (excluded) in (from) sustainability index (Consolandi et al., 2009; Cheung, 2011; Cheung and Roca, 2013; Daszyńska-Żygadło et al. 2014). The long term effect (usually calculated as a yearly effect over a certain period of time) is analyzed on the basis of financial performance (accounting or market measures) regressed over sustainability (or CSR) performance (scoring/rating result) (among the newest published research results being: Wang and Berens, 2015; Saeidi et al., 2015; Słoński et al., 2016). Depending on the period of the analysis, proxies selected for financial performance and sustainability performance as well as a sample of companies and methodology of research assessed impact is either positive, negative or inconclusive and insignificant (Margolis et al., 2007). Therefore, it is hard to have a casting vote over the final conclusion on the relationship of sustainable performance of companies and their financial standing.

Potentially, it leaves room for studies driven by different objective and analyses of the impact of sustainability performance on value creation using different approach. The underlying problem might be the information load of sustainability performance disclosed and reported that would allow for inclusion in sustainability indices, scorings, ratings or databases. The drawback of researches conducted up-to-date on the big sample is that companies on average are moderately efficient in sustainability performance, they disclose all the necessary information, but in many cases there is no significant improvement or mitigation of negative environmental, social and governance impacts. This is why, assessment of sustainable value created could have much bigger potential in terms of explaining the impact of sustainability performance over value creation and financial results. This research takes initial steps to solve that puzzle and to identify the gap in the literature that could be explored in this and future studies.

Additionally, a tool that shows the economic value of sustainability in monetary terms such as Sustainable Value (SV) can be beneficial for companies from managerial perspective. They could practically assess which social or environmental actions and investment projects undertaken create additional economic value and which destroy this value.

In recent years, a big step towards creating analytical methods of sustainability assessment has been made. Including the ones that capture the sustainability effect or environmental or social effect in qualitative and quantitative way. Among recognized tools and metrics there are: FVTool, Measuring Impact Framework Methodology and Sustainable Value. Sustainability investments (understood as programs, initiatives or infrastructure investments done by companies to manage environmental and social risks and support the development needs of local communities) might be analyzed by FVTool developed in 2009 by International Finance Corporation's Infrastructure & Natural Resources Advisory team in partnership with Rio Tinto and Deloitte in order to justify their implementation from economic perspective. Measuring Impact Framework Methodology (by World Business Council for Sustainable Development and International Finance Corporation from 2008) could be used as complex tool for sustainability management within an organization, it includes quantitative and qualitative metrics which could be well aligned with more general and strategic goals of an organization.

Sustainable Value initially introduced by Figge and Hahn (2004) and later implemented in ADVANCE project (2006) is an approach showing overall performance of the companies that report on 7 environmental resources, expressed in monetary terms in relation to a benchmark being GDP of EU15 in Gross Value Added. This method could be even perceived as a framework because it allows modifications of number and types of resources as well as a different choice of the benchmark (e.g. additional social resources and sector EBIT as a benchmark as proposed in Figge et al., 2014). Out of the three above mentioned methods SV seems to be the most aligned to the stated research problem of this paper. Due to the fact that its aim is to show the impact of corporate sustainability performance on value of the company in monetary terms. Moreover, sustainable value added reflects the value that could be generated if resources were relocated from inefficient to efficient users, assuming overall constant level of resources and all forms of capital being perfectly substitutable (weak form of sustainability) (Perman et al., 2003).

2 Methodology and Data

Sustainable value (SV) methodology extends the logics of financial market to eco-efficiency theory. It deals with the pricing problem in monetary sustainability assessment, namely how to value resources that are not explicitly priced. It introduces opportunity cost thinking to sustainability assessment: if the return an economic entity achieves with the use of resources exceeds the opportunity cost of these resources, then this economic entity contributes to sustainable resource use at the benchmark level. The opportunity cost indicates how much return the benchmark alternative would create with the same set of resources. The return of the economic entity and the return of the

benchmark are then compared (Hahn et al., 2010). The SV accounts for how much value has been created as a result of the economic entity using the resources instead of the benchmark. It indicates how efficiently resources are being allocated between different economic entities (Figge and Hahn, 2004). In contradiction to what is usually used – analysis of the burden by internationalizing external environmental damages through complex pricing procedures. Furthermore, the investor’s perspective about efficient allocation of resources is taken into account (Ang and van Passel, 2010) and not the business entity productivity perspective as indicated in the discussion paper of Kuosmanen and Kuosmanen (2009).

A yearly value for an individual company can be derived on the basis of the following equation:

$$SV_i = \frac{1}{R} \sum_{r=1}^R \left(\frac{y_i}{x_{ir}} - \frac{y^*}{x_r^*} \right) x_{ir} \quad (1)$$

Model Specification

SV_i - sustainable value added for company i,

R – total number of the resources,

y_i – gross value added for company i,

y* – value added for the benchmark,

x_{ir} – amount of the resource for company i,

x*r – amount of the resource for the benchmark.

General concept of sustainable value leaves space for certain flexibility in shaping factors and benchmark content. It allows to adjust model parameters according to the availability of the data. Sample for this research was chosen in order to analyze the prospects and advancement in sustainable value creation as well as mitigation of negative environmental impact in reference to value created by companies initially examined in the research of ADVANCE project (2006). Out of the 65 manufacturing companies from EU-15 countries it was possible to select 20 with a set of complete financial and environmental data. Results of ADVANCE project for the years 2001-2003 were compared with results obtained in this study for years 2004-2012. Data for the EU-15 countries were chosen for the benchmark following results of ADVANCE project. The dataset was obtained from Eurostat and European Environment Agency (EEA). Water usage data point was missing for 2013 year, it limited the period of analysis to 2012. It was recognized as less harmful to the research results than excluding water from the analysis. Water is an important environmental resource, though in the overall SV result it has a minor, even insignificant share. That is due to the fact that, following the original model, water is measured in cubic meters what makes the gross value added per cubic meter of water extremely low in comparison with other values per resource. From this observation general conclusion can be drawn about the impact of each resource for the overall value that is weighted by the size of emission or usage/generation of the resource. Therefore, additional weighting, as proposed in the recent work of Stakova (2015) might seem to be unnecessary effort.

Out of initially chosen seven resources five were included in the analysis, namely: carbon dioxide (CO₂)-emissions, nitrogen oxide (NO_x)-emissions, sulphur oxide (SO_x)-emissions, waste generation and water use. Environmental data for companies were collected from Thompson Reuters Datastream ASSET4 database and financial data for companies were collected from Amadeus database, both accessed from Wroclaw University of Economics. Added value, understood as gross value added was calculated by adding depreciation to added value obtained from Amadeus database. Value added shows the contribution of particular company to both private and public income as well as its distribution among all stakeholders. It represents the economic value to be compared with GDP of EU-15 standing for the economic value of the benchmark.

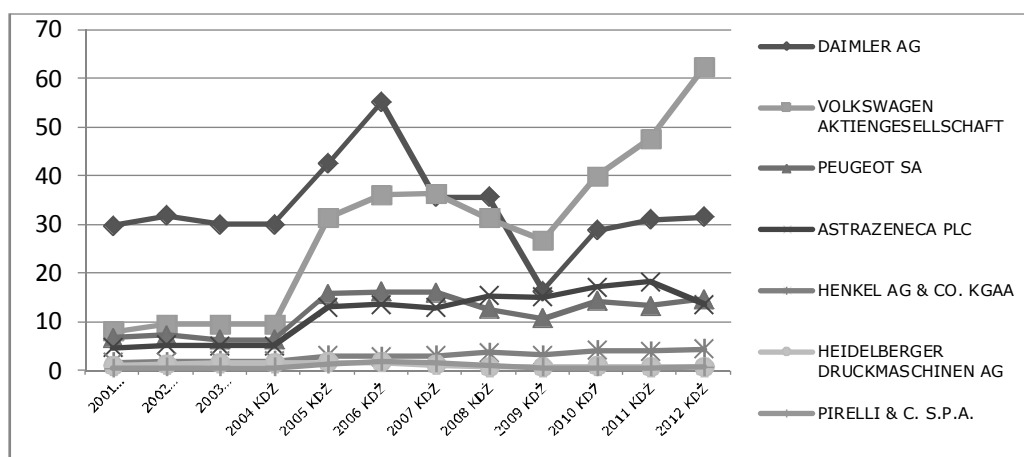
3 Results and Discussion

Performance of 20 manufacturing companies was analyzed in the recent period of 2004-2012 in comparison with research results of ADVANCE (2006) for the period of 2001-2003. Two subsamples were created for a better clarity of results presentation. First one consists of companies creating positive sustainable value added and second one – of those destroying SV. It was an easy task to do due to the fact that companies were very consistent in their performance. Seven companies were permanently creating SV with some picks in 2006 and downturns in 2009 throughout the whole period. Remaining 13 were mainly destroying SV with some insignificant short-term improvements.

Figure 1 shows that companies which were creating positive sustainable value in the ADVANCE research (2006) continue to do so in the following years. Majority of them improved their results. Only Henkel and Pirelli were creating relatively small values and demonstrating either minor progress (Henkel) or decrease in sustainable value over the period of analysis. Outstanding result was shown by Volkswagen which right after crisis year of 2009 outperformed all other companies (figure 1). Observing constant SV margin of approx. 30% (figure 3) it could be noticed that such results of Volkswagen resulted from very high increase in net sales (20-25% in years 2010-2012).

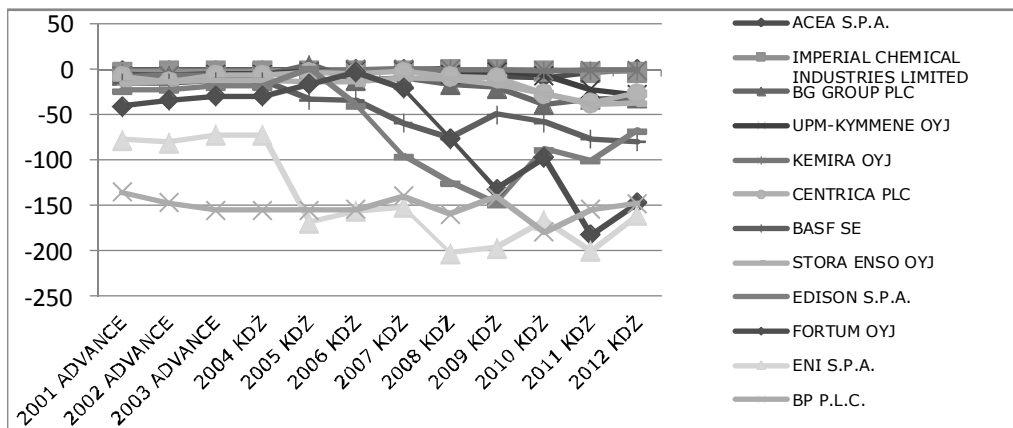
Majority of companies that were destroying sustainable value reached lower results at the end of the period of analysis in reference to the beginning and to results from ADVANCE. Enel SPA data is not shown at figure 2 due to overly low value of almost -600 billions of EUR in 2012. It was also performing poorly in 2003, being at the 45 place of the ranking. Nevertheless, companies in that subsample were successively creating less sustainable value than the benchmark, their SV margins (figure 5) and operating profit margins (EBIT margins) depicted at figure 6 stayed at almost constant level. Only ACEA, Italian company from utilities sector, had outstanding decrease in SV margin value (figure 5) and increase in EBIT margin in 2010. Financial results of that company show that in this year its sales decreased and it caused worsening of SV margin.

Figure 1 Sustainable Value (Positive) of Companies in 2001-2012 (Billions of EUR)



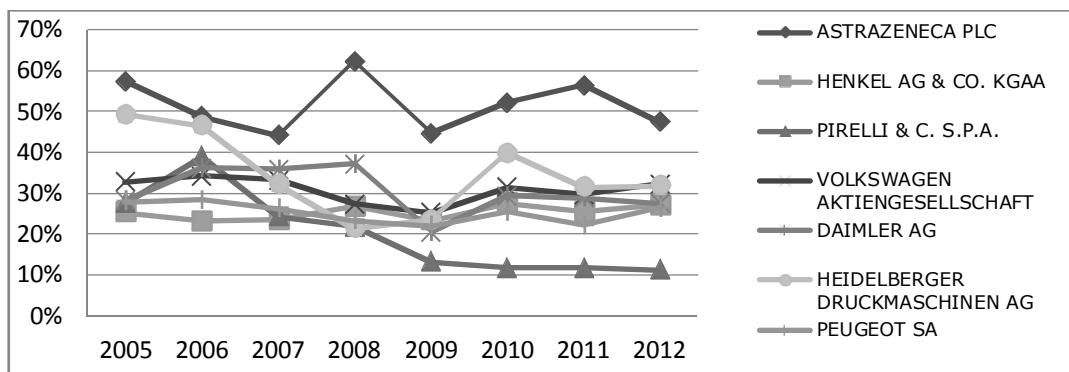
Source: Own elaboration.

Figure 2 Sustainable Value (Negative) of Companies in 2001-2012 (Bn EUR)



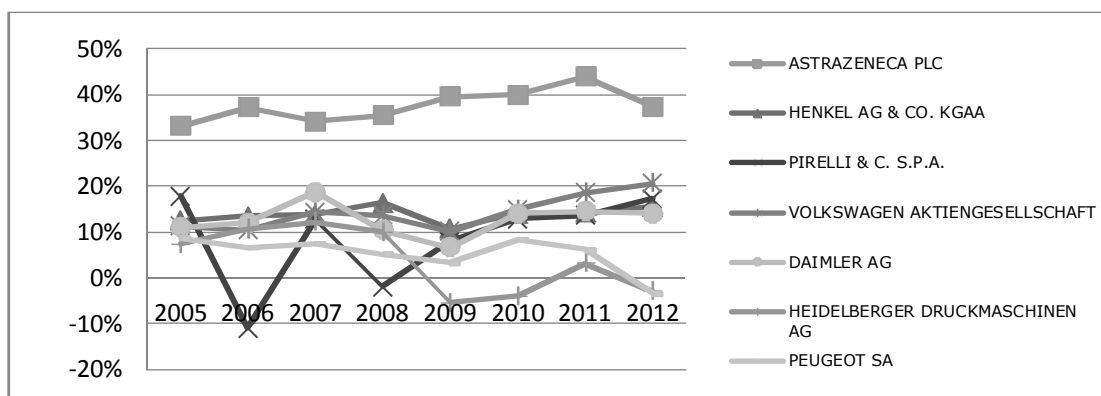
Source: Own elaboration.

Figure 3 Sustainable Value Margin for Companies in Years 2005-2012 (Positive SV)



Source: Own elaboration.

Figure 4 Operating Profit (EBIT) Margin for Companies in Years 2005-2012 (Positive SV)

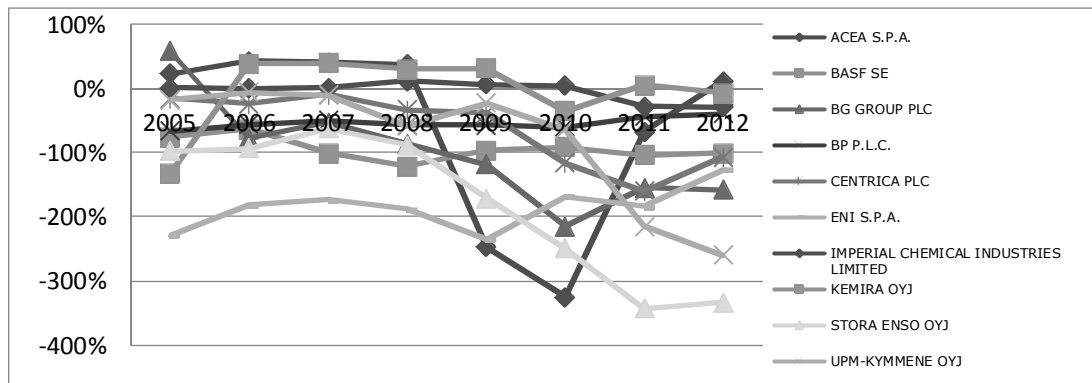


Source: Own elaboration.

Astrazeneca PLC is leader in both SV margin creation and operating profit margin creation (figure 3 and 4), it is British pharmaceutical company, it also had positive results in ADVANCE project study with 18th place (out of 65) in the ranking for 2003.

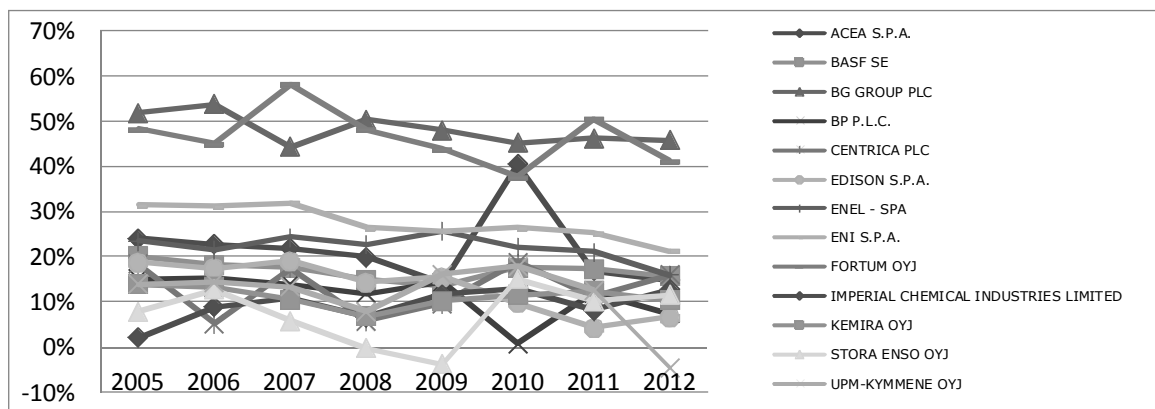
Analysis of particular companies leads to the conclusion that sector specifics (high profitability, low GHGs emission, low polluting, etc.) could be the explanation of the outstanding performance.

Figure 5 Sustainable Value Margin for Companies in Years 2005-2012 (Negative SV)



Source: Own elaboration.

Figure 6 EBIT Margin for Companies in Years 2005-2012 (Negative SV)



Source: Own elaboration.

After analysis of absolute values of SV, it could be expected that Fortum OYJ (Finnish company operating in utilities industry, already poorly performing in ADVANCE, 56th place out of 65 in the ADVANCE ranking) will obtain very low negative results for SV margin. It ranged between -56% in 2006 and -2409% in 2009. It extended the scale of the figure 5 that is why it was excluded from it, together with two other very poorly performing companies – Edison SPA (Italian company operating in utilities industry, already with a very poor score in ADVANCE research, at 55th place) and Enel - SPA (Italy, utilities industry, around 60th place in ADVANCE).

Analysis of sustainable value and relevant margins of this small sample showed couple of interdependencies. Choice of the benchmark determines the results among companies that operate in different sectors. Heavy industry, emitting a lot of GHGs and using a lot of resources will have bigger problems with reaching or outperforming the benchmark constructed on the basis of EU-15 results. It finds confirmation in results of ADVANCE project (2006) and study of Hahn et al. (2007). Later research of Hahn et al. (2014) changes the benchmark for sector EBIT values instead of EU-15 GDP. Positive results are more easily obtained by the companies realizing high profit margins and high increases in sales and profits.

4 Conclusions

The purpose of this study was to discuss possibility of employing a different approach to analysis of the impact of companies' sustainability performance on their financial results and value creation. Sustainable value allows to show the individual value created by an entity in monetary terms using the opportunity costs approach. It shows it in reference to the benchmark. The concept is clear and methodology – coherent, but from the application perspective there are four important issues that require further studies and

consideration: 1. The choice of economic activity of companies (instead of gross value added one could use operating profit or cash flows), 2. The choice of resources and their units, 3. The choice of the return figure, 4. The choice of benchmarks (economic result at sector or national or EU level).

Empirical study showed the development and prospects of companies initially tested in ADVANCE project (2006). In conclusion one could notice observable sector specific differences between the companies as well as positive tendencies among sustainable value creators and negative tendencies among SV destructors. This puts into the question the disclosure policies (sustainability policies) of those companies together with involvement in mitigation of their negative impact on the environment. The studied sample was too small to draw general conclusions, but it was an initial study that leaves space for more careful choice of the sample, benchmark and set of resources. Further studies will also explore the problem of alignment of sustainable value results with sustainability performance disclosure, the choice of companies being disclosing leaders might allow further interesting conclusions.

References

- ADVANCE-project, (2006). *Sustainable value of European industry: a value-based analysis of environmental performance of European manufacturing companies*. Final report of the ADVANCE-project, full version.
- Ang, F., van Passel, S. (2010). The Sustainable Value approach: A clarifying and constructive comment. *Ecological Economics*, vol. 69, pp. 2303-2306.
- Aupperle, K. E., Carroll, A. B., Hatfield, J. D. (1985). An empirical examination of the relationship between Corporate Social Responsibility and profitability. *The Academy of Management Journal*, vol. 28, no. 2.
- Figge, F., Hahn, T., (2004). Sustainable value added: measuring corporate contributions to sustainability beyond eco-efficiency. *Ecological Economics*, vol. 48 (2), pp. 173–187.
- Hahn, T., Figge, F., Barkemeyer, R., (2007). Sustainable value creation among companies in the manufacturing sector. *International Journal of Environmental Technology and Management*, vol. 7 (5/6), pp. 496–512.
- Figge, F., Hahn, T., (2009). Not measuring sustainable value at all: a response to Kuosmanen and Kuosmanen. *Ecological Economics*, vol. 69 (2), pp. 244–249.
- Hahn, T., Figge, F., Barkemeyer, R., Liesen, A. (2014). Operationalizing sustainability targets: An introduction to sustainable value approach. *Global Compact International Yearbook*.
- Godfrey, P. C., Hatch, N. W. (2007). Researching Corporate Social Responsibility: An agenda for the 21st Century. *Journal of Business Ethics*, vol. 70, no. 1, pp. 87-98.
- Guenster, N., Bauer, R., Derwall, J., Koedijk, K. (2010). The economic value of corporate eco-efficiency, *European Financial Management*, vol. 17, no. 4, pp. 679-704.
- Kuosmanen, T., Kuosmanen, N. (2009). How not to measure sustainable value (and how one might). *Ecological Economics*, vol. 69, pp. 235-243.
- Margolis, J. D., Elfenbein, H. A., Walsh, J. P. (2007). Does it pay to be good? An analysis and redirection of research on the relationship between corporate social and financial performance. *Working Paper, Harvard University*, Available: <http://stakeholder.bu.edu/Docs/Walsh,%20Jim%20Does%20It%20Pay%20to%20Be%20Good.pdf>.
- Perman, R., Ma, Y., McGilvray, J., Common, M., (2003). *Natural Resource and Environmental Economics*, 3rd ed. Longman, New York.
- Saeidi S. P., Sofian S., Saeidi P., Saeidi S.P., Saeidi S.A., (2015). How does corporate social responsibility contribute to firm financial performance? The mediating role of

competitive advantage, reputation, and customer satisfaction, *Journal of Business Research*, vol. 68, pp. 341-350.

Shleifer, A. (2004). Does competition destroy ethical behaviour? *NBER Working Paper no 10269*.

Słoński, T., Daszyńska-Żygadło, K., Zawadzki, B. (2016). The market value of CSR performance across sectors. *Inżynieria i Gospodarka - Engineering Economics*, vol. 27(2), pp. 230-238.

Strakova, J., (2015). Sustainable value added as we do not know it. *Verslas: Teorija ir Praktika / Business: Theory and Practice*, vol. 16 (2), pp. 168-173.

Wang, Y. and Berens, G. (2015). The Impact of Four Types of Corporate Social Performance on Reputation and Finance Performance. *Journal of Business Ethics*, vol. 131, pp. 337-359.

Systemic Risk Indicators in the Eurozone: An Empirical Evaluation

Oleg Deev¹, Martin Hodula²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: oleg@mail.muni.cz

² VŠB-Technical University Ostrava
Economic Faculty, Department of European Integration
Sokolská třída 33, 701 21 Ostrava, Czech Republic
E-mail: martinhodula@gmail.com

Abstract: *In this brief paper, we use combination of Markov-switching models and dynamic conditional correlation models to ex-post evaluate the performance of three widely used systemic risk measures (SRISK, CISS and term-spread) based on their ability to predict financial turmoil. We first compare systemic risk measures based on their dynamic correlations. Second, we identify three regimes for each indicator and evaluate them based on their ability to capture crisis information. We found that in practice, the correlations between studied systemic risk measures are indeed high and indicators are successful in capturing regimes of high financial stress. We have however, identified a few periods when the indicators are not overlapping, especially in pre- and post-crisis period.*

Keywords: systemic risk measures, Markov-switching models, DCC-GARCH models

JEL codes: C34, C58, E44, G01

1 Introduction

After the financial crisis economists started to recognize that adverse shocks to the financial sector can have a significant impact on the real economy. This ability of financial system stress (or financial instability) to trigger sharp macroeconomic downturns has fostered extensive research on systemic risk, either on its definition, measurement, or regulation. The identification of Systematically Important Financial Institutions (SIFIs) - the financial institutions that contribute the most to the overall risk of the financial system - was initially the main interest among practitioners and researchers. As SIFIs pose a major threat to the system, regulators and policy makers from around the world have called for tighter supervision, extra capital requirements, and liquidity buffers for SIFIs under the microprudential regulatory framework.

Currently, as there is a growing consensus among central banks about the financial stability objective and its definition, the policy interest has shifted from microprudential to macroprudential policies. The job of these policies is to ensure that the financial system does not become extremely vulnerable or that some shocks would not ultimately cause financial instability in the form of a crisis. The two main tasks of macroprudential policy - to prevent systemic risk and, if prevention fails, to mitigate the impacts when it materializes - are given by the existence of two phases of development of systemic risk: (i) accumulation phase, which can be explained as the build-up of systemic risk in the economy, and (ii) materialization phase, when economic agents revise their expectations and radical change in their behavior will occur. Banks will revise their evaluation of the credit, market and liquidity risk accumulated in their balance sheets, increase credit margins or credits spreads, and tighten lending conditions (more on this topic can be found in Frait and Komárková 2011).

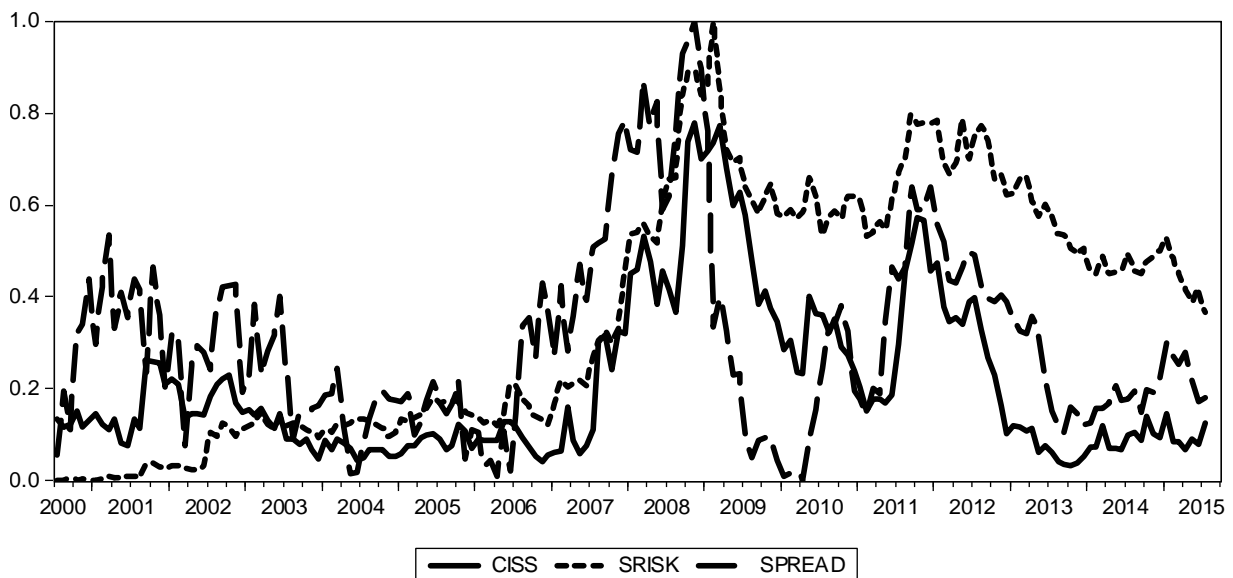
In their pursuit for financial stability, the monetary authorities need to identify and correctly assess the evolution of systemic risk over the financial cycle. Many systemic risk indicators have already been proposed in the aftermath of the 2007-2009 financial crisis, but the question remains of to what extent are they able to trace the development of the systemic stress? Hence, the goal of this brief paper is to propose a comprehensive

comparison of some of the most used systemic risk indicators for analysis in the Eurozone area. To our knowledge, this research is the first attempt to derive and compare major systemic risk measures within the common Eurozone framework. We hope that our analysis allows us to uncover the theoretical and empirical link between systemic risk measures. Such research is much needed as there is no consensus on the topic of which of the indicator's type is the most appropriate to uncover the accumulation of systemic risk within the financial system. It should be noted that the goal of this research is not to find the best systemic risk indicator as the "one-size-fits-all" approach.

Overview and Systemic Risk Measures Characteristics

There are a few approaches to measure systemic risk and to identify and assess the evolution of systemic risk over the financial cycle. Because we are interested in the former, we will consider only those indicators that can be used not only to measure systemic risk, but also to assess the systemic risk build-up (accumulation phase) in the financial system. We are also interested only in those indicators that cover the time dimension (this criterion is given by the nature of our analysis as we compare indicators in time). We also do not cover such indicators that are not available for Eurozone or do not have sufficiently long time series or frequency.

Figure 1 Systemic Risk Indicators



Source: VLAB, ECB.

Note: Time series were normalized to scale 0 to 1.

First, we consider SRISK indicator as a representative of institution-specific market-based risk measure. The indicator is designed to capture an individual bank's contribution to economy-wide systemic risk. SRISK (proposed by Brownlees and Engle, 2015) measures the capital shortfall of the financial institution. if there is another crisis in the financial system. Simply put, it estimates the amount of capital needed by a financial firm in the event of a crisis. The SRISK equation is calculated as follows:

$$SRISK = k \cdot DEBT - (1 - k) \cdot EQUITY (1 - LRME\$) \quad (1)$$

where k is the capital requirement and $LRME\$$ is the long-run marginal expected shortfall. By multiplying the components in (1), we obtain the total differential of SRISK:

$$\Delta SRISK = k \cdot dDEBT - (1 - k) \cdot (1 - LRME\$) \cdot dEQUITY + (1 - k) \cdot EQUITY \cdot dLRME\$ \quad (2)$$

The change in SRISK can be hence decomposed into three parts:

- $\Delta(DEBT) = k \cdot dDEBT$ - the contribution of firm's debt to SRISK: as the company takes on more debt, it increases its leverage and the contribution to the systemic risk will be positive;
- $\Delta(EQUITY) = -(1-k) \cdot (1-LRME) \cdot dEQUIT$ can be described as firm's equity position: as firm's market capitalization declines, the SRISK contribution rises;
- $\Delta(RISK) = (1-k) \cdot EQUITY \cdot LRME$ shows a potential increase in firm's risk attributes, such as increased correlation or volatility.

The SRISK measure is mostly used to identify SIFIs at micro-level (Banulescu and Dumitrescu 2015; Benoit et al. 2015), but there already exist a growing number of studies using this indicator as a proxy for aggregate systemic risk at macro-level in the financial system (Engle et al. 2015; Grinderslev and Kristiansen 2016; Langfield and Pagano 2015).

Second, we analyze the term spread (the slope of the yield curve) calculated as the difference between 10-year swap rate and 3-month EURIBOR. This can be viewed as a measure that takes into account liquidity and credit conditions in financial markets. Gerlach (2009) considers interest rates a useful indicator of systemic risk as they are continuously available with no delay and contain information about markets participants' views of a range of different risks. Wheelock and Wohar (2009) provide a survey of empirical evidence on how the term spread predicts output growth and recessions up to one year in advance. If we consider the systemic risk as a main driver of recessions, the term spread acts as a good measure of systemic risk.

Third, we consider the official ECB financial stability indicator – Composite Indicator of Systemic Stress (CISS). The index is the composite indicator which aims to represent the level of systemic stress in the Eurozone's financial system based on 15 mainly market-based financial stress measures from the financial intermediaries sector, money markets, equity markets, bond markets and foreign exchange markets. All components carry equal weightings, thereby allowing the stress index to place relatively more weight on situations in which stress prevails simultaneously in several market segments. The stress index falls within 0 and 1, where higher stress levels are closer to one.

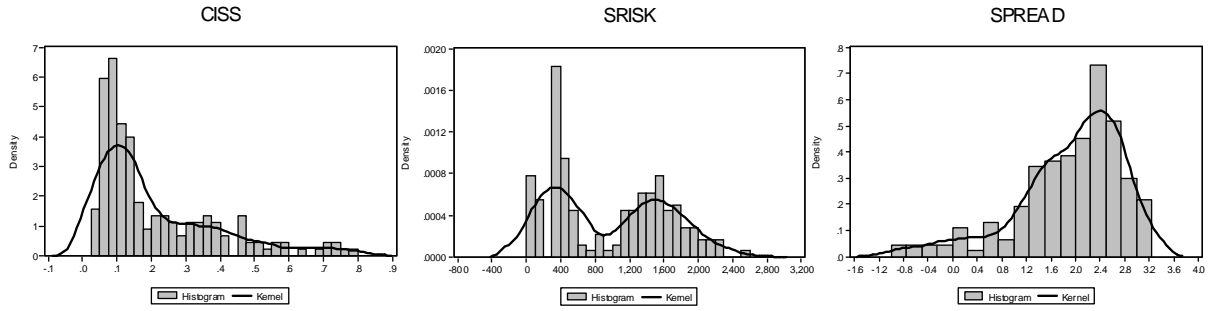
There are of course many indicators of systemic risk that are not covered here and will be incorporated in future analysis (such as indicators based on Value at Risk, non-performing loans, CDS spreads etc.).

2 Methodology and Data

Since the main goal of any financial risk indicator (or in this case systemic risk) is to identify such level of risk that is able to disrupt the market and endanger economy as a whole, it is possible to identify two basic approaches on how to do so. First approach is to set some benchmark level of financial stress and classify its level as significant in case it exceeds one unit of variance (Illing and Liu 2006). Such approach must, however, explicitly assume that the indicator follows normal distribution, which assumption in many cases cannot be fulfilled. The second approach separates periods of high or extreme financial stress from periods with only moderate or low levels of stress based on the assumption that the time series properties of particular indicators are state-dependent. This approach may seem appropriate, as it is assumed for financial stress to cluster around local attractor levels across different regimes, thereby, displaying some intra-regime persistence. Hence, the measure acts stochastically, unpredictably.

Therefore, it is useful to first analyze the distribution of particular indicators. It is visible from Figure 2 that the distribution of indicators cannot be described as Gaussian. The distribution is heavily skewed towards its right (CISS) or left (SPREAD) tail or even multimodal (SRISK). This means that the empirical density function should be represented as a mixture of distributions, each characterizing a separate regime.

Figure 2 Histogram Display for Analyzed Indicators



Source: Own estimations

Note: Histograms calculated for analyzed indicators are based on monthly averages of monthly data from July 2000 to June 2015. Smoothed histogram is based on Epanechnikov kernel.

In order to model this regime-dependence, we estimate several variations of Markov-Switching models with up to three states (s_t):

$$R_t = \alpha(s_t) + \beta(s_t)R_{t-1} + \sigma(s_t)u_t, \text{ for } s_t = \{0,1,2\}, \quad (3)$$

where $R_t = [CISS, SRISK, SPREAD]$, all coefficients (α, β, σ) are allowed to switch across states and residuals are assumed to be standard, normal, independent and identically distributed. Models are assumed to have an ergodic Markov chain with transition probabilities $p(s_t = i | s_{t-1} = j) = p_{ij}$ and the following transition matrix:

$$P = \begin{bmatrix} p_{00} & p_{01} & p_{02} \\ p_{10} & p_{11} & p_{12} \\ p_{20} & p_{21} & p_{22} \end{bmatrix} = \begin{bmatrix} p_{00} & p_{01} & p_{02} \\ p_{10} & p_{11} & p_{12} \\ 1 - p_{00} - p_{10} & 1 - p_{01} - p_{11} & 1 - p_{02} - p_{12} \end{bmatrix}, \quad (4)$$

where the third row conditional probabilities have been replaced by adding-up constraints for probabilities. For a model with three regimes only six out of nine transition probabilities can be estimated independently).

As seen from Table 1, our preferred model specification is MS(3)-AR(1), that is a Markov-Switching model with three regimes. Some summary statistics suggest superiority of the model with regimes in terms of log-likelihood values and information criteria. More importantly, all model specifications survived the residuals misspecification tests of non-normality and autocorrelation.

Table 1 Different Markov-Switching Model Specifications

Indicator	Model	Log-likelihood	AIC	Normality (D-W)	Auto-correlation
CISS	MS(3)-AR(1)	333.889	-3.601	1.853	0.227
	MS(2)-AR(1)	318.279	-3.503	1.984	0.714
SRISK	MS(3)-AR(1)	290.025	-3.954	1.949	0.421
	MS(2)-AR(1)	262.356	-3.719	1.888	0.327
SPREAD	MS(3)-AR(1)	305.651	-3.132	1.981	0.351
	MS(2)-AR(1)	294.561	-3.056	1.915	0.153

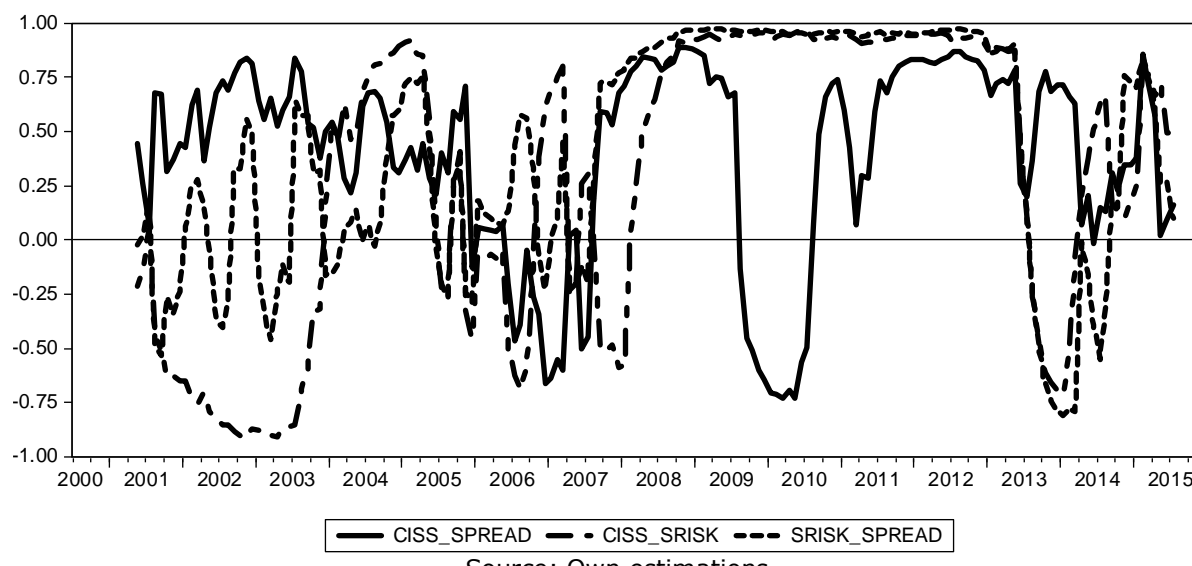
Source: Own estimation

Notes: MS(s) stands for a Markov-Switching models with 2 or 3 regimes, AR(p) denotes an autoregressive model of order p . Estimations are based on monthly data from July 2000 to June 2015. We have generated 50 sets of random starts with 20 iteration refinements.

3 Results and Discussion

Before we proceed to Markov-Switching models results, it is useful to look at time-varying correlations between our modelled indicators. We estimate dynamic conditional correlation GARCH (1,1) models whose results are plotted in Figure 3. First, it is evident that our analyzed indicators are highly correlated during the crisis period from 2008 to 2013. Second, estimated correlations are somewhat mixed during the pre- and after-crisis periods. In terms of identifying risk materialization phase, all of the indices seem to be successful, but they are posing different results in the risk-accumulation phase from 2005 to 2007.

Figure 3 DCC-GARCH(1,1) Model Estimations



Notes: Time-varying correlations were computed as dynamic conditional correlation model estimated by log likelihood for integrated process since the data in levels have a unit root. Mathematical propositions of the model are described in Engle (2002). Used calculation code is available upon request.

Results of Markov-switching model estimations are shown in Figure 4. Regime 1 represents the case when financial stress is relatively low and we can identify it as “normal” times. Regime 3 identifies structural breaks, shocks and levels of extremely high financial stress, such is only visible during rare events (financial crisis, 9/11 attack, oil shocks). Regime 2 is somewhat problematic for interpretation. Judging from our estimations, it can be interpreted as intermediate level of systemic stress as it occurs in periods before and after Regime 3 events. Fostel and Geneakoplos (2008) speak of “anxious economy” and this truly might be the case. The central question is however different – does Regime 2 capture the accumulation phase of systemic risk? The answer varies among different indicators and it is not as straightforward as needed.

In terms of regime probabilities, the estimations of each indicator nicely show their differences:

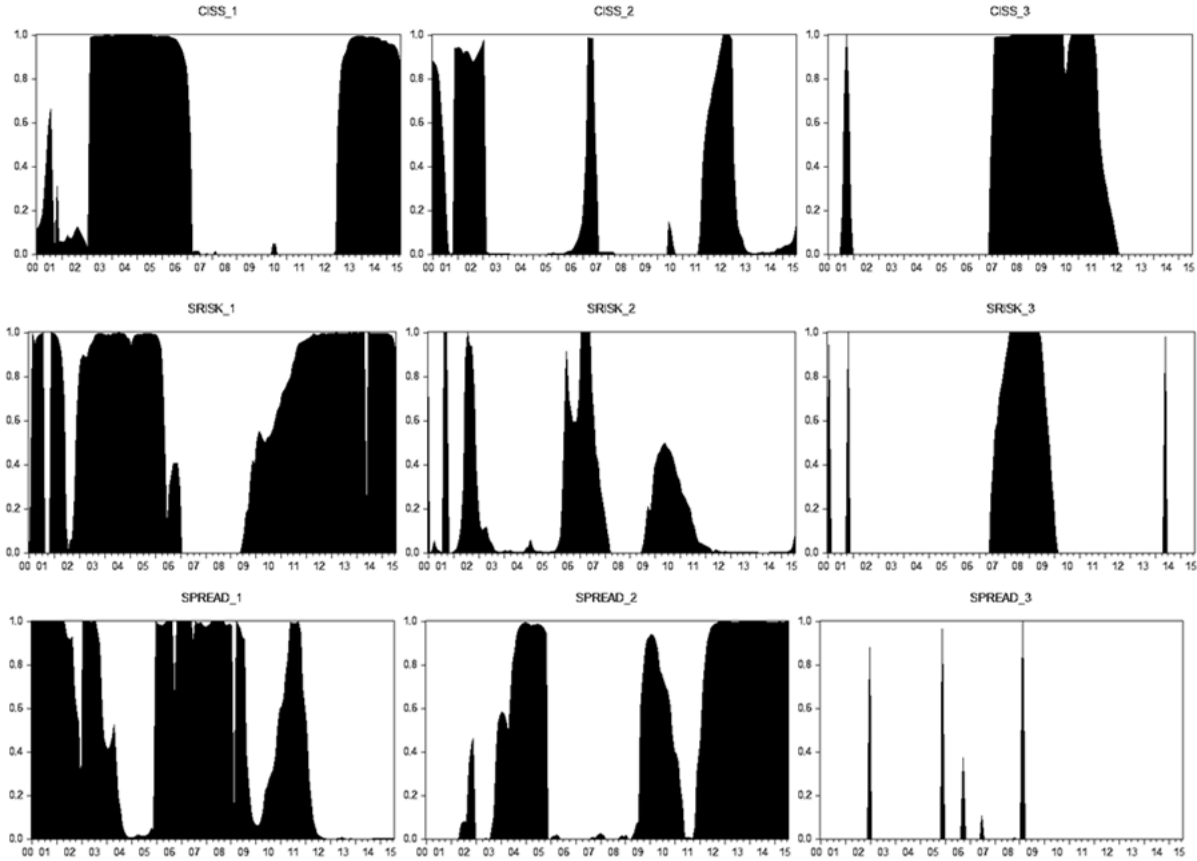
First, the CISS indicator as a representative of aggregate systemic risk indexes successfully identifies rare events under Regime 3, such as terrorist attacks 9/11 in the US, after which even European markets had exhibit increased volatility and sold-outs, or Lehman Brothers bankruptcy and Greek crisis. Regime 2 is displayed before and during the dot-com bubble burst and subsequent bear market and also shortly before and after the financial and debt crises. Regime 1 displays the great moderation period from 2002 to 2006 and the after-crisis period of economic recovery after 2013. Overall, CISS index appears successful in capturing materialization phase of systemic risk. As for the build-up phase of systemic risk, we would expect to see Regime 2 active in 2006, when the

financial risk was truly accumulating and many potential non-performing loans contracts were made. The CISS index seems to fail to comprehensively display the build-up phase of systemic risk (which is in line with some recent research, such as Giglio et al. 2015).

Second, SRISK (financial sector equity return volatility measure) is more focused on particular failures from micro viewpoint under Regime 3. It coincides strongly with CISS indicator in this Regime. They differ, however, in the interpretation of Regime 2. SRISK places Regime 2 especially under the increased systemic volatility after dot-com bubble burst in 2002 and more importantly at the beginning of 2006, which is now identified as a direct pre-crisis period and it is characterized by a strong build-up of systemic risk and credit risk in the mortgage market in the US. It seems that financial sector equity return volatility variables are the most informative individual predictors of downside macroeconomic risk. These findings are consistent with the view of Schwert (1989). His empirical analysis highlights the co-movement among aggregate market volatility, financial crises, and macroeconomic activity.

Third, we analyzed the term spread measure. It captures liquidity and default risk, but also the fact that during periods of turmoil investors lend against treasury bills (the best form of collateral), measuring the “flight to quality” effect (Rodríguez-Moreno and Peña 2011). These stylized facts are nicely reflected in Regime estimates. Regime 3 marks the start and end of a credit cycle in the period from 2001 to 2005. First, it identifies the end of 2001, when ECB started to slowly downgrade its interest rates to boost the economy after the dot-com bubble. Second, it highlights the end of 2005, when the expansionary monetary policy ended and the ECB raised its official interest rates. Regimes 1 and 2 should then capture the periods of low and moderately high liquidity and default risk. It does so nicely, as we know that the pre-crisis period from 2006 to 2007 was characterized by seemingly low liquidity and default risk. The increased risk premium has only started to rise after the Lehman’s bankruptcy.

Figure 4 Smoothed Regimes Probabilities from Markov-Switching Model Estimations



Source: Own estimations

4 Conclusions

In this brief paper, we quantitatively examined a collection of systemic risk measures that are proposed and used in the literature. We argue that systemic risk measures should be able to capture not only the materialization phase of systemic risk, but also the build-up (accumulation) phase. We analyzed three widely used systemic risk indicators: CISS, SRISK and term spread. We assume the empirical density functions of analyzed indicators can be represented as a mixture of distributions, each characterizing a separate regime. In other words, we assume the systemic risk indicators to be regime-dependent. In order to model this regime-dependence, we estimate several variants of Markov-Switching models with up to three states.

So far, we can present here a few stylized facts. First, systemic risk indicators analyzed here have an especially strong association with the materialization phase of systemic risk in the financial system, but mostly fail to capture the build-up phase. Second, indicators based on financial sector equity volatility (such as SRISK) were particularly informative about future real activity and seem to identify successfully the accumulation phases that might eventually lead to financial instability.

In our future research we aim to incorporate more indicators generally used in the literature (such as indicators based on Value at Risk, non-performing loans, CDS spreads etc.). Study results might be improved by prolonging time series to include more business cycles and including a dynamic regression Markov-switching model proposed by Doornik (2011) instead of described fully fledged model.

Acknowledgments

Authors acknowledge the support of the project GAČR 16-13784S "Financial sector policy and institutions: Current challenges in balancing financial development and Stability" and Masaryk University internal grant MUNI/A/1025/2015. We are also thankful to V-Lab Institute for sharing their data.

References

- Banulescu, G. D., Dumitrescu, E. I. (2015). Which are the SIFIs? A Component Expected Shortfall approach to systemic risk. *Journal of Banking & Finance*, vol. 50, pp. 575-588.
- Benoit, S., Colliard, J., Hurlin, Ch., Perignon, Ch. (2015). Where the Risks Lie: A Survey on Systemic Risk. *HEC Paris Research Paper*, No. 1088.
- Brownless, T. C., Engle, R. F. (2015). SRISK: A Conditional Capital Shortfall Measure of Systemic Risk. *Working Paper*. Retrieved from: <http://dx.doi.org/10.2139/ssrn.1611229>.
- Doornik, J. A. (2011). *Markov-Switching Models*, University of Oxford and OxMetrics Technologies Ltd., Mimeo.
- Engle, R. (2002). Dynamic Conditional Correlation. *Journal of Business & Economic Statistics*, vol. 20(3), pp. 339-350.
- Engle, R. F., Jondeau, E., Rockinger, M. (2015). Systemic Risk in Europe. *Review of Finance*, vol. 19(1), pp. 145-190.
- Fostel, A., Geneakoplos, J. (2008). Leverage Cycles and the Anxious Economy. *American Economic Review*, Vol. 98(4), pp. 1211-1244.
- Frait, J., Komárková, Z. (2011) Financial stability, systemic risk and macroprudential policy. In: *Financial stability report 2010/2011*. Praha: Czech National Bank, pp. 96-111.
- Gerlach, S. (2009). Defining and Measuring Systemic Risk. *Directorate General for Internal Policies Note*, No. 2009/040.
- Giglio, S., Kelly, B. T., Pruitt, S. (2015). Systemic risk and the macroeconomy: an empirical evaluation. *NBER Working Paper Series*, No. 20963.

- Grinderslev, O. J., Kristiansen, K. L. (2016). Systemic risk in Danish Banks: implementing SRISK in Danish context. *Danmarks Nationalbank Working Paper*, No. 105.
- Illing, M., Liu, Y. (2006). Measuring Financial Stress in Developed Country: An Application to Canada. *Journal of Financial Stability*, vol. 2(3), pp. 243-265.
- Langfield, S., Pagano, M. (2015). Bank bias in Europe: effects on systemic risk and growth. *ECB Working Paper Series*, No. 1797.
- Rodríguez-Moreno, M., Peña, J. I. (2011). Systemic risk measures: the simpler the better? *BIS Papers*, No 60.
- Schwert, G. W. (1989). Business cycles, financial crises, and stock volatility. In: *Carnegie-Rochester Conference Series on Public Policy*, vol. 31, pp. 83-125.
- Wheelock, D.C., Wohar, M. (2009). Can the Term Spread Predict Output Growth and Recessions? A Survey of the Literature. *Federal Reserve Bank of St. Louis Review*, No. 91.

The Impact of Contingent Convertible Bond Issuance on Bank Credit Risk

Oleg Deev¹, Vlad Morosan²

¹ Masaryk University
Faculty of Economics and Administration
Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: oleg@mail.muni.cz

² Masaryk University
Faculty of Economics and Administration
Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: 440132@mail.muni.cz

Abstract: *Contingent convertible bonds are designed to provide additional capital to banks in times of distress and discourage the risk-taking incentives of the stockholders and, hence, decrease bank credit risk. In this paper, we study bank CDS spreads as a proxy of credit risk during the periods around the announcement of contingent convertible bond issuance. We analyze whether investors see these bonds as signs of possible bank distress or the stabilizing mechanism decreasing the probability of bank default. We use event study methodology where abnormal CDS spreads are identified based on constant mean return model and basic market model. Our data sample consists of 41 banks with 109 current unique issues taken from Bloomberg. Our results indicate that CDS spreads show a systemic reaction to the announcement of contingent convertible instruments and are economically significant for the bond holders that value the decreased default probability and reduced risk incentives of the issuing institution.*

Keywords: contingent convertible bonds, event study, CDS prices, bank credit risk

JEL codes: G21, G14

1 Introduction

The financial crisis of 2007-09 revealed that financial institutions had insufficient adequate loss absorbing capital and very little insight on the credit and liquidity risks related to subprime mortgages and other risky investments. As a result, regulators and governments had to intervene and bail out the global systemically important banks by nationalizing, using liquidity insurance schemes and injecting public sector funds i.e. taxpayers' money in the statutory capital of the banks, in order to address the risk of an even bigger systemic crisis. This led to a moral hazard problem where banks have no incentive to prioritize and empower risk management, since taxpayers' money is used as insurance (Calomiris & Herring 2011). As the response to the financial crisis, the Basel Committee on Banking Supervision issued a set of proposals (Basel III) with the main priority to strengthen the quality, consistency and transparency of the regulatory capital base (BIS 2009). Under these new requirements, only truly loss absorbing capital will be recognized as regulatory capital consisting of common equity, retained earnings and contingent convertibles – a new asset class in the family of hybrid financial instruments (BIS 2010). According to Hilsher and Raviv (2014), the addition of contingent convertibles to regulatory capital represents "one of the most prominent suggested solutions for the shortfall of capital in bad times".

Contingent convertible bonds (CoCos) are hybrid capital securities that absorb losses on a going concern basis when the capital of the issuing bank falls below a predetermined level (Avdjiev et al. 2015). Based on the contractual agreement, the loss absorption mechanism can either take the form of an automatic mandatory conversion into equity or take place through a full or partial principal write-down of the CoCos' face value (Spiegeleer et al. 2014). This mechanism of swapping debt into equity or "bail-in" is

considered potentially valuable since it is triggered on a going concern basis, unlike other hybrid instruments, such as Tier 1 bonds, which were outlawed in Basel III due to their failure during the recent near collapse of the financial system (Hilsher & Raviv 2014). Central bankers believe that the issuance of CoCo bonds reduces the default probability of the issuing bank by providing an additional buffer that can absorb losses meanwhile discouraging risk taking incentives of the stockholders in times of crisis. In this context, CoCos represent an attractive mean to raise the necessary capital in order to meet the requirements due to lower cost of capital as coupon payments are tax deductible and dividends are not. On the other hand, from the investors' standpoint, CoCo bonds offer a higher yield compared to other bonds. Therefore, it is no surprise that according to Bloomberg the market of contingent convertibles is growing with nearly USD 77 billion issued in 2015 alone, and that in the following years this market will have an even stronger growth.

The issuance of contingent convertible bonds has a stabilizing effect on the issuing institution by providing more loss absorbing capital and discouraging risk taking incentives of the stockholders in times of crisis (Flannery 2009). Consequently, if investors assume that the bank can decrease its probability of default, then the issuance of CoCos should have a positive announcement effect on the market based indicators, such as CDS spreads. On the other hand, opposing effects are also being considered. A prevailing positive effect of the CoCo issuance resulting in a decreasing CDS spreads around the announcement date is possible, since bond investors are facing the downside risk and do not gain from the firm's additional risk taking. At the same time, considering that CDS spreads are negatively correlated with the value of the firm, the decrease in share prices after the announcement could imply also a higher default probability, and so, it is possible that CDS spreads to increase.

The purpose of this paper is to investigate the effects associated with the issuance of contingent convertible capital instruments on banks' financial stability. In order to test this impact, we apply an event study analysis on a sample of 41 banks with 109 unique issues of contingent convertible bonds. As a proxy of financial soundness of bank, we use a market-based indicator - credit default swap spreads. The use of market-based indicator was determined by their general availability at high frequency and better risk-signaling qualities compared to accounting-based indicators (Cihak 2007).

Our research adds to the literature on contingent convertible instruments by analyzing market's perception of the announcement of CoCos issued in countries with different levels of development, while in the previous studies the focus has been put on issuers from a single country (Schmidt & Azarmi 2014) or from a group of countries with similar characteristics (Avdjiev et al. 2015, Rüdinger 2015, Ammann et al. 2015). We provide a broader view of the impact of the event on bank stability and perceived default risk and compare the results using two different models of abnormal CDS spreads calculation (market model and constant mean return model).

Related Literature

Flannery (2002) introduces the theoretical concept of a new type of bond for large financial institutions called "Reverse Convertible Debenture". Banks' balance sheet should include an instrument that would initially take the form of a subordinated debt but that would automatically convert into common equity if the market capital ratio of the bank would fall under a predetermined level. This mandatory conversion mechanism would facilitate the deleveraging of the bank in times of distress with little effects on risk taking incentives. Only after the financial crisis of 2007-09 this instrument was considered to reduce the systemic risk of large financial institutions. BIS (2011) provides the regulatory framework for this type of capital consisting only of fully absorbing instruments in times of distress. The literature on CoCos mainly concentrates on the optimal design and pricing of these financial instruments, while there is little empirical evidence on the effects of contingent convertible capital on bank risk-taking and investor behavior mainly due to the fact that CoCos are still a new asset class with the first placements being made in 2009.

One of first attempts to estimate the effect of issuance of contingent convertible bonds on bank value and perceived default risk was done by the Schmidt and Azarmi (2014) for the first issue of CoCos made by Lloyds Banking Group in 2009. This first evidence suggests that CoCos can have a negative effect on a bank's creditworthiness and firm value. Avdjiev et al. (2015) find that the issuance of CoCos has a negative impact on the issuer's CDS spreads. The sample used in this study was based on the CoCos using mandatory conversion to equity issued by banks from all advanced economies with the exception of the euro area periphery. Table 1 presents a summary of existing studies that examine the announcement effect of contingent convertible instruments on market-based indicators along with the applied methodology and scope of the event study.

Table 1 Comparison of Studies on CoCo Announcement Effect

Study	Scope	Period	Methodology	Findings
Schmidt and Azarmi (2014)	Lloyds Banking Group (UK)	2009	MM	Significant positive effect
Ammann, Blickle and Ehmann (2015)	34 large banks (mostly European)	2009 - 2014	MM	Significant negative effect
Rüdlinger (2015)	12 large banks (Eurozone)	2009 - 2014	MM, CMRM	No significant effect
Avdjiev et al. (2015)	Advanced economies (except PIGS)	2009 - 2015	MM	Significant negative effect

Source: Own elaboration

Note: MM - market model, CMRM - constant mean return model

2 Methodology and Data

In order to examine the effect associated with the issuance of contingent convertible instruments on banks' financial stability, we conduct an event study. Given rationality in the marketplace, the effect of an event is instantly captured by the market and reflected in CDS prices. In this context, we follow the event study methodology of Campbell et al. (1997) and Mackinlay (1997) to determine the announcement effect of the CoCo bonds issuance on credit default swap (CDS) spreads.

An event study analysis has the following steps:

Defining the event. Event day is represented by the announcement day that corresponds with the official disclosure of new information on the issuance of CoCo bond. The day after the event day is also imperative for analysis since it captures the impact on market prices, if the information was released after the market was closed. The period preceding the event day should also be analysed, because market participants might acquire some information before the public announcement which can affect the prices of securities of the affected firm. According to Avdjiev et al. (2015), banks do not publicly announce the issuance of CoCos. Instead, the intention is revealed privately to the groups of potential buyers, usually over the course of 2 weeks before the date of issuance. Hence, the event date cannot be easily associated to a specific date that would represent the intention of the bank to issue contingent convertible bonds. Considering that the information is being spread prior to the date of issuance, the information about the upcoming issuance could be incorporated in CDS spreads before the actual issuance. For this reason, as suggested by Ball and Torous (1988), when the exact event day is unclear the maximum likelihood estimation length should be applied. The common practice is to consider 41 days, 20 days before the event (t-20 to t-1), the event day (t), and 20 days after the event (t+1 to t+20).

Firm selection criteria. Bloomberg provides information on 229 unique issues of contingent convertible bonds for 132 banks over the period from January 1, 2009 to December 31, 2015. However, due to the lack of actively traded CDS (we consider only the banks with corresponding USD denominated daily 5-year CDS as they are the most liquid credit derivative instruments present on the credit market), the initial sample is reduced to 41 banks with 109 unique issues.

Measurement of normal and abnormal CDS spreads. The normal CDS spread is defined as the return that would have occurred, if the event did not take place. Abnormal spreads or returns $\epsilon_{i,t}$ are estimated by subtracting the normal return from the actual ex post return of the security in the event period. Considering a security i at the event day t the abnormal return is defines as:

$$\epsilon_{i,t} = R_{i,t} - E[R_{i,t}|X_t], \quad (1)$$

where $R_{i,t}$ is the realized return, $E(R_{i,t})$ is the return of the security and X_t is the conditioning information for the performance model. Because realized returns $R_{i,t}$ are observable from the market, realized return has to be modelled using the conditioning information X_t from one of the two benchmark models. Through the constant mean return model (CMRM) X_t is a constant equal to the mean return. In this case the normal return of the security i is equal to a mean return of the firm in the estimation window. The market model (MM) assumes a stable linear relationship between the returns of the assessed security and the market returns. The market model normal returns are determined using the geographical iTraxx CDS bank indices (European, American or Asian).

CMRM assumes a realized return $R_{i,t}$ of a security i in the period t equal to the mean return μ_i and an error term ς_{it} as follows:

$$R_{i,t} = \mu_i + \varsigma_{it}, \quad E[\varsigma_{it}] = 0, \quad \text{Var}[\varsigma_{it}] = \delta_{\varsigma_i}^2 \quad (2)$$

where $R_{i,t}$ is the i th element of R_t for period t and ς_{it} is the error term for security with an expectation of zero and a constant variance $\delta_{\varsigma_i}^2$. The parameters of the constant mean return model for the security i are μ_i and $\delta_{\varsigma_i}^2$.

The market model assumes that the asset returns have a joint normal distribution and has the following form:

$$R_{i,t} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}, \quad E[\epsilon_{it}] = 0, \quad \text{Var}[\epsilon_{it}] = \delta_{\epsilon_i}^2 \quad (3)$$

where $R_{i,t}$ denotes the return of the security i , R_{mt} is the market return in the period t , and ϵ_{it} is error term for security with a zero mean and a constant variance $\delta_{\epsilon_i}^2$. Therefore, the parameters in the MM are α_i , β_i and $\delta_{\epsilon_i}^2$. The advantage of using the MM over CMRM is that it reduces the variation of abnormal return, as it removes the portion of return attributed to the variation in the market's return. Consequently, using the MM can give us a better perspective on the effects of the event.

In order to analyze longer-term inferences of the abnormal returns for the event of interest daily abnormal returns of each security i in the event window are aggregated to cumulative abnormal returns (CAR). The cumulative abnormal return $\widehat{CAR}_{i(\tau)}$ of security i in the event window from τ_1 to τ_2 , where $T_1 < \tau_1 \leq \tau_2 < T_2$, is defined as:

$$\widehat{CAR}_{i(\tau_1, \tau_2)} = \gamma' \widehat{\xi}_i^*, \quad (4)$$

where γ is a $(L_2 \times 1)$ vector having ones in the positions from τ_1 to τ_2 and zeros elsewhere and $\widehat{\xi}_i^*$ represents the vector of abnormal returns with the dimensions of $L_2 \times 1$ and which is based either on the constant mean return model where $\widehat{\xi}_i^* = \widehat{\varsigma}_i^*$, or the market model where $\widehat{\xi}_i^* = \widehat{\epsilon}_i^*$.

Since we cannot conclude about the results based on the tests of one singular event, the abnormal returns (AR) and the cumulative abnormal returns (CAR) are aggregated. The aggregation of AR and CAR is performed along two dimensions – through time, by aggregating the data in the event window by date from $(t - 20)$ to $(t + 20)$; and across securities, by averaging the abnormal returns across all securities included in the sample. For this aggregation we use the simplifying assumption of no correlation between the abnormal returns of different securities. Therefore, the aggregation of individual abnormal returns can be performed using the results from the constant mean return

model (CMRM) where $\widehat{\xi}_i^* = \widehat{\zeta}_i^*$, or the market model (MM) where $\widehat{\xi}_i = \widehat{\epsilon}_i$ for each event period $\tau = T_1 + 1, \dots, T_2$ as follows:

$$\overline{AR}^* = \frac{1}{N} \sum_{i=1}^N \widehat{\xi}_i^* \quad (5)$$

Cumulative average abnormal returns $\overline{CAR}_{(\tau_1, \tau_2)}$ for the period from τ_1 to τ_2 across all the securities in the event window is computed as follows:

$$\overline{CAR}_{(\tau_1, \tau_2)} = \frac{1}{N} \sum_{i=1}^N \overline{CAR}_{(i)}(\tau_1, \tau_2), \quad (6)$$

Estimation procedure. Model parameters are assessed based on the data from the estimation window. Estimation window is the period of time that is not included in the event window, preferably prior to the event that is used for estimating parameters of the normal performance, but that are not influenced by the information from the event. The parameters for the benchmark model used for the computation of the expected CDS spreads are usually computed based on the estimation window of 80 trading days prior to the event window (t-100 to t-21).

Data testing. In order to conclude on the significance of the results, parametric t-tests are used. A t-test is a parametric hypothesis test that is based on the assumption that returns are independent and identically distributed, i.e., knowing the abnormal return $\overline{AR}_{i(\tau)}$ of the security i for the day τ , the standardized abnormal returns on the day τ of the individual security i :

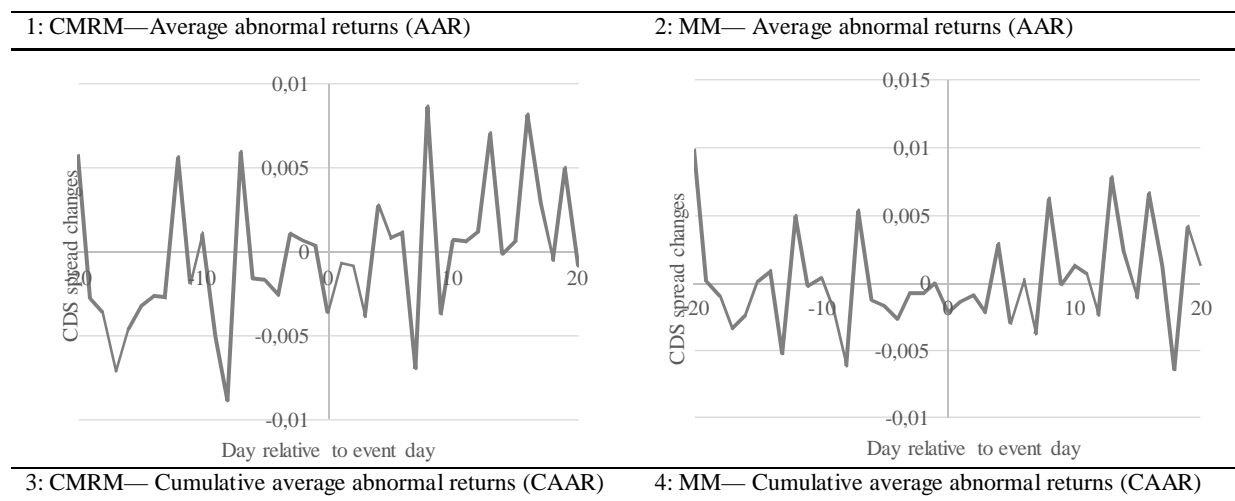
$$J_{\overline{AR}(\tau)} = \widehat{SAR}_{(\tau)} = \frac{\overline{AR}^*(\tau)}{\widehat{\delta}_{(\tau)}}, \quad (7)$$

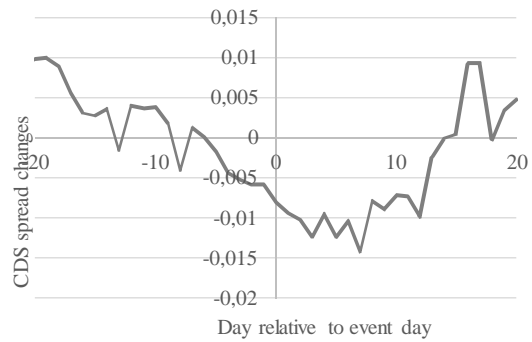
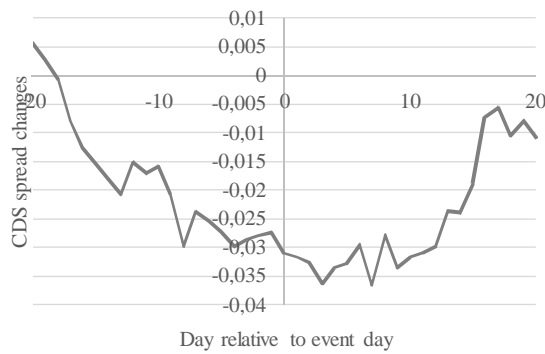
where $\widehat{\delta}_{i(\tau)}$ denotes the standard deviation of the abnormal return on the day τ , being equal to the square root of the (τ, τ) th element of the covariance matrix V_i . Under the null hypothesis, the distribution of $J_{\overline{AR}_{i(\tau)}}$ is Student-t with $L_2 - 2$ degrees of freedom. To test the null hypothesis of no effect of the announcement on the individual returns of security i , standardized cumulative abnormal return can be used as follows:

$$J_{\overline{CAR}(\tau)} = \widehat{SCAR}_{(\tau_1, \tau_2)} = \frac{\overline{CAR}_{(\tau_1, \tau_2)}}{\widehat{\delta}_{(\tau_1, \tau_2)}}, \quad (8)$$

where $\widehat{\delta}_{(\tau_1, \tau_2)}$ is measured based on $\widehat{\delta}_{(\tau_1, \tau_2)} = \left(\frac{1}{N^2} \sum_{i=1}^N \delta^2(\tau_1, \tau_2) \right)^{1/2}$ and is calculated with the consideration that under the null hypothesis $\widehat{SCAR}_{i(\tau_1, \tau_2)}$ is Student-t with $L_2 - 2$ degrees of freedom.

Figure 1 CDS Spreads around CoCo Bond Issuance





Source: Own elaboration based on Bloomberg data

3 Results and Discussion

Our event study results show that the overall impact of a CoCos issue on the average abnormal CDS spreads of the issuing banks is significantly negative. However, the significance of results obtained by using the constant mean return model (CMRM) and the market model (MM) are different. This can be easily explained by the fact that using the market model as the normal return model leads to a reduced abnormal return variance by removing the share of the return associated to the variation in the market return. This results follow the conclusion of Campbell et al. (1997) that the market model is more precise in estimating the event effects and depends on the R^2 of the market-model regression. A higher R^2 leads to a greater variance reduction of the abnormal CDS spreads and, in consequence, to the more precise inference.

Table 2 Abnormal CDS Spreads around the Announcement Date

Day	CMRM						MM					
	AARs	t-stat	Sig.	CAARs	t-stat	Sig.	AARs	t-stat	Sig.	CAARs	t-stat	Sig.
t-20	0.574%	0.743		0.574%	0.743		0.984%	1.273		0.984%	1.273	
t-19	-0.280%	-0.363		0.294%	0.380		0.007%	0.009		0.991%	1.282	
t-18	-0.358%	-0.463		-0.064%	-0.083		-0.100%	-0.129		0.891%	1.153	
t-17	-0.713%	-0.922		-0.776%	-1.005		-0.334%	-0.432		0.557%	0.721	
t-16	-0.464%	-0.601		-1.241%	-1.606		-0.238%	-0.308		0.319%	0.413	
t-15	-0.319%	-0.412		-1.525%	-1.973	**	0.010%	0.013		0.286%	0.370	
t-14	-0.263%	-0.341		-1.788%	-2.313	**	0.085%	0.111		0.371%	0.480	
t-13	-0.270%	-0.349		-2.058%	-2.663	***	-0.523%	-0.676		-0.149%	-0.193	
t-12	0.567%	0.733		-1.518%	-1.965	**	0.495%	0.640		0.390%	0.505	
t-11	-0.180%	-0.233		-1.699%	-2.198	**	-0.023%	-0.029		0.368%	0.476	
t-10	0.107%	0.139		-1.577%	-2.041	**	0.043%	0.055		0.372%	0.481	
t-9	-0.498%	-0.645		-2.075%	-2.685	***	-0.198%	-0.256		0.173%	0.224	
t-8	-0.886%	-1.147		-2.972%	-3.846	***	-0.616%	-0.798		-0.403%	-0.521	
t-7	0.598%	0.774		-2.374%	-3.072	***	0.535%	0.693		0.132%	0.171	
t-6	-0.163%	-0.211		-2.537%	-3.282	***	-0.125%	-0.162		0.007%	0.010	
t-5	-0.170%	-0.220		-2.707%	-3.502	***	-0.171%	-0.222		-0.164%	-0.212	
t-4	-0.256%	-0.331		-2.962%	-3.833	***	-0.269%	-0.348		-0.433%	-0.561	
t-3	0.113%	0.146		-2.850%	-3.687	***	-0.083%	-0.107		-0.516%	-0.668	
t-2	0.074%	0.096		-2.776%	-3.592	***	-0.074%	-0.096		-0.590%	-0.763	
t-1	0.035%	0.046		-2.741%	-3.546	***	0.002%	0.002		-0.588%	-0.761	
t0	-0.357%	-0.461		-3.097%	-4.008	***	-0.213%	-0.275		-0.801%	-1.036	
t+1	-0.065%	-0.085		-3.163%	-4.093	***	-0.133%	-0.173		-0.935%	-1.210	
t+2	-0.082%	-0.106		-3.245%	-4.199	***	-0.085%	-0.110		-1.020%	-1.320	
t+3	-0.384%	-0.498		-3.629%	-4.696	***	-0.221%	-0.286		-1.238%	-1.602	
t+4	0.275%	0.356		-3.354%	-4.340	***	0.291%	0.377		-0.947%	-1.225	
t+5	0.086%	0.111		-3.268%	-4.229	***	-0.292%	-0.377		-1.235%	-1.598	
t+6	0.120%	0.155		-2.952%	-3.820	***	0.023%	0.029		-1.026%	-1.327	
t+7	-0.694%	-0.898		-3.646%	-4.718	***	-0.380%	-0.492		-1.408%	-1.822	*
t+8	0.867%	1.122		-2.779%	-3.596	***	0.627%	0.811		-0.781%	-1.011	
t+9	-0.364%	-0.471		-3.342%	-4.325	***	-0.009%	-0.011		-0.890%	-1.152	
t+10	0.072%	0.093		-3.156%	-4.084	***	0.129%	0.167		-0.719%	-0.931	
t+11	0.061%	0.079		-3.096%	-4.006	***	0.072%	0.093		-0.738%	-0.955	
t+12	0.129%	0.167		-2.967%	-3.839	***	-0.239%	-0.309		-0.977%	-1.264	
t+13	0.705%	0.912		-2.378%	-3.077	***	0.781%	1.011		-0.236%	-0.305	
t+14	-0.010%	-0.013		-2.388%	-3.091	***	0.234%	0.303		-0.001%	-0.002	
t+15	0.070%	0.090		-1.885%	-2.439	**	-0.107%	-0.138		0.046%	0.059	
t+16	0.817%	1.057		-0.713%	-0.922		0.662%	0.857		0.932%	1.206	
t+17	0.291%	0.377		-0.554%	-0.717		0.130%	0.168		0.924%	1.196	
t+18	-0.045%	-0.058		-1.036%	-1.340		-0.646%	-0.837		-0.015%	-0.019	
t+19	0.502%	0.650		-0.793%	-1.026		0.418%	0.540		0.353%	0.457	
t+20	-0.077%	-0.099		-1.075%	-1.391		0.137%	0.178		0.480%	0.622	

Source: Own calculation based on Bloomberg data

Note: The table reports the average abnormal CDS spreads (AARs) and the cumulative average abnormal CDS spreads (CAARs) based on the constant mean return model (CMRM) and the market model (MM) for different periods around the event day (t_0). Test statistics are represented in the column with the header "Sig." indicating the significance of returns where *, **, and *** indicate statistical significance at the 10%, the 5%, and the 1% levels, respectively.

As we can see in the results for the cumulative average abnormal returns in Figure 1, most of the decrease in the CDS spreads tend to start in the period from ($t-18$), according to the CMRM, and ($t-6$) according to the MM. This indicates that the information about an upcoming CoCo issuance is being spread prior to the announcement date. Table 2 shows that while the average abnormal returns are not significant over the entire event period, they are on average negative, indicating that the credit market values the CoCo emission. However, cumulative average abnormal returns are statistically significant for the event period from ($t-15$) to ($t+15$) according to the constant mean return model (CMRM), and only on ($t+7$) based on the market model (MM).

Table 2 shows cumulative average abnormal CDS spread changes for the period from ($t-9$) to ($t+14$) are statistically significant at 1% level, and 6 results outside this timeframe are statistically significant at 5% level, using the constant mean return model (CMRM). At the same time, there is just one statistically significant result at the 10% level, according to the market model (MM). The discrepancy in the significance of the results can be explained by comparing the abnormal return variances of the two models, since the lower market model variance is carried forward to the aggregate results leading to more price results. Despite the discrepancies in the significance of results, we can conclude based on both the market model (MM) and to the constant mean return model (CMRM) that CDS spreads show a systemic reaction to the announcement of contingent convertible instruments and are economically significant for the bond holders that value the decreased default probability and reduced risk incentives of the issuing institution.

Although cumulative average abnormal returns are not statistically significant, we observe that there are much more positive than negative, suggesting that the issue of CoCos is considered as a positive signal for the shareholders. The result is in accordance with the hypothesis of mixed signals where the positive effect of the decreased default probability is canceled by the risk of dilution and the increase of the bond portfolio for which the bank has to pay coupons. At the same time, we find significant negative CDS spread changes around the announcement date. The negative effect on the CDS spreads can be explained by the additional protection buffer offered to senior creditors by the contingent convertible capital.

4 Conclusions

Our results confirm that market shows a systemic reaction to the announcement of contingent convertible instruments and that bondholders value the decreased default probability and reduced risk incentives of the issuing institution. The obtained results follow most closely the previous event study findings of Avdjiev et al. (2015) regarding the announcement effect of CoCos on CDS spreads. However, our approach is different from the one used by Avdjiev et al. (2015) considering that our sample consists of banks from countries with different levels of development while they focused on advanced economies with the exception of the euro area periphery (Greece, Ireland, Italy, Portugal and Spain). The similarity of results proves that in many contexts the differences between the two approaches is not significant. This can be explained by the fact that the vast majority, both by number (84%) and by issuing volume (72%), of the CoCo issuing institutions are from Europe. In this context, we can conclude that the additional banks added to the sample do not have a significant impact on the estimation. At the same time, we obtain different results compared to the studies that used a shorter estimation period (Schmidt and Azarmi, 2014; Ammann et al., 2015; Rüdlinger, 2015). This is due to the relatively young nature of the CoCos market, with the first issuance made in 2009.

The total amount issued in 2015 is about USD 76 billion, which is 24% of the total amount issued from 2009 to 2015. Therefore, our research contributes to the previous findings on contingent convertible instruments by providing up-to-date information on the developments of contingent convertible capital and their effect on the perceived default probability of banking institutions.

The results of our study illustrate that the issuance of contingent convertible instruments is viewed as positive information by the credit markets. The decreased probability of default of the issuing institution is reflected in the lower CDS spreads. Additionally, obtained results allow us to conclude that the market sentiment regarding the issuance of CoCos follows the intention of the Basel Committee on Banking Supervision to strengthen the quality and consistency of the regulatory capital base. However, important question emerged and that is how these instruments will react in financial distress, considering that none of CoCos has been tested in crises. Also, in order to provide a more detailed analysis on the effects of issuance of contingent convertible capital instruments on banks' financial stability, further research should evaluate the CoCos announcement effect on other, more elaborate, market indicators, such as distance to default (DD).

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 is gratefully acknowledged.

References

- Ammann, M., Blickle, K., & Ehmann, C. (2015). Announcement effects of contingent convertible securities: Evidence from the global banking industry. *University of St.Gallen, School of Finance Research Paper*, No. 2015/25, pp. 1-39.
- Avdjiev, S., Kartasheva, A., & Bogdanova, B. (2013). CoCos: a Primer. *Bank for International Settlements Quarterly Review*, September 2013, pp. 43-56.
- Ball, C. A., Torous, W. N. (1988). Investigating security-price performance in the presence of event-date uncertainty. *Journal of Financial Economics*, vol. 22(1), pp. 123-153.
- BIS (2009). *Strengthening the resilience of the banking sector*. Consultative Document, Retrieved from: <http://www.bis.org/publ/bcbs164.pdf>.
- BIS (2011). *Basel Committee issues final elements of the reforms to raise the quality of regulatory capital*. Consultative Document. Retrieved from: <http://www.bis.org/press/p110113.pdf>.
- BIS (2011). *Basel III: A global regulatory framework for more resilient banks and banking systems*. Consultative Document. Retrieved from: <http://www.bis.org/publ/bcbs189.pdf>.
- Calomiris, C. W., & Herring, R. J. (2011). Why and How to Design a Contingent Convertible Debt Requirement. *Financial Institutions Center at The Wharton School Working Paper*.
- Campbell, J. Y., Lo, Andrew W., MacKinlay, A. C. (1997). *The Econometrics of Financial Markets*, Princeton University Press.
- Cihak, M. (2007). Systemic Loss: A Measure of Financial Stability. *Czech Journal of Economics and Finance*, vol. 57, pp. 5-26.
- Flannery, M. J. (2002). No Pain, No Gain? Effecting Market Discipline Via 'Reverse Convertible Debentures'. *University of Florida Working Paper*, pp. 1-32.
- Flannery, M. J. (2009). Stabilizing Large Financial Institutions with Contingent Capital Certificates. *University of Florida Working Paper*, pp. 1-34.

Hilsher, J., & Raviv, A. (2014). Bank Stability and Market Discipline: The Effect of Contingent Capital on Risk Taking and Default Probability. *Journal of Corporate Finance*, vol. 53, pp. 1-45.

Mackinlay, A. C. (1997). Event Studies in Economics and Finance, *Journal of Economic Literature*, vol. 35, pp. 13-39.

Rüdlinger, M. (2015). *Contingent Convertible Bonds: An Empirical Analysis of Drivers and Announcement Effect*. Dissertation of the University of St. Gallen.

Schmidt, C., & Azarmi, T. (2014). The Impact Of CoCo Bonds On Bank Value And Perceived Default Risk: Insights And Evidence From Their Pioneering Use In Europe. *Journal of Applied Business Research*, vol. 31(6), pp. 2297-2306.

Spiegeleer, J. D., Schoutens, W., & Hulle, C. V. (2014). *The Handbook of Hybrid Securities: Convertible Bonds, CoCo Bonds and Bail-In*. Wiley.

Hedging Case Study in the Exchange Rate Commitment Regime Environment

Jaroslava Dittrichová¹, Libuše Svobodová², Ivan Soukal³

¹ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: jaroslava.dittrichova@uhk.cz

² University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: libuse.svobodova@uhk.cz

³ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: ivan.soukal@uhk.cz

Abstract: *The paper deals with topic of hedging as an instrument of foreign exchange exposure treatment. This case study is focused on traditional export-oriented company PETROF, s. r. o. Analysis of scenarios is performed by the loss-profit comparison. The study dataset is consisted of internal financial statements gathered in period from 2010 to 2015 and provided the company representatives. Analyses are based on spot rates effective at studied periods and signed hedging contracts – forward derivatives. Analyses include data processing and proposals for consideration of macroeconomic factors that determine the company's business environment. Qualitative research is concluded with a discussion on proposed approaches and instruments. Despite the fact that in November 2013 Czech national bank entered foreign exchange interventions regime with exchange rate commitment of 27 CZK/EUR and so the companies knows the expected rate of the Czech currency, the topic is still current. The importance of the topic will be greater with the upcoming end of intervention regime in 2017 when we can expect increased volatility of the Czech crown again.*

Keywords: Financial derivatives, forward, hedge, foreign exchange risk, monetary policy

JEL codes: F31, F37

1 Introduction

On 7 November 2013 the supreme governing body of the Czech National Bank (thereinafter as CNB) started to use foreign exchange market interventions. This decision regarding this instrument was made already on the autumn 2012 after reaching “technical zero” interest rate. Czech koruna exchange rate was the only one more or less conventional instrument left because negative interest rates were not taken into consideration. This decision outlined the exchange rate asymmetric commitment of CZK appreciation close to CZK 27/EUR. Further appreciation would and is being prevented by purchases of foreign currencies against the Czech koruna on the foreign exchange market by the CNB. This is the managed zone of managed floating regime. A floating approach is applied at levels weaker than CZK 27 to the EUR. It allows the CZK exchange rate to float according to supply and demand on the foreign exchange market. Statement of the Bank Board from 4 January 2016 informs about a plan to use foreign exchange interventions at least till 2017.

Weaker home currency increases imported goods and services prices creating inflation pressure although low oil prices prevented from clear manifestation in a way of reaching the inflation goal. On the other hand the effect of domestic output consumer preference, due to foreign goods and services price increase, was and could not be affected by oil market situation. Increase of domestic output is supported by the lowest interest rates in history for more than a year. Another stimulus again comes from the exchange rate

respectively from increased price competitiveness improving financial results of domestic export-oriented companies. The positive effects of higher investment activities again improve figures related to the domestic economy increasing even the lagging macro-indices such as wages and employment rate.

CNB is determined to intervene as long as necessary for reaching the inflation goal. Foreign exchange market interventions are going to end when significant inflation pressure would manifest and or when the Bank Board will be under control of new members with a negative attitude regarding the interventions. It is highly probable that the first situation won't take place. If so then restrictive monetary policy would have taken the place increasing among other the interest rates. However the eased monetary policy is likely to continue more than one year.

The paper is focused on the impacts of foreign exchange market interventions in business practice. Cooperation with the PETROF, s. r. o. company (thereinafter as PETROF), with a domicile in Hradec Králové, was arranged. By different means of communication we acquired from this company internal accounting data and business documents regarding the contracts from 2010-2015 period. Older data are not available due to a new information system implementation.

At first a literature overview is performed, followed by methodology and the goal. The main part of the paper concerns the PETROF company and its case study of possible foreign exchange exposure treatment by forwards. Since PETROF did not use forward hedging the forward rates had to be taken from other company. Consequently we present an example of how the foreign exchange interventions influenced foreign exchange exposure management since the November of 2013. This case is compared to forward contracts from the period before the interventions. Forward offer is taken from the offer made for EXCON, a. s. (thereinafter as EXCON) since PETROF did not use the forward hedging. Jílek (2005) describes forward as a contract regarding the exchange of previously agreed amount of money in one currency to another at specific date and with specific exchange rate. The exchange expresses the ration of exchange between two currencies. It states how much of contract currency units equal the value of a base currency. Regarding direct quotation 25.630 CZK equal to base currency which is in our case EUR. The ration is inversed in case of indirect one and so 0.039 EUR equals 1 CZK. (Dittrichová et al., 2016) A case study, as one of the main qualitative study instruments (Hendl, 2012), would allow suggesting ways to achieve better results. The results are sum up at the end of the paper.

2 Methodology and Data

Theoretical approach for the case of an internationally competitive but domestically monopolistic firm under exchange rate uncertainty (the model that fits the PETROF's market position regarding the high quality classic keyboard music instruments market) is represented e.g. by Wong (2007). The general model's outcome is that the effect of financial hedging on output is always positive. In other words it is profitable. However some empirical evidence clearly shows the problem that forward hedging could result in loss because the forward-real future spot rate correlation varies. The empirical study concerning exchange rate prognosis successfulness by forwards was performed e.g. by Ptatscheková and Draessler (2013). Another factor to mention is that nowadays monetary policy rather less conventional. Unlike the free floating regime the exchange rate commitment is now applied. Among other things it improves market transparency. That can be considered as by "publicly observable signal". These signals, as Broll and Eckwert (2009) claim, are the factors decreasing prices and contracts traded on the currency forward market. So again it can be considered as factor supporting the forward hedging.

The main objective of this paper is to analyse development and use of instruments of CNB monetary policy and impacts on selected export-oriented company. The analysis will be accompanied by model examples using the acquired data. This paper can be beneficial, especially in processing of acquired data with consequent evaluation and

conclusions, not only for the selected company but also for other export-oriented companies and expert community.

The main purpose is the analysis of impacts of eased monetary policy and financial derivatives hedging usage as foreign exchange exposure treatment for export-oriented company PETROF (the closest company form in British corporate law for s. r. o. is private company). PETROF did not use forward hedging. Then the forward derivatives offer for EXCON was taken into the calculation. This offer was up to date for given period and adequate regarding the contacts' value.

The case study is based on accounting and business materials of PETROF company. The object of the analysis is long-term contract with Russian customer with an application of the forward rates taken from previously mentioned offer. The business case will be applied on exchange rate commitment regime of CNB. Qualitative research is sum up by evaluation of volatility of the Czech crown exchange rate, impacts of foreign exchange market interventions and conclusions on elaborated issues. The data presented are supplemented by tables and graphs.

The article is based on primary and secondary sources. The primary sources are represented by the information from the companies. The secondary sources are represented in greater extent. They comprise information from expert literature, information collected from specialized press and other official sources, previous participations in specialized seminars and conferences related to the given subject. The processed calculations come from supervised theses (Šimek, 2013; Šumpich, 2016).

3 Results and Discussion

The PETROF company regularly delivers its products to the Russian company LLC SALON «ACCORD». The goods of nearly 23 million Czech koruna value were delivered in 2011-2012 period. The forward contracts of EXCON are used because the PETROF company did not use financial derivatives for hedging, see table 1 and 2.

Table 1 EXCON's Forward Contract with Maturity in 2011

Contract ID	Date of signature	Due date	Foreign currency	Volume	Home currency	Forward rate
49750018	5.1.2011	19.7.2011	EUR	200.000	CZK	24.7
50256647	24.5.2011	29.7.2011	EUR	376.000	CZK	24.44
50380119	24.6.2011	29.7.2011	USD	47.000	CZK	17.03
49750020	5.1.2011	17.8.2011	EUR	650.000	CZK	24.70
50256661	24.5.2011	31.8.2011	EUR	176.000	CZK	24.44
49750022	5.1.2011	19.9.2011	EUR	200.000	CZK	24.70
49750032	5.1.2011	19.10.2011	EUR	200.000	CZK	24.70
49750036	5.1.2011	18.11.2011	EUR	200.000	CZK	24.70
50227993	17.5.2011	30.11.2011	EUR	170.000	CZK	24.24
49750040	5.1.2011	19.12.2011	EUR	650.000	CZK	24.70
50237799	19.5.2011	2.1.2012	EUR	170.000	CZK	24.30
50237828	19.5.2011	31.1.2012	EUR	170.000	CZK	24.30
50380051	24.6.2011	31.1.2012	USD	150.000	CZK	17.03
50105452	30.6.2011	18.7.2011	EUR	176.000	CZK	24.29

Source: (Šimek, 2013)

The volume is nominated in EUR and USD. Signed forward rate is e.g. 24.70 CZK per 1 EUR using the direct quotation CZK/EUR in case of contract 49750020 with maturity 17.8.2011.

Table 2 EXCON's Forward Contract with Maturity in 2012

Contract ID	Date of signature	Due date	Foreign currency	Volume	Home currency	Forward rate
50706167	13.9.2011	31.1.2012	EUR	150.000	CZK	24.35
50746085	21.9.2011	31.1.2012	EUR	600.000	CZK	24.66
50741533	20.9.2011	29.2.2012	EUR	150.000	CZK	24.60
50872333	21.10.2011	29.2.2012	EUR	2.300.000	CZK	24.85
50406172	13.9.2011	30.3.2012	EUR	150.000	CZK	24.35
50741535	20.9.2011	30.3.2012	EUR	150.000	CZK	24.60
50938842	9.11.2011	30.3.2012	EUR	800.000	CZK	25.19
50748088	21.9.2011	27.4.2012	EUR	600.000	CZK	24.66
50706175	13.9.2011	30.4.2012	EUR	150.000	CZK	24.35
50741537	20.9.2011	30.4.2012	EUR	150.000	CZK	24.60
50706177	13.9.2011	31.5.2012	EUR	150.000	CZK	24.35
50741538	20.9.2011	31.5.2012	EUR	150.000	CZK	24.60
50706184	13.9.2011	29.6.2012	EUR	150.000	CZK	24.35
50741539	20.9.2011	29.6.2012	EUR	150.000	CZK	24.60
50706191	13.9.2011	31.7.2012	EUR	150.000	CZK	24.35
50746055	21.9.2011	31.7.2012	EUR	150.000	CZK	24.66
50746090	21.9.2011	31.7.2012	EUR	600.000	CZK	24.66
50605195	13.9.2011	31.8.2012	EUR	150.000	CZK	24.35
50746058	21.9.2011	31.8.2012	EUR	150.000	CZK	24.66
50706197	13.9.2011	27.9.2012	EUR	150.000	CZK	24.35
50746063	21.9.2011	27.9.2012	EUR	150.000	CZK	24.66
50706200	13.9.2011	31.10.2012	EUR	150.000	CZK	24.35

Source: (Šimek, 2013)

The forwards, used for case study in the following part, are greyed in two previous tables. These forwards of EXCON company are applied on the business case of PETROF company with the Russian customer LLC SALON «ACCORD». The following table 3 presents profits and losses from the applied forwards, see the right-hand greyed column.

The first column contains the date of maturity. Left columns consist of received payments from customer in CZK and consequently in EUR. This allows us to calculate the exchange rate of transaction. Forward taken from offer for EXCON company is the last but one column.

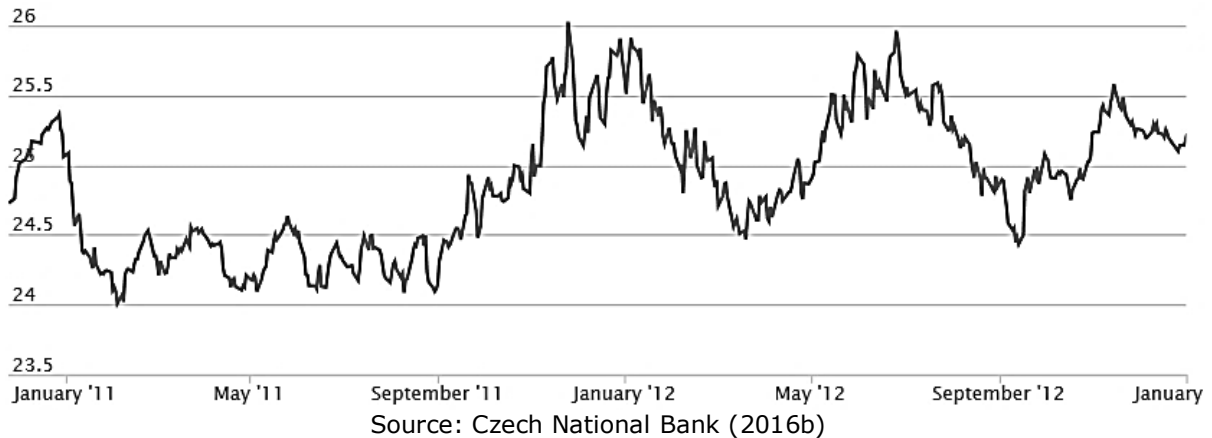
Table 3 Forward Rates Application for the PETROF-LCC SALON «ACCORD» Case

Date of signature	CZK	EUR	Contract rate	Forward rate	Profit / loss
17.8.2011	301.516	12.480	24.16	24.70	6.739
17.8.2011	1.259.388	52.127	24.16	24.70	28.148
17.8.2011	2.425.591	100.397	24.16	24.70	54.214
6.10.2011	2.318.772	93.217	24.88	24.70	-16.312
6.10.2011	1.616.700	64.993	24.88	24.70	-11.373
18.11.2011	1.161.598	46.399	25.04	24.70	-15.543
18.11.2011	1.892.646	75.600	25.04	24.70	-25.326
18.11.2011	1.415.478	56.540	25.04	24.70	-18.940
	12.391.694	501.753			1.604

Source: Own elaboration

Transactions in year 2011 took place in three days in various quantities. Forward rate was 24.70 CZK/EUR for all these three transactions. Forward with maturity nearest to the given business case was used for all the cases. Exchange rate of the transaction was however changing according to the exchange rate development in year 2011 (see figure 1). Czech Koruna appreciated against euro by one unit during the autumn. In the case of PETROF company in 2011 forward would pay off due to transactions on 17.8.2011 when profits from rate differences amounted to 89.102 CZK. This applies even despite of later transactions from October and November with loss-making forward rate. The result is profit of 1.605 CZK from hedging with the contract forward rate in year 2011.

Figure 1 CZK/EUR Exchange Rate Development in 2011-2012



Similar development of forward usage was in year 2012 in which the forward contract would have paid off during transactions on March 3rd. During business in August and November were analysed forwards creating the loss. Especially in the case of invoices due on August 15th by receiving payment in the amount of 167.601 EUR. In this case was forward rate (24.35 CZK/EUR) approximately by one koruna per euro lower than spot one (25.36 CZK/EUR). Fluctuations in the development of CZK/EUR exchange rate can be seen on the figure 1 and so the exchange rate profit opportunity from forward use was present. However it is true that forward contracts are not an instrument of speculations. However the EXCON company did not signed forwards at the best moment and so their use has negative consequences also on the business case with Russia for the PETROF company. Given contracts appear not to be profitable on the contrary – the loss during the 2011-2012 period is as high as 233.427 CZK regarding the trade volume of 22.882.987 CZK.

Instead of previously mentioned forwards we can use CNB commitment which determines the lower bound of the exchange rate to euro since 7 November 2013. Economic agents can be sure that the exchange rate won't drop under the value of 27 CZK/EUR.

The "post-intervention" or we can say "CNB commitment regime" period 2014-2015 transaction overview is in the table 4 bellow. The total value traded in this period is 18.477.519 CZK.

Table 4 The Commitment Regime and the PETROF-LCC SALON «ACCORD» Case

Date of signature	CZK	EUR	Contract rate	Commitment rate	Possible loss
26.3.2014	1360662	49750	27.35	27.00	17412
26.3.2014	1634545	59764	27.35	27.00	20917
5.8.2014	2466565	89239	27.64	27.00	57112
5.8.2014	875911	31690	27.64	27.00	20281
2.10.2014	3046418	110799	27.49	27.00	54845
2.10.2014	1307744	47563	27.49	27.00	23543
	10691848	388805		27.00	194113
27.1.2015	396968	14331	27.7	27.00	10031
27.1.2015	1321068	47692	27.7	27.00	33384
13.5.2015	1111183	40606	27.36	27.00	14821
1.9.2015	1682211	62258	27.02	27.00	1245
1.9.2015	1587019	58735	27.02	27.00	1174
3.11.2015	1454700	53679	27.1	24.70	5367
3.11.2015	232518	8580	27.1	24.70	858
	7785670	285881			66883

Source: Own elaboration

One of the outcomes of recent regime is possible hedging substitution when the export company does not need to use derivatives to counter the possibility of the loss due to home currency appreciation. This situation also refutes the argument or rather a myth that due to the hedging the exporters won't have any gain from interventions. The companies never hedge 100 % of the trade and now it would be logical to have even lower volumes of hedged trade. To be more specific a survey of CNB and the Confederation of Industry of the Czech Republic showed that 37 % of the export was hedged in the second quartile of 2013. The number is lower by 2 per cent points regarding the expected export contracts hedging share in the next 12 months. Moreover we have to mention that small companies have more limited access to hedging instruments.

Studied business case of PETROF shows that under the "CNB commitment regime" with sureness of 27+ CZK/EUR rate the intervention is more profitable than standard hedging by derivatives. Of course we mean short-time planning within the frame of the intervention regime. The exchange rate fluctuations result in maximal possible loss of 260.997 CZK in 2014-2015 period.

Still it is worth mentioning that hedging brings another benefit in form of planning. With forward contract the cash-flow, liquidity and other financial management is much more predictable and accurate. So there is a question whether the company would still pay for forwards to make their planning more precise. The question is as well what if other currency would be taken into the consideration. Another step could be cross-hedge strategy or multi-currency diversification. As Álvarez-Díez et. al (2015) show this strategy can solve hedge needs as well as generate return accordingly the value at risk ratio.

4 Conclusion

The example of forward usage was given in our model case showing the CNB exchange rate commitment is now a part of financial management of the export company. It can be seen as a way of hedging instead of a standard forward contract. The forward rate offer of EXCON company was applied on Czech PETROF and Russian LLC SALON

«ACCORD» company regarding the period 2011-2012. Then since 7 November 2013 we applied CNB exchange rate commitment of 27+ CZK/EUR.

The company would have profited less in case of using the forward contracts than without them at all. It is greatly influenced by the exchange rate development showing the appreciation trend. The only profitable forwards were at the turn of the year. For instance profitable forwards would have been those from 5 January with forward rate of 24.7 CZK/EUR with maturity of the August, September and November. During the August the profit would have been 89.102 CZK with so far profitable exchange rate. But at the end of the August strong depreciation of CZK took place and so the invoice payments resulted in loss of 87.497 CZK regarding the rest of the year 2011. In spite of this fluctuation the forward rate was profitable for 2011 with the exchange rate difference positive outcome of 1.605 CZK. It could have been much more without the depreciation of CZK. see fig. 1.

In case of the year 2012 the EXCON forward rates from September and November 2011 were applied. November forward rate contract of 25.19 CZK/EUR appeared to be profitable because of its maturity in March concerning the PETROF-LLC SALON «ACCORD» case. The exchange rate profit was 33.505 CZK. On the other hand the forward contract from September 2011 with maturity in October 2012 with the 24.35 CZK/EUR rate created the loss. The EXCON obviously expected the appreciation of the CZK but the development was the opposite one. Later appreciation did not balance it and so the final result is a loss of 268.537 CZK in total for 2012. The forward rate was very unprofitable.

The second case was using the CNB commitment from 7 November 2013 as a form of hedging. This commitment of 27+ CZK/EUR rate will be held at least till the 2017. If this would be considered as the foreign exchange resistance value the export company must profit from it and has no hedging issue since 2013. The second case shares the same idea with the first one however the forward rate was substituted for the commitment exchange rate. Virtually there is no space for loss and despite hedging price decrease suggested by Broll and Eckwert (2009) the company is better off. In 2014 the maximum possible loss resulting from difference between the commitment rate and the contract rate was 194.114 CZK. However CZK started to appreciate at the turn of the June forcing the CNB to come up with new interventions. Since then the exchange rate is above 27 CZK/EUR. From transactions from the first half of 2015 the maximum possible loss of 66.883 CZK might have been generated due to the difference of contract rate and commitment rate.

Acknowledgments

This paper is written with financial support of IGP from Faculty of Informatics and Management of the University of Hradec Králové to the Department of Economics.

References

Álvarez-Díez, S. et al. (2015). Hedging foreign exchange rate risk: Multi-currency diversification. *European Journal of Management and Business Economics*, vol. 25(1), pp. 2-7.

Broll, U., Eckwert, B. (2009). Modelling information and hedging: The exporting firm. *Economic Modelling*, vol. 26(5), pp. 974-977.

Czech National Bank (2016a). *Foreign exchange market information*. Retrieved from: http://www.cnb.cz/en/financial_markets/foreign_exchange_market/index.html.

Czech National Bank (2016b). *Selected exchange rates - charts*. Retrieved from: http://www.cnb.cz/financni_trhy/devizovy_trh/kurzy_devizoveho_trhu/grafy_form.jsp.

Czech National Bank (2016c). *Statement of the Bank Board for the press conference following the monetary policy meeting*. Retrieved from:

https://www.cnb.cz/en/monetary_policy/bank_board_minutes/2016/160505_prohlaseni.html.

Dittrichová, J., Svobodová, L., Soukal, I., Jindra, V. (2014). *Základy financí*. 2. vyd. Hradec Králové: Gaudeamus.

Hendl, J. (2012). *Kvalitativní výzkum: základní teorie, metody a aplikace*. 3. vyd. Praha: Portál.

JÍLEK, J. (2010). *Finanční a komoditní deriváty v praxi finančního trhu*. Praha: Grada.

Ptatscheková, J., Draessler, J. (2013). Empirické ověření prognózy prostřednictvím forwardového kurzu. *E + M Ekonomie a Management*, vol. 15(2), pp. 129-137.

Šimek, P. (2013). *Finanční deriváty pro zajišťování kurzových rizik*. Diploma thesis. University of Hradec Králové.

Šumpich, M. (2016). *Monetární politika centrální banky*. Diploma thesis. University of Hradec Králové.

Wong, K. P. (2007). Operational and financial hedging for exporting firms. *International Review of Economics and Finance*, vol. 16(4), pp. 459-470.

Influences on Consumer Rationality

Bohuslava Doláková¹, Jan Krajíček²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41 a, 602 00 Brno, The Czech Republic
E-mail: 175975@mail.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41 a, 602 00 Brno, The Czech Republic
E-mail: jan.krajicek@mail.muni.cz

Abstract: *The aim of this paper is to evaluate key components in consumer behaviour. Consumer behaviour is influenced by several factors; one with the greatest influence is genetic predisposition of each individual and also experience and knowledge acquired during the life of the society. The consumer is often irrational even in those cases in which we could expect rational behaviour (regarding to the prevailing economic opinion and rational choice theory). People are subjects to irrational influences. These influences come from their surroundings, feelings, emotions and other sources.*

Keywords: consumption, behaviour, consumer behaviour, rationality, irrationality

JEL codes: G02, H31

1 Introduction

As for the evaluation of results of the actions, as well as a numerical expression of this assessment, the in literature usually uses designations benefit or value to the result. The assessment, which is used for comparison, is usually referred to as benefit decision. The introduction of a specific label assessment, which is actually used, is particularly timely in light of the fact that, according to the results of the decision-making research, there are more types of evaluation result when all types are in some way related to decisions, but not the same origin. People in the moment used as a decision-benefit just one of them.

Rational behaviour defined Pareto two conditions, named axioms. We can say that these axioms are built completely full microeconomic theory consumers. This theory states that the individual is only mechanism, acting on genetically embedded instincts. According to this model, a person should receive stimuli from the environment and by It would determine its next action. But the situation is not as simple as it might seem. Process hides many simplifications and assumptions with a significant influence. It is important to note that sensory perception is not perfect. Many medical experiments demonstrated that the ability to recognize human senses the reality is very limited. Moreover, the load capability repeatable mistakes that we cannot avoid results of psychological experiments point to the fact that behaviour patterns are frequent cases learned - they are influenced by perceptions surrounding accompany us throughout our lives.

Psychological knowledge in this case is undoubted assistance, precisely because psychology seeks to define complex systems of human perception. The results can then expand the capabilities of microeconomic analysis. And that is the goal wide behavioural economics - to extend the neoclassical mathematical-logical model of significant quantities discovered in psychology. It is a huge step that will develop new areas of research, and especially also contribute to a more realistic perception economic science.

Author Max Planck this problem indicates Phantom term problem. In the case that we are trying to define the problem too narrowly, it is likely that becomes so limiting factor on the basis of the theory will be build. On the basis of this opinion, we conclude that Pareto defined rationality of economic man to become such a limiting factor. Noyes this fact and their findings on this issue published in 1950. Phantom term problem with his entire theory of the vanguard crisis economic theory as such. All conclusions that creates, are in

fact applicable to almost nonexistent kind of behaviour. It is therefore almost impossible to such a theory has become a tool for economic policy. It is therefore the a place to entertain the question whether it is necessary to individuals and define its behaviour so strictly and close it so within the framework of the utility function, which is defined only one parameter. This parameter is consumption.

Psychological knowledge in this case is undoubted assistance, precisely because psychology seeks to define complex systems of human perception. The results can then expand the capabilities of microeconomic analysis. And that is the goal wide behavioural economics - to extend the neoclassical mathematical-logical model of significant quantities discovered in psychology. It is a huge step that will develop new areas of research, and especially also contribute to a more realistic perception economic science.

Consumption

One of the most important driving forces of the market economy is consumption. Consumption of various goods and services is typical for a man because it allows people to live at a certain standard of living. For years, the consumption was seemed as a logical rational outcome of basic needs of the individual.

Rationality

Many experts explain consumer behaviour of individuals on the basis of rational decision-making economic theories. These theories see a man as a rational being that is in his economic decisions motivated primarily by the facts that he is able to reasonably consider the situation and its consequences in order to obtain the greatest benefit for the least expenditure of labour. Decisions of a rational man (*homo economicus*) are made by the judgments based on a sufficient amount of relevant information and efforts to get the greatest value at the lowest cost. Many recent researches have shown that consumer behaviour is much more driven by emotions, intuition, and others – these are for neo-classical economic theory utterly irrelevant influences (Kahneman; McKenzie, 2003). Current research findings of behavioural economists show that the consumer is often irrational even in those cases in which we could expect rational behaviour (regarding to the prevailing economic opinion and rational choice theory). Traditional economists argue that human decisions are rational, that people are able to estimate the value of all goods and pragmatically calculate, what will bring them greater benefits. People are therefore trying to maximize their profits and optimize their costs. Postmodernism puts behavioural economics in direct contrast to the classical economic theories. Behavioural economists believe that humans are subjects to irrational influences. These influences come from their surroundings, feelings, emotions and other sources. People decide rather on the basis of short-sighted decisions than by long-term plans. People decide according to other stimuli, than for a rational satisfaction of needs.

Consumer behaviour

Consumer behaviour is a type of human behaviour. A behaviour that is associated with the use of a particular object (product or service). It includes the reasons that lead consumers to use certain goods and ways in which it carried out, including the effects that accompany this process. Consumer behaviour is part of the human behaviour and cannot be understood independently. It is influenced by several factors, one of which has the greatest influence genetic predisposition of each individual as well as experience and knowledge acquired during the life of the society. For this reason, it is not possible for consumer behaviour mark only conduct associated with the immediate purchase or using the product, but also some other influences that determine it.

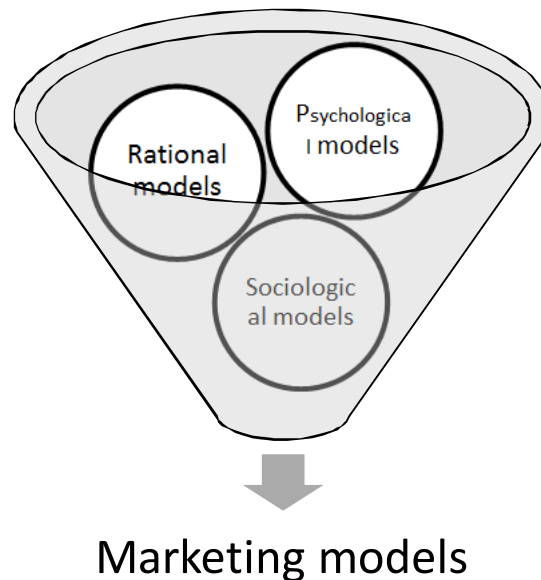
2 Methodology and Data

The main purpose of this work is to create a model of rational consumer behaviour under the influence of irrational factors. Another purpose of this work was to provide general recommendations to improve the success of transmission of advertising messages in

those cases where it is supposed influence of irrational factors of human behaviour on rational consumer behaviour.

Models of consumer's perception and interpretation of consumer behaviour

Figure 1 Models of Consumer's Perception and Interpretation of Consumer Behaviour



Source: Own elaboration

Rational models

Rational models of consumer behaviour consider a consumer as rational being who is in purchasing decisions influenced only by relevant information and an effort to maximize the satisfaction of his needs. Emotional, psychological and social elements in this process have only marginal role. The models assume a consumer with certain characteristics: fully informed of all the parameters, all options can create algorithm deciding which also consciously observes. Customer then monitors the link between income, prices, budgetary constraints, marginal benefits, cross-elasticity of indifference curves.

Psychological models

Psychological models are based on the influence of deeper motivation structures, showing how to reflect consumer behaviour influences coming from the unconscious. Consumer behaviour is explained by the relationship stimulus - reactions consequence of psychological processes. The consumer response is a response to a stimulus. These models of consumer behaviour are related to laws of conditioning defined by I. P. Pavlov. Importantly, this approach does not take into account the mental/thinking processes. They consider just external factors, such as various external stimuli and incentives. (Skinner, 1984).

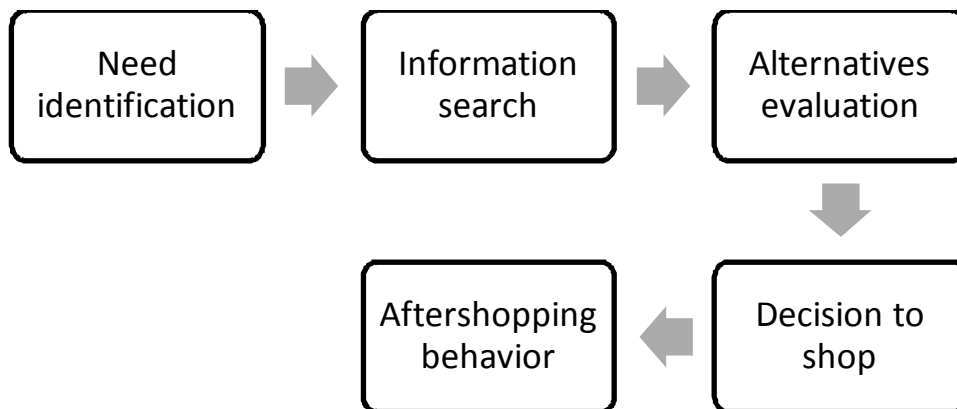
Sociological models

Sociological models explain consumer behaviour as based on influences of the social environment of consumers. This environment is made up of social circumstances and social groups (Koudelka, 2006). Models are based on the assumption that individual has a strong need to adhere to social norms. This need and effort influences actual purchasing process.

Marketing models

Consumer behaviour is influenced by many different factors that original models do not reflect. Original models do not reflect the impact of such things as consumer's habits, shopping conditions, or the consumer mood. Also a response to a stimulus is involved in the model, as Figure 2 illustrates.

Figure 2 How the customer decides



Source: Own elaboration

Irrationality in consumer behaviour

With the growing importance of behavioural economics it is often possible to observe application of its results into practical advertising practice. Advertising experts are aware of irrationality, a factor which significantly affects consumers in the process of its decision making. However, it should be noted that not all inexplicable in the process of consumer's behaviour is also irrational (Koudelka, 2006). It is important to distinguish between general rational human behaviour and rationality, as it is perceived by the rational choice theory. In the first case, the wide definition says that rational behaviour can be defined as personal views and behaviours based on logic and objective analysis of all available information (Koukolík, 2010). From the perspective of rational choice theory, it is considered that the rational individual evaluates every action time, cost, effort, money, investment, spending, spending, loss of (...) on one side, while good, favours, favour, benefit, advantages, benefits on the other side (Koukolík, 2010).

Factors influencing rationality

Decision-making is greatly influenced by the way a person perceives and risk assessment, respectively, emerging risks. When a person is familiar to evaluated risk, it is possible to estimate the likelihood for something to happen. However, the uncertainty of probability is not known. The decision affects cultural sphere in which people grew up. The risks those are very unlikely to happen have people a tendency to overestimate, while the risks that happen highly are likely underestimated. Decision on the same issue may turn out quite differently, decides if the individual in a very positive or very negative emotional state. Emotions affect decisions at the time that precedes it, to the next time. People receive and use information in the form in which it is acquired without about them in this regard they were thinking. The decision is affected by the learned rules. There is a greater influence of people from constructed within a hierarchy, and on the contrary, it reduces the influence of the people with lower ranking. Deciding changes the degree of uncertainty with which people make decisions. Simultaneously the same influence on decision making has the value that people give to objects and things. Deciding is influenced by the stereotypes. Especially those that relate to beliefs about the characteristics and behaviour of members of human groups (automatisms, delusions and prejudices). With the knowledge of factors affecting rationality can say that thinking, talking or conduct that is less useful or less logical than it would have been their rational alternatives are termed irrational (Koukolík, 2010).

3 Results and Discussion

The work provides an insight on the impact of various factors of irrationality on decision-making process of consumer especially on change of the hierarchy of effects that the advertising messages create in consumer's mind. The model itself provides sake of explanation of mechanism for activation of irrational human behaviour factors in consumer decision-making.

If these new findings will be taken into account by the process of developing advertising strategies, they can become very valuable. Thus, these findings can greatly contribute to increase the success rate of transmission of advertising messages and also can help to communicators to achieve the desired change in consumer's behaviour.

Irrationality

Irrational thought is a process, which leads to the conclusion or decision in the light of the evidence and considering time that was available, not the best that could have been achieved (Sutherland, 1994). At the same time there are some irrational judgments and decisions arising from the continuous ideological distortion, which can be avoided (Sutherland, 1994). There are special cases where is involved irrational behaviour determined by situations that person is located in. In many cases it is a situation where people are in difficult acute and chronic stress, especially if compromised their lives. Equally irrational behaviour is typical for people with disabilities person, mentally ill or intoxicated with narcotics (Koukolík, 2010). Healthy people, who tend not exposed to the huge level of stress, make also irrational behaviour. This irrational behaviour is also one of the major factors that affect the economic behaviour of individuals.

Irrational behaviour

This type of irrational behaviour due to many different factors that can be divided into four basic groups - a mistake resulting from a first impression, emotional and social causes, thought errors and problems of intuition (Koukolík, 2010).

Mistake From first impression (availability error)

The first and most crucial factor that negatively affects the rational individual behaviour is the first impression (Sutherland, 1994). It is probably the most important cause of irrational behaviour. Koukolík (Koukolík, Drtilová, 2002) notes the mistake is similar to the influence of propaganda. So is present a message that is specific, but simple, and emotional are addressed to imagination. Misleading first impression negatively affects the risk assessment. One type of availability error is called *Halo-effect*. It lies in the suppression of negative characteristics based on a particular positive feature individual. For example, experiments have shown that beautiful people are often considered smarter than you really are (Koukolík, 2010), opposite the halo-effect called *Devil effect* when people are ugly compared to the actual ascribed worse properties or low intelligence.

Emotional and social causes

Emotional and social causes have a major negative impact on the rational behaviour. Sutherland (1994) identified seven of them:

- obedience,
- conformity,
- belonging to group,
- irrationality of organizations,
- misplaced consistency,
- incorrect use of rewards and punishments,
- emotions,
- thought errors.

It is a different strain of thought processes and the judgements, which frequently arise under the pressure of the imperfections of human thought. Sutherland (Sutherland, 1994) presents ten basic intellectual errors:

- people ignore the views that testify against their opinion,
- people distort evidence which is against their opinion,
- people distort reality,
- people form non-existing connections,
- people misinterpret the facts,
- people do not know elementary statistical rules,
- people have unreliable memory,
- people committing incorrect conclusions,
- generation people return to the average,
- people are wrong on the issue of dependence and independence.

Intuition

Intuition and reliance on it is a very common cause of people's irrational behaviour (Koukolík, 2010). The belief in the superiority of intuition beyond rational analysis is part of the magical thinking that is evolutionary "natural", i.e. more or less innate, while critical thinking and statistical analysis must be learnt.

4 Conclusions

The paper focuses on consumer decision making risk conditions. Part of this work was to point to behavioural theories. Consumer behaviour is influenced by several factors, one of which has the greatest influence genetic predisposition of each individual as well as experience and knowledge acquired during the life of the society. Consumer behaviour is also driven by emotions, intuition. Consumer takes into advance various alternatives for his decision. The amount of information is crucial to determine an optimal solution.

Acknowledgements

Support of Masaryk University within the project MUNI/A/0916/2015 "Behavioral and knowledge aspects of trading and pricing financial assets" is gratefully acknowledged.

References

- Kotler, P. (1998). *Marketing Management*. Praha: Grada Publishing.
- Kotler, P. (2004). *Marketing*. Praha: Grada.
- Koudelka, J. (2006). *Spotřební chování a segmentace trhu*. Vyd. 1. Praha: Vysoká škola ekonomie a management.
- Koukolík, František a Jana Drtilová (2002). *Život s deprivanty*. Praha: Galén.
- Koukolík, F. (2010). *Mocenská posedlost*. Vyd. 1. V Praze: Karolinum.
- Mckenzie, Craig R.M. (2003). Rational models as theories not standards of behavior. *Trends in Cognitive Sciences*. Vol. 7, č. 9, pp. 403-406. Retrieved from: <http://linkinghub.elsevier.com/retrieve/pii/S1364661303001967>.
- Simon, H. A. (1991). Bounded Rationality and Organizational Learning. *Organization Science*, vol. 2, č. 1, pp. 125-134. Retrieved from: <http://orgsci.journal.informs.org/cgi/doi/10.1287/orsc.2.1.125>
- Skinner, B. F. (1984). The operational analysis of psychological terms. *Behavioral and brain sciences*. vol. 7, no. 4, pp. 547-581.
- Sutherland, S. (1994). *Irrationality: why we don't think straight!*. New Brunswick, N.J.: Rutgers University Press.
- Simon, H. A. (1955). A behavioral model of rational choice, The Quarterly. *Journal of Economics*.

Analysis of the Relationship between Taxes and Social Benefits and Transfers in the EU

Nadiya Dubrovina¹, Jana Peliova², Erika Neubauerova³

¹ National Economy Faculty,
University of Economics in Bratislava
Dolnozemska 1, Bratislava, 852 35, Bratislava,
E-mail: nadija@mail.ru

² National Economy Faculty,
University of Economics in Bratislava
Dolnozemska 1, Bratislava, 852 35, Bratislava,
E-mail: peliova@euba.sk

³ National Economy Faculty,
University of Economics in Bratislava
Dolnozemska 1, Bratislava, 852 35, Bratislava,
E-mail: erika.neubauerova@euba.sk

Abstract: Taxes have main contribution to the government revenue, tax revenue made up about 90% of total government revenue in the European Union. Government revenue, expenditure and deficit/surplus are main objectives of fiscal policy and the analysis of their dynamics plays very important role in the formation and coordination of the strategic and tactic tasks for socio-economic development in the countries. For the more detail analysis of dependence between taxes and social benefits and transfers we used time series of these indicators for EU countries. For the modeling the initial data as absolute values of the different taxes, social contributions and social benefit and transfers per inhabitant were used for 2002-2012. It should be noted that most of time series included linear trends that is why for the panel data analysis we used the first differences of these indicators. These models explain the complicated relationship between changes of taxes, social contributions and social benefits and transfers with individual countries effects (fixed effects) for each EU countries and can be used for prediction of features of social benefits and transfers as results of changes in fiscal policy in different EU countries.

Keywords: taxes, social contribution, social benefits, social transfers, econometric modeling

JEL Classification: H20, H53, C50

1 Introduction

The problem of rationales for taxes and transfers is very popular among as researches as well as policy makers. Taxes and social transfers had very important role in the formation of the concept of "social state" and improving the living standards in the period of the Second World War in USA and, especially, in West Europe. Taxes as important part of public finance fulfill the three important functions: 1) allocation; 2) distribution and redistribution and 3) stabilization (Owsiak, 2005). Function of allocation is concerned with the governmental expenditures on socio-economic needs and their optimal proportions between public and private sectors in the economy. Functions of distribution and redistribution are related with the shift of part of incomes and wealth from rich part of population to the poor population. Here, for the realization of these functions the social transfers as instruments are used (Schultzova, 2009). Function of stabilization is very important as preventive measure for the negative consequences of the cyclic development of market economy. Social transfers cover the social help given by central, state or local institutional units. They include: old-age (retirement) and survivors' (widows' and widowers') pensions; unemployment benefits; family-related benefits; sickness and invalidity benefits; education-related benefits; housing allowances; social assistance; other benefits (Zubařová, 2008).

In most countries the total taxes are about 40% of national income and total monetary transfers are approximately 15% of national income. Usually monetary transfers are public pensions, unemployment and family benefits, means-tested transfers. Other government spending or in-kind transfers is made approximately 25% of national income and they are used for education, health care, police, defense, roads, etc. On long-run dynamics the ratio of taxes to national income is essentially changed, from less than 10% in the early of twenty century to 40% in nowadays.

It should be noted that different countries have own experience in the tax-transfers or tax-benefit systems and their efficiency in the reducing inequality between regions, social and ethnical groups, migrants and native population, etc. (Goñi et al., 2008) A lot of publications concerned the study of income transfers and their role in reducing inequality was published in the USA. D.Betson and R.Haveman (1981) studied the role of income transfers in the observed reduction of income inequality among regions in the USA during two decades in the XX c. (from 1960 till 1980); geographical distribution of regions with greatest income inequality; the efficiency of income transfers programs in reducing regional market inequality and set of factors determine the impact of transfers in reducing inequality within states and regions. Based on the empirical analysis and econometric models, the mentioned authors found that the marginal impact of transfers on inequality reduction is larger in states with higher unemployment rates, larger average family sizes, a higher proportion of female-headed families and a higher proportion of aged persons (Betson and Haveman, 1981).

Another authors, such as X.Wu, J.Perloff and A.Golan (2006) studied the effects of taxes and other governmental policies on income distribution and welfare in the USA during period of 1981-1997. They examined the distributional effects of major government tax and welfare policies in the USA and found that marginal tax rates have larger income redistribution and equilibrating welfare effects than social insurance or direct transfers programs. These authors analyzed the impact of all major government programs that directly or indirectly transfer income to the poorest members of society and variation of these transfers in real terms over time or across states during the period of 1981-1997. Due to the model they showed that the marginal income tax rates and the Earned Income Tax Credit play a more important role in equalizing income than do the other government programs. In addition, the mentioned authors found that several of the other government programs have undesirable distributional effects (Wu et al., 2006).

Nevertheless, the large difference in the efficiency of tax-transfers or tax-benefit systems is observed between macro regions and countries in the world. M. Luebker (2004) shows results of the impact of taxes and transfers on inequality for different macro regions and countries. According to the analysis provided in his paper, the Latin American and East Asian countries have mildly redistribute transfer systems, but European countries have well-developed social security systems. Australia, Canada, Israel and the USA have noticeably higher inequality of disposable incomes than Europe (M. Luebker, 2004, 2011). Luebker argued that the income inequality growth over the past decades was driven by a greater dispersion of market incomes, but countries with the same market inequality achieved different outcomes, so political choice and institutional factors in the formation of effective redistribute results are very important in the national tax and transfers systems.

Another important empirical research devoted the role of taxes and transfers in the solution of income inequality and growth was published in the report for the OECD countries (OECD, 2012). In this report the six important facts were observed:

1. Inequality of income before taxes and transfers is mainly driven by the dispersion of labor income.
2. Tax and transfers systems reduce overall income inequality in all countries. Approximately 75% of the reduction in inequality is due to the transfers and 25% to direct household taxation.

3. In some countries, cash transfers are small in size but highly targeted on those in need. In others, large transfers redistribute income mainly over the life-cycle rather than across individuals.
4. The personal income tax tends to be progressive, while consumption taxes and real estate taxes often adsorb a larger share of the current income of the less well-off.
5. Some reforms of tax and transfers systems entail a double dividend in terms of reducing inequality and raising GDP per capita. Reducing tax expenditure, which mostly benefit the well-off, contributes to equity objectives while also allowing for a growth-friendly cut in marginal tax rates.
6. Other reforms may entail trade-offs between these two policy objectives. Shifting the tax mix to less-distorting taxes from social contributions to consumption would improve incentives to work and save, but stimulates the raising inequality.

2 Methodology and Data

In our article the purpose was to analyze the relationship between tendencies of the main taxes in EU and the development of social benefits and transfers. The data of main components of government revenue and expenditures across EU countries were used for the econometric analysis and modeling. For the modeling the initial data as absolute values of different taxes, social contributions and social benefit and transfers per inhabitant were used for 2002-2012. In first stage of our research we analyzed time series of the mentioned data and built the linear trend models, which were reflected the character of tendencies in the most EU countries. Then we calculated the correlation matrices for the components of government revenue and expenditures across EU countries and found that these indicators were strong correlated for most of EU countries during 2002-2012. It should be noted that most of time series included linear trends and have strong correlations. That is why in the second stage of our research, i.e. for the panel data analysis we used the first differences of these indicators. The first differences of the mentioned indicators are count as differences between the current and former values and equal to annual the changes of the indicators in the original time series. The tests for the analysis of the causality between these time series were used. We used Granger causality test and found that for most EU countries the dynamics of taxes and social contributions defined the social benefits and transfers tendencies (Richter and Paparas, 2013). The different models on the panel data were tested and the models with fixed effects were used as the best. The fixed effects reflected the individual effect for each country in the econometric model based on the panel data. The built econometric model with fixed effects was used for the prediction of the annual changes of social benefits and transfers as dependence from annual changes of taxes and social contributions in each EU country. The soft Statistica and Eviews were used for the calculation and tested of the models.

3 Results and Discussion

In 2013 for EU-28 taxes and net social contributions made 88.2% of total government revenue, in 2014 this value was 88.6%. Across different countries sum of taxes and net social contributions are changed more, from lowest level in Bulgaria (77.5% in 2013 and 77.7% of total government revenue) to highest level in Belgium (91.6% in 2013 and 92.2% in 2014). Coefficient of variance for these values in different EU, calculated as ratio of sample average to its standard deviation, is small, less than 5%. It means that sum of taxes and social contributions are varied slightly in EU during last time period.

For EU-28 sum of social transfers, other current transfers and subsidies is varied about 51% of total government expenditure. In 2013 this value was 50.9% and in 2014 it raised up 51.3%. Across different EU countries sums of social transfers, other current transfers and subsidies as percentage of total government expenditure are changed more, from 37-38 % in Malta till 60-61 % in Germany and Luxembourg. Coefficient of variance for these values in different EU is about 15%. It means that policy concerned

social benefits and transfers are visible varied in different countries of EU, especially it is significant for the different design of main components in government expenditure.

For the more detail analysis of dependence between taxes and social benefits and transfers we used time series of these indicators for EU countries. For the modeling we used initial data as absolute values of different taxes, social contributions and social benefits and transfers per inhabitant for 2002-2012. The recent data will be used for the comparative analysis of the real and predicted data.

Most of time series of mentioned indicators included linear trends. It means that the linear trend models should be analyzed in the first stage of this research. In linear trend model we reveal two parameters of the linear function: intercept (or a_0) and slope (or a_1). The estimation of the parameter a_0 is the estimated initial level of the indicator, when time variable is 0. The estimation of the parameter a_1 is the constant slope or the estimated fixed annual change of the indicator over $[t-1,t]$ period.

In table 1 the characteristics of the linear trend model are shown for the description of the taxes and social contributions dynamics across EU countries.

Table 1 The Characteristics of the Linear Trend Model for the Taxes and Social Contributions Dynamics

Country	Taxes on production and imports, receivable (euro per inhabitant)			Current taxes on income, wealth, etc., receivable (euro per inhabitant)			Social contributions, receivable, (euro per inhabitant)		
	linear trend: estimations and correlation			linear trend: estimations and correlation			linear trend: estimations and correlation		
	a_0	a_1	R	a_0	a_1	R	a_0	a_1	R
BE	3271.82	102.51	0.96	4370.53	99.97	0.87	3824.41	192.76	0.99
BG	279.29	53.66	0.94	116.87	16.19	0.8	168.62	43.94	0.98
CZ	732.79	98.81	0.99	765.43	33.46	0.73	854.05	117.19	0.98
DK	6094	127.46	0.81	10219.85	289.45	0.9	5447.34	176.72	0.94
DE	2565.07	96.56	0.97	2647.49	106.77	0.9	4801.37	39.97	0.83
EE	650.6	107.15	0.95	468.67	40.28	0.79	376.54	108.4	0.96
IE	5036.94	-74.06 ⁿ	0.33	4513.93	-12.41 ⁿ	0.1	2648.71	286.05	0.97
EL	1899.99	54.49	0.69	1214.75	52.68	0.91	2107.54	155.78	0.92
ES	2311.7	7.21 ⁿ	0.1	2099.87	31.24 ⁿ	0.3	1812.02	172.59	0.99
FR	3742.57	98.84	0.96	2802.14	64.15	0.71	4144.56	186.22	0.99
HR	1326.36	59.55	0.86	425.81	29.84	0.72	925.91	55.02	0.94
IT	3261.48	47.35	0.73	3069.48	83.58	0.82	3604.45	142.83	0.99
CY	2551.07	87.33	0.55	1550.83	99.36	0.67	1637.39	140.26	0.98
LT	452.63	452.63	0.88	319.02	50.69	0.72	254.1	81.44	0.95
LV	451.5	73.22	0.94	486.07	11.66 ⁿ	0.2	253.33	109.99	0.95
LU	6905.57	328.88	0.93	7341.39	423.54	0.97	7284.69	527.36	0.99
HU	1054.27	67.18	0.95	790.96	2.92 ⁿ	0.1	977.56	64.34	0.87
MT	1420.21	75.13	0.96	1075.28	100.93	0.97	1256.07	74.52	0.98
NL	3611.45	69.5	0.74	3152.7	106.04	0.82	3052.31	113.7	0.98
AU	3839.17	129.23	0.99	3560.42	110.61	0.88	4926.8	187.17	0.99
PL	607.56	70.72	0.9	310.66	41.81	0.83	782.73	59.63	0.94
PT	1956.27	26.31	0.57	1131.05	39.29	0.81	1584.35	123.71	0.99
RO	221.08	62.67	0.93	113.28	31.8	0.88	98.15	70.22	0.95
SI	2008.43	51.25	0.85	1056.25	44.3	0.68	1795.23	123.45	0.99
SK	535.48	80.77	0.96	303.85	42.81	0.91	411.78	133.66	0.99
FI	3621.25	122.26	0.94	5084.43	61.96	0.56	4138.05	210.92	0.97
SE	4396.2	283.05	0.94	6310.69	122.06	0.57	4752.23	93.93	0.78
UK	3772.62	-7.53 ⁿ	0.1	4728.7	-15.1 ⁿ	0.1	3554.29	74.85	0.79

Note: ⁿ - estimation is not significant at level $p < 0.1$;

Source: Own statistical calculation based on Eurostat data

It is clear seen from the table 1 that the most of estimations of the parameters are statistically significant and correlations of the linear models are closed to 1. Nevertheless for some countries the stable linear trends in these indicators are absent. For example, there are no linear tendency in the taxes on production and imports dynamics in Spain and United Kingdom, and very weak linear trend of such indicator is in Ireland.

In table 2 the characteristics of the linear trend model are shown for the description of the social benefits and transfers dynamics across EU countries.

Table 2 The Characteristics of the Linear Trend Model for the Social Benefits and Transfers Dynamics

Country	Social benefits other than transfers in-kind (euro per inhabitant)			Social transfers in – kind (euro per inhabitant)			Other current transfers (euro per inhabitant)		
	linear trend: estimations and correlation			linear trend: estimations and correlation			linear trend: estimations and correlation		
	a_0	a_1	R	a_0	a_1	R	a_0	a_1	R
BE	3824.41	192.76	0.99	1579.45	110.61	0.99	532.9	33.86	0.97
BG	168.62	43.94	0.98	12.16	7.75	0.95	19.04	8.71	0.55
CZ	854.05	117.19	0.97	378.85	48.89	0.99	47.91	20.14	0.98
DK	5447.34	176.72	0.94	470.79	20.73	0.95	864.21	39.37	0.98
DE	4801.37	39.97	0.83	1814.13	69.52	0.97	382.7	27.75	0.98
EE	376.54	376.54	0.96	57.27	16.21	0.98	44.71	16.49	0.92
IE	2648.71	286.05	0.97	497.6	46.13	0.96	435.64	0.71 ⁿ	0.04
EL	2107.54	155.78	0.92	-12.72 ⁿ	69.72	0.85	239.46	4.47 ⁿ	0.25
ES	1812.02	172.59	0.99	433.14	24.25	0.88	263.4	12.52	0.75
FR	4144.56	186.22	0.99	1318.94	50.6	0.99	613.85	40.49	0.99
HR	925.91	55.02	0.94	130.24	9.01	0.85	103.69	-0.38 ⁿ	0.08
IT	3604.45	142.83	0.99	605.2	14.21	0.87	324.69	10.84	0.85
CY	1637.39	140.26	0.98	10.12 ⁿ	1.37 ⁿ	0.43	331.25	28.42	0.77
LT	254.1	81.44	0.95	14.67	9.1	0.95	33.53	34.93	0.84
LV	253.33	109.99	0.95	47.91	14.93	0.97	4.4	14.41	0.9
LU	7284.69	527.36	0.99	2597.59	136.56	0.97	1415.3	120.28	0.94
HU	977.56	64.34	0.87	234.44	3.47 ⁿ	0.29	147.32	11.82	0.82
MT	1256.07	74.52	0.98	45.15	6.07	0.97	108.46	18.78	0.95
NL	3052.31	113.7	0.98	1943.89	221.82	0.98	532.61	7.85	0.51
AU	4926.8	187.17	0.99	1320.64	70.92	0.99	650.35	16.75	0.83
PL	782.73	59.63	0.94	81.39	13.06	0.97	49.28	18.93	0.89
PT	1584.35	123.71	0.99	306.33	47.83	0.93	265.34	15.57	0.9
RO	98.15	70.22	0.95	15.92	7.2	0.91	1.99	12.39	0.92
SI	1795.23	123.45	0.99	244.11	14.29	0.96	169.55	21.22	0.9
SK	411.78	133.66	0.99	79.31	58.59	0.97	73.6	13.83	0.91
FI	4138.05	210.92	0.97	458.34	48.29	0.99	589.52	45.48	0.99
SE	4752.23	93.93	0.78	741.02	65.41	0.92	990.38	11.46 ⁿ	0.46
UK	3554.29	74.85	0.8	0	0	0	832.18	5.67 ⁿ	0.31

Note: ⁿ - estimation is not significant at level $p < 0.1$;
Source: Own statistical calculation based on Eurostat data

From the table 2 that the most of estimations of the parameters are statistically significant and correlations of the linear models are closed to 1. Nevertheless for some countries the stable linear trends in these indicators are absent. For example, the social transfers in-kind are absent in United Kingdom and there are very weak linear trends of this indicator are observed in Hungary and Cyprus.

It should be noted that most of time series were included linear trends that is why for the panel data analysis we used the first differences of these indicators.

Such as endogenous variables the first differences for social benefits other than transfers in-kind, euro per inhabitant (Z1); social transfers in -kind, euro per inhabitant (Z2), and other current transfers, euro per inhabitant (Z3) were used. As exogenous variables we used first differences for taxes on production and imports, euro per inhabitant (T1), current taxes on income and wealth, euro per inhabitant (T2) and social contributions, euro per inhabitant (T3). Results of models defined the relation between taxes, social contributions and social benefits & transfers with fixed effects for each EU countries are shown in table 3.

Table 3 Results of the Panel Data Analysis for Taxes, Social Contributions and Social Benefits and Transfers (Euro per Inhabitant)

	Z1	Z2	Z3
T1	-0.1166** (0.0459)	0.0567*** (0.0198)	0.0739** (0.0351)
T2	-0.0487 (0.0357)	-0.0496*** (0.0154)	-0.0518* (0.0307)
T3	0.5613*** (0.0681)	0.118*** (0.0294)	0.0935*** (0.0333)
Fixed Effects			
C1 (BE)	125.1406	93.9903	18.0231
C2 (BG)	34.5592	2.5221	1.7213
C3 (CZ)	52.1974	26.5313	5.2033
C4 (DK)	218.1221	25.75	47.8415
C5 (DE)	17.7659	54.6382	19.495
C6 (EE)	57.7935	0.5328	3.0584
C7 (IE)	233.2791	45.8192	5.9564
C8 (EL)	108.6714	47.0607	3.294
C9 (ES)	126.2116	10.8221	3.1387
C10 (FR)	119.5574	33.2246	23.8413
C11 (HR)	23.9773	3.9897	-4.5259
C12 (IT)	103.9254	3.7224	2.3726
C13 (CY)	113.7694	-10.489	15.793
C14 (LT)	43.2404	-0.1718	23.0126
C15 (LV)	51.6875	0.5864	2.3795
C16 (LU)	360.0692	99.6259	95.8033
C17 (HU)	44.8971	-5.1592	7.2458
C18 (MT)	65.6564	2.3635	26.4736
C19 (NL)	20.7012	177.4117	-8.2815
C20 (AU)	113.588	49.1385	-4.4077
C21 (PL)	27.0581	4.3524	9.9589
C22 (PT)	103.7356	40.5725	7.9155
C23 (RO)	42.8072	1.9258	6.0488
C24 (SI)	65.2408	-0.0694	7.7305
C25 (SK)	71.7887	37.4122	-0.6164
C26 (FI)	156.8223	24.9913	22.8367
C27 (SE)	202.9336	63.1172	15.504
C28 (UK)	79.7929	-6.2085	4.4317
R²	0.4854	0.5024	0.2712
F	117.4439	125.7112	46.3333
DW	1.9890	1.9976	2.5956
S.E.	119.7047	51.727	52.7232

Note: * - estimation is significant at level $p < 0.1$; ** - estimation is significant at level $p < 0.05$,
*** - estimation is significant at level $p < 0.01$.

In the parentless the standard deviations of the estimated parameters are given.

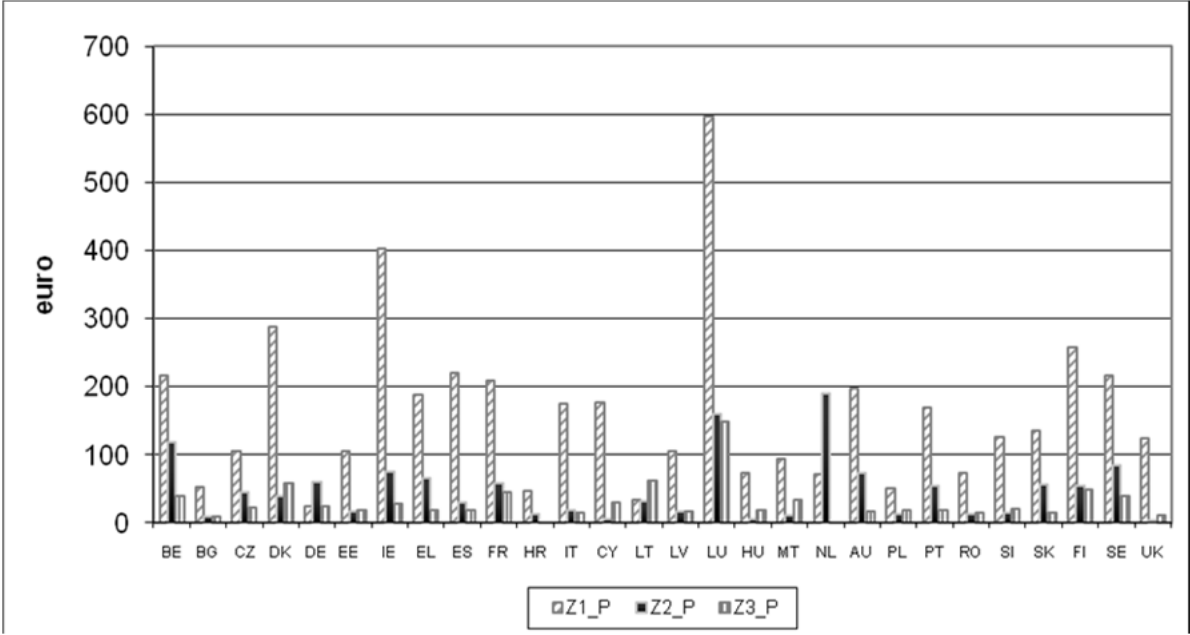
Source: Own statistical calculation based on Eurostat data

It should be noted that the relationship between annual changes of social benefits other than transfers in-kind (Z1), social transfers in-kind (Z2) and annual changes of main kinds of taxes (T1, T2 and T3) are more strong (R^2 is 50%) than the relationship between annual changes of current transfers (Z3) and annual changes of main kinds of taxes (T1, T2 and T3). The positive and negative estimations of the parameters for the first differences (or annual changes) means the cyclic character of dynamics of social benefits and transfers as dependence from annual changes of main kinds of taxes and social contributions.

We used these models with fixed effects for the predictions of the annual changes of social transfers and benefits. We assumed that for the next forecast period in studied EU countries the annual changes of taxes and social contributions per inhabitant will be equal the related estimations of the parameters a_1 (see table 1), so the planned annual changes of the taxes and social contributions per inhabitant will be constant over $[t, t+1]$ period. Thus, introducing the planned annual changes of the taxes and social contributions per inhabitant in the econometric models with fixed effects for each EU country, we get the predicted annual changes of the social benefits and transfers per inhabitant.

The predicted annual changes of the social benefits and transfers per inhabitant are shown in Fig.1.

Figure 1 The Predicted Values of the Annual Changes of Social Benefits and Transfers in EU Countries (per Inhabitant)



Source: Own elaboration

These models explain the complicated relationship between changes of taxes, social contributions and social benefit and transfers with individual countries effects (fixed effects) for each EU countries and can be used for prediction of features of social benefits and transfers as results of changes in fiscal policy in different EU countries.

4 Conclusions

Taxes and social contributions influence to social benefits and transfers and define the wealth and social standards in the countries. In the EU we observed some diversity in the social benefits and transfers, in one hand, and their efficiency in point of social equality, in other hand. The efficiency of tax and transfer systems in the different EU countries depend not only from the more appropriate variant of composition taxes and social contributions, their redistribution in the forms of social benefits and transfers, but also from the various institutional factors, the transparency of national fiscal systems, their

synchronization and capacities to fulfill related administrative functions by their central, state and local governments.

Acknowledgments

This paper is the result of the research project Experimental investigation on incentives of economic subjects for paying taxes co-financed by Research Grant Agency of the Ministry of Education of the Slovak Republic.

References

- Betson, D., Haveman, R. (1981). The role of Income Transfers in Reducing Inequality between and within Regions. In: *Economic Transfers in the United States*. University of Chicago Press. Retrieved from: <http://www.nber.org/books/moon84-1>.
- Goñi, E., López, J.H., Servén, L. (2008), Fiscal Redistribution and Income Inequality in Latin America. *Policy Research Working Paper 4487*. Washington DC. World Bank.
- Luebker, M. (2004). Globalization on and perceptions of social inequality. *International Labour Review*, vol. 143, No. 1-2, pp. 91-128.
- Luebker, M. (2011). The impact of taxes and transfers on inequality. *TRAVAIL Policy Brief* No. 4, ILO, Switzerland, pp. 1-8.
- OECD (2012). Income inequality and growth: The role of taxes and transfers. *OECD Economics Department Policy Notes*, No. 9. January 2012.
- Owsiak, S. (2005). *Finanse publiczne. Teoria i praktyka*. Warszawa.
- Richter, Ch., Pappas, D. (2013). Tax and Spend, Spend and Tax, Fiscal Synchronization or Institutional Separation? Examining of the Case of Greece. In: *Working Paper. International Network for Economic Research*.
- Schultzova, A. (2009). *Daňovníctvo: daňová teória a politika*. Bratislava.
- Wu, X., Perloff, J., Golan, A. (2006). Effects of taxes and other Government Policies on Income Distribution and Welfare. Retrieved from: <http://are.berkeley.edu/~perloff/PDF/tax.pdf>.
- Zubaľová, A. (2008). *Daňové teórie a ich využitie v praxi*. Bratislava.

The Role of Life Insurance in the Context of Cover the Needs of the People in the Czech Republic

Eva Ducháčková¹

¹ University of Economic in Prague
Faculty of Finance and Accounting, Department of Banking and Insurance
nám. W. Churchilla 4, 130 67 Prague 3, Czech Republic
E-mail: duchack@vse.cz

Abstract: *The life insurance is considered to be an instrument to cover the needs of people, on the one hand, a tool of covering the consequences of the risk (death and other risks – accident, invalidity, illness etc.), and on the other hand, a tool for savings to cover the needs of people in post-productive age. At present, many factors affect the development of life insurance and especially its efficiency. In the use of life insurance as a means of addressing the needs of people in old age is in the last period on the Czech insurance market a number of problems. The problems arise from the form of life insurance products, from regulatory approaches in life insurance, from approaches to selling life insurance contracts. The paper focuses on the analysis and evaluation of the role of life insurance in current conditions and on the question of consumer protection issues in connection with the life insurance. The aim of the paper: analyze the role of the life insurance by the cover the needs of the people nowadays in the Czech Republic in the context new changes on the market, in the new conditions on the insurance market.*

Keywords: life insurance, death, unit linked life insurance, technical provision of life insurance, risk portion of premium, investment portion of premium

JEL codes: G22, G28

1 Introduction

Life insurance is intended for life natural events, i.e. demise and the rest of one's life. Its content and concept have been changing throughout its development. The original form connected with covering risks of the family breadwinner's demise and the consequences for the family members has been extended to cover additional risks affecting people's lives, such as injuries, invalidity, illness etc. by the savings portion (rest of one's life).

Recently there have been a few tendencies and factors affecting life insurance development on the Czech life insurance market. At the same time, they have an impact on the life insurance efficiency from the perspective of covering the needs of people (Daňhel, Ducháčková, 2013). There are a few open questions:

- recent developments on financial market, especially on interest rates and their impact on life insurance,
- impact of the gender directive on life insurance (judgment of the European Court of Justice (ECJ) in March 2011 which removes the ability of insurers to use gender as a factor in pricing and benefits from 21 December 2012),
- intermediated sale of life insurance,
- tax questions of life insurances,
- an increasing role of unit-linked life insurances,
- products of lump-sum paid life insurances,
- the effects of the use of Solvency II method for life insurance operation.

Recent developments on the Czech insurance market indicate a decline in the field of life insurance and that is a decline both in the amount of premium written and in the number of insurance policies. If the indicators vary, it is possible to anticipate changes in the role of life insurance of cover the peoples' needs. On the other hand, there is a need to distinguish several roles of life insurance. Life insurance is used to provide risk solution

primarily the risk of death and the other risk of injuries, invalidity, critical illness etc. In this connection, there is a need to highlight a continuity between life insurance and credit risk solution –that implies the use of life insurance for covering credit risk of consumers. At the same time, there is an emphasis on saving portion that means the use of life insurance as a saving instrument especially for covering the needs of people in retired age. The paper analyzes some selected factors mentioned above.

2 Methodology and Data

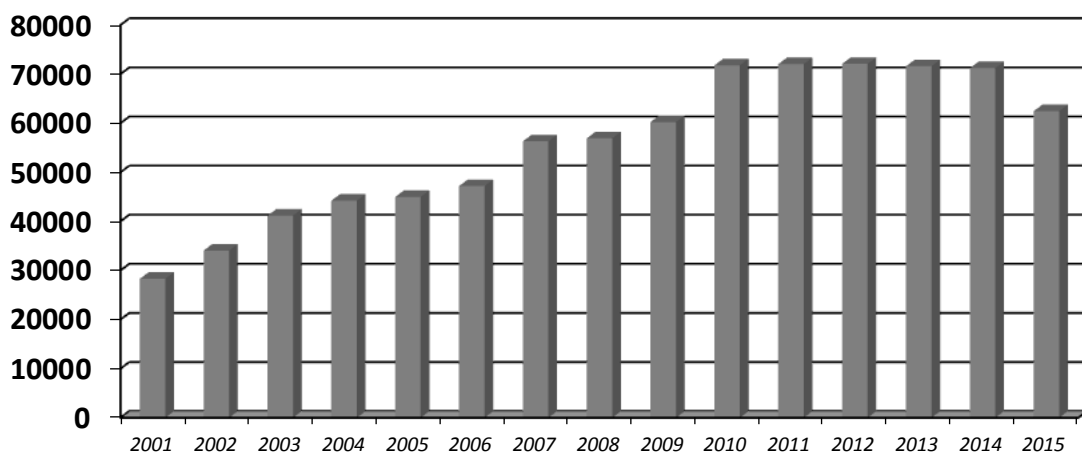
In this paper the author inquires about the effects which are the consequence of the changes on the life insurance market to the coverage of people's needs through life insurance for the next period. In processing the contribution were used the methods of description, deduction, analytic comparisons and literature review. The author uses life insurance information available primarily from resource materials of statistics of the Czech National Bank and the Czech Insurance Association.

3 Results and Discussion

Recent Developments on the Czech Life Insurance Market

In the period after the year 2000, developments on the Czech life insurance market have been destabilized due to a number of factors (at the same time we can see unstable developments both in European and also in a global perspective). Since 2001, State aid has been applied in form of tax advantage within life insurance. At that time, lump-sum paid life insurance played an important role. Life insurance is influenced by the state's approaches to covering of people's needs within social insurance (the higher amount of risk cover within social insurance the less room for commercial insurance) and existence of state-supported pension products. Furthermore, developments of life insurance was affected by gender directive as well. Recent developments on the market are determined especially by the situation on the financial market (very low interest rates or negative interest rate) and largely by the situation in life insurance mediation. In analyzing life insurance one cannot look away from the impact of changes in demographic structure of the population, because there has been a significant population decline in the age group of 30-45 year-olds.

Figure 1 Premium Written on the Czech Life Insurance Market in Mil CZK

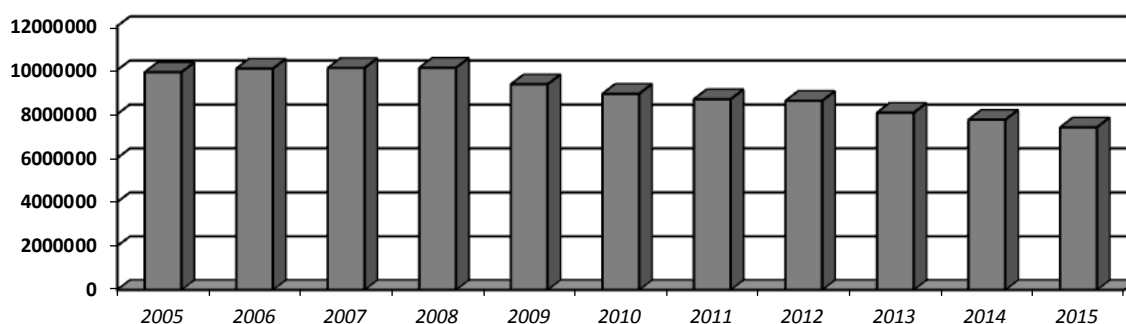


Source: Basic information on life insurance, available at:
http://www.cnb.cz/cs/dohled_finančni_trh/souhrnné_informace_fin_trhy/zakladní_ukazatele_fin_trhu/pojistovny/poj_ukazatele_tab04.html

All these factors, some of which will be further specified, affected developments in premium written (see Figure 1), there was a significant decline (in 2015 compared to 2005, there was a 13% decline of premium written). This tendency is going on in 2016.

At the same time, recent developments also demonstrate a decline in the number of insurance policies (see Figure 2).

Figure 2 Number of Life Insurance Policies in the Czech Republic



Source: Basic information on life insurance, available at:
http://www.cnb.cz/cs/dohled_financni_trh/souhrnne_informace_fin_trhy/zakladni_ukazatele_fin_trhu/pojistovny/poj_ukazatele_tab04.html

Until recently, emphasis has been placed on saving portion within the construction of life insurance – that means solutions to fill people's needs in retirement age (State aid moves towards that). The decreasing demand for life insurance leads insurance companies to offer life insurance products with the higher emphasis on risk portion – primarily solutions for critical illness, permanent consequences of accident, long-term care etc.

Appreciation of financial means invested in life insurance

Capital life insurance, where the risk connected with the investment of technical provisions of life insurance is carried by the insurance company, applies the regulation of the investment of technical provisions that are created within this insurance. Insurance companies can invest mainly in more conservative investment instruments (e.g. government bonds). The insurance company ensures the appreciation of the financial means invested in life insurance by applying the technical rate of interest. The level of the technical rate of interest is determined by the insurance company. On the one hand, the technical rate of interest means guaranteed minimum appreciation of the financial means invested in life insurance (investment portion of premium) and on the other hand it affects the price of life insurance. When determining the technical rate of interest, the insurance company has to take into consideration the situation at financial markets (from the perspective of achievable investment yields), the competitiveness of the life insurance product as well as the regulation of this technical rate of interest (since 2000, the technical rate of interest has been regulated by the state).

There is Freedom of investment in unit linked life insurance, where the insured chooses the method of investing technical provision of life insurance, however, at the same time it carries investment risk. The problem in terms of running the unit linked life insurance lies in the approach towards its sale. It is common that the unit linked life insurance is sold to clients who do not understand the way it works, i.e. they expect outlined yield which is not achieved subsequently. Unlike the capital life insurance, the feature of the unit linked life insurance is that the insurance company does not guarantee the payment of the arranged part at the end of the insurance period; the size of the insurance benefit is based on the value of share units.

Insurance companies do not specify the settlement to their clients in advance (the usual practice is that the amount of the settlement is calculated by means of insurance-mathematical methods depending on the duration of the period of insurance) although the client could obtain information for the respective years of the insurance period

related to the paid insurance premium, capital value of reserves with the guaranteed appreciation and capital value of reserves with the expected value of appreciation, including the method used by the insurance company to determine the level of profit-sharing.

Intermediated sale of life insurance

Life insurance is commonly arranged through insurance intermediaries or financial advisors. These sellers are remunerated with commissions for the arranged life insurance. As for the life insurance, these commissions are currently set at high values (savings products of life insurance show around 150-200 % of annual premium). Higher commissions are connected with the sale of the unit linked life insurance. Insurance companies pay such high commissions in order to enhance insurance contracts set of life insurance. On the other hand, this fact often results in efforts of the sellers (of several tens of thousands operating on the Czech insurance market) to sell the life insurance products (especially unit linked life insurance) even to clients these products are not suitable for.

A current problem also related to the sale of life insurance is the so-called „over-insurance“, i.e. sellers of insurance products convince the insurant to cancel the existing life insurance contract giving the reason he does not find it beneficial any more, and to conclude a new contract of an innovated form. This method is certainly profitable for the seller who collects money for the arranged insurance, however, completely disadvantageous for the insured person. Life insurance, especially life insurance with savings portion, has a long-term character and the technical provision of life insurance based on which the insurance company pays the settlement is created only after two or three years after the insurance is arranged, i. e. the client if he cancels the contract prematurely basically pays the cost of arranging the insurance policy and additional cost and the indemnity is not paid to him, or possibly only in a small amount.

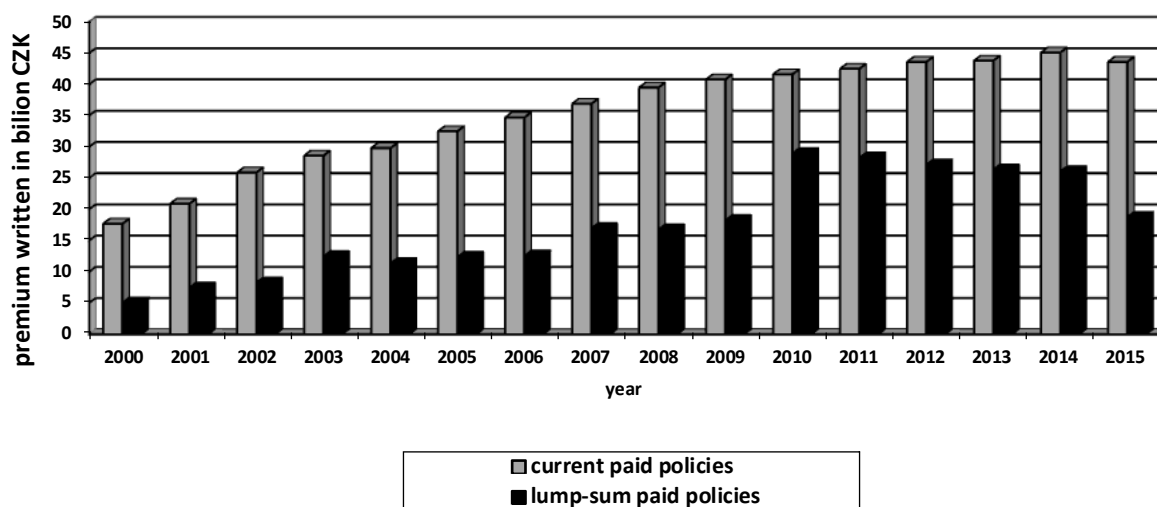
Products of lump-sum paid life insurance

The period after 2000 shows the trend to apply lump-sum paid life insurance products on the life insurance market. They usually represent products with prevailing investment portion and minimal risk portion arranged for four to five years. These characteristics make it clear that it is actually no longer an insurance product but a savings product. These products basically represent an alternative to some bank products, especially in connection with changes in the area of bank products (e.g. related to the financial crisis) and they are largely offered by bank-insurance institutions. Products of lump-sum paid life insurance substantially influence the indicators of life insurance market (see Figure 3) although by their nature they are not real insurance products (Ducháčková, Schlossberger, 2015).

Unit linked life insurance

Another area to deal with is represented by the products of unit linked life insurance. In the past, the unit linked life insurance was considered to be suitable for insureds who already are sufficiently provided with the standard life insurance (Hagelschuer, 1991, p. 44; Ducháčková, Daňhel, 2006, p. 382). Generally speaking, this is suitable for clients with certain knowledge and experience of investments. The significance of the unit linked life insurance was growing fast in the 90's of 20th century (Nyfeler, Lehmann, 1995, p. 6). The significance and share of the unit linked life insurance on the Czech insurance market substantially increased after 2000 (see Table 1). Increase in the share of the unit linked life insurance in the global prescribed premium has been determined by a number of factors, but mostly by the profitability for the insureds (shift of the investment risk to the insurant), thus resulting approach toward the sale through intermediaries (higher commission compared to other insurance products). The unit linked life insurance puts emphasis on flexibility, state subvention and the possibility of higher appreciation.

Figure 3 Development of the Premium Written of Life Insurance in the Czech Republic in Billion CZK



Source: <http://www.cap.cz/statisticke-udaje/vyvoj-pojistneho-trhu>

A big challenge in relation to clients in life insurance is the issue of transparency and comprehensibility of life insurance products. Life insurance products are often intricately formed and incomprehensible to the client. Standard capital life insurance is viewed by the client as a guaranteed product where the insurance company is obliged to pay the previously arranged capital sum. However, misunderstanding the product by the clients may result in taking wrong steps – e.g. premature termination of the insurance policy (especially shortly after arranging the insurance policy) and wrong ideas about the amount of the so-called settlement.

Table 1 Indicators of Unit Linked Life Insurance in the Czech Republic

	2010	2011	2012	2013	2014	2015
Number of policies	2 024	2 618	2 867	3 029	3 145	3 178
	798	238	261	495	950	659
Number of new policies	709 748	753 756	729 873	614 011	584 955	533 634
Premium written	33 956	36 584	37 799	34 763	37 246	35 125
	363	233	094	925	298	244
-lump-sum paid	18 495	19 756	18 173	13 813	15 401	13 418
	718	620	544	301	693	227
-new policies	19 581	19 160	18,632,9	12 628	13 972	13 173
	999	608	16	742	142	488
Acquisition costs of insurance policies	6 818	7 415	7 010	5 969	5 868	5 391
	930	447	366	490	079	763
Cost of provisions for intermediaries	5 577	5 736	5 495	4 526	4 612	4 168
	270	525	480	489	539	726

Source: Basic information on life insurance, available at: http://www.cnb.cz/cs/dohled_finančni_trh/souhrnne_informace_fin_trhy/zakladni_ukazatele_fin_trhu/pojistovny/poj_ukazatele_tab04.html

The unit linked life insurance is connected with the application of a whole range of fees that are intricately formed and often non-transparent. Regular fees of the unit linked life insurance are as follows:

- administrative charges for administrative expenses charged for the whole policy period,
- collection fees covered from each premium payment,

- fees of a certain percentage from the difference between the purchase price and the selling price of share units (bid/offer spread),
- fees to cover initial costs (50 – 70 % of the annual premium of the savings portion for the period of 2-3 years).

Furthermore, the unit linked life insurance is connected with other fees, such as fees for insurance policy cancellation, changes in insurance policies, extra withdrawal of share units.

As a result of the structure of fees, the value of accumulated share units as part of the savings portion of unit linked life insurance at the level of paid premium is achieved only around the tenth year of the policy period (especially due to the fee to cover the initial costs of concluding the insurance policy). It implies that this insurance is suitable only in the long-term perspective.

Considering the long-term nature of unit linked life insurance, an incorrect approach is the termination of the policy after a short time (or concluding a new insurance policy). Also, given the non-transparent structure of the product and the fees, the product is non-transparent.

It is possible to enhance transparency through indicators characterising this product. The client should be provided with more detailed information about the structure of the insurance price (SUN indicator – standardized cost indicator). The price of unit linked life insurance consists of following portions:

- risk portion – intended to cover risks, such as death, injury, invalidity, illness etc.,
- cost portion – intended to cover costs of assurer, such as acquirable commission, collection fee, administrative expenses, claims expenses etc.,
- investment portion – a part of premium intended to purchase share units.

In terms of the product transparency, it is suitable to inform the client about the structure of the insurance premium in the initial phase of the insurance with regard to the basic purpose of the insurance policy and client's expectations.

In order to enhance the transparency of unit linked life insurance, other indicators may be recommended that provide a better picture, especially about the product expense ratio:

- TANK indicator – expense ratio indicator generally used for investment products with periodical investment – basically an equivalent to RPSN (annual percentage rate of costs). TANK is a ratio of all expected paid fees to expected future investment.

$$TANK = \text{all fees} / \text{future value of investment}$$

- TER indicator (Total Expense Ratio) indicates how much of the investor's property value is represented by the fund administrator costs per year (Cipra, 2006).

$$TER = \text{total operating expenses of the Fund} / \text{Total assets of the Fund}$$

- PER indicator (Product Expense Ratio) evaluates the product expense ratio and how much percent of the paid premium will not be invested but used to cover the administrative expenses.
- Ongoing charge indicator related to individual funds of unit linked life insurance and expressing the amount of total costs of unit linked life insurance in relation to average controlled assets within the fund (in short, if a shares fund appraises the means by 5.3 % and the fund expense ratio is 2.1 %, the net appreciation of a share unit is then 3.2 %); the indicator includes all costs connected with the control of the shares fund and generally speaking if the funds are actively controlled, there are higher

costs, and the passively controlled funds show lower costs (Ducháčková, Schlossberger, 2015).

- RiY indicator (Reduction I Yield) that does not take into account the insured part of the product and all fees are expressed with one percent; its flaw is that it can be influenced by the inclusion of some cost portions in the risk portion of premium, which distorts the final evaluation through this indicator (Ducháčková, Schlossberger, 2015).

SUN indicator, which explains the layout of premium during the insured period, is the most important indicator from client's perspective. TANK indicator represents total costs of investment component of Unit Linked life insurance. TER indicator is suited for evaluation of cost of individual investment funds.

4 Conclusions

Developments on the Czech insurance market can be described as unstable after the year 2000. Nevertheless, a decline in both premium written and number of insurance policies is typical for the last period. This decline was largely affected by the situation on the financial market. The insurance institutions are not able to achieve assessment of recourses of technical reserves of life insurance (primarily saving portion), which they were in the past. The fact will be emphasized by the need of risk solutions in life insurance operations following the use of Solvency II method.

At the same time, problems in intermediated sales and unresolved regulation of intermediated sale have a negative effect on life insurance development. There is the problem with reworking of the life insurance policies (there is the role of provision size). The life insurance policies should be long-term, but currently this is not true.

The next factor affecting the life insurance market development was the tightening in using tax advantage of life insurance. The state supports the life insurance, but the support is not effective (although the change was made from 2015).

There are high costs connected with the life insurance especially provisions (see Table 1). In connection of a reduction in the trust in life insurance at present, there is an effort for increasing the transparency of life insurance, primarily United Linked life insurance. The indicators used for that purpose introduce closer the content of a particular product of life insurance especially within united linked life insurance. SUN indicator, TANK indicator and TER indicator are the most important indicators.

Nowadays we can say that the life insurance is not covering the needs of peoples in full. The life insurance has often very small risk portion (for death or other risks). A trend for the next period is to operate life insurance with the emphasis on its risk portion primarily critical illness and long-term care. These questions are getting more serious with regard of population ageing.

Also the saving portion of life insurance is nowadays problematic. Majority of life insurance are unit linked polities: the polities have short validity and that the insurance cannot fulfill the role of safe instrument for old age. The unit linked polities are not suitable for all clients, it is not adequate for risk-averse clients.

Some life insurance product are not inherently insurance (they are more savings products, but disadvantageous) and so they cannot play the primary role of life insurance. This is especially true for lump-sum paid life insurance policies.

Acknowledgments

The paper has been prepared under financial support of project IGA F1/21/2016 at the University of Economics and under financial support of constitutional support to long-term conceptual development of research at the Faculty of Finance and Accounting of the University of Economics Prague in 2016 IP 100040/1020.

References

- Cipra, T. (2006). *Finanční a pojistné vzorce*. 1st ed. Prague: Grada.
- Daňhel, J., Ducháčková, E. (2013) Today's Social Dilemma: Does a New Paradigm in Economics Demand Higher Ethics or Wider Regulation. *Journal of Emerging Trends in Economics and Management Science (JETEMS)*, vol. 4 (1), pp. 98–102.
- Ducháčková, E., Daňhel, J. (2006) Nové prvky v architektuře pojistných trhů v současné globalizační éře. *Politická ekonomie*, vol. LIV(3), pp. 382–393.
- Ducháčková, E., Schlossberger, O. (2015) Life Insurance and the Role of Financial Arbitrator for the Resolution of Disputes within Life Insurance. In: *Proceedings of the 7th International Scientific Conference Finance and Performance of Firms in Science, Education and Practice* [online]. Zlín, 23.04.2015 – 24.04.2015. Zlín : Univerzita Tomáše Bati ve Zlíně, 2015, s. 217–231.
- Hagelschuer, P. B. (1991). *Lebensversicherung*, In: *Gabler Verisicherungsenzyklopädie*, 5. vol., Wiesbaden, Gabler.
- Nyfelner, S., Lehmann, A. (1995). *Lebensversicherungsprodukte im europäischen Vergleich*. *Versicherungswirtschaft*, No. 1, Karlsruhe.
- Samoregulační standardy. Retrieved from: <http://www.cap.cz/odborna-verejnost/samoregulacni-standardy-cap/modelace-vyvoje-pojisteni>.
- Základní informace o životním pojištění. Retrieved from: http://www.cnb.cz/cs/dohled_financni_trh/souhrnne_informace_fin_trhy/zakladni_ukazatele_fin_trhu/pojistovny/poj_ukazatele_tab04.html

Quality and Efficiency of Bank Branch Services

Vlastimil Farkašovský¹, Ľubomír Pinter²

Matej Bel University in Banská Bystrica
Faculty of Economics, Department of Finance and Accounting
Tajovského 10, 975 90 Banská Bystrica, the Slovak Republic
E-mail: ¹ vlastimil.farkasovsky@umb.sk ² lubomir.pinter@umb.sk

Abstract: *The goal of the paper is to deepen understanding between the two key indicators of bank branch production, the quality of services and the technical efficiency. The indicator of service quality is a composite indicator harmonized at the European level that includes the assessment of three main areas: the quality of customer service, the quality of sale of financial products, and customer satisfaction. The technical efficiency of the bank branches is analysed with the aid of non-radial SBM model by Tone. A spatial aspect is found to be a factor that affects both, quality and technical efficiency of the bank's branches. The paper reveals, that individual managers have still enough room to improve their skills in managing their branches.*

Keywords: quality, technical efficiency, the SBM model, correspondence map, cartogram

JEL codes: R12, G21, G14

1 Introduction

The economic growth and development of any economy hinges strongly on the proper functioning of the banking system. It is considered to be the backbone of the most economies and plays a vital role in attaining economic growth. The performance of the banks is determined by internal factors specific to the banks and by external macro- and micro-economic factors unique to the environment in which the banks perform their activities. Specific features of the Slovak banking sector can be studied in Horvátová (2014, 2015) and an impact of the crisis on the financial system of Visegrad countries is explored in Lawson and Zimková (2009). As all these factors influence the degree of efficiency of the banks, the nexus between the internal and external bank environment demands the special attention of the regulatory bodies, shareholders, and managers of banks as well.

In the production process of a commercial banks the retail segment belongs to the core of the business. Since financial crisis it have undergone a radical change and the notion of performance evaluation become even more studied. In this paper, we present results from an ongoing study on the multi-criteria assessment of the production process of bank branches. Main objective was to propose and elaborate alternative options for evaluating retail production process of 185 branches of one of the largest commercial bank in Slovakia and thus to complement the existing system of production evaluation of commercial bank branches with additional independent information. The broader study examined issues of technical efficiency, profitability, quality and dynamics of service by the mean of the data envelopment analysis and by modified decision-making matrix and the results have been reported in Zimková (2015).

In this paper, the spatial analysis of the technical efficiency and quality of services is revealed by the means of correspondence map and cartogram to demonstrate the relation between the two key indicators of the bank branch production. Most DEA models developed for banks and bank branches consider issues of technical or operating efficiency and/or profitability (see Berger and Humphrey (1997), Berger (2007), Fethi and Pasiouras (2011) and Paradi and Zhu (2013) for an international survey of recent studies). A bank branch, however, needs to ensure not just high volume of output, but also volume of high quality. A branch may report high volume of products and services offered, as well as profits, but lose this advantage in the long run because of eroding service quality. Each branch utilizes some consumable resources to provide some level of service quality. The DEA model compares branches on how well they transform these

resources (inputs) to achieve their level of service quality (output), given their client base. In their paper, Soteriou and Stavrinides (1997) developed a DEA model which incorporated service quality output to provide bank branch benchmarks of internal customer service quality perceptions. As they stated, the model cannot be used alone to assess branch performance since it only considers a single service quality output which may ignore other important bank branch performance measures. Nevertheless, the model provides direction forwards service quality pitfalls.

The main aim of the paper is to deepen understanding between the two key indicators of bank branch production, the quality of services and the technical efficiency. The indicator of service quality is expressed by a composite indicator harmonized at the European level that includes the assessment of three main areas: the quality of customer service, the quality of sale of financial products, and customer satisfaction. The technical efficiency of the bank branches is analysed with the aid of non-radial SBM model by Tone. A spatial aspect is found to be a factor that affects both, quality and technical efficiency of the bank's branches. The paper reveals, that individual managers have still enough room to improve their skills in managing their branches in both volume and quality of services as well.

To the best knowledge of the authors, this paper is the only empirical inquiry into the relationship between technical efficiency and quality of services through the optics of correspondence map and cartogram. The spatial analysis was also applied in the research of Boďa, Farkašovský and Zimková (2016) that revealed outcomes of the relationship between technical efficiency and profitability.

Save the introductory and concluding sections, the body of the paper is organized into two other sections. The next section gives an overview of the database and methodology. The third section reports the results and includes their interpretation.

2 Data and Methodology

Well established commercial bank divides its branches according to several criteria, in this contribution we will divide them according to average registered number of employees and according to region, in which the branches operate. In terms of the number of employees the branches are divided into four typologically different groups: branches of type I usually have 20 employees, branches of type II usually have from 10 to 19 employees, branches of type III usually have up to 10 employees and finally branches of type IV usually have up to 3 employees

Technical efficiency is within the paper analysed in the context of nine regions chosen by bank, where branches of commercial bank operate. It is the Bratislava region – East (abbr. BAE), Bratislava region – West (abbr. BAW), Banská Bystrica region (abbr. BB), Košice region (abbr. KE), Nitra region (abbr. NI), Prešov region (abbr. PO), Trnava region (abbr. TR), Trenčín region (abbr. TRE) and Žilina region (abbr. ZI). Two of the nine territorial divisions of the analysed branches of bank are located in the capital city.

One of the key factors in applying DEA in banking is the selection of the set of inputs and outputs. The selection of input and output variables is determined by identifying the particular economic problem of the production process being studied. An insight into the specification of the input-output set for DEA-based bank efficiency measurement provide Ahn, Le (2013) and Boďa, Zimková (2015a).

The selection of input and output variables in SBM model corresponds to the production theoretical principle and it reflects an important requirement of bank representatives, so that DEA model includes those variables, which are directly influenced by directors of branches of a commercial bank. The input side of the production process is therefore number of employees of a commercial bank branch and the output side is the volume of accepted deposits, volume of granted loans and the volume of participation certificates sold to customers in thousands of euro. The anonymized data set was valid on December 31, 2014.

In measuring technical efficiency of individual branches, the non-oriented SBM model under the assumption of variable returns to scale is used. The non-oriented SBM model conforms to the fact that branch managers are capable of controlling and managing both the input and output side of retail branch production. The choice of the SBM model reflects the desire to measure technical efficiency in the sense of Pareto and Koopmans (see e.g. Zimková, 2014; Boďa and Zimková, 2015b), and this measurement is then accomplished in a more comprehensive way than common or basic DEA models.

Finally, as direct proportional links between inputs and outputs can scarcely be anticipated in the case of bank branch production, it is variable returns to scale that are acceptable as a valid and reasonable assumption. The SBM model yields for each bank branch in the sample an efficiency score (i.e. an estimate of the true value of the SBM) from the interval [0,1]. The value of one therein signifies that the concerned bank branch operates technically efficiently, and it cannot improve further on the quantity of labour force used or the amounts of services produced without affecting its production negatively. The technical details on the SBM model are well described in the paper by Tone (2001) who gave it a solid theoretical foundation.

The indicator of service quality provided by analysed commercial bank branches is a composite indicator, which includes the assessment of three main areas: quality of customer service, quality of sale of financial products and customer satisfaction. The indicator of service quality is from the interval [0,100], the value of 100 signifies that the concerned bank branch provides service of the highest standard.

3 Results and Discussion

In order to examine the effect of regional affiliation on the two performance characteristics under research, the bank's branches were cross-tabulated according their regional affiliation and ordinalized technical efficiency as well as according to their regional affiliation and ordinalized profitability.

Table 1 The Correspondence Table of Regional Division of Commercial Bank Branches and Their Technical Efficiency

Technical efficiency	Region									Frequency
	BAE	BAW	BB	KE	NI	PO	TR	TRE	ZI	
Lowest*	1	1	9	15	3	9	3	4	5	50
Low**	2	1	8	6	6	7	5	4	7	46
Medium***	4	4	2	3	7	6	9	3	6	44
High****	10	12	3	0	3	1	5	8	3	45
Frequency	17	18	22	24	19	23	22	19	21	185

Source: The authors.

Notes: *The lowest level of technical efficiency, score between 0.00 – 0.22. ** Low level of technical efficiency, score between 0.221– 0.3, *** Medium level of technical efficiency, score between 0.31 – 0.45,**** High level of technical efficiency, score 0.451 and more.

The score of technical efficiency is a measure of managerial skills of directors of commercial bank branches to utilize inputs of commercial bank branch (in this case the ability of employees) to produce financial services (in this case the volume of accepted deposits, granted loans and volume of sold participation certificates). The directors of commercial bank branches managing the branches of the commercial bank in Bratislava region reached the highest level of technical efficiency, as the absolute majority of them had technical efficiency at a high level, and 4 branches from both regions reached technical efficiency on a medium level. Into the group of managers technically able to ensure high technical efficiency of branches can be included also half of the directors of branches of commercial bank from Trenčín region, where 3 branches had technical efficiency on a medium level. The directors of branches with higher level of technical efficiency represent natural models for managers of branches with low or the lowest

technical efficiency. Among branches with the lowest level of technical efficiency belong branches in the Košice region and Prešov region.

Table 2 The Correspondence Table of Regional Division of Commercial Bank Branches and Indicator of Quality Service

Quality Service	Region									Frequency
	BAE	BAW	BB	KE	NI	PO	TR	TRE	ZI	
Lowest*	7	7	1	5	7	5	6	4	4	46
Low**	6	4	5	4	5	6	3	4	8	45
Medium***	1	5	7	9	3	4	6	7	5	47
High****	3	2	9	6	4	8	7	4	4	47
Frequency	17	18	22	24	19	23	22	19	21	185

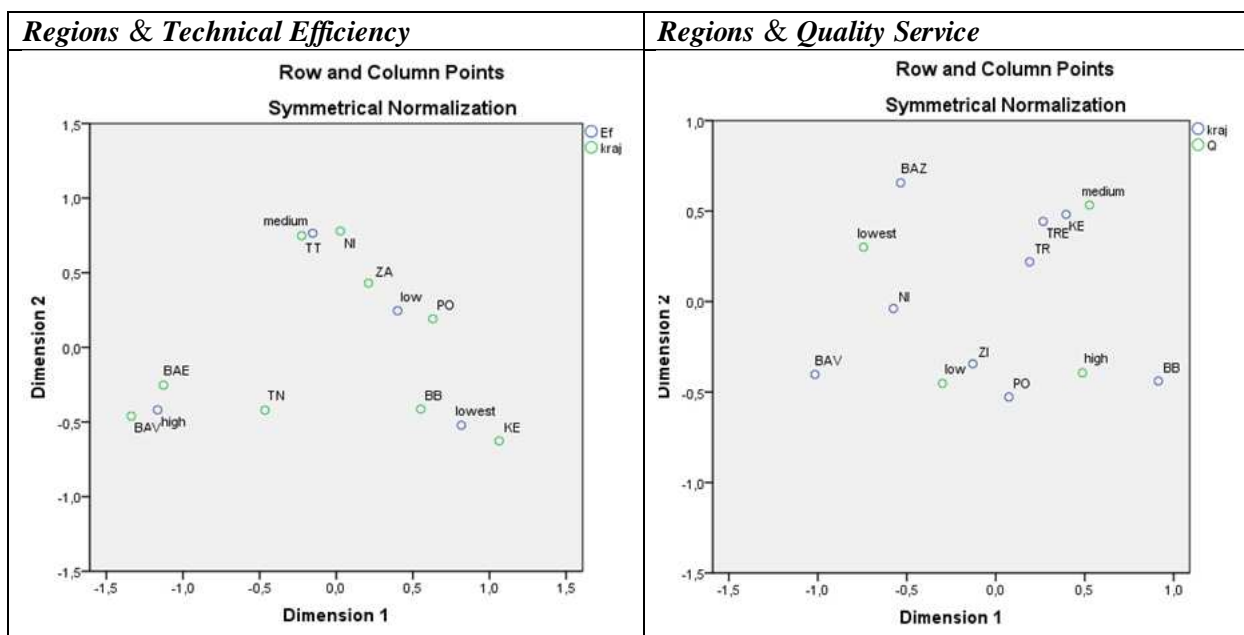
Source: The authors.

Notes: *The lowest level of indicator of service quality, value between 0.00 – 87.25. ** Low level of indicator of service quality, value between 87.26 – 88.55.. *** Medium level of indicator of service quality, value between 88.56 – 90.15... **** High level of indicator of service quality, value 90.16 and more.

From the correspondence table of regional division and indicator of service quality in commercial bank branches follows that when evaluating the service quality branches of commercial bank reach different results than in case of employee profitability. The results of correspondence table do not confirm the assumption that the level of employee profitability depends on the service quality. On the contrary, Bratislava region with the highest employee profitability is the most numerous in the category of the lowest evaluation of quality of their services along with branches of the Nitra region. The most frequent evaluation of quality on the high level from the side of customers had branches in regions, which reached the lowest employee profitability, namely branches in Prešov and Trnava region.

These two contingency tables were analysed in the framework of correspondence analysis whose results are exhibited Graph 1. It provides information about regional division of bank branches compared to technical efficiency and indicator quality indicator.

Figure 1 Correspondence Maps of Regional Division of Branches and Selected Criteria



Source: The authors.

It reveals that the highest technical efficiency in general have branches in Bratislava region. Up to 10 branches in Bratislava region – East and 12 branches in Bratislava

region – West reached technical efficiency with chi-square distance closest to the highest level of technical efficiency. Further, four branches from each Bratislava region reached technical efficiency with chi-square is the closest to the medium level of technical efficiency. On the contrary, the lowest technical efficiency in general reach branches within Košice and Banská Bystrica region. Their chi-square distance from the lowest level of achieved technical efficiency is in fact the lowest. This fact is confirmed also by the contingency 3, which implies that up to 15 branches of the analysed bank from 24 branches located in Košice region reach the score of technical efficiency within range 0 – 22, which corresponds to a quarter of the lowest scores of technical efficiency within the whole analysed group of commercial bank branches (lowest). Six branches are in a group with the highest score of technical efficiency between the first quartile and median (low), thus, in interval 0.221 – 0.3. In other words, 21 from 24 branches of commercial bank located in Košice region have technical efficiency lower than 30% compared to technically efficient branches of the analysed bank. Unfavourable results when assessing technical efficiency reach also branches located in Banská Bystrica region, while up to 11 of them reached technical efficiency of the lowest quartile of technical efficiency and 8 of them recorded technical level in the second quartile of technical efficiency.

When evaluating the quality of offered services the order of success of commercial bank branches is different from the previous evaluations of technical efficiency and employee profitability. The highest quality of offered services recorded branches in Prešov and Banská Bystrica region, where 9 branches in Banská Bystrica region and 8 branches in Prešov region reached service quality with chi-square distance closest to the highest level of service quality. Conversely, the worst rating of service quality had branches in Bratislava region and in Nitra region.

Table 3 The Adopted Notation for the Districts of Slovakia

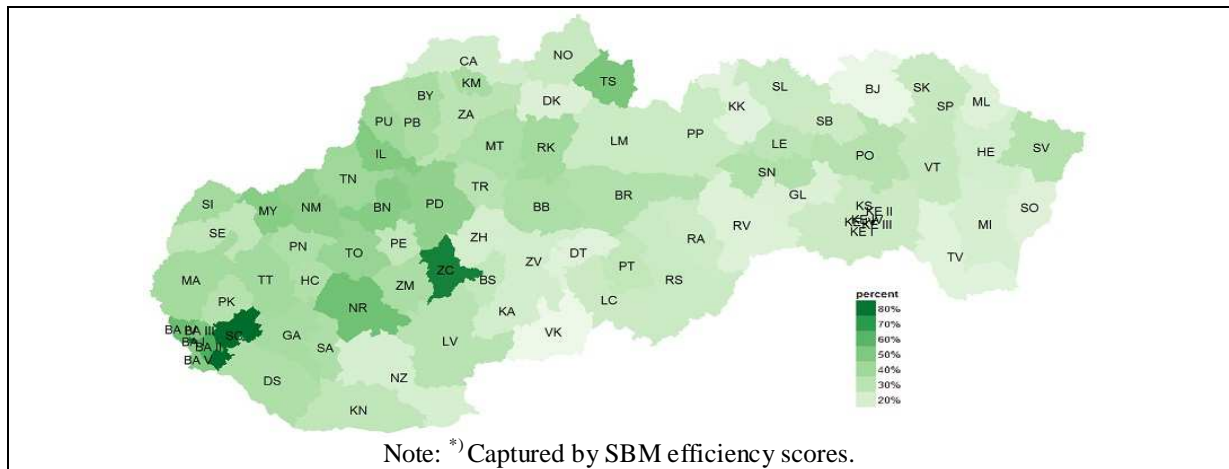
Abbr.	District	Abbr.	District	Abbr.	District	Abbr.	District
BN	Bánovce nad Bebravou	KK	Kežmarok	NM	Nové Mesto nad Váhom	SO	Sobrance
BB	Banská Bystrica	KN	Komárno	NZ	Nové Zámky	SN	Spišská Nová Ves
BS	Banská Štiavnica	KS	Košice - okolie	PE	Partizánske	SL	Stará Ľubovňa
BJ	Bardejov	KE I	Košice I	PK	Pezinok	SP	Stropkov
BA I	Bratislava I	KE II	Košice II	PN	Piešťany	SK	Svidník
BA II	Bratislava II	KE III	Košice III	PT	Poltár	SA	Šaľa
BA III	Bratislava III	KE IV	Košice IV	PP	Poprad	TO	Topoľčany
BA IV	Bratislava IV	KA	Krupina	PB	Považská Bystrica	TV	Trebišov
BA V	Bratislava V	KM	Kysucké Nové Mesto	PO	Prešov	TN	Trenčín
BR	Brezno	LV	Levice	PD	Prievidza	TT	Tmava
BY	Bytča	LE	Levoča	PU	Púchov	TR	Turčianske Teplice
CA	Čadca	LM	Liptovský Mikuláš	RA	Revúca	TS	Tvrdošín
DT	Detva	LC	Lučenec	RS	Rimavská Sobota	VK	Veľký Krtíš
DK	Dolný Kubín	MA	Malacky	RV	Rožňava	VT	Vranov nad Topľou
DS	Dunajská Streda	MT	Martin	RK	Ružomberok	ZM	Zlaté Moravce
GA	Galanta	ML	Medzilaborce	SB	Sabinov	ZV	Zvolen
GL	Gelnica	MI	Michalovce	SC	Senec	ZC	Žarnovica
HC	Hlohovec	MY	Myjava	SE	Senica	ZH	Žiar nad Hronom
HE	Humenné	NO	Námestovo	SI	Skalica	ZA	Žilina
IL	Ilava	NR	Nitra	SV	Snina		

Source: The authors.

The spatial distribution of the technical efficiency and quality service indicator of the bank's branches is more accurately demonstrated in the cartograms of Figures 2 and 3.

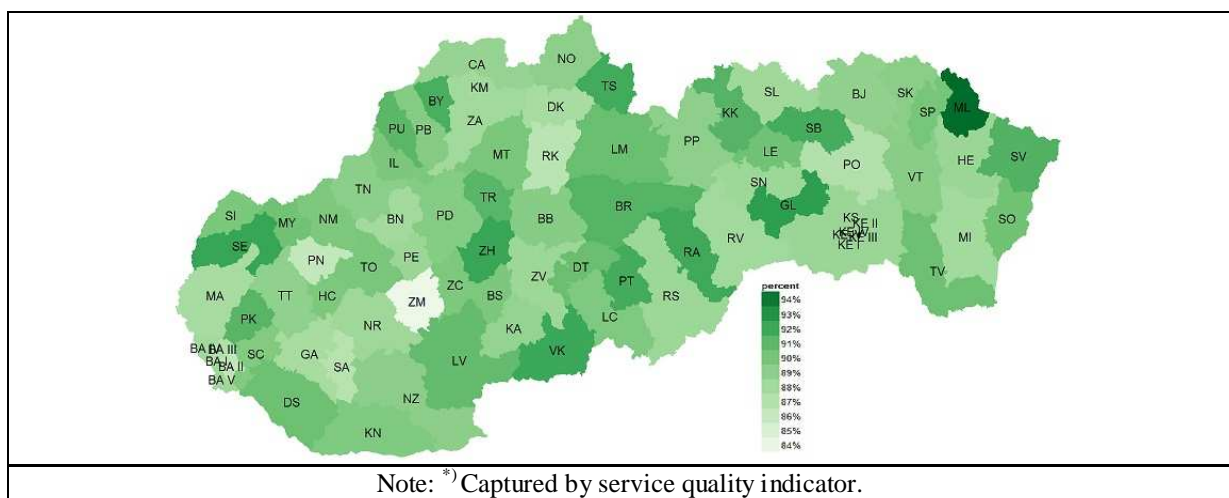
For each of the 79 districts of Slovakia, they display simple averages of either indicator computed for the bank's branches residing in the respective district.

Figure 2 The Spatial Distribution of the Technical Efficiency* of the Bank's Branches in the Districts of Slovakia



For each of the 79 districts of Slovakia, graphs display simple averages of either indicator computed for the bank's branches residing in the respective district. The cartogram in Graph 2 reveals significant differences between the districts of Slovakia in the average level of the technical efficiency of branches. The lowest average level of technical efficiency in the provision of banking services was attained by the bank's branches in the districts Veľký Krtíš ("VK") and Bardejov ("BJ"), in either case lower than 0.15. These two districts alongside some other districts with a low average level of technical efficiency such as Kežmarok ("KK"), Trebišov ("TV"), Detva ("DT"), Sobrance ("SO"), Medzilaborce ("ML"), Revúca ("RV"), Košice – okolie ("KS") and Gelnica ("GL") belong to the least developed parts of Slovakia. On the contrary, the highest average level of technical efficiency was recorded by the branches in the districts Senec ("SC"), Bratislava I ("BA I") and Žarnovica ("ZC"), in each case higher than 0.80. The districts in which branches with a higher level of technical efficiency prevail are concentrated in Western Slovakia as the most economically developed part of Slovakia.

Figure 3 The Spatial Distribution of the Service Quality indicator* of the Bank's Branches in the Districts of Slovakia



The cartogram in Graph 3 demonstrates significant differences between the districts of Slovakia in the average level of the quality service of bank's branches. The lowest

average level of quality service was attained by the bank's branches in the districts Zlaté Moravce ("ZM"), lower than 84 points out of 100. Moreover, Bratislava II ("BA II"), Bratislava III ("BA III") and Bratislava I ("BA I") with the highest employee profitability is the most numerous in the category of the lowest evaluation of quality of their services along with branches of the Piešťany ("PN") and the Prešov ("PO"). On the contrary, the highest average level of quality service was recorded by the branches in the districts Medzilaborce ("ML"), Košice region ("KS"), Gelnica ("GL"), Žiar nad Hronom ("ZH") and Senica ("SE"), in each case higher than 82 points.

4 Conclusions

This paper represents a results of the spatial analysis applied on the technical efficiency and quality of services by the means of correspondence maps and cartograms. It is a part of ongoing study on the multi-criteria assessment of the production process of bank branches for one of the largest bank operating in the Slovak Republic. Taking into consideration 185 bank's branches clustered from two points of view, the size of the branch and region in which the branch operates, we can state that the results are rather heterogeneous. Moreover, it was not proved that the technical efficiency of the bank branches is associated with the high service quality standards. It was proved that while comparing the technical efficiency and service quality indicator, the order of success of commercial bank branches is different.

An outcome of this research enables: to provide important information to both senior and branch management; to improve multi-dimensional performance evaluation; to strengthen adjustment of organizational culture differences across bank's branches. It is evident that there is a large space for an improvement of managerial skills of bank's branch management.

Acknowledgement

The support of the grant schemes VEGA 1/0757/15 Augmentation of the theoretical construct of the SCP paradigm and of the efficient structure hypothesis in banking and insurance by the aspect of risk and their empirical validation in the conditions of the Slovak Republic and VEGA 1/0859/16 Dynamics of nonlinear economic processes is gladly acknowledged.

References

- Ahn, H., Le, M. H. (2014). An insight into the specification of the input-output set for DEA-based bank efficiency measurement. *Management Review Quarterly* 64, pp. 3–37.
- Berger, A.N. (2007). International Comparisons of Banking Efficiency. *Financial Markets, Institutions & Instruments*, vol. 16(3), pp. 119–144.
- Berger, A.N., Humphrey, D.B. (1997). Efficiency of Financial Institutions: International Survey and Directions for Future Research. *European Journal of Operational Research*, vol. 98(2), pp. 175–212.
- Bodá, M., Zimková, E. (2015a). Efficiency in the Slovak banking industry: a comparison of three approaches. *Prague Economic Papers*, 24(4), pp. 434–451.
- Bodá, M., Zimková, E. (2015b). How Non-radiality Matters – Pareto-Koopmans Technical Efficiency in Production of Branches of a Slovak Commercial Banks. *Procedia Economics and Finance*, vol. 30, pp. 100–110.
- Bodá, M., Farkašovský, V., Zimková, E. (2016). Technical Efficiency and Profitability in Retail Production of Bank Branches. In: *Palečková, I. and Szarowská, I. (eds.) Proceedings of the 15th International Conference on Finance and Banking. Karviná: Silesian University, 2016. pp. 1-13.*

- Fethi, M.D., Pasiouras, F. (2010). Assessing Bank Efficiency and Performance with Operational Research and Artificial Intelligence Techniques: A Survey. *European Journal of Operational Research*, vol. 204(2), pp. 189–198.
- Horvátová, E. (2014). Development and characteristics of Slovak banking system. In *Political sciences, law, finance, economics and tourism, vol II. Book series: International Multidisciplinary Scientific Conferences on Social Sciences and Arts*, pp. 201-208.
- Horvátová, E. (2013). Analysis of the problem of pro-cyclicality in the Eurozone and pro-cyclicality solutions in Basel III. In: *European Financial Systems 2013*. Proceedings of the 10th International Scientific Conference, Brno: Masaryk University, pp. 126-133.
- Lawson, C., Zimková, E. (2009). The Credit Crisis: What lesson for Visegrad? *Prague Economic Papers*, 18(2), pp. 99-113. doi: <http://dx.doi.org/10.18267/j.pep.344>.
- Paradi, J.C., Zhu, H. (2013). A Survey on Bank Branch Efficiency and Performance Research with Data Envelopment Analysis. *Omega*, vol. 41(1), pp. 61–79.
- Soteriou, A.C., Stavrinides, Y. (1997). An internal customer service quality data envelopment analysis model for bank branches. *International Journal of Operations & Production Management*, vol. 17(8), pp. 780-789.
- Tone, K. (2001). A Slacks-Based Measure of Efficiency in Data Envelopment Analysis. *European Journal of Operational Research*, vol. 130(3), pp. 498–509.
- Zimková, E. (2015). *Retailový produkčný proces v komerčnom bankovníctve a jeho hodnotenie*. Bratislava: Wolters Kluwer.
- Zimková, E. (2014). Technical Efficiency and Super-Efficiency of the Banking Sector in Slovakia. In *Enterprise and Competitive Environment 2014*. Proceedings of the 17th International Scientific Conference, Brno: Mendel Univ, 2014. Book Series *Procedia: Economics & Finance*, vol. 12, pp. 780-787.

The Access to Instrument of Countercyclical Capital Reserves in the European Union and the USA

Luboš Fleischmann¹

¹ University of Economics, Prague
Faculty of Finance and Accounting, Department of Banking and Insurance
W. Churchill Sq. 1938/4, 130 67 Prague, The Czech Republic
E-mail: lubos.fleischmann@gmail.com

Abstract: Repeating financial crisis brings new actions in regulatory rules of the financial markets each time. Regulatory authorities seek to increase the resilience of the banking sector through modified and brand new instruments, especially against cyclical risks associated with fluctuations in credit activity. The same is happening in the post-lehman approach to macro-prudential tools. This paper deals with the impact of countercyclical capital reserves, one of the new supplementary capital reserves, which introduces the Third Basel Accord (Basel III). The paper analyzes the objectives of the countercyclical capital reserve instrument and the method for determining its amount. A comparison is performed among rates set in other European Union countries and approach to the countercyclical capital reserve in the USA. The method also carries out a comparison between the European and American approach. The primary question of the paper is answered using empirical data that relates to the effectiveness of the chosen instrument to achieve the objective, which is to ensure the stability of the banking sector during the crisis and what rate of the countercyclical capital reserve matches the above objectives. The paper also aims to assess whether the tool can fulfill the high expectations of regulatory authorities.

Keywords: countercyclical capital reserve, Basel III, regulatory capital, cyclical risk capital ratio

JEL codes: C15, E 37, E43, G20, G21

1 Introduction

Repeating financial crisis brings new actions in regulatory rules of the financial markets each time. Regulatory authorities seek to increase the resilience of the banking sector through modified and brand new instruments, especially against cyclical risks associated with fluctuations in credit activity. The same is happening in the post-lehman approach to macro-prudential tools.

This paper deals with the impact of countercyclical capital reserves (CCyB), one of the new supplementary capital reserves, which introduces the Third Basel Accord (Basel III). The paper analyzes the objectives of the countercyclical capital reserve instrument and the method for determining its amount. A comparison is performed among rates set in other European Union countries and approach to the countercyclical capital reserve in the USA. The method also carries out a comparison between the European and American approach.

The aim of this paper is an attempt to answer the primary question, which concerns the efficiency and impact of CCyB tools to achieve the goal of ensuring stability of the banking sector. Appropriate conclusions are drawn at the end of the paper.

Capital adequacy of financial institutions

Capital adequacy is based on will to cover all future losses of banks or investment companies that are subject to risk with shareholders' equity (ie. internal resources of the particular joint-stock company). Potential losses of financial institutions should bear primarily their shareholders and not the clients. The market regulation authority sets the minimum amount of these capital requirements. It is also necessary to find a compromise between the costs associated with the possible lapse of the bank. The actual capital base of banks is in practice often over the permitted minimum, which on the other

hand increases their credit ratings and allows them (eg.) getting cheaper loans. (Cipra, 2015)

The capital adequacy represents the ratio of bank's equity capital and risk-weighted assets. Adequacy of internal resources represents maintaining a minimum amount of regulated capital due to volume and riskiness of its own assets. The value of the bank's capital should cover future potential losses from the current risks of financial institution. (Vokorokosová, Kočíšová, 2009).

Globally enhanced regulatory systems set up primarily so-called Basel Accords: Basel I, Basel II and Basel III. Within the European Union apply also financial regulation known as the CRR / CRD with the corresponding serial number (Capital requirements directive), which is primarily based on the above mentioned Basel Accord.

Table 1 Development of the Basel Reform

	Effective since	Risk approach	Characteristics
Basel I	1993	Inadequate risk management	Very simple application. Easy reduction of regulatory capital without significant restrictions or risk transfer (easy regulatory arbitrage).
Basel II	2006	Higher risk sensitivity	Effect on a change in the behavior of banks. A number of gaps allowing banks to evade unpleasant consequences of regulation.
Basel III	2019 (full implementation)	Very high risk sensitivity	Removing gaps of Basel II. Significant impacts on business portfolio, liquidity and balance sheets of the banks. A significant increase in the qualitative and quantitative regulatory capital requirements.

Source: Cipra, T. (2015): Riziko ve financích a pojišťovnictví: Basel III a Solvency II. Ekopress, s.r.o. ISBN: 978-80-87865-24-8

2 Methodology and Data

New capital reserves introduced in Basel III

The financial crisis hit financial markets worldwide in 2008. The banking sector run into problems in liquidity and capital adequacy. It turned out that the rules set by the Basel II directive had been inadequate.

The Basel III rules require a higher volume, quality, consistency and transparency of capital. The directive improves the quality and volume of Tier 1 as the predominant component of regulatory capital. It simplifies and reduces Tier 2, cancels Tier 3 and tightens requirements for hybrid instruments.

Basel III introduces three additional capital buffers: a capital conservation buffer CCB, a countercyclical buffer CB and a systemic risk buffer.

The capital adequacy ratio (CAR) is a measure of a bank's capital. It is expressed as a percentage of a bank's risk weighted credit exposures. Also known as capital-to-risk weighted assets ratio (CRAR), it is used to protect depositors and promote the stability and efficiency of financial systems around the world. Two types of capital are measured: tier one capital, which can absorb losses without a bank being required to cease trading, and tier two capital, which can absorb losses in the event of a winding-up and so provides a lesser degree of protection to depositors. (Investopedia, 2016)

$$CAR = \frac{\textit{Tier One Capital} + \textit{Tier Two Capital}}{\textit{Risk Weighted Assets}}$$

Countercyclical capital buffer

CRD IV directive (in response to Basel III regulatory concept) introduced an important macro-prudential tool into regulatory practice in the EU, which is counter-cyclical capital buffer (CCyB).

The purpose of this tool is to increase the resilience of the financial system to risks associated with the behavior of the banking sector during the financial cycle, especially with strong fluctuations in the credit dynamics that amplify cyclical fluctuations in economic activity. The banks should create this buffer according to the guidelines of regulatory authorities in the period of excessive credit growth, when (due to high credit expansion) usually increase financial imbalances that lead to accumulation of systemic risk. In contrast, the created reserve should be dissolved and used by banks as a capital cushion to cover losses during the downturn in economic activity accompanied by increased financial strain and rising credit losses. It is necessary to prevent the decline in the supply of credit and bank transfer of an additional shock from the financial sector to the real economy. (CNB, 2016)

Based on public data from the Czech National Bank, we can observe an increasing trend of mandatory capital requirements for banks and credit companies in the czech banking sector (see. Table 2). Despite this trend, the members of the CNB Bank Board decided to establish a countercyclical capital buffer from 1 1st 2017.

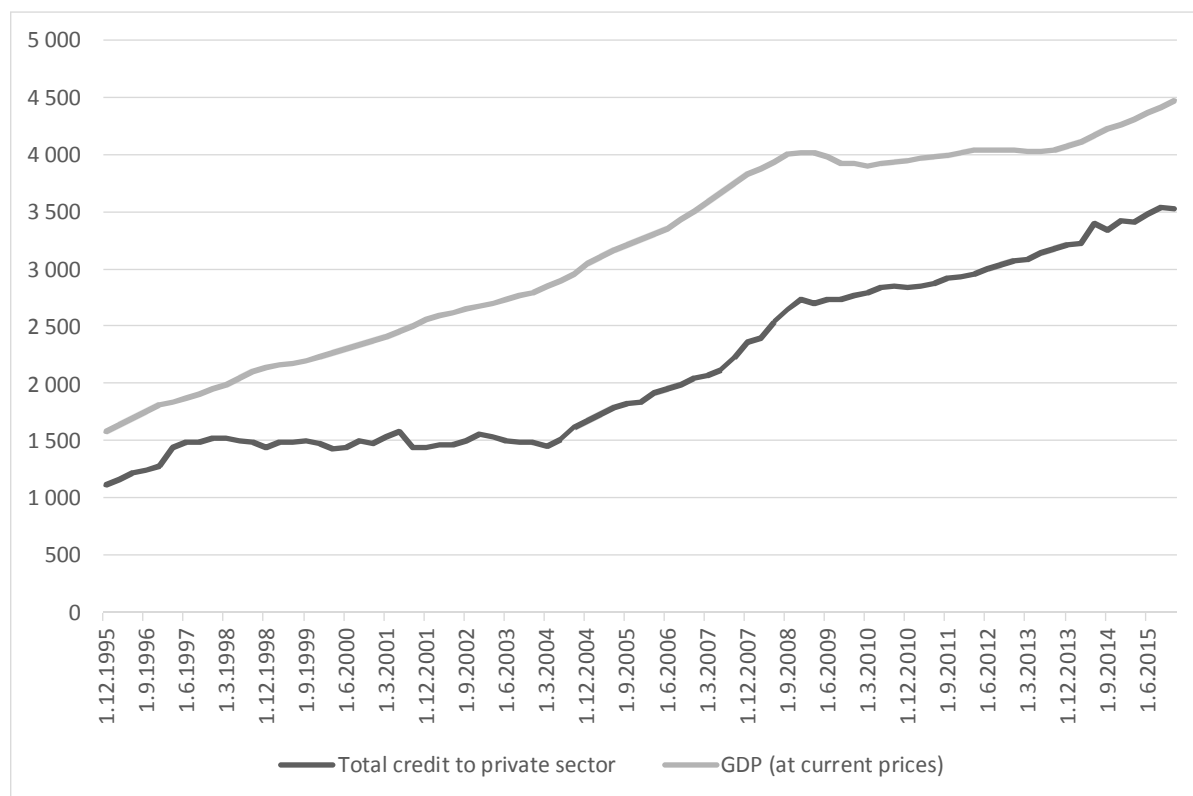
Table 2 Minimum Capital Reserves in the Czech Banking Sector (in Mil. CZK)

Period	Bank and credit companies reserves	Mandatory reserves	Free reserves
31.12.2015	75.27	66.46	8.81
31.12.2014	63.8	60.9	2.9
31.12.2013	59.86	57.13	2.73
31.12.2012	55.59	54.73	0.86
31.12.2011	52.9	51.29	1.61
31.12.2010	52.95	50.63	2.32
31.12.2009	50.35	49.8	0.55
31.12.2008	45.73	47.22	-1.49
31.12.2007	41.47	42.18	-0.72
31.12.2006	36.28	36.59	-0.31
31.12.2005	33.32	33.41	-0.09
31.12.2004	31.62	31.2	0.42
31.12.2003	29.38	29.42	-0.04
31.12.2002	28.51	28.34	0.17
31.12.2001	28.25	28.12	0.13
31.12.2000	26.95	26.85	0.1
31.12.1999	25.49	25.52	-0.03
31.12.1998	84.69	84.28	0.41
31.12.1997	103.63	101	2.63
31.12.1996	113.61	115.46	-1.85
31.12.1995	75.84	75.69	0.15
31.12.1994	56.39	56.34	0.04
31.12.1993	39.39	39.27	0.13

Source: CNB, processed by the author

The following Figure 1 shows the main indicators for calculating the rate of countercyclical capital buffer and Table 2 lists the deviations from the long-term trend in relation to the main indicators.

Figure 1 The Main Indicators for Calculating the Rate of CCyB



Source: CNB, processed by the author

Table 3 Deviation from the Long-term Trend

	Long-term trend deviation	Corresponding rate of countercyclical capital buffer	Long-term trend deviation	Corresponding rate of countercyclical capital buffer
	the start of time serie: Q4 1995		the start of time serie: Q1 2004	
	HP filter, lambda = 400 000		HP filter, lambda = 400 000	
31.3.2014	8.4	2.00	-2.1	0.00
30.6.2014	7.3	1.75	-2.6	0.00
30.9.2014	6.1	1.25	-3.5	0.00
31.12.2014	6.0	1.25	-3.4	0.00
31.3.2015	4.4	1.00	-4.7	0.00
30.6.2015	3.1	0.50	-5.7	0.00
30.9.2015	3.4	0.50	-5.1	0.00

Source: http://www.cnb.cz/en/financial_stability/macprudential_policy/countercyclical_capital_buffer/index.htmlThe deviation from the long-term trend rate and corresponding

Counter-cyclical capital buffers are always counted on data available for the particular quarter (data are not retroactively adjusted eg. due to significant data revisions).

The total volume of credits in the private sector still has not reflected methodological changes arising from the methodological manual BPM6, ie. Cross-border loans to non-financial corporations has been still reported on a net basis. (CNB, 2016)

The above stated main indicators show that the objective of setting the countercyclical capital buffer arises from the concern of the risk budget of the loans and their amounts.

Authorities responsible for setting the rate of countercyclical capital buffer (CCyB) in different countries consider a number of key indicators.

A cornerstone of the countercyclical capital buffer (CCyB) framework is that foreign institutions should face the same CCyB rate as domestic institutions when they lend cross-border. This is given effect in the EEA by CRDIV, in accordance with the Basel international agreement. Under these arrangements, where a foreign authority sets a CCyB rate, this can be applied to the foreign exposures of domestic institutions, within each institution specific CCyB rate - this process is referred to as "recognition" or, if mutual, 'reciprocation'.

CRDIV as implemented in an individual state a transitional period, during which the central bank or authorized institutions FPC is responsible for deciding whether CCyB rates set by EEA States should be recognised and for taking certain decisions about third country rates, including whether a higher rate should be set for the purposes of Central bank or individual institutions calculating their CCyBs. (Bank of England, 2016)

Higher than the zero rate of CCyB have already set 3 EU countries - Czech Republic (0.5% from April 1, 2017), Sweden (1.5% from June 1, 2016 and 2% from March 19, 2017) and Great Britain (0.5 by 29 March 2017) and 3 non-EU countries - Norway (1.5% from March 1, 2017), Iceland (1% from March 1, 2017) and Hong Kong (0.0625% from January 27, 2016 and 1.25% from 1.1 .2017). (ESRB, 2016) Table 4 summarizes the established rates of CCyB and their implementation date.

Table 4 Current and Pending CCyB Rates of Institutions in the Simple Countries

Country	Current CCyB rate	Implementation date	Pending CCyB rate (1)	Implementation date	Pending CCyB rate (2)	Implementation date
England	0%		0,5%	29 March 2017		
Czech Republic	0%		0.5%	1 Jan 2017		
Hong Kong	0.625 %	27 Jan 2016	1.25%	1 Jan 2017		
Norway	1%	3 Oct 2015	1.5%	30 Jun 2016		
Sweden	1%	3 Oct 2015	1.5%	27 Jun 2016	2%	19 March 2017
Iceland	0%		1%	1 Mar 2017		

Source: Bank of England, 2016

3 Results and Discussion

Approach to banking supervision and instruments of counter-cyclical buffers in the US Regulatory response on the global financial crisis in the US embodies particularly Dodd - Frank Wall Street Reform and Consumer Protection Act, abbreviated DFA (2010). The main objectives of this act are promoting financial stability by increase of credibility and transparency of the US financial system and protection of US taxpayers - in order not to bear the cost of rescuing unduly risking and poorly capitalized banks in the future. It also covers protecting of the financial consumers from unfair financial practices and limitations of shadow banking. DFA, as an essential response to the global financial crisis, aims both to create preconditions for financial stability (central monitoring of systemic risk, limiting of systemic risks of big banks, reducing information asymmetry), as well as the transparency of derivatives (especially swap) and securitization markets and transparency of the shadow banking the rating. DFA key objective is to gradually reduce the risk of exposure of commercial banks, not just in terms of capital adequacy and liquidity rules and by introducing leverage rules, but also a significant reduction in interconnection of commercial and investment banking. The original version of the

Volcker rule (named after Paul Volcker, former Chairman of the Board of Governors of the Federal Reserve System) should have completely prohibited trading and investments of banks in risky investment instruments on their own account - practically as a modern version of GSA. Finally, a much milder version of the rules was accepted, in DFA section 619. This section banned short-term deals on own account in securities, derivatives and commodity futures to commercial banks and their subsidiaries. It also significantly reduced investments by commercial banks in hedge and private funds, up to a maximum of 3% of the capital, defined as Tier I. The total stake held by banks must not exceed 3% of the total-equity hedge or private fund. (Musilek, 2014)

Supervisory and regulatory system in the US is different from regulatory directives within the European Union. The Federal Reserve System supervises and regulates a wide range of financial institutions and activities. The Federal Reserve works in conjunction with other federal and state authorities to ensure that financial institutions safely manage their operations and provide fair and equitable services to consumers. Bank examiners also gather information on trends in the financial industry, which helps the Federal Reserve System meet its other responsibilities, including determining monetary policy. (FED. 2015)

Several federal and state authorities regulate banks along with the Federal Reserve. The Office of the Comptroller of the Currency (OCC), the Federal Deposit Insurance Corporation (FDIC), the Office of Thrift Supervision (OTS) and the banking departments of various states also regulate financial institutions. The OCC charters, regulates and supervises nationally chartered banks. The FDIC, the Federal Reserve and state banking authorities regulate state-chartered banks. Bank holding companies and financial services holding companies, which own or have controlling interest in one or more banks, are also regulated by the Federal Reserve. The OTS examines federal and many state-chartered thrift institutions, which include savings banks and savings and loan associations. (FED, 2015)

The Federal Reserve has supervisory and regulatory authority over a variety of financial institutions and activities with the goal of promoting a safe, sound, and stable financial system that supports the growth and stability of the U.S. economy. As described in this report, the Federal Reserve carries out its supervisory and regulatory responsibilities and supporting functions primarily by

- promoting the safety and soundness of individual financial institutions supervised by the Federal Reserve;
- taking a macroprudential approach to the supervision of the largest, most systemically important financial institutions (SIFIs);
- developing supervisory policy (rulemakings, supervision and regulation letters (SR letters), policy statements, and guidance);
- identifying requirements and setting priorities for supervisory information technology initiatives;
- ensuring ongoing staff development to meet evolving supervisory responsibilities;
- regulating the U.S. banking and financial structure by acting on a variety of proposals;
- enforcing other laws and regulations. (Annual Report, 2015)

Above all, it is necessary to mention the introduction of Volcker rule. US banking authorities have not introduced countercyclical capital buffer yet.

Implementation of the rules is also subject to a public comment procedure and thus also the whole process slows down. Likewise is the implementation of the Basel regulatory acts in the US.

The Federal Reserve Board on 2 July 2013 approved a final rule to help ensure banks maintain strong capital positions that will enable them to continue lending to

creditworthy households and businesses even after unforeseen losses and during severe economic downturns.

The final rule minimizes burden on smaller, less complex financial institutions. It establishes an integrated regulatory capital framework that addresses shortcomings in capital requirements, particularly for larger, internationally active banking organizations, that became apparent during the recent financial crisis. The rule will implement in the United States the Basel III regulatory capital reforms from the Basel Committee on Banking Supervision and certain changes required by the Dodd-Frank Wall Street Reform and Consumer Protection Act.

Under the final rule, minimum requirements will increase for both the quantity and quality of capital held by banking organizations. Consistent with the international Basel framework, the rule includes a new minimum ratio of common equity tier 1 capital to risk-weighted assets of 4.5 percent and a common equity tier 1 capital conservation buffer of 2.5 percent of risk-weighted assets that will apply to all supervised financial institutions. The rule also raises the minimum ratio of tier 1 capital to risk-weighted assets from 4 percent to 6 percent and includes a minimum leverage ratio of 4 percent for all banking organizations. In addition, for the largest, most internationally active banking organizations, the final rule includes a new minimum supplementary leverage ratio that takes into account off-balance sheet exposures.

On the quality of capital side, the final rule emphasizes common equity tier 1 capital, the most loss-absorbing form of capital, and implements strict eligibility criteria for regulatory capital instruments. The final rule also improves the methodology for calculating risk-weighted assets to enhance risk sensitivity. Banks and regulators use risk weighting to assign different levels of risk to different classes of assets--riskier assets require higher capital cushions and less risky assets require smaller capital cushions.

Adoption of the capital rules, along with the stress testing and capital review measures, are a component of a set of mutually reinforcing capital requirements.

The banking agencies carefully reviewed the comments received on the proposal and made a number of changes in the final rule, in particular to address concerns about regulatory burden on community banks. For example, the final rule is significantly different from the proposal in terms of risk weighting for residential mortgages and the regulatory capital treatment of certain unrealized gains and losses and trust preferred securities for community banking organizations (FED, 2013).

4 Conclusions

The counter-cyclical capital buffer is a new instrument and we can not yet analyze data so that it is possible to predict or to justify its introduction in the third Basel Accord. For this reason it is necessary to wait for the practical consequences of the introduction of the instrument.

Czech National Bank announced the first non-zero countercyclical capital buffer of 0.5 percent at the end of 2015. The announcement of regulation was not surprising, because it had been indicated quite a long time before. This measure also increased minimum capital requirements for the banking sector which must be respected from January 2017. Likewise is the rate introduced in the four other above mentioned countries. An interesting feature of the list is the fact that none of the countries, which have introduced CCyB rate, is a member of the euro zone.

Czech National Bank, as well as other mentioned countries with established rate CCyB, has a sufficient insurance of capital reserves. Goal and purpose of inclusion the countercyclical capital buffer to mandatory reserves will be evident in the period decreasing GDP trend and the increasing trend of risky cheap loans. Assets of this tool should be dissolved among the banks in the case of worsened economic development and a reduction in the rate.

The difference between the European and US regulatory concept is in the process of adopting and implementing rules. On the European scale, in addition to the Basel reform, also regulations according to the European Union institutions are introduced. In the US, Volcker rule will be introduced into legislation relatively soon, which clearly defines the obligations of US banks.

Acknowledgments

This paper has been prepared under financial support of a grant "Trends in the Banking and Insurance Sectors in Changing Financial Markets" VŠE IGA F1/21/2016, which authors gratefully acknowledge.

References

Bank of England (2016): *Countercyclical Capital Buffer (CCyB) rates*. Retrieved from: <http://www.bankofengland.co.uk/financialstability/Pages/fpc/ccbrates.aspx>.

Basel Committee on Banking Supervision (2011): *Basel III: A global regulatory framework for more resilient banks and banking systems*. Retrieved from: <http://www.bis.org/publ/bcbs189.pdf>.

Czech National Bank (2016): *Countercyclical capital buffer*. Retrieved from: http://www.cnb.cz/en/financial_stability/macprudential_policy/countercyclical_capital_buffer/index.html.

Cipra, T. (2015): *Riziko ve financích a pojišťovnictví: Basel III a Solvency II*. Ekopress.

Česká národní banka (2016): *ARAD – systém časových řad*. Retrieved from: <http://www.cnb.cz/docs/ARADY/HTML/index.htm>.

Investopedie (2016): *Capital Adequacy Ratio*. Retrieved from: <http://www.investopedia.com/terms/c/capitaladequacyratio.asp?o=40186&l=dir&qsrc=1&qo=serpSearchTopBox&ap=investopedia.com>.

Musílek, Petr (2014): *Regulace vlastních obchodů bank s investičními instrumenty*. Retrieved from: www.vse.cz/polek/download.php?jnl=cfuc&pdf=419.pdf.

The Federal Reserve Board (2015): *102nd Annual Report*. Retrieved from: <http://www.federalreserve.gov/publications/annual-report/files/2015-annual-report.pdf>.

The Federal Reserve Board (2016): *Banking Information and Regulation*. Retrieved from: <http://www.federalreserve.gov/bankinfo/reg/default.htm>.

Vokorokosová, R., Kočíšová, K. (2009): *Manažment bankových operácií*. Košice: Elfa.

Hedging of Portfolios and Transaction costs

Hana Florianová¹, Tomáš Dráb²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: hanaflorianovaa@gmail.com

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: 321854@mail.muni.cz

Abstract: *The aim of this paper is to decide whether to rebalance hedged portfolios often to reduce risk or to rebalance them less often to lower transaction costs. In this paper we use delta-hedging for portfolios consisting of warrants and shares. We focus on how portfolio rebalancing works on real financial markets with an emphasis on situation on European stock exchanges. The motivation for this research is to gain knowledge for investing in real markets more effectively than just by using theoretical methods. In our research we achieved interesting results under the terms of transaction costs and different frequency of rebalancing portfolios. We constructed 30 portfolios consisting of American style plain vanilla call warrants and correspondent amount of underlying shares. We compared one week and two weeks period of rebalancing with no rebalancing. The results are that you pay more money on transaction costs to reduce one percent of risk as the rebalancing is more frequent.*

Keywords: warrants, hedging, portfolio, transaction costs

JEL classification codes: G10, G11, G12, G14, G15

1 Introduction

When studying financial markets and portfolio theory, one of the issues is how to protect a portfolio from risk, be profitable and how often rebalance it. Some of the investors are willing to undergo higher risk and some prefer lower risk. These conservative investors would not be compliant to invest to financial derivatives as they are in general very risky. One way to make derivatives feasible for risk-averse investors is delta-hedging. In general hedging is essential to the theory of warrant pricing.

These days financial institutions and speculators hold nontrivial amounts of derivatives and they want them to be hedged. Improper hedging may bring unexpected future losses. However, forming a hedged portfolio and consequent rebalancing is always problematic.

Delta-hedging is a possibility how to protect a portfolio from unnecessary risk. This method's basic idea is that investor tries to stay in delta-neutral position with his portfolio as it is resistant to the small changes in underlying asset's price of the derivative he hedge. This method is derived from Black-Scholes option pricing model (Black and Scholes, 1973). The use of this theoretical model is problematic because as it is known real markets do not behave how Black-Scholes model presumes. Many of assumptions of the model are not fulfilled by real markets. For example, one assumption says that investor can trade continuously in time, which is not possible on the floor but nowadays we are meeting this assumption by creating online trading environment, for example Xetra, where we can make operations without time restrictions. Another assumption says that we can buy any fraction of a share which is in fact not possible; we cannot buy one half of a share in real world. Nevertheless Black-Scholes model and delta-hedging are steadily used by financial market's subjects nowadays therefore this topic is highly relevant.

It is also a method which is expensive in terms of transaction costs, because staying in delta-neutral position requires frequent rebalancing. Every change in price leads to different delta and as a consequence the portfolio must be rebalanced by selling or buying additional shares to keep delta equal to zero.

The first paper about delta-hedging under transaction costs was written by Leland (1985). He found out that in Black-Scholes model when rebalancing is made at discrete intervals the expected volume of transaction costs becomes unbounded as the frequency of rebalances grows.

According to Nandi and Waggoner (2000) it is important to find correct approach to delta-hedging. We must distinguish between frequent rebalancing costing us a lot of money and rare rebalancing costing us less money but taking us far from the optimal portfolio where hedging is not effective.

Earlier work by Hodges and Neuberger (1989) who analysed hedging of European call options under the transaction costs under the condition of maximising utility led to conclusion that the approach depends on the risk profile of an investor. Willmott and Whalley (1993) also studied hedging at discrete intervals. The framework of the model has been broadened by Clewlow and Hodges (1997). Other authors also applied different approaches – e.g. binomial trees (Boyle and Vorst, 1992).

All foreheads mentioned authors were always concerned with options. Aim of this paper is not to do research on options but on warrants. Author states that no valid study on delta-hedging under transaction costs in relation to warrants is available, especially for European financial markets, although our earlier research brought some interesting facts about delta-hedging without rebalancing and without transaction costs (Florjanová, 2015). For these reasons author of this paper believes it is important to investigate consequences of delta-hedging on real markets because this strategy is often used by its participants. Paper follows earlier works and extends the theory to warrants.

Transaction costs in this paper comprise commissions but bid-ask spread is omitted.

2 Methodology and Data

We make analysis in the standard Black-Scholes option pricing model. We use warrants which have shares as underlying assets. We assume that the price of a warrant is approximately equal to the price of an option. Also we assume that the price of an American call warrant is approximately equal to the price of a European call warrant without dividends:

$$W(S_t, K, r, T, \sigma) = S_t N(d_1) - Ke^{-rT} N(d_2) \quad (1)$$

where S_t stands for a spot price of an underlying asset of a warrant, K is a strike price, T is time to maturity, r is risk-free interest rate, σ stands for volatility and $N(\cdot)$ represents distribution function of normal distribution and

$$d_1 = \frac{\ln \frac{S_0}{K} + \left(r + \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}} \quad (2)$$

$$d_2 = \frac{\ln \frac{S_0}{K} + \left(r - \frac{\sigma^2}{2}\right)T}{\sigma\sqrt{T}} \quad (3)$$

Variable Delta (Δ) is a characteristic of a warrant which shows how the change in price of a warrant depends on changes in the price of an underlying asset (Hull, 2012). It is a coefficient measuring the dependence of one price moving on another. It can be derived from Black-Scholes model as follows:

$$\Delta_W = \frac{\Delta W}{\Delta S_0} \approx \frac{\partial W}{\partial S_0} = \frac{\partial S_0 N(d_1) - K e^{-rT} N(d_2)}{\partial S_0} \quad (4)$$

After calculation of equation (4) we get:

$$\Delta_W = N(d_1) = \int_{-\infty}^{d_1} \frac{1}{\sqrt{2\pi}} e^{-\frac{x^2}{2}} dx \quad (5)$$

Similarly we have to calculate Delta of a share:

$$\Delta_{S_0} = \frac{\Delta S_0}{\Delta S_0} = 1 \quad (6)$$

We construct 30 portfolios consisting of N_W warrants and corresponding amount of shares. To hedge one warrant in portfolio we need the amount of Δ_W shares, which are the underlying assets of that particular warrant. For call warrants we have to sell shares, for put warrants we have to buy shares. We assume we currently hold N_S shares in each case.

We are in delta-neutral position if $\Delta_p = 0$. Therefore we need $N_S - n$ shares in a portfolio where

$$n = N_W \cdot \Delta_W \quad (7)$$

At time t price of a warrant is equal to W_t and the price of a share is S_t . We calculate the value of the portfolio in given time intervals by the equation:

$$P_t = N_W \cdot W_t + (N_S - n) S_t \quad (8)$$

Transaction costs are calculated as a sum of trading fees for warrants and shares separately.

$$C = f_W + v_W \cdot V_W + f_S + v_S \cdot V_S \quad (9)$$

where f_W and f_S stand for fixed costs and v_W and v_S stand for variable costs. Other transaction costs and VAT we omit.

Calculation of relative rate of return R of both delta-hedged (P_D) and non-hedged portfolios (P_N) is given by the formula

$$R = \frac{P_N - P_D}{P_N} \cdot 100\% \quad (10)$$

In addition we calculate how much was the risk reduced:

$$AR = \frac{R_N - R_D}{R_N} \cdot 100\% \quad (11)$$

where AR stands for avoided risk, R_N is risk of non-hedged portfolio and R_D is risk of delta-hedged portfolio.

Finally we are able to compute how much does one percent of reducing risk cost us in transaction costs. The lowest number is the best option.

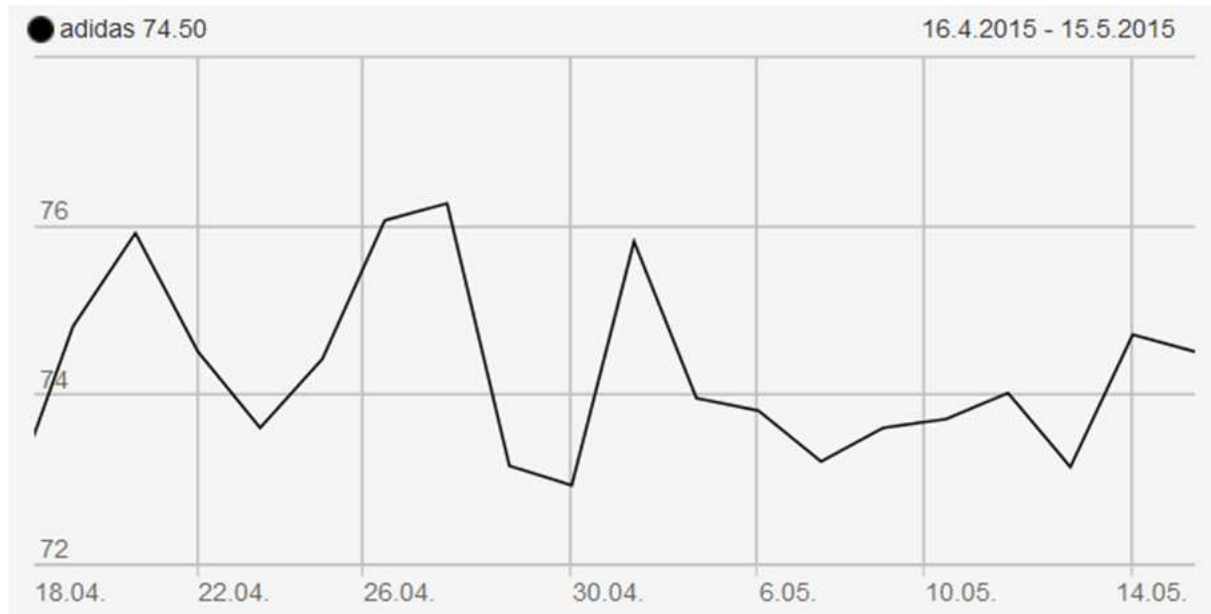
We presume no spread between bid and ask price, we use daily opening prices.

Data was gathered from Frankfurt Stock Exchange. It has been chosen because in the European area it is the most liquid stock exchange in terms of trading warrants. From plenty possibilities warrants on shares of Adidas were chosen. These shares belong to well-known company so they are liquid and provide smooth conditions for further examination.

The dataset consists of 30 different warrants, each 10 of them issued by different financial institution:

- HSBC Trinkaus & Burkhardt AG
- Commerzbank AG
- HypoVereinsbank/UniCredit.

Figure 1 Adidas Performance



Source: Frankfurt Stock Exchange

The features which all of the warrants in the dataset have in common is the exercise date 06/17/2015, type: American plain vanilla call, underlying asset: share of Adidas AG and denomination in Euros. We count with risk-free interest rate of 3 %.

As the exercise date is 06/17/2015 and we presume forming the initial portfolios on 04/17/2015, we rebalance the portfolios on 04/24/2015, 04/30/2015, 05/08/2015 and exercise it on 05/15/2015 for one week rebalancing interval, rebalance on 04/30/2015 and exercise on 05/15/2015 for two week interval and exercise on 05/15/2015 with no rebalancing for the last case. Assuming following notation

- $t = -4$ for 04/17/2015, $T_{-4} = 40/240$
- $t = -3$ for 04/24/2015, $T_{-3} = 35/240$
- $t = -2$ for 04/30/2015, $T_{-2} = 30/240$
- $t = -1$ for 05/08/2015, $T_{-1} = 25/240$
- $t = 0$ for 05/15/2015, $T_0 = 20/240$

as we usually work with 240 trading days a year.

Table 1 Price of Adidas Share (in Euro)

Date	$t(0)$	$t(-1)$	$t(-2)$	$t(-3)$	$t(-4)$
Price	74.01	73.60	72.92	74.41	72.75

Source: Author's own adjustment based on Frankfurt Stock Exchange data

We gathered needed variables for Black-Scholes model, see table 2.

Table 2 Characteristics of Warrants, Part 1

WKN	Issuer	Strike	σ_0	σ_{-1}	σ_{-2}	σ_{-3}	σ_{-4}
TB3VR3	HSBC	60	0.47	0.36	0.10	0.10	0.32
TB3VR4	HSBC	65	0.38	0.30	0.20	0.15	0.27
TB3VR5	HSBC	68	0.34	0.30	0.24	0.15	0.23
TB3VR6	HSBC	76	0.27	0.28	0.25	0.22	0.22
TB3VR7	HSBC	80	0.27	0.28	0.25	0.22	0.22
TB3VR8	HSBC	84	0.28	0.30	0.26	0.23	0.22
TB3VR9	HSBC	90	0.35	0.23	0.23	0.18	0.19
TB5BN1	HSBC	75	0.27	0.27	0.23	0.21	0.22
TB5BMZ	HSBC	100	0.51	0.36	0.33	0.28	0.29
TB5BN0	HSBC	70	0.31	0.29	0.24	0.20	0.24
CZ3PW5	Commerz	84	0.29	0.27	0.28	0.23	0.25
CZ3PWA	Commerz	100	0.51	0.35	0.33	0.28	0.28
CZ3PW1	Commerz	70	0.29	0.29	0.25	0.20	0.25
CZ3PW2	Commerz	74	0.27	0.27	0.26	0.21	0.24
CZ3PW6	Commerz	88	0.34	0.29	0.32	0.27	0.25
CZ3PW3	Commerz	78	0.27	0.26	0.27	0.22	0.24
CZ3PW9	Commerz	98	0.48	0.33	0.36	0.30	0.30
CZ3PW4	Commerz	80	0.27	0.26	0.27	0.22	0.24
CZ3PW7	Commerz	90	0.37	0.56	0.53	0.45	0.46
CZ3PW0	Commerz	68	0.31	0.29	0.22	0.16	0.25
HY1DPZ	UniCredit	84	0.29	0.27	0.26	0.23	0.22
HY1DP0	UniCredit	85	0.29	0.25	0.27	0.22	0.24
HY1DP1	UniCredit	86	0.29	0.27	0.25	0.24	0.22
HY1DP2	UniCredit	87	0.30	0.20	0.47	0.40	0.41
HY1DP7	UniCredit	92	0.38	0.25	0.25	0.20	0.22
HY1DQN	UniCredit	107	0.58	0.40	0.40	0.35	0.35
HY1PKH	UniCredit	80	0.27	0.26	0.27	0.22	0.22
HY1PKJ	UniCredit	82	0.28	0.25	0.27	0.23	0.23
HY199J	UniCredit	76	0.27	0.25	0.25	0.22	0.23
HY199K	UniCredit	78	0.26	0.25	0.26	0.23	0.23

Source: Author's own adjustment based on Frankfurt Stock Exchange data

Assuming we currently hold 100 shares of Adidas and 100 call warrants on these shares in each and every portfolio. We need to form delta-neutral portfolios, find out how much is the delta and how many shares do we have to sell to be in delta-neutral position, see table 3.

Table 3 Characteristics of Warrants, Part 2

WKN	W_0	W_{-1}	W_{-2}	W_{-3}	W_{-4}	Δ_{W0}	Δ_{W-1}	Δ_{W-2}	Δ_{W-3}	Δ_{W-4}
TB3VR3	1.44	1.39	1.31	1.44	1.33	0.94	0.97	1.00	1.00	0.94
TB3VR4	0.96	0.91	0.83	0.96	0.86	0.88	0.91	0.96	0.99	0.87
TB3VR5	0.69	0.66	0.58	0.68	0.59	0.81	0.82	0.82	0.95	0.79
TB3VR6	0.16	0.17	0.15	0.19	0.15	0.39	0.39	0.35	0.44	0.35
TB3VR7	0.055	0.07	0.06	0.08	0.06	0.19	0.20	0.17	0.22	0.17
TB3VR8	0.011	0.03	0.02	0.03	0.02	0.07	0.10	0.07	0.10	0.07
TB3VR9	0.001	0.001	0.001	0.001	0.001	0.04	0.00	0.01	0.00	0.00
TB5BN1	0.19	0.2	0.16	0.22	0.18	0.45	0.45	0.40	0.50	0.41
TB5BMZ	0.001	0.001	0.001	0.001	0.001	0.03	0.01	0.00	0.00	0.00
TB5BN0	0.52	0.5	0.43	0.53	0.46	0.74	0.73	0.72	0.81	0.69
CZ3PW5	0.02	0.02	0.03	0.03	0.03	0.08	0.08	0.09	0.10	0.10
CZ3PWA	0.001	0.001	0.001	0.001	0.001	0.03	0.00	0.00	0.00	0.00
CZ3PW1	0.51	0.5	0.44	0.53	0.47	0.75	0.73	0.71	0.81	0.68
CZ3PW2	0.25	0.25	0.23	0.28	0.25	0.52	0.51	0.47	0.56	0.47
CZ3PW6	0.011	0.01	0.02	0.02	0.01	0.05	0.03	0.06	0.06	0.04
CZ3PW3	0.098	0.1	0.11	0.13	0.11	0.28	0.27	0.27	0.32	0.27
CZ3PW9	0.002	0.001	0.004	0.003	0.003	0.03	0.00	0.01	0.01	0.01
CZ3PW4	0.058	0.06	0.07	0.08	0.07	0.19	0.18	0.19	0.22	0.19
CZ3PW7	0.007	0.1	0.1	0.1	0.1	0.05	0.16	0.16	0.16	0.16
CZ3PW0	0.67	0.65	0.57	0.68	0.61	0.83	0.82	0.84	0.94	0.78
HY1DPZ	0.014	0.02	0.02	0.03	0.02	0.08	0.08	0.07	0.10	0.07
HY1DP0	0.009	0.01	0.02	0.02	0.02	0.07	0.04	0.06	0.07	0.07
HY1DP1	0.005	0.01	0.01	0.02	0.01	0.05	0.04	0.04	0.07	0.04
HY1DP2	0.003	0.001	0.1	0.1	0.1	0.04	0.01	0.17	0.18	0.17
HY1DP7	0.001	0.001	0.001	0.001	0.001	0.03	0.00	0.01	0.00	0.01
HY1DQN	0.001	0.001	0.001	0.001	0.001	0.02	0.00	0.00	0.00	0.00
HY1PKH	0.053	0.06	0.07	0.08	0.06	0.19	0.18	0.19	0.22	0.17
HY1PKJ	0.028	0.03	0.04	0.05	0.04	0.12	0.10	0.13	0.16	0.12
HY199J	0.16	0.15	0.15	0.19	0.16	0.39	0.38	0.35	0.44	0.36
HY199K	0.09	0.09	0.1	0.13	0.1	0.27	0.26	0.26	0.32	0.26

Source: Author's own adjustment based on Frankfurt Stock Exchange data

We form the portfolios of 100 - n shares where

$$n = 100 \cdot \Delta_W \quad (12)$$

That means we have to sell n shares.

3 Results and Discussion

The value of portfolio at time t is equal to

$$P_t = 100 \cdot W_t + (100 - n_t) S_t \quad (13)$$

Transaction costs are calculated as a sum of trading fees for warrants and shares separately. We assume trading within an anonymous but real financial institution. Its fees are 2 euros plus 0.02 % of trading volume for shares and 2 euros plus 0.1 % of trading volume for warrants. Other transaction costs and VAT we omit. Transaction costs C are equal to:

$$C = 2 + 0,001 \cdot V_W + 2 + 0,0002 \cdot V_S \quad (14)$$

Firstly see results for one week interval of rebalancing in table 4.

Table 4 Portfolios' Numerical Features, One Week Rebalancing

WKN	#S ₀	#S ₋₁	#S ₋₂	#S ₋₃	#S ₋₄	P ₀	P ₋₄	C	R _D	R _N	AR
TB3VR3	6	3.26	0.00	0.00	5.72	588.06	549.29	15.82	4.18	8.27	49.50
TB3VR4	12	8.63	4.32	0.68	13.09	984.12	1037.94	15.80	-6.71	11.63	157.68
TB3VR5	19	18.46	18.14	4.67	20.63	1475.19	1559.90	15.73	-6.44	16.95	137.99
TB3VR6	61	60.85	64.86	56.26	65.03	4530.61	4745.66	14.86	-4.84	6.67	172.67
TB3VR7	81	80.04	83.19	77.88	83.07	6000.31	6049.70	14.47	-1.06	-8.33	87.33
TB3VR8	93	90.45	92.84	90.09	92.95	6884.03	6763.99	14.26	1.56	-45.00	103.48
TB3VR9	96	99.57	99.38	99.62	99.59	7105.06	7244.94	14.07	-2.12	0.00	NA
TB5BN1	55	55.44	60.22	50.15	59.43	4089.55	4341.35	14.99	-6.15	5.56	210.62
TB5BMZ	97	99.47	99.56	99.62	99.51	7179.07	7239.76	14.05	-1.03	0.00	NA
TB5BN0	26	26.90	28.49	18.53	31.09	1976.26	2307.79	15.47	-15.04	13.04	215.28
CZ3PW5	92	92.47	91.01	90.09	90.47	6810.92	6584.69	14.19	3.22	-33.33	109.66
CZ3PWA	97	99.57	99.56	99.62	99.63	7179.07	7248.50	14.04	-1.15	0.00	NA
CZ3PW1	25	26.90	29.15	18.53	31.65	1901.25	2349.37	15.50	-19.73	8.51	331.88
CZ3PW2	48	49.31	52.92	43.50	52.94	3577.48	3876.65	15.08	-8.11	0.00	NA
CZ3PW6	95	96.63	94.20	93.74	96.12	7032.05	6993.62	14.16	0.35	10.00	96.53
CZ3PW3	72	73.00	73.19	67.97	72.94	5338.52	5317.74	14.58	0.12	-10.91	101.07
CZ3PW9	97	99.54	98.71	98.95	99.01	7179.17	7203.37	14.07	-0.53	-33.33	98.41
CZ3PW4	81	81.98	81.16	77.88	80.77	6000.61	5883.20	14.41	1.75	-17.14	110.21
CZ3PW7	95	84.26	84.36	84.03	84.44	7031.65	6152.70	14.41	14.05	-93.00	115.11
CZ3PW0	17	17.73	16.23	5.75	22.32	1325.17	1684.43	15.69	-22.26	9.84	326.31
HY1DPZ	92	92.47	92.68	90.09	93.32	6810.32	6791.32	14.20	0.07	-30.00	100.24
HY1DP0	93	95.60	93.56	93.19	93.17	6883.83	6779.85	14.18	1.32	-55.00	102.41
HY1DP1	95	95.61	96.25	93.13	96.10	7031.45	6992.24	14.17	0.36	-50.00	100.72
HY1DP2	96	99.40	83.07	82.08	83.02	7105.26	6050.02	14.58	17.20	-97.00	117.73
HY1DP7	97	99.64	99.45	99.64	99.40	7179.07	7231.59	14.06	-0.92	0.00	NA
HY1DQN	98	99.75	99.55	99.56	99.53	7253.08	7240.55	14.04	-0.02	0.00	NA
HY1PKH	81	81.98	81.16	77.88	83.07	6000.11	6049.70	14.41	-1.06	-11.67	90.93
HY1PKJ	88	89.62	87.34	84.43	87.99	6515.68	6405.29	14.33	1.50	-30.00	105.00
HY199J	61	62.50	64.86	56.26	64.25	4530.61	4690.47	14.85	-3.72	0.00	NA
HY199K	73	73.91	74.08	67.53	74.27	5411.73	5412.94	14.61	-0.29	-10.00	97.08

Note: #S_t stands for amount of shares involved in portfolio

Source: Author's own adjustment based on Frankfurt Stock Exchange data

For rebalancing interval of two weeks and *never* we used similar process and final results are available at table 5.

Table 5 Comparison of Transaction Costs and AR for Different Intervals of Rebalancing

WKN	C	1	2	C	AR	1	AR	2	AR	How much we paid for 1
	week	weeks	weeks	never	week	weeks	weeks	never	never	% of risk reduction
TB3VR3	15.82	11.82	9.74	49.50	40.69	36.10	0.32	0.29	0.27	
TB3VR4	15.80	11.69	9.62	157.68	154.28	152.57	0.10	0.08	0.06	
TB3VR5	15.73	11.33	9.56	137.99	136.32	135.66	0.11	0.08	0.07	
TB3VR6	14.86	10.60	9.44	172.67	171.32	170.96	0.09	0.06	0.06	
TB3VR7	14.47	10.29	9.46	87.33	88.16	88.33	0.17	0.12	0.11	
TB3VR8	14.26	10.11	9.48	103.48	103.61	103.63	0.14	0.10	0.09	
TB3VR9	14.07	10.06	9.43	NA	NA	NA	NA	NA	NA	
TB5BN1	14.99	10.72	9.44	210.62	208.84	208.32	0.07	0.05	0.05	
TB5BMZ	14.05	10.05	9.44	NA	NA	NA	NA	NA	NA	
TB5BN0	15.47	11.18	9.49	215.28	213.85	213.29	0.07	0.05	0.04	
CZ3PW5	14.19	10.17	9.51	109.66	109.84	109.87	0.13	0.09	0.09	
CZ3PWA	14.04	10.04	9.44	NA	NA	NA	NA	NA	NA	
CZ3PW1	15.50	11.19	9.46	331.88	329.72	328.85	0.05	0.03	0.03	
CZ3PW2	15.08	10.81	9.45	NA	NA	NA	NA	NA	NA	
CZ3PW6	14.16	10.10	9.46	96.53	95.95	95.86	0.15	0.11	0.10	
CZ3PW3	14.58	10.44	9.48	101.07	101.78	101.95	0.14	0.10	0.09	
CZ3PW9	14.07	10.04	9.45	98.41	98.57	98.60	0.14	0.10	0.10	
CZ3PW4	14.41	10.30	9.49	110.21	110.62	110.70	0.13	0.09	0.09	
CZ3PW7	14.41	10.40	9.64	115.11	115.18	115.19	0.13	0.09	0.08	
CZ3PW0	15.69	11.36	9.51	326.31	323.69	322.58	0.05	0.04	0.03	
HY1DPZ	14.20	10.12	9.46	100.24	100.44	100.47	0.14	0.10	0.09	
HY1DP0	14.18	10.12	9.48	102.41	102.52	102.53	0.14	0.10	0.09	
HY1DP1	14.17	10.08	9.46	100.72	100.83	100.85	0.14	0.10	0.09	
HY1DP2	14.58	10.45	9.68	117.73	117.80	117.82	0.12	0.09	0.08	

HY1DP7	14.06	10.05	9.44	NA	NA	NA	NA	NA	NA
HY1DQN	14.04	10.03	9.46	NA	NA	NA	NA	NA	NA
HY1PKH	14.41	10.29	9.46	90.93	91.52	91.63	0.16	0.11	0.10
HY1PKJ	14.33	10.20	9.48	105.00	105.21	105.25	0.14	0.10	0.09
HY199J	14.85	10.62	9.46	NA	NA	NA	NA	NA	NA
HY199K	14.61	10.41	9.47	97.08	97.85	98.03	0.15	0.11	0.10

Note: NA stands for Not Available (cause: dividing by zero)

Source: Author's own adjustment based on Frankfurt Stock Exchange data

Afterwards we can compare how much is hedging expensive for each strategy by computing its simple average, see table 6.

Table 6 Average Cost of Reducing Risk by 1 %

	C 1 week	C 2 weeks	C never
Average cost (in euros)	0.13	0.10	0.09

Source: Author's own adjustment

Apparently the never-hedging strategy is cheaper than other strategies with regular intervals of hedging, because 1 % of risk reduction costs approximately 9 cents, while when rebalancing every two weeks it is 10 cents and for one week interval of rebalancing it is 13 cents.

4 Conclusions

The main aim of this paper was to answer the question how expensive is hedging of delta-hedged portfolios. On a sample of 30 delta-hedged portfolios of American plain vanilla call warrants on Adidas shares and these shares which were rebalanced in three different intervals of time it was shown that the average costs to avoid a unit of risk are growing as the rebalancing is more frequent. The average cost of reducing risk by 1 % was 9 cents for never rebalanced portfolios, 10 cents for every two weeks rebalanced portfolios and 13 cents for every week rebalanced portfolios. However investor must operate with the fact that the less often he rebalances the less risk will be avoided in general so it is not clever to make decisions only on the amount of money he spend on that.

These results are valid under the Black-Scholes model approach. Transaction costs involve commissions but omit taxes and other possible fees. It is assumed that there is no bid-ask spread and it is possible to buy even a fraction of a share. We used daily opening prices which were obtained from Frankfurt Stock Exchange as a representative of the most liquid stock exchanges in Europe in terms of trading warrants. Our results are in accordance with papers focused on options. We may conclude that in this case warrants behave similarly to options.

Acknowledgements

Support of Masaryk University within the project MUNI/A/0916/2015 "Behavioral and knowledge aspects of trading and pricing financial assets" is gratefully acknowledged.

References

- Black, F., Scholes, M. (1973). The Pricing of Options and Corporate Liabilities. *Journal of Political Economy*, vol. 81(3), pp. 637-654.
- Boyle, P., Vorst, T. (1992). Option replication in discrete time with transaction costs. *Journal of Finance*, vol. 47, pp. 259-282.
- Clelland, L., Hodges, S. (1997). Optimal delta-hedging under transaction costs. *Journal of Economic Dynamics and Control*, vol. 21(8-9), pp. 1353-1376.

Florianová, H. (2015). Delta-hedging of Warrants: Evidence from Frankfurt Stock Exchange. In: Hromada, E., ed., *Procedia Economics and Finance*. Rome: Elsevier, pp. 239-244.

Hodges, S., Neuberger, A. (1989). Optimal replication of contingent claims under transaction costs. *The Review of Futures Markets*, vol. 8, pp. 222-239.

Hull, J. (2012). *Options, futures and other derivatives*, 8th ed. Boston: Pearson.

Nandi, S., Waggoner, D. (2000). Issues in hedging options positions. *Economic Review, Federal Reserve Bank of Atlanta*, vol. Q1, pp. 24-39.

Whalley, A., Wilmott, P. (1993). Counting the Cost. *Risk*, vol. 6, pp. 59-66.

Comparative Study of Banking Sector in Republic of Moldova and Czech Republic

Frunza Irina¹

¹ Academy of Economic Studies of Moldova
Faculty of Finance and Insurance, Department of Finance
Banulescu-Bodoni G., 61, MD-2005, Chisinau, Republic of Moldova
E-mail: irina.stegarescu@yahoo.com

Abstract: *The paper deals with the factors affecting the development of the Moldovan banking system and what experience can Moldova take from Czech Republic to meet the standards of EU integration. In this meaning, was evaluated the situation in the sector compared to the banking system from Czech Republic, based on series of conventional indicators. The result explain the causes of high cost of credit, high levels of inefficiency and the systemic weaknesses, as well as other major factors hindering dynamic development of the banking sector. The experience of the Czech Republic as an EU Member State, is useful for Moldova in terms of transformation of the banking sector into a competitive and functional, which meets the requirements of the post-transformation economy and meet the EU accession standards. Research results highlight the main features of the banking system and solutions for a stable banking system with high performance.*

Keywords: *banking system, financial indicators, efficiency, banks, Moldova, Czech Republic*

JEL codes: *E52, E58, G210, G33*

1 Introduction

The banking system is one of the sectors most deeply embedded in the national economy due to its lending activity, as well as collection and aggregation of savings of the population/companies. Therefore, it is most sensitive to changes regarding the macroeconomic situation and expectations. With the collapse of the socialist bloc and the Soviet Union, Moldova and the Czech Republic have stepped energetically towards building democracies, competitive economical market, and aspiring to become a legitimate part of the European Union. Therefore, the first aim of this study was to highlight the most important features of ways of transition for both countries and to draw important conclusions from the Czech experience for Moldova. Second goal of the reasearch was to identify factors affecting the development of the Moldovan banking system and the measures and strategies implemented by the Czech Republic. In this sense, was evaluated the situation in the sector compared to the banking system from Czech Republic, based on series of conventional indicators: legal framework, structure and financial situation of the banking sector and the evolution of financial indicators for 2006-2015. The research methodology consists of comparative analysis of the Moldovan banking sector with Czech Republic, deductive analysis based on the balance sheets of banks, statistical data analysis from National Czech Bank, National Bank of Moldova and economic freedom index. Czech transition was based on the so-called "Washington Consensus", which can be expressed as follows: liberalization, privatization, stabilization. A source of dissatisfaction was the way privatization was conducted by the government. This process is given special attention, because Moldova has chosen the same method for privatization.

In this study were analyzed the following aspects: regulatory framework of the banking sector both in Moldova and the Czech Republic, laws and regulations of Moldovan and Czech banking sector structure, trends in the evolution of the banking sector, financial situation of the banking sector using financial indicators for a period of 10 years and efficiency of the Moldovan banking sector compared to the banking system in the Czech Republic highlighting banking problems.

The banking legislative framework of the Republic of Moldova. According to Moldovan law, the banking system include: National Bank, commercial banks and other lending institutions. In the banking legislation adopted in 1991, taking into account global banking experience have found new approaches to regulatory issues of monetary circulation and, in general, of the banking activity (IMF 2008). This legislation determines the directing state methods of monetary lending relationships and exposes new legal basis of the model of monetary-credit regulation of economy and economic methods of control over the activity of commercial banks in Moldova, stipulate main regulations for conducting banking operations and design principles of the banking system in Moldova. During the transition, the new legislation of Moldova took over many elements of French, Romanian, Russian, German laws and currently gathering all the characteristics of a civil law system. The legislation consists primarily of the Law on Financial Institutions, Law on the National Bank of Moldova, the Law on Securities Market and the Law on Insurance.

The banking legislative framework of the Czech Republic. The Czech Republic has made a considerable effort to fully adjust its legislation to the *acquis communautaire*, which was supported by the PHARE program and others. The provisions relating to security interest law are contained in the Civil Code of the Czech Republic. The rules of procedure for contentious and execution proceedings are contained in the Civil Procedure Code (ZPO2). The two laws have been strongly influenced by Austrian legal tradition. Before its accession to the EU, the Czech Republic adopted the *acquis communautaire* (body of legislation of the Member States of the European Union) in the field of banking law and banking supervision. Banking supervision is the responsibility of the Czech National Bank (C'eská narodní banka). The legislation consists primarily of Act No. 21/1992 Coll. on Banks, Act No. 219/1995 Coll. the Foreign Exchange Act, Act No. 256/2004 Coll. on Capital Market Undertakings. Since 2004, when the Czech Republic became a EU member, many laws had to be amended. During the years of 2004 – 2013, the Law on banks has been modified 25 times. In 2014, a new civil code was replaced the existing civil law system, which was based on former Austro-Hungarian civil codes and socialist theory and has been amended 40 times since the Communist regime fell in 1989.

2 Methodology and Data

The paper is concerned with the situation of comparing banking sector from 2 different countries: Republic of Moldova and Czech Republic. The study examines which factors affect Moldovan banking system and what measures should be taken, taking in consideration the experience of Czech Republic. The study uses financial data of the banking sector collected from Czech National Bank and National Bank of Moldova, World Bank databases and trading economics indicators. The proposed period was from 2006 to 2015. The methodology is based on comparative and deductive analysis, balance sheets of banks, statistical data analysis and economic freedom index. It was also calculated only for 2014 the profitability indicators: Equity Multiplier (EM) and Net profit rate (Rpn).

Data was analyzed using general variable as: economic growth: the rate of change of real GDP taking into account the inflation of these 2 countries, particular indicators like: Basic rate applied by National Bank from Moldova and Czech Republic, efficiency indicators: ROA, ROE, non-performing loans and all this indicators were analyzed for the period 2006-2015.

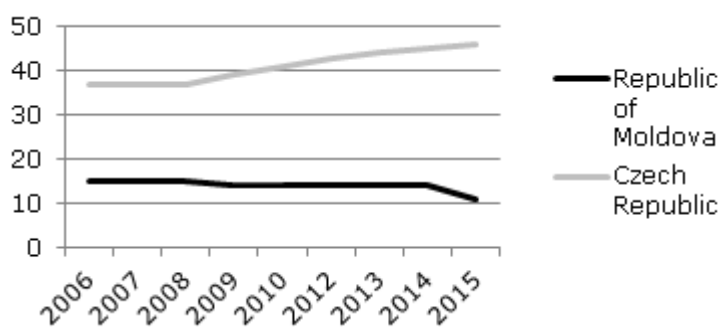
3 Results and Discussion

First of all have to take into account that the Czech Republic is a member of the EU and structure of banking sector differs from that of the Republic of Moldova. A common aspect of both countries is two-tiered banking system: National Bank and commercial banks.

Structure of banking system

Depending on the specific business and legal form of activity in the banking sector in Moldova and Czech Republic we meet the different types of institutions. For example in the Czech Republic are: banks and credit unions. Czech National Bank uses a classification of banks by size of total assets on their organization and specialization. They are distinguished: commercial banks, branches of foreign banks and savings and loan banks for housing. Commercial banks are classified by asset size in three categories: large banks, medium-sized banks and small banks. The Czech banking system is a two-tiered system and consists of: Central Bank (Bank of Issue) and commercial banks. The same structure has the Moldovan banking system: two-tiered system. The main part of banking sector is formed by the group of four large banks (Komerční Banka, Československá obchodní banka, Cezka Sportovní and Unicredit Bank Czech Republic). Besides these institutions exists saving and lending banks in housing area with over 10% market share (*Financial Market Supervision Report 2010, Czech National Bank*), quite high in comparison with Moldova and other countries in Central and Eastern Europe. Compared to Moldova, the Czech banking system has a positive net external position (*Tomsik, 2011*), Czech banks being net lenders in relation to the institutions of the eurozone. As can be seen the concentration in the banking system it is very high, the top three banks controlling about 60% of banking sector assets in 2010. The market share of the credit union segment loans and deposits is very low, below 1%. 44 banks had a banking license in the Czech Republic as of the 2014 year end (Figure 1).

Figure 1 Number of Banks in Republic of Moldova and Czech Republic



Source: Data from www.cnb.cz and www.bnm.md

Contemporary Moldovan banking system includes three basic elements: the Central Bank, commercial banks and specialized financial-credit institutions, comprising both banking organizations as well as non-banks. The structure of the branch network of banks operating in Moldova is determined by administrative-territorial division of the country, being organized as follows: central bank; subsidiaries; agencies and representative offices. Market lacks specialized banks, even if the banks working in the field give priority to one or another market segment. In early 2006, in Moldova were operating 15 commercial banks. It was opened a branch of the famous Austrian bank Raiffeisen Bank. But in 2015 the number of banks decreased, 4 banks were bankrupt. Of the total number of banks, four banks have a capital formed of foreign investments (CB „Mobiasbanca – Groupe Société Générale”, CB "EXIMBANK-Gruppo Veneto Banca", CB ProCredit Bank, RCB Chisinau, 2 of which are subsidiaries of foreign banks (Agora Redaction 2014).

Trends in the evolution of banking sector

In recent years both in Moldova as well as in Czech Republic, defective managed banks, undercapitalized have undergone several changes and have become a functional and competitive banking sector. In Moldova still continue the transformation, passing over some obstacles as: restrictions imposed by Russia which have caused deterioration of the financial situation of exporters of farming products, as a result, these economic agents reimburses bank loans with greater difficulty, but the Moldovan banking system

remains a fairly stable yet, despite the impact of the crisis in the eurozone crisis that has slowed economic boom in Moldova. Following are presented (Table 1) the evolution of trends in the banking sector of the Republic of Moldova and the Czech Republic. The case of the Czech Republic is interesting because, among other things, its banking sector remained stable during the crisis and did not suffer the tremors that affected many other European countries (CNB: *Basic Trends in the Czech Banking Sector 2014*).

Table 1 Trends in the Evolution of the Banking Sector

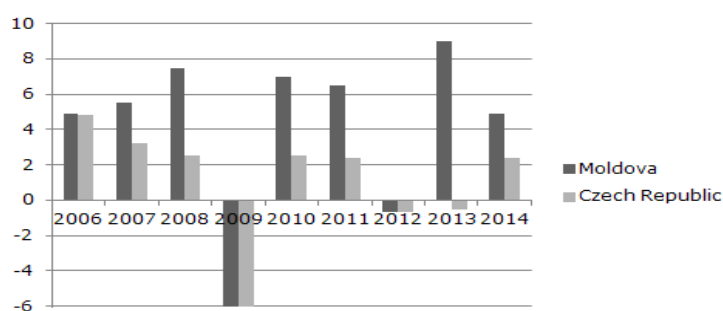
Republic of Moldova	Czech Republic
The share of foreign investments in the banks' capital in 2015 constituted 82.9%, maintaining the same level as in 2014.	Highly concentrated banking sector (TOP4 = 57% of the sector's assets). • 92% of bank assets foreign-owned.
Assets in the banking system increased by 15% compared to the beginning of 2015.	The sector has been very profitable in the EU context.
The long-term liquidity ratio constituted 0.7, down by 0.1 p.p. compared 2014. Current liquidity ration constituted 41.5%, increasing compared to the end of 2014	Total impairment losses decreased significantly by 24.7% in 2015 as a result of a decrease in impairments on loans and receivables (by 23.1%).
The share of non-performing loans in total loans increased, accounting for 9.95% as of 2015.	Credit costs decreased in 2015 both in absolute and relative terms.
The average capital adequacy maintain further at a high level (24%).	Financial assets held for trading comprised 6% of total assets and declined by 75.3% year on year.
Interest rates are declining, although their level is still well above the European average, from 22% in 2014 to 15%- 2015	The evolution of base rate is stable, 0.05% in 2013 till now. Improvements in loan portfolio quality.
Uncertainties about the credit quality and bank capital in 2014 will continue to persist and now.	Maintenance of sufficient capital coverage. The revenues of banks are greatly focused on the provision of loans

Source: National Bank of Moldova (2012), *Annual Report 2012* and Pavlat, V. (2016), *Biggest Czech Banks In The Mirror Of Annual Reports*, Ecoforum, Volume 5, Issue 1 (8), 2016

The financial situation of the banking sector

According to the 2016 Index of Economic Freedom, Moldova ranks 117th globally with the overall score of 57.4, and Czech Republic ranks 21th globally with the overall score of 73.2. The real economic growth rate builds onto the economic growth rate by taking into account the effect that inflation has on the economy. The statistic shows the growth in real GDP in Czech Republic and Republic of Moldova from 2006 to 2015 (Figure 2). Grow potential of Czech Republic remains constrained by impediments to the geographical mobility of workers, skills mismatches and weaknesses in the business-legal environment. Despite a pickup in growth, inflation stayed low, remaining on average below 2% compared to Moldova where inflation rate is above 5%.

Figure 2 Economic Growth: the Rate of Change of Real GDP (%)



Source: Author's own work based on data from investopedia.org

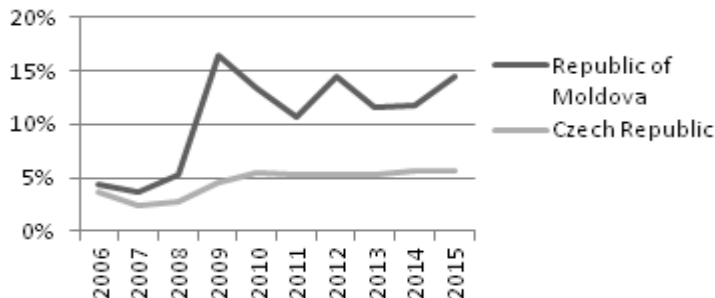
Table 2 Basic Rate (Rate Applied on the Main Short-term Monetary Policy Operation)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Republic of Moldova, %	14,5	15	17	9	6	9,5	4,5	3,5	6,5	22
Czech Republic, %	2,5	3,5	2,25	1	0,75	0,75	0,05	0,05	0,05	0,05

Source: Author's own work based on NBM and CNB of Czech Republic reports

In Republic of Moldova the base interest rate are declining, although their level is still well above the European average, from 22% in 2015 to 15% in this year (Table 2). In Czech Republic in comparison with Moldova the base interest rate is at lower level, and maintains this level from 2012, that has a good impact on bank's activity.

Figure 3 Banking Non Performing Loans to Total Gross Loans (%)



Source: Author's own work based on World Bank data

From figure 3 can be observed that in Republic of Moldova persists the problem of non performing loans, this indicator affects the entire banking sector, in comparison with Czech Republic where this indicator is below 6% and maintains stable. The worsening of quality of the loan portfolio is due to a bad management, high base interest rate, currency depreciation and other factors. The Czech banks have the highest level of assets as % of GDP than Moldovan banks from 90% (2006) increased to over 120% (2015). Bank Assets as % of GDP in Republic of Moldova are below 80%.

Efficiency of Moldovan and Czech banking sector

Banking efficiency study will allow us to compare the performance of the banking system in Moldova with the Czech Republic. The banking sector in Moldova against the Czech Republic, remained poorly integrated into the national economy, placing it on the last places in the region at the Chapter share of lending in GDP (Stavarek D. 2003). Taking the example of the Czech Republic banking sector is stabilised, it shows good financial results and has sufficient capital to cover the assumed risks (Barta and Singer, 2006). Assessing the profitability of commercial banks rely on bank profitability indicators. The main indicators of this analysis are: Return on equity (ROE), Return on assets (ROA),

Equity Multiplier (EM), and Net profit rate indicator (Cociug, V. (2008) "Banking management, collections of problems").

The typical size of ROA is 0.5 - 1%. More than a half of the Czech banks have reached ROA over 1%, which is considered as a success value in the banking industry. The typical size of the ROE in developed countries is approximately 10-12%. A higher rate of return on financial capital could be the effect of a low or elevated expression of ability to obtain through debt, additional resources, as in the case of Moldova in 2006-2007 and 2015.

Table 3 The Value of Bank Efficiency Indicators: ROA, ROE

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	
ROA	Republic of Moldova, %	3,44	3,94	3,49	-0,39	0,54	1,9	1,1	1,5	0,85	2,1
	Czech Republic, %	0,9	1,1	1,2	0,87	1,1	1,19	1,3	1,23	1,19	1,2
ROE	Republic of Moldova, %	20,64	24,16	19,9	-2,12	3,04	10,6	5,6	9,4	5,86	12,78
	Czech Republic, %	12,1	15,3	16,7	13,8	14,4	9,9	11	12,8	7,28	12,9

Source: Author's own work based on reports of NBM and CNB of Czech Republic

We take an example for 2014 and calculate the profitability indicators (table 4) as follow:

- Equity multiplier (EM) - Show indebtedness of the bank, how many times are greater assets than equity

$$EM = \frac{\text{Total assets}}{\text{Equity}} \quad (1)$$

- Net profit rate (Rpn) - shows the relation between expenses and operating income, and effectiveness of expenditure, resource and management and ensure the functioning of the bank:

$$Npr = \frac{\text{Net profit}}{\text{Operating income}} * 100\% \quad (2)$$

Table 4 The Financial and Profitability Indicators

Country	Total assets	Equity	Net profit	Operating income	EM	Npr
Republic of Moldova, mil MDL	69,095	11,765	713	6848	5,87	10,41
Czech Republic, mil CZK	214686	512332	64264	378693	0.41	16,9

Source: own calculation based on data from "Banking management, collections of problems", ASEM 2008 - 137 p.

Matoušek and Taci (2005) examined the efficiency of the Czech-banking system and they found that results indicated that foreign banks were on average more efficient than other banks, although their efficiency was comparable with the efficiency of 'good' small banks in the early years of their operation. Based on these results, it was argued that the early privatization of state-owned commercial banks and a more liberal policy towards foreign banks in the early stages of transition would have enhanced efficiency in the banking system. Stavárek and Polouček (2004) conclude that to achieve greater efficiency, a bank should be large, well-known, easily accessible and offer a wide range of products

and services, or if small, must focus on specific market segments, offering special products (Palečková (Řepková), Iveta, (2013), *Estimation of Banking Efficiency in the Czech Republic: Dynamic Data Envelopment Analysis*).

The problems in the banking sector. For example in Czech Republic this situation occurred after 1990 when of the total of created 18 banks, in the case of nine banks the license was withdrawn or went into special administration procedure and other situation occurred in 1994, when 3 banks went bankrupt (Spulbar C. 2012). The same case was in Republic of Moldova, when in 2015, Moldova's banking sector went through a qualitative and quantitative reorganization process. The National Bank of Moldova ruled to revoke the licenses of financial activity of three commercial banks, with the liquidation process being launched. In table 5 are represented some of problems that faces the banking system from both countries:

Table 5 Problems in the Banking Sector

Republic of Moldova	Czech Republic
<ul style="list-style-type: none"> • Insufficient regulation and supervision; • Lack of secure facilities to use funds in the currency of the Republic of Moldova; • Qualitative deterioration in the structure of loans provided to customers, growing share of poor quality loans to the detriment of good one; • The problem of access to credit is an extremely actual; • High real interest rate; • The involvement of banks in financial service such as capital markets, leasing, factoring, or insurance is low; • Tax evasion and a lack of trust in the banking system are partly to blame. • The national currency went down by 26% in nominal terms against US Dollar and 13% against Euro. • The high level of concentration and relatively low degree of competition in the banking market. 	<ul style="list-style-type: none"> • The overall "political" environment and subsequent pressure for the banks to provide financing for the privatized companies; • Serious flaws in the credit screening processes adopted by many banks implies that the problem of non - performing loans in bank portfolios may become more serious; • The oligopolistic structure of the Czech banking sector during those years, where just a few banks (including the formerly state-owned and still state-controlled banks) played a predominant role; • The high costs of operation of banks; • Excessively high involvement of the banks of a single state can pose a risk of greater instability, especially at times of economic swings and insufficiently diversified portfolios. • The CNB has reservation about enlarging the power and responsibility to inspect nonregular entities within a group.

Source: Tomsik, V. (2011), *Financial System in the Czech Republic: The Story of Two Decades*, National Bank of Moldova Conference

4 Conclusions

This research has enabled a broader analysis of the situation in the banking sector of the Republic of Moldova and the Czech Republic, after which we can deduce following conclusions:

Moldova could benefit enormously from the experience of the social and economic transformations of Czech Republic, achieving the transition to a market economy, maintaining broad access to basic services and establish rule of law. In the transition from a centrally planned economy to a market economy and one-party political system to a democratic regime, the Czech Republic has advanced faster than Moldova. Given that in some cases both countries followed the same path to a market economy, some experiences, positive and negative, can be a lesson for the future development of

Moldova. Although, Czech experience can not be total applied to Moldovan, there are some base lessons which must be appropriated.

In conclusion, macroeconomic stabilization achieved is one of the most significant successes of Moldova in its way to a market economy, but still more efforts must be made to reduce the risks of inflation, even more because inflation is not only a macroeconomic indicator, but an indicator of the economy's competitiveness. As shown in the Czech and Moldovan experience, politically dependent judiciary can significantly undermine banking sector climate. Another important lesson, which is required to be learned from the Czech Republic is the need to build an institutional infrastructure to support the efficient Moldovan banking sector. Banking system policy should be simple and transparent as possible. The chaos in the banking system did not bring economic progress anywhere, so it is necessary to maintain monetary and banking stability. It should be further promoted free and fair competition entering the market: the failed banks must be subject to a modern bankruptcy laws that would protect the rights of creditors. The banks that went bankrupt should not be saved by using state funds, but by privatizing them in transparent auctions with an emphasis on strategic investors with experience. The financial sector should not be forced to provide subsidized loans or lending based on political preferences (bankruptcies banks are very expensive, as shown by the Czech experience).

References

Agora Redaction (2014), *Analysis of banking system of Moldova, assessments, forecasts and recommendations*. Retrieved from: <http://agora.md/analize/14/sistemul-bancar-din-republica-moldova---evaluari-prognoze-si-recomandari>.

Barta, V., Singer, M. (2006), *The banking sector after 15 years of restructuring: Czech experience and lessons*, BIS Papers no. 28.

ČNB (2016). *Annual reports on banking supervisory activities (2006-2015)*. Prague: Czech National Bank. Retrieved from: <http://www.cnb.cz/en/index.html>.

Cociug, V., Cinic, L., Timofei, O. (2008). "Banking management, collections of problems", ASEM Ed. Chisinau.

Economic Research, Federal Reserve Bank of St. Louis: *Bank's Return on Equity for Czech Republic*. Retrieved from: <https://research.stlouisfed.org/fred2/series/>.

IMF (2008) Republic of Moldova: *Financial System Stability Assessment—Update*, Country Report No. 08/274, Washington D.C.

IMF (2010), *Czech Republic: 2010 Article IV Consultation Concluding Statement*. Retrieved from: <https://www.imf.org/external/np/ros/cze/bank.html>.

Matoušek, R., Taci, A. (2005). Efficiency in Banking: Empirical Evidence from the Czech Republic. *Economic Change and Restructuring*, vol. 37, pp. 225–244.

NBM (2016). *Information on financial and economic activities of banks*. Retrieved from: <http://bnm.md/bdi/pages/reports/drsb/DRSB1.xhtml?id=0&lang=en>.

Palečková (Řepková), I., (2013), *Estimation of Banking Efficiency in the Czech Republic: Dynamic Data Envelopment Analysis*, DANUBE: Law and Economics Review, vol. 4, pp. 261-275.

Pavlat, V. (2016), *Biggest Czech Banks In The Mirror Of Annual Reports*, Ecoforum, Volume 5, Issue 1 (8).

Spulbar, C. (2012). *Comparative Analysis of Banking Systems*. Sitech ed. Craiova.

Statistical Data Warehouse (2016), *Financial sector indicators for Czech Republic and Republic of Moldova*. Retrieved from: <http://sdw.ecb.europa.eu/>.

Stavarek, D. (2003), *Banking Efficiency in Visegrad Countries Before Joining the European Union*, Workshop on Efficiency of Financial Institutions and European Integration October 30 – 31, Technical University Lisbon.

Stavárek, D., Polouček, S. (2004). *Efficiency and Profitability in the Banking Sector*. In Polouček, S. (ed.), *Reforming the Financial Sector in Central European Countries*. Hampshire: Palgrave Macmillan Publishers.

Tomsik, V. (2011), *Financial System in the Czech Republic: The Story of Two Decades*, National Bank of Moldova Conference.

World Bank (2013), *Bank non performing loans to total gross loans 2006-2015*. Retrieved from: <http://data.worldbank.org/country/czech-republic>.

Competitiveness Assessment of Slovak Republic Regions

Beáta Gavurová¹, Tatiana Vagašová², Viliam Kováč³

¹ Technical University of Košice
Faculty of Economics, Department of Banking and Investment
Němcovej 32, 04001 Košice, Slovakia
E-mail: beata.gavurova@tuke.sk

² Technical University of Košice
Faculty of Economics, Department of Finance
Němcovej 32, 04001 Košice, Slovakia
E-mail: tatiana.vagasova@tuke.sk

³ Technical University of Košice
Faculty of Economics, Department of Finance
Němcovej 32, 04001 Košice, Slovakia
E-mail: viliam.kovac@tuke.sk

Abstract: *The issue of competitiveness is directly related to international trade. The theories explain the factors of international trade in such a way that there is visible indication of a need to change an approach to understand competitiveness in economic policy. Despite the fact competitiveness is discussed in many studies, there is still no clear definition of this term in the literature. Competitiveness can be viewed from multiple angles. Therefore, it can be analysed at the international level and at the national level too. Besides this introduction, the theoretic part of the paper offers an overview of the approaches applied to not only describe competitiveness as part of trade, but also to measure it and to evaluate it. The special attention is paid to the analysis devoted to the Slovak regions. Local targeting lies in observation the data from the particular regions. One of the approaches understands competitiveness in form of gross domestic product. Our analysis takes it in this way. There are the eleven indicators selected that are able to model the level of competitiveness. These indicators are based on distribution of population, patents, households' income, employment, tertiary educated employed population, unemployment, economic activity of population, health insurance, criminality, municipal waste, and road network.*

Keywords: competitiveness, region, Slovak Republic

JEL codes: C32, C33, R10

1 Introduction

Nowadays, competitiveness is a frequently used concept which involves various approaches relating mainly to the international trade and welfare. In fact, it is concerned with the each economic subject – country, region, enterprise or individual. The most famous world institutions dealing with the competitiveness of the national economy are the International Institute for Management Development and the World Economic Forum.

There are many definitions of competitiveness at the national, regional, and local level. According to the European Competitiveness Report, the economy is competitive when the country's inhabitants have enjoyed the high and rising standard of living, and high employment on a sustainable basis (European Commission Enterprise and Industry Directorate-General – Unit B4, Economic Analysis and Evaluation, 2010). More precisely, the level of economic activity should not cause an unsustainable external balance of the economy, or threaten the well-being of future generations. Storper (1997) defined regional competitiveness as the ability of the region to attract and retain companies with stable or increasing market share while achieving a stable or rising standard of living for those who contribute to it. The most frequently cited author in the discussions on competitiveness, Porter, pointed out that the best measure of the competitiveness of the region relative to other regions is their productivity. Competitiveness is then measured by productivity (Porter, 1999).

Delgado et al. (2012) define competitiveness as the expected level of performance per employee which is supported by the overall quality of the country representing a business location. Their research points out the three interrelated drivers of core competitiveness: social infrastructure and political institutions, monetary and fiscal policies, and microeconomic environment. They also find a positive and separate influence of each driver on output per potential worker. Ilzkovitz et al. (2008) analyse the structural changes that could explain the performance of trade inside countries and between countries too in the euro area. The research revealed a positive relationship between business performance and the degree of technological development.

Structural competitiveness is the field of interest for Mothe and Paquet (1998) who argue that the overall performance of the national economy, flexible structure of its industry, the amount and structure of capital investments, technical infrastructure, and other factors are affected by externalities, namely economic, social and institutional framework of a country. However, many researchers address the regional competitiveness within one country. Fontagne and Santoni (2014) state that competitiveness is a multidimensional concept within the overall level of the country and is the result of the interaction of several independent drivers where individual companies perform the key players. The main determinants of regional competitiveness can be considered agglomeration and their growth, the existence of local institutions, regional policy, infrastructure and public finance. Martin (2005) defined the key determinants of regional competitiveness, namely productive capital, human capital, infrastructure, competitiveness and adaptability of companies, ability to innovate and their interaction with other factors. For comparison of regional competitiveness, he proposes to use an indicator of long-term sustainable economic growth of the region compared to other regions.

Many Czech and Slovak researches devote to the analyses of regional competitiveness and its determinants. Provazníková et al. (2009) describe the regions of the Slovak Republic, the Czech Republic, Poland, Hungary, Lithuania, Latvia, and Estonia. They analysed the role of the regions in these countries. In addition to basic macroeconomic indicators, as gross domestic product, labour productivity, total employment are, they also follow specific factors like age and educational structure of the population, transport infrastructure, investment rate, average wage, disposable income of households, spending on research and development in the regions, employment in science and research, amount of foreign investment. Some studies (Petr et al., 2010; Petr et al., 2011) describe the set of the composite indicators in terms of regional competitiveness using factor analysis and cluster analysis. A group of Slovak regions reached the worst results.

Since 1993, the Slovak Republic has gone through the extensive reforms. These reforms have influenced every aspect of economic and social development. The transformation from a centrally planned economy to a market economy caused changes in understanding of economic and regional policy. This transformation revealed the structural weaknesses of the Slovak economy. These days, the Slovak Republic is a part of the European single market and the euro area. The economic growth, which has been reached in recent years, is reflected in the uneven development of the Slovak regions. This implies that the existing structural barriers have their natural origin at the regional level. The several analyses deal with the economic and demographic factors that impact on global or national competitiveness (Šikula, 2006; Hošoff and Hvozdková, 2009; Šikula, 2010). For example, corporate sector, labour market, and foreign direct investment belong to the economic factors. Human potential performs as an instance of demographic factor. Analysis of the selected structural characteristics is described by the Frank (2014) who defines the main trends and barriers in the Slovak regions throughout the main macroeconomic indicators, demographic trends, income and educational level, and the impact of the implementation of cohesion policy on regional competitiveness. Morovská et al. (2009) argue that regional competitiveness is closely related to the four main aspects, namely the structure of economic activities, the level of innovation, the degree of accessibility of the region, and the level of education. Lábaj (2014) points out

that the increasing interdependence of national economies leads to necessity to revise the traditional view on comparative advantages and competitiveness of the economies at the national or regional level.

2 Methodology and Data

The dataset involves the eleven variables. It was obtained from the database of the Statistical Office of the Slovak Republic (Štatistický úrad Slovenskej republiky) which provides primary source these statistics.

Data

As the elementary input data for the regression modelling process, the mid-year state of all the variables is applied from 1993 to 2012.

The eleven elementary fields covering contents of regression analysis are:

- distribution of population;
- patents;
- households' income;
- employment;
- tertiary educated employed population;
- unemployment;
- economic activity of population;
- health insurance;
- criminality;
- municipal waste;
- road network.

Methodology

We have applied the regression analysis for the panel dataset. The selected methodology of the regression analysis is a pooling approach. This choice was done according to the executed tests that show usage of this methodology as the most appropriate manner to examine such a dataset.

After choice of the pooling approach, we performed the Baltagi-Li joint test to find out presence of random effects. Difficult issue of this test is that it can reveal influence of random effects also with presence of serial autocorrelation. The model has χ^2 test statistics at level of 39.503 with 2 degrees of freedom and p-value at $3,276 \cdot 10^{-10}$. This outcome means rejection of the zero hypothesis, which signals absence of random effects or serial autocorrelation. That is why, it should involve random effects.

To confirm the outcome of the Baltagi-Li joint test, it is appropriate to perform another test revealing random effects themselves. The Bera-Sosa-Escudero-Yoon locally robust test investigates a presence of random effects within the regression model. Its forte lies in revealing local serial correlation itself. The model test statistics stands at 38.767 with one degree of freedom and p-value at level of $4.774 \cdot 10^{-10}$. This test gives the result in terms of rejecting the zero hypothesis stating random effects are present in form of sub-random effects. It means their presence is confirmed, but they do not have such a big influence on explaining the explained dimension.

The subsequent step is continuation of the previous finding – taking the Wooldridge test to explore found random effects. Its z test statistics reaches value of -1.0238 with p-value at level of 0.3059. This demonstrates that the zero hypothesis cannot be rejected. It means individual effect is observed.

Model Specification

The above mentioned dimensions are represented by the ten variables involved in the regression model. Each one is evaluated individually.

Hence, the regression analysis has the subsequent equation:

$$GDP = \beta_0 + \beta_1 PS + \beta_2 TEEPTP + \beta_3 MHI + \beta_4 EP + \beta_5 TEEP + \beta_6 UR + \beta_7 EAP + \beta_8 HI + \beta_9 C + \beta_{10} MW + \beta_{11} RN \quad (1)$$

where involved variables mean:

- GDP – gross domestic product
- β_0 – a constant value;
- β_1 – regression coefficient of the PS variable;
- PS – a population share of a self-governing region;
- β_2 – regression coefficient of the TEEPTP variable;
- TEEPTP – a tertiary educated employed population to a number of patents ratio;
- β_3 – regression coefficient of the MHI variable;
- MHI – households' income per capita per month in euro;
- β_4 – regression coefficient of the EP variable;
- EP – employed population;
- β_5 – regression coefficient of the TEEP variable;
- TEEP – tertiary educated employed population without constantly preparing for profession;
- β_6 – regression coefficient of the UR variable;
- UR – unemployment rate;
- β_7 – regression coefficient of the EAP variable;
- EAP – economically active population;
- β_8 – regression coefficient of the HI variable;
- HI – expenditures on health insurance in thousands of euro;
- β_9 – regression coefficient of the C variable;
- C – a number of malfeasances;
- β_{10} – regression coefficient of the MW variable;
- MW – a weight of municipal waste per capita in tons;
- β_{11} – regression coefficient of the RN variable;
- RN – a length of newly built expressways in kilometres.

3 Results and Discussion

The estimated regression coefficients of the variables involved in the model and their related p-values are displayed in the Table 1 Regression Model Attributes.

Table 1 Regression Model Attributes

Variable	Estimated regression coefficient	p-value	Statistical significance
β_0	$1.0642 \cdot 10^4$	$2.133 \cdot 10^{-4}$	****
PS	$2.5053 \cdot 10^5$	$4.156 \cdot 10^{-11}$	****
TEEPTP	$1.2047 \cdot 10^7$	0.0268961	**
MHI	14.426	0.0024199	***
EP	32.201	0.0703163	*
TEEP	45.548	0.0355422	**
UR	241.16	$6.615 \cdot 10^{-4}$	****
EAP	0.082	$1.449 \cdot 10^{-6}$	****
HI	0.018	$8.405 \cdot 10^{-7}$	****
C	0.2253	$3.356 \cdot 10^{-7}$	****
MW	0.0092	0.1171078	
RN	15.813	0.0201003	**

Source: Own elaboration by the authors

Legend for the Table 1 – the boundaries for the statistical significance levels are set to be as follows:

- the first level – marked * – p-value is lower than 0.1 including but higher than 0.05;
- the second level – marked ** – p-value is lower than 0.05 including but higher than 0.01;
- the third level – marked *** – p-value is lower than 0.01 including but higher than 0.001;
- the fourth level – marked **** – p-value is lower than 0.001 including.

There are six positively influencing variables and five variables which affect negatively the explained indicator quantified in the regression model. Tertiary educated employed population, households' income, criminality, economic activity of population, health insurance, and municipal waste increase the explained indicator, whilst patents, distribution of population, unemployment rate, road network and employed population decrease the main estimated variable. The biggest influence in a positive way tertiary educated employed population has and in a negative way patents have. The most statistically significant variable is distribution of population, but there are four others in the highest significance level where criminality, households' income, economic activity of population and unemployment rate belong. The second level of statistical significance is reached by health insurance. Road network, tertiary educated employed population, and patents are significant at the third level. From all the statistically significant variables, the less important employed population is. The sole variable is insignificant according to the common threshold of ten-per-cent level – municipal waste. Although, there is to note that its p-value only very slightly oversteps this boundary and stands at level of 0.1171. Therefore, it can be considered to be statistically significant enough for this model. To sum it all up, all the comprised variables are significant in terms of purpose of this model and their regression coefficients are interpretable.

The regression model equation looks like:

$$\begin{aligned}
 GDP = & 10642 + 250530 PS + 12047000 TEEPTP + 14.426 MHI + 32.201 EP + \\
 & + 44.548 TEEP + 241.16UR + 0.082 EAP + 0.018 HI + 0.2254 C + 0.0092 MW + \\
 & + 15.813 RN
 \end{aligned} \quad (2)$$

The regression coefficients determine the final value of the explained indicator. The basement is induced by a constant value of 10642. Subsequently, the biggest positive impact is caused by tertiary educated employed population. Each increment of this variable by one unit – one person in this case – brings an addition of 44.55 to the explained variable. If households' income rises by one unit – one euro, it increases gross domestic product by 14.43. Criminality effects also positively and this influence can be considered paradoxically. Each increment of criminality by one unit – by one malfeasance – causes a 0.2254 growth of the explained variable. Economic activity of population measured as a number of economically active inhabitants enhances gross domestic product by 0.082 per every newly economically active person. Each further euro paid in a form of health insurance means enlarge of the explained variable by $1.802 \cdot 10^{-5}$. The last positive indicator is municipal waste, whose increment by one unit – in this case one ton – causes a $9.221 \cdot 10^{-3}$ increase. The biggest negative impact patents have – at level of -12047100, so each increment of this ratio increases gross domestic product by this value. Distribution of population decreases the explained variable by 250526. As it is calculated as a population share of the particular self-governing region, the higher number it is, the higher decrease happens. Therefore, the most uniform distribution of population among all the self-governing regions is appropriate. Reduction of unemployment rate by one unit – by one per cent – causes a 0.0241 cut to the explained variable. Road network as the influencing indicator behaves very surprisingly. Its increase brings diminish of gross domestic product. Each additional unit – a newly built kilometre of expressway – brings reduction by 0.1581. This unexpected point probably lies in the fact that a number of new-built expressways does not involve all the types of

motorways built. We had to take into consideration just right this number, because aggregate sum of all the motorways also comprise roads, which are not available in full profile and by this fact they do not fulfil the factual requirements to become expressways. The least negatively influencing variable is employed population. Every one additional employed inhabitant decreases gross domestic product by $3.22 \cdot 10^{-4}$. Again, this is not expectable outcome, as employment should be one of driving force of economy. The explanation is little bit structured. Firstly, influence of this indicator is very weak and moves on the fourth decimal point. Secondly, unemployment rate effects gross domestic product in a positive way, so a true share of employed people gives the right outcome. Thirdly, employed population does not involve all the working inhabitants, because person employed by work performance agreement outside employment relationship does not count the number of this indicator. Hence, we declare it as a component of the regression model despite its influence.

4 Conclusions

The paper discusses the structural aspects of competitiveness at the level of self-governing regions of the Slovak Republic. The aim of this paper is to identify the impact of monitored variables on gross domestic product per capita using the dataset reflecting the figures of the self-governing regions and to confirm influence of these dimensions on the creation of gross domestic product. The purpose of this analysis is to make a basic scheme for the further regional and national benchmarking.

Most countries in the world have intended to become more dynamic and competitive economy capable of sustainable economic development. A uniform approach to define and measure competitiveness has not been introduced so far. Nevertheless, increasing competitiveness of the particular region is often presented as one of the fundamental objectives of regional policy.

Whatever incorrect assessment of competitiveness of a country may have negative impacts on its social and political stability. On the contrary, negative assessment of the competitiveness can boost economy, mobilise the internal reserves and use certain market gaps. It is able to possess not only economic stimulus, but also psychological influence. Then, this is reflected in the restoration of confidence in the capital markets as well as production growth rate, or other types of outputs with adequate positive consequences in the export increase, employment growth and the consequent growth of domestic consumption.

As the executed regression analysis has shown, there is a plenty of indicators which can influence quantification of competitiveness – from the demographic factors through the socio-economic aspects to the infrastructure elements. All these factors interact altogether. Therefore, it is difficult to mark the most significant ones. Now, according to this analysis, they are recognisable only by their statistical significance. To determine it, it should be a question for further analysis. There are also other specialised types of analyses that suit to demonstrate not yet revealed linkages among the explored dimensions.

In the recent years, issue of regional competitiveness have gained great popularity due to the fact that one of the accompanying effects of advancing globalisation is increasingly important role of regions in the economic development of a country. The annually published reports of the International Institute for Management Development and the World Economic Forum have achieved high support from government level or business sphere. Consequently, they are considered the most authoritative to evaluate competitiveness. However, it is very important to make analyses by the national team of researchers because they know the strengths and the weaknesses of their countries in detail and such a look is essential in creation of regional policies.

Acknowledgments

This work is supported by the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic as part of the research project VEGA 1/0986/15 Proposal of the Dimensional Models of the Management Effectiveness of ICT and Information Systems in Health Facilities in Slovakia and the Economic-Financial Quantification of Their Effects on the Health System in Slovakia.

References

Delgado, M., Ketels, Ch., Porter, M., Stern, S. (2012). The Determinants of National Competitiveness. *National Bureau of Economic Research Working Paper* 18249. Retrieved from: <http://www.nber.org/papers/w18249.pdf>.

European Commission Enterprise and Industry Directorate-General – Unit B4, Economic Analysis and Evaluation (2010). *European Competitiveness Report 2009*. Luxembourg: Publications Office of the European Union. Retrieved from: http://bookshop.europa.eu/en/european-competitiveness-report-2009-pbNBAK09001/downloads/NB-AK-09-001-EN-C/NBAK09001ENC_002.pdf?FileName=NBAK09001ENC_002.pdf&SKU=NBAK09001ENC_PDF&CatalogueNumber=NB-AK-09-001-EN-C.

Fontagne, L., Santoni, G. (2014). *Theoretical and policy aspects of competitiveness at different aggregation levels*. Retrieved from: http://mapcompete.eu/wp-content/uploads/2015/05/D5_1_ComSurvey.pdf.

Frank, K. (2014). Analýza vybraných štrukturálnych charakteristík slovenských regiónov. *Ekonomický ústav Slovenskej akadémie vied Working Papers* 68. Retrieved from: http://ekonom.sav.sk/uploads/journals/265_wp68frank1.pdf.

Hošoff, B., Hvozdková, V. (2009). Analýza konkurencieschopnosti krajín V4 z pohľadu atraktivity pre PZI. *Ekonomický ústav Slovenskej akadémie vied Working Papers* 21. Retrieved from: <http://ekonom.sav.sk/uploads/journals/WP21.pdf>.

Ilzkovitz, F., Dierx, A., Galgau, O., Leib, K. (2008). *Trade Performance and Structural Competitiveness Developments in the Euro Area: Are Member States Equipped to Meet the Globalisation Challenges of the 21st Century?* Retrieved from: <https://research.stlouisfed.org/conferences/integration/Galgau-paper.pdf>.

Lábaj, M. (2014). Štrukturálne aspekty ekonomického rozvoja: Slovenská ekonomika v globálnych súvislostiach. Bratislava: Ekonomický ústav Slovenskej akadémie vied. Retrieved from: http://www.ekonom.sav.sk/uploads/journals/255_labaj-monografia-2.pdf.

Martin, R. L. (2005). *A study on the factors of regional competitiveness*. University of Cambridge. Cambridge: Cambridge Econometrics, University of Cambridge. Retrieved from: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/3cr/competitiveness.pdf.

Morovská, I., Butoracová Šindleryová, I., Gburová, J. (2009). Analýza regionálneho rozvoja vybraných krajov SR s podporou marketingového inštrumentária a zvyšovanie konkurencieschopnosti regiónu. In: *Zborník vedeckých prác Katedry ekonómie a ekonomiky ANNO 2009*. Retrieved from: http://www.pulib.sk/elpub2/FM/Kotulic10/pdf_doc/16.pdf.

Mothe, J., Paquet, G. (1998). Finance and the Technology-Trade Nexus. *Technology in society*, vol. 20(4), pp. 441–468. Retrieved from: <http://www.gouvernance.ca/publications/98-08.pdf>.

Petr, P., Křupka, J., Provazníková, R. (2010). Statistical Approach to Analysis of the Regions. In: *10th World Scientific and Engineering Academy and Society International*

Conference on Applied Computer Science. Retrieved from: <http://www.wseas.us/e-library/conferences/2010/Japan/ACS/ACS-43.pdf>.

Petr, P., Křupka, J., Provazníková, R. (2011). Multidimensional Modeling of Cohesion Regions. *International Journal of Mathematical Models and Methods in Applied Sciences*, vol. 5(1), pp. 150–158. Retrieved from: <http://www.naun.org/main/NAUN/ijmmas/19-659.pdf>.

Porter, M. E. (1999). *The Competitive Advantage of Nations*. New York: Free Press.

Provazníková, R., Křupka, J., Kašparová, M. (2009). Modelování konkurenceschopnosti regionů v podmínkách globalizace. *Scientific Papers of the University of Pardubice - Series D, Faculty of Economics and Administration*, vol. 14, pp. 113–124.

Storper, M. (1997). *The Regional World: Territorial Development in a Global Economy*. New York: The Guilford Press.

Šikula, M. (2006). Konkurencieschopnosť slovenskej a českej ekonomiky – stav a perspektívy. In: *Zborník príspevkov zo slovensko-českej vedeckej konferencie konanej pod záštitou podpredsedu vlády Slovenskej republiky pre európske záležitosti, ľudské práva a menšiny Pála Csákyho v Bratislave 14. marca 2006*. pp. 264.

Šikula, M. (2010). Krízové a pokrízové adaptačné procesy a nové nároky na konkurencieschopnosť. In: *Zborník príspevkov zo slovensko-českej vedeckej konferencie konanej pod záštitou podpredsedu vlády Slovenskej republiky pre európske záležitosti, ľudské práva a menšiny Pála Csákyho v Bratislave 14. marca 2006*.

Keynesian Model in Small and Medium Enterprises Development: Puzzling Case of Russian Regions

Maria Ginzburg¹, Nadezhda Yashina¹, Elena Ivanova²

¹ Lobachevsky State University
Institute of Economics and Entrepreneurship, Finance and Credit Department
Gagarin ave., 23, 603950 Nizhny Novgorod, Russia
E-mail: ginzburg@iee.unn.ru, yashina@iee.unn.ru

² The Russian Presidential Academy of National Economy and Public Administration
Nizhny Novgorod Institute of Management, Finance and Credit Department
Gagarin ave., 46, 603950 Nizhny Novgorod, Russia
E-mail: ivanova457@yandex.ru

Abstract: *This study explores the potential effects of Keynesian demand stimulation for small and medium-size businesses in Russian regions. The authors tested the following hypotheses: (1) is there a connection between small and medium-size business development in any given region of Russia and regional output (Gross Regional Product – GRP); (2) the higher the share of electric power consumption in GRP of a given region, the more regional product is created in this region and the higher the share of this regional product can be redistributed by means of small businesses. To test these hypotheses, the authors developed three indices related to the development of small and medium-size enterprises and the GRP, produced in the provinces of the Russian Federation. One index (SMEDI) summarizes the level of development of small and medium-size businesses in a region; another (GRPI) – the level of Gross Regional Product, produced in a given region; and finally (EPCI) – the level of electric power consumption in the GRP of a corresponding region. Correlation analysis was used to analyze data for 83 federal subjects of the Russian Federation for 2010-2014. The results indicate a moderate relationship between SMEDI and GRPI, and no relationship between SMEDI and EPCI. We conclude that the level of development of SMEs in the regions of Russia in 2010-2014 depends on the level of GRP to a certain degree. The level of development of SMEs is directly proportional to increases in GRP. But Keynesian model of demand stimulation, if applied to the Russian economy, stumbles upon the problems of fiscal federalism and the excessive centralization of economic governance, and this fact does not create effective stimulus for economic growth and small business development in Russia.*

JEL codes: G38, H77, L26, O52, R11

1 Introduction

Regional- and local-level entrepreneurship is an important engine of sustainable economic development and growth in the current knowledge-based economy (Baumol, 2004; Grudzinsky and Bedny, 2013; Grossman and Helpman, 1994; Shane, 2000; Kirzner, 1997). Specifically in the case of Russia, the share of revenue in the form of taxes collected from small businesses, according to the Treasury of the Russian Federation (RF) for 2014, is rather low - 3.61% (OFFICIAL STATISTIC, 2015). But the number of people employed in small and medium-size businesses in Russia has reached 24% of the economically active population (Small and medium-size businesses in Russia, 2014), which signals the importance of this segment, both for the economy and for the society as a whole. Following Doh and Kim (2014), Bateman (2000), this study acknowledges a crucial role played by small- and medium-size enterprises (SME) around the world, providing sources for most new jobs and platforms. Some Russian scholars have observed that the existing model of fiscal federalism does not create incentives for SME growth because it does not leave the regions with significant discretionary spending capacity and authority (Asadullina et al., 2015). Karpov et al. (2015), Yashina et al. (2016) identify several key problems in the mechanism of small and medium-size business development. They include the asymmetry of subsidies in the federal budget,

delays with the receipt and distribution of subsidies at the regional level, faulty program evaluation of the state SME support, as well as ineffective methodology for grant awards. At the same time, Tereshchenko and Sherbakov (2015) report significant positive correlation between major institutional indicators, on the one hand, and the indicators of economic development in the regions, on the other. They determined that the strengthening of the institutions responsible for the protection of the rights of ownership and the promotion of entrepreneurial activity can produce important synergies for growth in separate regions and at the national level.

The purpose of our study is to explore the possibility and the potential effectiveness of the Keynesian model implementation of demand stimulation for small and medium-size business development in the Russian regions. Keynesian model is interesting to scientists worldwide. Murota and Ono (2015) analyze possibilities of demand-stimulation, suggest that countries that have lapsed into long-run stagnation should expand government spending that directly creates employment in order to reduce the deflationary gap. Costabile (2009) argue that the structural reform and the technical provisions proposed by the "Keynes Plan" may provide useful remedies to curb both inflationary and deflationary pressures on the world economy. Ostapenko (2014) claimed that the multiplier value tends to be the highest in Keynesian structural macro-econometric models. Hernández de Cos and Moral-Benito(2013)provide some evidence that output growth might affect the fiscal tightening process so that fiscal consolidations are not exogenous to economic growth. Once they allow for feedback effects from economic growth to fiscal adjustments, they find that expansionary effects disappear and recover the typical Keynesian effect of fiscal adjustments.

2 Methodology and Data

In our study, we relied on the Keynes research (1936), he supposed that demand stimulating among consumers, and inside the industry, creates its multilevel distribution structure. The industrial production that is present in the region, stimulates consumer demand, and it supports small and medium-sized businesses, and allows them to grow in the region. We also used the results obtained by us in the pilot study (Yashina et al., 2016), where we revealed the dependence of the level of development of small and medium-sized businesses in the region from the level of financial conditions of this particular region. The better the financial status of the region is, the higher it the level of development of SMEs. Relying on the Keynes provisions (1936), we believe that small and medium-sized businesses realizes through a distribution function of finance. As a consequence, actively development is possible where industrial potential is. The industry creates the national income, which redistributes by SMEs. Therefore, we hypothesized that:

- (1) there is a link between the level of development of small and medium-sized businesses in particular Russian region and the level of gross regional product (GRP), created in the region. We believe that the higher the level of GRP of the region, the higher the level of development of SMEs in the region.

Our second hypothesis connected with the fact that industry in the Russian Federation has a "heavy" structure, characterized by a high proportion of fixed assets and high level of energy consumption. So, 59% of fixed assets concentrated in "heavy" industries such as mining, manufacturing, power generation and distribution, etc. (OFFICIAL STATISTIC, 2015c). Accordingly, the GRP growth connected with increased electric power consumption. And regions, created more value added than others, consume more electricity. Therefore we hypothesized that:

- (2) the higher the proportion of electric power consumption in GRP of the region, the more regional product creates in this region. And the more regional product may be distributed through small businesses. That should entail an increase in the development of SMEs in the Russian regions.

To test our hypotheses, we relied on the methodology contained in our pilot study (Yashina et al., 2016). To operationalize the key variables, we started by constructing three measures that aggregated distinct explanatory factors or, in the case of the dependent variable, outcome indicators into unique indices. Aggregating the influence of several factors into a single index allows obtaining parsimonious measure for the analyzed phenomena. For example, the level of SME development in the regions of the Russian Federation is a complex economic category, which cannot be sufficiently described by any one indicator. Altman (1968) in his work suggests that combinations of ratios can be analyzed together to remove possible ambiguities and errors observed in the earlier studies. The strength of regional SMEs has been estimated by examining changes in the number of people employed in this sector as well as changes in the share of SME tax contributions to the total tax income of a region: the higher levels of SME development are reflected in the higher proportion of SME taxes in the tax income of the federal subject.

The absolute numbers in official records are not comparable and fail to take into account changes over time. Thus, **the second step** of the study entailed index *standardization (normalization)* in order to obtain comparable estimates.

As **the third step** of the study, we used the tools of *linear correlation analysis* to detect possible relationships and explore their characteristics. The indicators for composite indices have been selected from a larger set of economic indicators, following the principles elaborated in Ginzburg et al. (2015). We relied on: the principle of data reliability - the use of credible statistical sources to minimize the probability of incorrect information; the principle of data relevance - the use of indicators that are directly (rather than indirectly) related to the subject of the study; the principle of versatility - the use of indicators that characterize distinct dimensions of the phenomenon in order to avoid "lopsided" analysis. In the study, we used the data of the Federal State Statistics Service, Federal Treasury, Ministry of Economic Development of the Russian Federation for the period 2010-2014 years for all 83 federal subjects of the Russian Federation (excluding the affiliated territories of the Republic of Crimea and Sevastopol for 2014).

In accordance with these principles, the indices were computed using the following sets of statistics:

The SME Development Index (SMEDI) comprises: the share of the tax collected from different forms of SMEs in the tax revenue of the region, (%); total employed labor force in the Russian Federation, thousands of people; the number of employed in SMEs by region, thousands of people.

The index is calculated by the following formula:

$$SMEDI_{jn} = \frac{1}{2} \left(\frac{(TA)_{jn}}{\max_T((TA)_j)} + \frac{\left(\frac{NESME}{SPE}\right)_{jn}}{\max_T\left(\left(\frac{NESME}{SPE}\right)_j\right)} \right), \quad (1)$$

where: TA - the share of total income tax amount collected from different forms of SMEs; NESME - number of employees in SMEs in the region of the Russian Federation; SPE- the region's population, employed in Economics, T – a period of time (from 2010 to 2014), j – the number of the relevant region in the list of regions of Russian Federation, n – the number of the year.

SMEDI changes in the interval from 0 to 1. SMEDI growth means increase the contribution of small and medium-sized enterprises in Gross Regional Product (GRP) and/or the growth of employment in small and medium business compared to similar indicators in other years of the period analyzed. The growth index is considered to be a positive factor, the decline is considered to be a negative factor.

Next we computed two value-added indexes: Gross Regional Product Index and Energy Consumption Index. When formed these indexes we did not include data on the mining and transportation of minerals, oil extraction, we included only the electricity

consumption, because resources are mines in several regions of the country, but electricity consumes everywhere.

The Gross Regional Product Index (GRPI) comprises: gross regional product in current prices, (mln. rubles). We believe that the higher the GRP level in the region is, according to the Keynesian model, the higher the level of the development of SMEs in the region should be. The index is calculated by the following formula:

$$GRPI_{jn} = \frac{GRP_{jn}}{\max_T(GRP_j)^n} \quad (2)$$

where GRP – Gross Regional Product, T – a period of time (from 2010 to 2014), j – the number of the relevant region in the list of regions of Russian Federation, n – the number of the year.

GRPI changes in the interval from 0 to 1. The higher the value in a specified interval in the GRPI, the higher is the possibility for Value-Added creation which is demonstrated in given region of the Russian Federation. The growth index is considered to be a positive factor, the decline is considered to be a negative factor.

The Electric Power Consumption Index (EPCI) comprises: the share of the energy consumption in the corresponding region, in the gross regional product, (%). This index will allow us to identify the relationship between the level of SME development and the level of electric power consumption in the region. We believe that the higher the industrial potential of the region, the higher is the share of electric power consumption in GRP. We formed this index to reverse the regional disproportions presented in the previous index (for example, in the year 2014 gross regional product of city of Moscow amounted to 21.8% from GRP, produced by all the regions of the Russian Federation together. While the level of electric power consumption in the city was 5.18% of the total consumption of the Russian Federation) (OFFICIAL STATISTIC, 2015d). The index is calculated by the following formula:

$$EPCI_{jn} = \frac{\left(\frac{EPC}{GRP}\right)_{jn}}{\max_T\left(\frac{EPC}{GRP}\right)_j} \quad (3)$$

Where EPC – electric power consumption, mln. kilowatt-hours, GRP – Gross Regional Product, T – a period of time (from 2010 to 2014), j – the number of the relevant region in the list of regions of Russian Federation, n – the number of the year.

EPCI changes in the interval from 0 to 1. The higher the value of EPCI in a specified interval, the higher is the share of electric power consumption in GRP. Growth of this index indicates that the power consumption increases in the region as a consequence of the industrial production growth. The growth index is considered to be a positive factor, the decline is considered to be a negative factor. When the indexes were formed, we explored the relationship between them.

3 Results and Discussion

Table 1 reports the SME development index. A very low level of SME development characterizes the fiscal transfers-dependent regions, such as Dagestan (0,1926 in 2014), Ingushetia (0,0977) and Chechnya (0,1136).

Table 1 The SME Development Index (SMEDI) for Years 2010-2014 (Fragment)

	2010	2011	2012	2013	2014
City of Saint-Petersburg	0.3415	1	0.9433	0.9735	1
City of Moscow	0.4390	0.9427	1	1	0.9946
The Krasnodar Territory	0.5324	0.8962	0.8634	0.8766	0.9255
Republic of Dagestan	0.0848	0.1490	0.1560	0.1477	0.1926
Republic of Chechnya	0.0246	0.0648	0.0904	0.1009	0.1136
Republic of Ingushetiya	0.0554	0.0509	0.0478	0.0691	0.0977

Source: calculated by authors. Based on OFFICIAL STATISTICS (2015a,b,c,d), (2016)

It needs to be pointed out though that SMEDI increased over 2010-2014. More robust levels of SME development are observed in Krasnodar Territory ($SMEDI_{2014} = 0.9255$) and federal centers - city of Saint-Petersburg ($SMEDI_{2014} = 1$) and Moscow (0.9946). In these regions, too, the values of SMEDI grew from 2010 to 2014.

Table 2 demonstrates that the largest GRP is in the Federal Center – city of Moscow, while industrial regions lagging behind it several times.

Table 2 The Gross Regional Product Index (GRPI) for Years 2010-2014 (Fragment)

	2010	2011	2012	2013	2014
City of Moscow	1	1	1	1	1
The Tumen Region	0,3942	0.4134	0.4336	0.4190	0.4043
Khanti-Mansi Autonomous Area	0.2354	0.2453	0.2535	0.2310	0.2206
Republic of Tatarstan	0.1196	0.1313	0.1347	0.1313	0.1305
Krasnoyarsk Territory	0.1260	0.1177	0.1109	0.1064	0.1111
Republic of Severnaya Osetia	0.0090	0.0086	0.0091	0.0100	0.010

Source: Calculated by authors. Based on OFFICIAL STATISTICS (2015a,b,c,d), (2016)

Thus, Tumen region GRP Index in year 2014 was almost 2.5 times lower than has the Federal Center (the city of Moscow) ($GRPI_{2014} = 0.4043$), Khanti-Mansi GRPI lagged in 4.5 times, GRP index of Republic of Tatarstan – in 7.7 times. While the listed regions are the major industrial regions of Russia. In Table 3 we present data on The Electric Power Consumption Index for several Russian regions.

Table 3 The Electric Power Consumption Index (EPCI) for Years 2010-2014 (Fragment)

	2010	2011	2012	2013	2014
Republic of Khakassia	1	1	1	1	1
The Irkutsk region	0.5545	0.6073	0.5812	0.6145	0.6064
The Krasnoyarsk Territory	0.2814	0.3031	0.3366	0.3697	0.3655
The Chelyabinsk region	0.3000	0.3197	0.3191	0.3559	0.3596
The Tumen region	0.1529	0.1525	0.1499	0.1705	0.1807
City of Moscow	0.0346	0.0363	0.0371	0.0406	0.0421

Source: Calculated by authors. Based on OFFICIAL STATISTICS (2015a,b,c,d), (2016)

The regions with the highest GRPI in 2014, have quite low The Electric Power Consumption Index. The city of Moscow ($EPCI_{2014} = 0.0421$), The Tumen region ($EPCI_{2014} = 0.1807$).

The relationship between the Small and Medium-sized Enterprises Development Index (SMEDI) and Gross Regional Product Index (GRPI), between SMEDI and Electric Power Consumption Index (EPCI) was tested by means of linear correlation analysis. The correlation coefficients were computed by the following formulas:

$$r_{SMEDI-GRPI} = \frac{\sum_{j=1}^N (SMEDI - \overline{SMEDI})(GRPI - \overline{GRPI})}{\sqrt{\sum_{j=1}^N (SMEDI - \overline{SMEDI})^2 \sum_{j=1}^N (GRPI - \overline{GRPI})^2}}, \quad (4)$$

$$r_{SMEDI-EPCI} = \frac{\sum_{j=1}^N (SMEDI - \overline{SMEDI})(EPCI - \overline{EPCI})}{\sqrt{\sum_{j=1}^N (SMEDI - \overline{SMEDI})^2 \sum_{j=1}^N (EPCI - \overline{EPCI})^2}}, \quad (5)$$

where \overline{SMEDI} - the index, value of the SME development level, \overline{GRPI} - the index, value of the Gross Regional Product level, \overline{EPCI} - the index, value of Electric Power Consumption level, all three averaged over the set of regions; N – the number of studied regions. Calculations according to the formulas (4), (5) yielded the following results (Table 4):

Table 4 Correlation Analysis between SMEDI – GRPI, SMEDI – EPCI for Years 2010-2014

	2010	2011	2012	2013	2014
$r_{SMEDI-GRPI}$	0.194918	0.419228	0.446969	0.442711	0.414872
$r_{SMEDI-EPCI}$	-0.114418	-0.077492	-0.056294	0.012258	-0.011530

Source: Calculated by authors. Based on OFFICIAL STATISTICS (2015a,b,c,d), (2016)

We can see that the correlation between SME development and Gross Regional Product ($r_{SMEDI-GRPI}$) gets notably stronger, starting with 2012. Low levels of correlation between the two indices in 2010 can arguably be attributed to the lingering effects of the 2008-2009 crisis.

The correlation coefficients between SME development and Electric Power Consumption ($r_{SMEDI-EPCI}$) indicate there is no connection between the two indices. This can be caused by a number of reasons, for instance, the absence of a relationship or non-linear connection between the variables.

To check for the lagged effects (one year) of GRP growth on SME development, energy consumption on SME development, we calculated lagged correlations in which the SMEDI index for year n is correlated with the GRPI/EPCI indexes for the preceding year ($n-1$). The results are as follows (Table 5).

Table 5 Lag Correlation for SMEDI – GRPI, SMEDI – EPCI for Years 2010-2014

	$SMEDI_{2011}$ – $GRPI_{2010}$	$SMEDI_{2012}$ – $GRPI_{2011}$	$SMEDI_{2013}$ – $GRPI_{2012}$	$SMEDI_{2014}$ – $GRPI_{2013}$
$r_{SMEDI-GRPI}$	0.416868235	0.445839414	0.443910586	0.414264501
	$SMEDI_{2011}$ – $EPCI_{2010}$	$SMEDI_{2012}$ – $EPCI_{2011}$	$SMEDI_{2013}$ – $EPCI_{2012}$	$SMEDI_{2014}$ – $EPCI_{2013}$
$r_{SMEDI-EPCI}$	-0.07391109	-0.087640102	0.010378072	-0.00756268

Source: Calculated by authors. Based on OFFICIAL STATISTICS (2015a,b,c,d), (2016)

There seems to be evidence of lagged effects for all years: a higher gross regional product of a region in a year n corresponds to a more robust SME development in the following year. As we can see, correlation results as well as lagged correlation support hypothesis (1) – SME development in a certain region of Russian Federation depends on level of GRP of this region, that support findings of our pilot study (Yashina et al., 2016).

As for energy consumption effect on SME development, we conclude that there is no strong evidence of lagged effect: energy consumption does not translate into higher levels of SME development in the following year. Correlation results do not support hypothesis (2) – SME development in Russia's regions during the period from 2010 to 2014 years do not associated with an increase in energy consumption in the Russian regions.

Regression analysis involves the effect of approximation of real dependency values of some analytic function that is selected in accordance with several criteria (Fisher, etc.), the function must be a good match with the real dependency. This, in the face of a lack of data and their inaccuracies, is rather difficult to describe. The consequence of small correlation coefficients is the graph, more similar to stain than graph- this geometry is hard to approximate. To talk about regression analysis makes sense, starting with the correlation coefficients > 0.7 . Therefore, at this stage, we cannot use this tool, but it is the goal of our future work on this topic.

4 Conclusions

Our test supports hypothesis (1) – SME growth appears to respond to the Gross regional product of the region increase, as proposed by Tereshchenko and Sherbakov (2015), Bondareva and Zatrochová (2014). And totally reject hypothesis (2) – the higher the level of electric power consumption in the region is, so most likely, the higher industrial

production in the region, and, as a consequence - the level of development of SMEs. Relationship between the level of SMEs development and GRP growth, is moderate. We believe that this situation is a consequence of the current model of fiscal federalism in Russia, when the cash flows generated in the regions redistribute in favor of the Federal Centre at the expense of regions. As well as models of centralization of the economy when companies working in Russia's regions, have registrations for tax purpose in Moscow, and, accordingly, pay taxes to the Federal Center, leaving regions where their main activities are, alone with their unresolved social problems. In such circumstances, there is no direct relationship between the index of small business development and value creation indexes (in our case are Gross Regional Product Index and Electric Power Consumption Index). The consequence is the attraction and the concentration of capital in the metropolitan area and regional underdevelopment, spreading to the most sensitive and flexible element-small business. This is consistent with the findings obtained by Asadullina et al. (2015) that the Russian model of fiscal federalism does not create effective incentives to economic growth. This model belongs to the class of low competition models, distinguished by the fact that all levels of the budgetary system, both vertically and horizontally, are in hard-deterministic relationships, not leaving the territories to compete among themselves, thereby extinguishing the incentives for economic growth in territories. We share the view of Aleshin et al. (2013) that it needs to change the mechanism of fiscal redistribution of tax revenues towards its decentralization. Now the Russian capital is not distributed in Russian small business area, tend to consolidation, and can be considered as an integration part of the European financial system, aimed at expansion. Thus, Keynesian demand stimulation model for small and medium business development in Russia's regions faces with features of Russian fiscal federalism, that does not allow it to be implemented in full size.

References

- Aleshin, V. A., Ovchinnikov, V. N., Chelysheva, E. A. (2013) Fiscal federalism: problem and development prospect today. *Journal of Economic Regulation*, vol. 1, Iss.4, pp. 115-123.
- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, vol.23, Iss.4, pp. 589-609.
- Asadullina, A. V., Asylguzhin, B. V., Truhov, A. I. (2015). Competitive fiscal federalism and its role in the economic development of the country. *Finance and Credit*, vol. 13 (637).pp. 44-53.
- Bateman, M. (2000) Neo-Liberalism, SME Development and the Role of Business Support Centres in the Transition Economies of Central and Eastern Europe. *Small Business Economics*, vol. 14, Iss. 4, pp. 275-298.
- Costabile, L. (2009) Current global imbalances and the Keynes Plan: A Keynesian approach for reforming the international monetary system. *Structural Change and Economic Dynamics*, vol. 20, Iss.2, pp. 79-89.
- Doh, S., Kim, B. (2014) Government support for SME innovations in the regional industries: The case of government financial support program in South Korea. *Research Policy*, vol. 43 (9), pp. 1557-1569.
- Ginzburg, M. Y., Yashina, N. I., Litovsky, I. A. (2015). Standardised integro-differential index as an indicator, that uniquely characterizes socio-economic situation of a state at the world stage. *Economics and entrepreneurship*, vol. 5, Iss. I, pp. 360-368.
- Hernández de Cos, P., Moral-Benito E. (2013). Fiscal Consolidations and Economic Growth. *Fiscal Studies*, vol. 34, Iss. 4, pp. 491-515.
- Keynes, J. M. (1936) *The general theory of employment, interest and money*, New York: Palgrave Macmillan.

- Murota, R., Ono, Y. (2015) Fiscal policy under deflationary gap and long-run stagnation: Reinterpretation of Keynesian multipliers. *Economic Modelling*, vol.51, pp. 596–603.
- OFFICIAL STATISTICS (2015). Labor force. Federal Statistic. Retrieved from: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/wages/labour_force/#.
- OFFICIAL STATISTICS (2015a). National Account. Gross Regional Product. Retrieved from: www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/accounts/.
- OFFICIAL STATISTICS (2015b). Consolidated information on the performance of the budgets of the regions of the Russian Federation. Retrieved from: <http://old.roskazna.ru/byudzheto-subektov-rf-i-mestnykh-byudzheto/>.
- OFFICIAL STATISTICS (2015c). Fixes Assets. Retrieved from: www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/fund/.
- OFFICIAL STATISTICS (2015d). Manufacturing Output. Retrieved from: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/enterprise/industrial/.
- OFFICIAL STATISTICS (2016). Materials of the Federal Small and Medium Enterprises web-site. Retrieved from: <http://smb.gov.ru/statistics/officialdata>.
- Ostapenko, V. M. (2014). Fiscal Multipliers: Theory and Empirical Estimates. *Economics and Entrepreneurship*, vol. 5-2 (46-2), pp. 127-134.
- SMALL AND MEDIUM-SIZED BUSINESSES IN RUSSIA (2014). Statistical Digest. Federal service of State Statistics (Rosstat). Moscow.
- Yashina, N., Ginzburg, M., Emelyanova, O., Litovsky, I. (2016). Small and Medium Enterprise Development in Russia: Public Expenses – Are they effective? *Proceedings of the 20th Scientific Conference "Current Trends in Public Sector Research"*, Brno, Masaryk University, Faculty of Economics and Administration, Department of Public Economics, pp. 212-223.

Pension-related Application of the Cohort Life Table

Ján Gogola¹, Ondřej Slavíček²

¹ University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 84, 532 10 Pardubice, Czech Republic
E-mail: jan.gogola@upce.cz

² University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 84, 532 10 Pardubice, Czech Republic
E-mail: Ondrej.Slavicek@upce.cz

Abstract: *Longevity risk, the risk that people will live longer than expected, weighs heavily on those who run pension schemes and on insurers that provide annuities. Hence the prediction of future mortality rates is an issue of fundamental importance for the insurance and pensions industry. Our analysis focuses on mortality at higher ages (65-95), given our interest in pension-related applications where the risk associated with longer-term cash flow is primarily linked to uncertainty in future rates of mortality. The Lee-Carter model became one of the most applied models and it is used to forecast age-specific death rates. The main goal of this paper is to apply the Lee-Carter model to construct the so-called "cohort life tables" for calculation of a 30-year annuity to a person aged 65 in 2015. We use data on deaths and exposures for the Czech Republic from the Human Mortality Database (HMD). The HMD provides evidence that life expectancy is increasing. We have shown that if the today rate of increase will continue, it will at age 65 concluded (after calculation) to increase the present value of pension liabilities in defined-benefit schemes about 5 % if we use cohort life table instead of period life table. Probability statements derived from the use of a single model and parameter set should be treated with caution. Hence, there is a need for awareness of model risk when assessing longevity-related liabilities.*

Key words: longevity risk, annuity, stochastic mortality, life table, Lee-Carter model

JEL Classifications: C53, G22, J11, J32

1 Introduction

Benjamin Franklin said: "In this world nothing can be said certain, except death and taxes." The death is certain, but the timing is much less certain.

The mortality of the population in developed countries has improved rapidly over the last thirty years and this has important financial implications for the insurance industry, since several important classes of liability are sensitive to the direction of future mortality trends. This uncertainty about the future development of mortality gives rise to **longevity risk**.

Longevity risk, the risk that people live longer than expected, weighs heavily on those who run pension schemes and on insurers that provide annuities. The risk that the reserves established for the payment of benefits (retirement, widowhood, orphan hood, disability, dependency,...) are inadequate for that purpose if they are based on life tables (or mortality tables) with lower survival hypothesis than real. Longevity risk plays a central role in the insurance company management since only careful assumptions about future evolution of mortality phenomenon allow the company to correctly face its future obligations. Longevity risk represents a sub-modul of the underwriting risk module in the Solvency II framework. The most popular and widely used model for projecting longevity is the well-known Lee-Carter model.

This paper follows on articles Gogola, J. (2014), Gogola, J. (2014a), Gogola, J. (2015), Jindrová, P., Slavíček, O. (2012), Pacáková, V., Jindrová, P. (2014) and Pacáková, V., Jindrová, P., Seinerová, K. (2013). They deal with the development and the prediction of

life expectancy in selected European countries (Czech Republic, Slovakia, Finland and Spain) by applying Lee-Carter model and the Quantification of Selected Factors of Longevity.

Most stochastic mortality models are constructed in a similar manner. Specifically, when they are fitted to historical data, one or more time-varying parameters (κ_t) are identified.

By extrapolating these parameters to the future, we can obtain a forecast of future death probabilities and consequently other demographic quantities such as life expectancies. They are important for quantifying longevity in pension risks and for constructing benchmarks for longevity-linked liabilities. The main goal of this paper is to apply the Lee-Carter model to construct the so-called "cohort life tables" and use them for calculation of a 30-year annuity to a person aged 65 in 2015.

2 Methodology and Data

We use data of the total population, males and females' deaths and exposure to risk between 1950 and 2014 for the Czech Republic (CR) from the Human Mortality Database (www.mortality.org). We consider the restricted age range from 0 to 95.

Let calendar year t runs from exact time t to exact time $t+1$ and let $d_{x,t}$ be the number of deaths aged x last birthday in the calendar year t . We suppose that the data on deaths are arranged in a matrix $\mathbf{D} = (d_{x,t})$. In a similar way, the data on exposure are arranged in a matrix $\mathbf{E}^c = (e_{x,t})$ where $e_{x,t}$ is a measure of the average population size aged x last birthday in calendar year t , the so-called central exposed to risk. We suppose that $(d_{x,t})$ and $(e_{x,t})$ are each $n_a \times n_y$ matrices, so that we have n_a ages and n_y years.

We denote the *force of mortality* (or *hazard rate*) at exact time t for lives with exact age x by $\mu_{x,t}$. The force of mortality can be thought as an instantaneous death rate, the probability that a life subject to a force of mortality $\mu_{x,t}$ dies in the interval of time $(t, t+dt)$ is approximately $\mu_{x,t} \cdot dt$ where dt is small.

The force of mortality $\mu_{x,t}$ for human populations varies slowly in both x and t and a standard assumption is that $\mu_{x,t}$ is constant over each year of age, i.e., from exact age x to exact age $x+1$, and over each calendar year, i.e., from exact time t to exact time $t+1$. Thus,

$$\mu_{x+u,t+v} = \mu_{x,t} \text{ for } 0 \leq u < 1, 0 \leq v < 1, \quad (1)$$

and so $\mu_{x,t}$ approximate the mid-year force of mortality $\mu_{x+0.5,t+0.5}$.

We suppose that $d_{x,t}$ is a realization of a Poisson variable $D_{x,t}$:

$$D_{x,t} \sim Po(e_{x,t} \cdot \mu_{x,t}), \quad (2)$$

The expected values are the product of exposures $e_{x,t}$ and the force of mortality $\mu_{x,t}$.

Assumption (2) leads us to the maximum likelihood estimates of $\mu_{x,t}^{\text{MLE}} = m_{x,t}$ as

$$m_{x,t} = \frac{d_{x,t}}{e_{x,t}}, \quad (3)$$

or in a matrix form $\mathbf{m} = \frac{\mathbf{D}}{\mathbf{E}^c}$, that means element-wise division in \mathbf{R} .

We also consider the mortality rate $q_{x,t}$. This is the probability that an individual aged exactly x at exact time t will die between t and $t+1$.

We have the following relation between the force of mortality and the mortality rate:

$$q_{x,t} = 1 - \exp\left(\int_0^1 -\mu_{x+s,t+s} ds\right) \approx 1 - e^{-\mu_{x,t}}. \quad (4)$$

We use the following conventions for our model:

- The α_x, β_x coefficients will reflect age-related effects
- The κ_t coefficients will reflect time-related effects

Our models are fitting to historical data.

The Lee-Carter model was introduced by Ronald D. Lee and Lawrence Carter in 1992 with the article Lee, R. D., Carter, L. (1992). The model grew out of their work in the late 1980s and early 1990s attempting to use inverse projection to infer rates in historical demography. The model has been used by the United States Social Security Administration, the US Census Bureau and the United Nations. It has become the most widely used mortality forecasting technique in the world today.

Lee and Carter proposed the following model for the force of mortality:

$$\log m_{x,t} = \alpha_x + \beta_x \cdot \kappa_t, \quad (5)$$

with constraints

$$\sum_{x=1}^{n_a} \beta_x = 1, \quad (6)$$

$$\sum_{t=1}^{n_y} \kappa_t = 0. \quad (7)$$

The second constraint implies that, for each x , the estimate for α_x will be equal (at least approximately) to the mean over t of the $\log m_{x,t}$.

Let ϕ represent the full set of a parameters and the notation for $\mu_{x,t}$ is extended to $\mu_{x,t}(\phi)$, to indicate its dependence on these parameters.

For our model the log-likelihood is:

$$l(\phi; \mathbf{D}, \mathbf{E}) = \sum_{x,t} (d_{x,t} \cdot \log[e_{x,t} \cdot \mu_{x,t}(\phi)] - e_{x,t} \cdot \mu_{x,t}(\phi) - \log(d_{x,t}!)), \quad (8)$$

and estimation is by maximum likelihood (MLE).

By the equation (5) the log of the force mortality is expressed as the sum of an age-specific component α_x that is independent of time and another component that is the product of a time-varying parameter κ_t reflecting the general level of mortality and an age-specific component β_x that represents how rapidly or slowly mortality at each age varies when the general level of mortality changes.

Interpretation of the parameters in Lee-Carter model is quite simple: $\exp(\alpha_x)$ is the general shape of the mortality schedule and the actual forces of mortality change according to overall mortality index κ_t modulated by an age response β_x (the shape of the β_x profile tells which rates decline rapidly and which slowly over time in response of change in κ_t).

For practice the fitting of a model is usually only the first step and the main purpose is the forecasting of mortality. For forecasting-time series we use Random Walk with Drift.

The estimated age parameters, α_x, β_x , are assumed invariant over time. This last assumption is certainly an approximation but the method has been very thoroughly tested in Booth, H., Tickle, L., Smith, L. (2005) and found to work.

We assume that trend observed in past years can be graduated (or smoothed) and that it will continue in future years.

By the Random Walk with Drift the dynamics of κ_t follows

$$\kappa_t = \kappa_{t-1} + \theta + \varepsilon_{t-1}, \tag{9}$$

with i.i.d standard Gaussian distribution $\varepsilon_t \sim N(0; \sigma_\varepsilon^2)$.

Value at future time $t+h$ can be written as

$$\kappa_{t+h} = \kappa_t + h \cdot \theta + \sum_{s=0}^{h-1} \varepsilon_{t+s}, \tag{10}$$

which has Gaussian distribution $N(\kappa_t + h \cdot \theta; \sigma_\varepsilon^2 \cdot h)$.

Hence the best point estimate for future value at time $t+h$ is $\kappa_t + h \cdot \theta$,

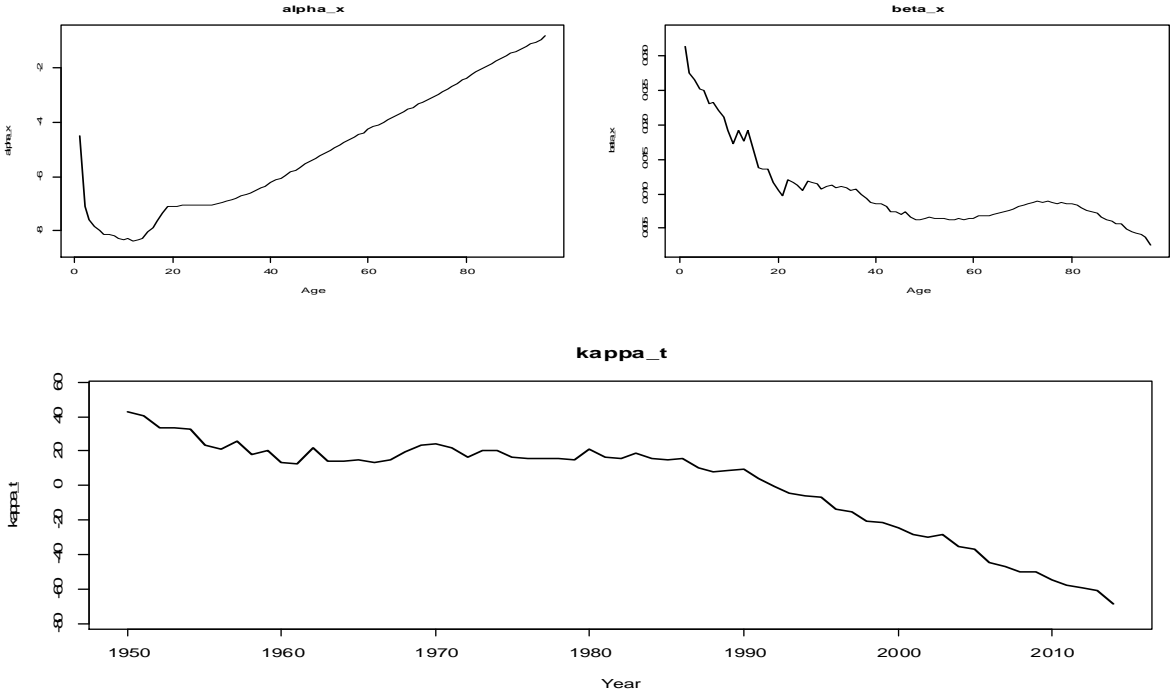
and the 95% confident interval is

$$(\kappa_t + h \cdot \theta - 1,96 \cdot \sigma_\varepsilon \cdot \sqrt{h}; \kappa_t + h \cdot \theta + 1,96 \cdot \sigma_\varepsilon \cdot \sqrt{h}). \tag{11}$$

3 Results

In Figure 1 we have plotted the maximum likelihood estimates for the parameters of the Lee-Carter model, using CR total population data, aged 0-95. Model fitting was done in **R**, which was also used for graphs (Figure 1). Note that estimated values for β_x are higher at the lowest ages, meaning that at those ages the mortality improvements are faster. The decreasing trend in κ_t reflects general improvements in mortality over time at all ages.

Figure 1 Estimated Parameters of the Lee-Carter Model for Population of CR

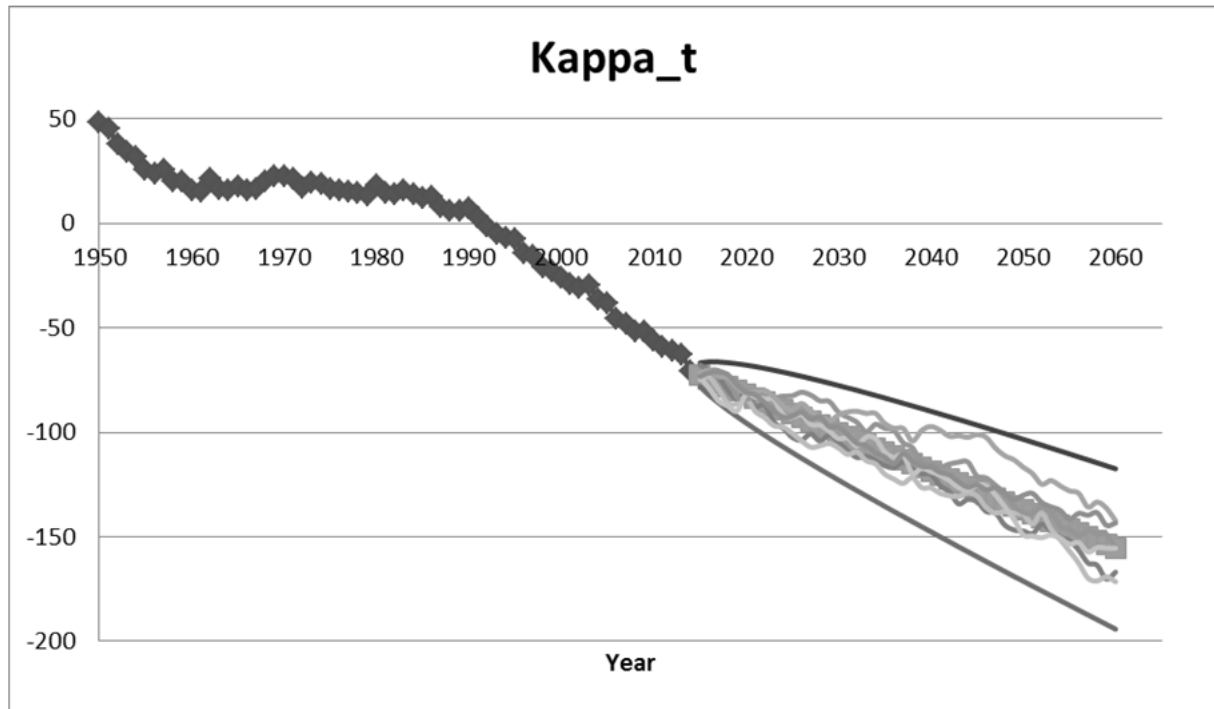


Source: Own processing

We will now simulate the κ_t up to 2060 according to equation (9). These results in case of the total population are plotted in Figure 2. The dashed curves in plot show the 2,5-th and 97,5-th percentile of the distribution of κ_t resulting in a 95 % confidence interval.

By forecasted κ_t we get the predictions for the force of mortality $\mu_{x,t} = \exp(\alpha_x + \beta_x \cdot \kappa_t)$, which lead us by equation (4) to mortality rates $q_{x,t}$.

Figure 2 Predicted κ_t for Total Population with 95 % CI and Few Simulations



Source: Own processing

To avoid underestimation of the relevant liabilities we use dynamic mortality model. Cohort or dynamic life table provide a view on the future evolution of mortality rates and it implies the diagonal arrangement in a projecting life table (see Table 1).

Table 1 Period Life Table vs. Cohort Life Table

$q_{x,t}$	2014	2015	2016	2017	2018	2019	2020
.
65	0.014699	0.014505	0.014314	0.014125	0.013938	0.013754	0.013573
66	0.015832	0.015618	0.015406	0.015197	0.014991	0.014788	0.014587
67	0.017191	0.016954	0.016721	0.016491	0.016263	0.016039	0.015818
68	0.018574	0.018311	0.018051	0.017795	0.017543	0.017294	0.017048
69	0.020037	0.019744	0.019456	0.019172	0.018892	0.018615	0.018343
70	0.021675	0.02135	0.021029	0.020714	0.020403	0.020097	0.019795
71	0.023349	0.02299	0.022637	0.022289	0.021946	0.021609	0.021276
.

Source: Own calculations

Finally by equations (12)-(15) we find the present values of the annuities such as term immediate annuity $a_{x:\overline{n}|}$, term annuity-due $\ddot{a}_{x:\overline{n}|}$. We will also consider annuities payable m -times per year.

$$a_{x:\bar{n}|} = \sum_{t=1}^n v^t \cdot {}_t p_x \quad (12)$$

$$a_{x:\bar{n}|}^{(m)} = a_{x:\bar{n}|} + \frac{m-1}{2m} \cdot (1 - v^n \cdot {}_n p_x) \quad (\text{UDD}) \quad (13)$$

$$\ddot{a}_{x:\bar{n}|} = \sum_{t=0}^{n-1} v^t \cdot {}_t p_x \quad (14)$$

$$\ddot{a}_{x:\bar{n}|}^{(m)} = \ddot{a}_{x:\bar{n}|} - \frac{m-1}{2m} \cdot (1 - v^n \cdot {}_n p_x) \quad (\text{UDD}) \quad (15)$$

(where (UDD) means the assumption of Uniform Distribution of Deaths).

Take an individual aged 65 in 2015 (birth year = 1950) who wants to purchase a 30 years annuity. For calculation annuities first we use the Period table, which contains the last available mortality rates. In our case it is year 2014 (the second column of Table 1). Then we use the diagonal values (Cohort table) for the cohort aged 65 in 2015 (born 1950) who are still alive in year 2015+t.

Table 2 gives present values of 30 years annuities for the individual aged 65 from the whole population of the Czech Republic with interest rate of 2 % p.a.

In appendix (Table 3 and Table 4) we show present values of annuities separately for both genders.

Table 2 Present Values of Annuities for the Total Population in the Czech Republic

($x=65, n=30, i=0,02$)

	$a_{x:\bar{n} }$	$a_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }$
Period table	14.04	14.31	14.74	15.01
Cohort table	14.75	15.01	15.43	15.69
Relative change	5.01%	4.85%	4.69%	4.54%
2.5%	14.13	14.40	14.83	15.09
	0.65%	0.61%	0.60%	0.57%
97.5%	15.34	15.60	16.01	16.27
	9.26%	8.99%	8.64%	8.39%

Source: Own calculations

4 Conclusions

National governments and the WHO announce life expectancies of different populations every year. To financial institutions, life expectancy is not an adequate measure of risk, because all it does not give any idea about how mortality rates at different ages vary over time. On the other hand, indicators of longevity risk cannot be too complicated. An indicator that is composed by a huge array of numbers is difficult to interpret and will lose the purpose as a "summary" of a mortality pattern.

We have presented stochastic models to analyse the mortality and shown how they may be fitted. Afterwards we can turn to the industry requirement to forecast future mortality.

We have shown that if the today rate of increase will continue, it will at age 65 concluded (after calculation) to increase the present value of pension liabilities in defined-benefit schemes cca. 4,5-5 % if we use cohort life table instead of period life table.

But forecasting of mortality should be approached with both caution and humility. Any prediction is unlikely to be correct.

There is a need for awareness of model risk when assessing longevity-related liabilities, especially for annuities and pensions. The fact that parameters can be estimated does not imply that they can sensibly be forecast.

Such forecasting should enable actuaries to examine the financial consequences with different models and hence to come to an informed assessment of the impact of longevity risk on the portfolios in their care.

Acknowledgments

This research could be performed due to the support of the University of Pardubice student project grant no. SGS_2016_023 „Ekonomický a sociální rozvoj v soukromém a veřejném sektoru“ (Faculty of Economics and Administration).

References

- Booth, H., Tickle, L., Smith, L. (2005). Evaluation of the variants of the Lee-Carter method of forecasting mortality: a multi-country comparison. *New Zealand Population Review*, vol. 31, pp. 13-34.
- Gogola, J. (2014). Lee-Carter family of stochastic mortality models. In: *Sborník 7. mezinárodní vědecká conference: Řízení a modelování finančních rizik*. VŠB-TU Ostrava, pp. 209 – 2017.
- Gogola, J. (2014). Stochastic Mortality Models. Application to CR mortality data. *Mathematical and Statistical Methods for Actuarial Sciences and Finance*, Springer, pp. 113-116.
- Gogola, J. (2015). Comparison of selected stochastic mortality models, *International Journal of Mathematical Models and Methods in Applied Sciences*. *INTERNATIONAL JOURNAL OF MATHEMATICAL MODELS AND METHODS IN APPLIED SCIENCES*, vol. 9, pp. 159-165.
- Human Mortality Database. University of California, Berkeley (USA), and Max Planck Institute for Demographic Research (Germany). Retrieved from: www.mortality.org.
- Jindrová, P., Slavíček, O. (2012). Life expectancy development and prediction for selected European countries. In: *6-th International Scientific Conference Managing and Modelling of Financial Risk proceedings*. VŠB-TU Ostrava, pp. 303-312.
- Lee, R. D., Carter, L. (1992). Modelling and forecasting the time series of U.S. mortality. *Journal of the American Statistical Association*, vol. 87, pp. 659-671.
- Pacáková, V., Jindrová, P. (2014). Quantification of Selected Factors of Longevity. In: *Proceedings of the 2014 International Conference on Mathematical Methods in Applied Sciences (MMAS'14)*. Saint Petersburg State Polytechnic University, pp. 170 – 174.
- Pacáková, V., Jindrová, P., Seinerová, K. (2013). Mortality Models of Insured Population in the Slovak Republic. In: *Proceedings of the 7th Professor Aleksander Zelias International Conference on Modelling and Forecasting of Socio-Economic Phenomena*. 7. – 10. 09. 2013. Zakopané, pp. 99-106.
- R Development Core Team (2005). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna. Retrieved from: <http://www.R-project.org>.

Appendix

Table 3 Present Values of Annuities for Males ($x=65, n=30, i=0,02$) in the CR

	$a_{x:\bar{n} }$	$a_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }$
Period table	12.68	12.95	13.38	13.66
Cohort table	13.29	13.55	13.99	14.25
Relative change	4.83%	4.65%	4.54%	4.38%
2.5%	12.72	12.99	13.43	13.70
	0.37%	0.33%	0.36%	0.32%
97.5%	13.85	14.11	14.54	14.80
	9.26%	8.95%	8.69%	8.40%

Source: Own calculations

Table 4 Present Values of Annuities for Females ($x=65, n=30, i=0,02$) in the CR

	$a_{x:\bar{n} }$	$a_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }^{(12)}$	$\ddot{a}_{x:\bar{n} }$
Period table	15.14	15.41	15.83	16.10
Cohort table	15.92	16.18	16.58	16.84
Relative change	5.13%	4.98%	4.78%	4.64%
2.5%	15.27	15.53	15.95	16.21
	0.83%	0.79%	0.76%	0.72%
97.5%	16.54	16.79	17.18	17.44
	9.23%	8.97%	8.59%	8.36%

Source: Own calculations

Influence of selected environmental factors on the efficiency of commercial insurers

Eva Grmanová¹, Peter Hošták²

¹Alexander Dubcek University of Trencin
Faculty of Social and Economic Relations
Studentska 3, 911 50. Trencín, Slovak Republic
E-mail: eva.grmanova@tnuni.sk

²Alexander Dubcek University of Trencin
Faculty of Social and Economic Relations
Studentska 3, 911 50. Trencín, Slovak Republic
E-mail: peter.hostak@tnuni.sk

Abstract: Paper aims to analyze the specifics of the efficiency of Czech and Slovak commercial insurers arising from the impact of environmental factors. Models of data envelopment analysis (DEA) are used to analyze the efficiency of insurance companies. Efficiency is evaluated based on the efficiency score. DEA models allow for the evaluation of factors which in the short term are not under the influence of the analyzed entities. These are called environmental factors. Impact of environmental factors is studied based on an approach proposed by Charnes, Cooper and Rhodes (1981). This procedure divides the analyzed subjects into and in each subgroup efficiency scores are determined. Target values corresponding to the full efficiency are calculated for inefficient subjects. In the next step the efficiency score is expressed on the basis of above mentioned target values and a statistical hypothesis testing is used to determine the statistical significance of the difference between the efficiency scores in groups. This approach allows to compare differences in the efficiency of various groups of insurance companies.

Keywords: environmental factors, efficiency, insurance companies

JEL codes: G22, C52

1 Introduction

The insurance market as one of the components of the financial market is of great importance in the national economy. It contributes significantly to the economic growth. It is a place where supply meets demand for various insurance products. Insurance is closely linked to the risk. Risk realization leads to loss. The size of the risk is the result of two characteristics –frequency and severity of damage. (Vávrová, 2015). Importance of insurance can be assessed both in terms of insured businesses and citizens, as well as in terms of the whole society. Insurance stabilizes the economic situation of the company in the event of an insurance claim. Costs in the critical period are distributed more evenly in comparison to the case of self-insurance. Availability of insurance to citizens stabilizes living standards and mitigates the impact of adverse consequences in the event of an adverse event. From the macroeconomic perspective, positive impact of the insurance industry for the national economy includes accumulation and redistribution of available funds, promotion and the development of the tertiary sector and the employment as well as support for the protection of values (Chovan, 2000).

The insurance market in the European Union is undergoing significant changes. Establishment of a common regulatory environment in the EU and the process of creating a single insurance market of the EU aim towards development of a common integrated insurance space. Central and Eastern European countries are significantly lagging behind in this area (Brokešová, Ondruška and Pastoráková, 2015). Insurance market in Slovakia and the insurance market in the Czech Republic are part of this space. These national insurance markets are linked through their history and the mutual resemblance. Commercial insurance companies operate in these markets in an increasingly competitive environment and their results are affected by many factors. Management of insurance

companies directly coordinates some of these factors in a way that supports the achievement of desired business objectives. However, there are factors that influence the activities of insurance companies and are not under the control of management. These include purchasing power, unemployment rate and others. Thus the efficiency of insurance company is directly related to its own activities as well as the factors that the insurance company does not directly manage. The management of insurance companies must adapt to these factors and seek an optimal response in order to ensure maximum efficiency.

2 Methodology and Data

In our analysis we will focus on the impact of selected environmental factors on the efficiency of commercial insurance companies. Our methodology builds upon established theoretical models that provide basis for the execution of the analysis and comparison of the efficiency of commercial insurance companies in Slovakia and the Czech Republic, with particular emphasis on the analysis of the impact of selected factors on the respective efficiency scores.

We will assess the efficiency of insurance companies by score of technical efficiency, expressed in DEA models. Individual entities are within the DEA analysis referred to as Decision Making Units (DMUs). These models enable us to analyze the efficiency of transformation of multiple inputs to multiple outputs. DEA models are based on non-parametric approach. They use linear programming methods to construct envelopment of data. (Grmanová and Jablonský, 2009) They assess the efficiency score for each analyzed subject. Efficiency scores are calculated as relative values to the envelopment of data.

DEA models are based on the assumption that all the DMUs to be analyzed have the same inputs and outputs, and they operate in the equal environment. In practice, the equal-environment assumption is not satisfied. Operation of insurance companies is affected by various factors, which cannot be directly affected by the insurance company managers. In our analysis, we refer to these factors as environmental factors. Thus, we understand the environmental factors as factors that are not directly influenced by management. Such factors can include macroeconomic as well as microeconomic indicators. Macroeconomic environmental factors may include, for example, GDP per capita, unemployment rate in a country where insurance companies operate, and more. Micro-environmental factors can include age structure of employees, total capital, and more. Among the environmental factors, however, we may also include territorial division, division by frequency of occurrence of floods or storms, demographic indicators and the like. In our analysis we examine the relationship of territorial specifications and technical efficiency of commercial insurance companies. Methods using environmental factors when assessing the efficiency can be, according to Fandel (2001), divided into four groups. Each method has some drawbacks. The first method assumes that values of environmental factors can be sorted according to their impact on technical efficiency ranging from best to worst. In this case, it is common to use the approach proposed by Banker and Morey (1986). The efficiency of a particular DMU is compared only against those DMUs that have values of environmental factors that are equal to or worse than the value of environmental factors of the analyzed DMU.

Another method that is not based on assumptions of previous method proposed Charnes, Cooper and Rhodes (1981). The method comprises of the following steps:

- all DMUs are divided into subgroups according to environmental variable,
- in each of the sub-groups a measure of technical efficiency is expressed for all DMUs belonging to the group,
- for each DMU is determined value of inputs respectively outputs at its projection on the production possibilities frontier of the group (projected values)

- the values of the technical efficiency score are calculated using the projected values.
- using appropriate statistical tests a statistical significance of differences in mean values of the score of technical efficiency is determined within established groups.

Another method according to Fandel is based on the assumption that environmental factors are part of the task of mathematical programming. They are classified as input, output or neutral variable. The fourth method consists of two steps. In the first step, linear programming is used to express the technical efficiency score using traditional non-environmental variables. In a second step the regression analysis is employed to determine the correlation of the technical efficiency and environmental factors. The technical efficiency scores have values in the range (0,1) as they originate in the input-oriented DEA model and therefore a special type of regression analysis, known as Tobit regression, is used.

In our analysis, we use a method proposed by Charnes, Cooper and Rhodes (1981). To express the technical efficiency score of insurance companies we use the input-oriented BCC model.

BCC model

We assume that we have n homogeneous DMUs and we monitor m inputs x_i and s outputs y_{ir} , then assuming variable returns to scale model expressing technical efficiency in input-oriented model has form

$$\min z = \theta_q - \varepsilon (\mathbf{e}^T \mathbf{s}^+ + \mathbf{e}^T \mathbf{s}^-) \quad (1)$$

$$\text{subject to } \mathbf{X}\boldsymbol{\lambda} + \mathbf{s}^- = \theta_q \mathbf{x}_q, \quad (2)$$

$$\mathbf{Y}\boldsymbol{\lambda} - \mathbf{s}^+ = \mathbf{y}_q, \quad (3)$$

$$\mathbf{e}^T \boldsymbol{\lambda} = 1, \quad (4)$$

$$\boldsymbol{\lambda}, \mathbf{s}^+, \mathbf{s}^- \geq \mathbf{0} \quad (5)$$

(Jablonský and Dlouhý, 2004) Efficiency score θ_q of the q -th DMU takes values in the $\langle 0,1 \rangle$ range.

The projected values for the inputs and outputs that are necessary to achieve the technical efficiency can be obtained in one of two ways

$$1. \mathbf{x}_q' = \mathbf{X}\boldsymbol{\lambda}^*, \quad \mathbf{y}_q' = \mathbf{Y}\boldsymbol{\lambda}^*, \quad (6)$$

where $\boldsymbol{\lambda}^*$ is the vector of optimal values of weights calculated by model or

$$2. \mathbf{x}_q' = \theta_q^* \mathbf{x}_q - \mathbf{s}^{-*}, \quad \mathbf{y}_q' = \mathbf{y}_q + \mathbf{s}^{+*}, \quad (7)$$

where variables marked * represent vector of optimal values of variables in the input-oriented BCC model.

The optimization process takes place in two phases. In the first phase is realized a maximum possible reduction of inputs with the help of value θ_q . In the second phase is realized a shift that takes effect with the help of variation variables $\mathbf{s}^+, \mathbf{s}^-$.

The objective of this model is therefore to reduce the inputs \mathbf{x} as much as possible, but so that they remain within an acceptable set of inputs. This reduction provides a projection of the DMU to the frontier, which is a linear combination of efficient DMUs.

To test the hypothesis of equal distribution of technical efficiency scores, we use the non-parametric Mann-Whitney U test based on the order of values. Evaluation of hypothesis testing is done based on the values of U statistics and p-values calculated in the program Statistica.

Our analysis includes 29 commercial insurance companies in Slovakia and the Czech Republic. Of this number, there were 14 commercial insurance companies based in Slovakia and 15 commercial insurance companies based in the Czech Republic. Inputs in the model include operating expenses and claims incurred. The outputs in the model include earned premium and income from financial investments. Data on insurance companies in Slovakia are collected from the respective annual reports. Data on insurance companies in the Czech Republic come from the results of individual members of the Czech Insurance Association.

The aim of our paper is to use the method of Charnes, Cooper and Rhodes (1981) in order to assess whether there is a statistically significant difference in mean scores of technical efficiency of commercial insurance companies on a common insurance market according to selected factors. Selected factors include territorial jurisdiction, and the size of the insurance company, expressed as its market share in terms of earned insurance premiums. Our basic premise reflects the fact that insurance companies in the Czech Republic operate in the larger insurance market, and at the same time the Czech Republic is characterized by lower unemployment rates and greater purchasing power. On this basis, we assume that the insurance companies in the Czech Republic have greater average score of technical efficiency compared to insurance companies in Slovakia. We also assume that insurance companies belonging to group with a greater market share in terms of earned premiums have higher average score of efficiency compared with insurance companies belonging to group with smaller market shares in terms of earned premiums.

3 Results and Discussion

At the beginning of the analysis, we expressed the basic descriptive statistics of the two inputs and two outputs. The data are in Table 1.

Table 1 Descriptive Statistics of Inputs/Outputs

	Mean (EUR)	Median (EUR)	Standard deviation (EUR)	Coefficient of variation (%)
Operating costs	54807.3	27651.0	62288.6	113.7
Claims incurred	135465.7	73187.0	174675.1	128.9
Earned premiums	201089.5	119984.0	241977.6	120.3
Income from financial investments	45119.8	17225.0	70912.7	157.2

Source: Own processing in Statistica

The parameter earned premiums has the highest mean and median values and the parameter operating cost has the smallest mean and median values. The mean of all analyzed parameters was greater than the median i.e. more than half of insurance companies had parameter values that are below the arithmetic mean. The parameter income from financial investments has the highest coefficient of variation.

In the next step we have expressed a correlation matrix of analyzed parameters. The values of correlation coefficients are reported in Table 2.

There is a strong linear dependence between all pairs of analyzed parameters, as all correlation coefficients are statistically significant. The strongest linear dependence is between the pair of earned premiums and claims incurred. The lowest value of linear dependence is reported between income from financial investments and claims incurred.

Table 2 Correlation Matrix

	Claims incurred	Operating costs	Earned premiums	Income from financial investments
Claims incurred	1	0.91	0.96	0.78
Operating costs	0.91	1	0.94	0.80
Earned premiums	0.96	0.94	1	0.86
Income from financial investments	0.78	0.80	0.86	1

Source: Own processing in Statistica

Efficiency of commercial insurance companies in Slovakia and Czech Republic

Next, we divided the 29 analyzed insurance companies into two groups. In one group were insurance companies from Slovakia and in the other group were insurance companies from Czech Republic. We used the EMS program to determine in each group the technical efficiency score according to relations (1) to (5). These values allow to project in each of the two groups the inefficient DMUs on the efficiency frontier in the respective group. Descriptive statistics for the technical efficiency scores in the two groups are presented in Table 3.

Table 3 Descriptive Statistics – Technical Efficiency Score (Territorial)

	Mean	Median	Min	Max	Standard deviation
Insurance companies in Slovakia	0.9299	1	0.7309	1	0.1167
Insurance companies in the Czech Republic	0.7960	0.8237	0.2914	1	0.2452

Source: Own processing in Statistica

The mean of the technical efficiency scores in the Slovak Republic is greater than in the Czech Republic. The mean of the technical efficiency scores of insurance companies in Slovakia and the Czech Republic is less than the median. The standard deviation of the technical efficiency scores of insurance companies in the Czech Republic is much greater than the standard deviation of the technical efficiency scores of insurance companies in Slovakia.

In each of these groups, we adjusted the values of indicators in accordance with equation (7) and this way we have obtained the projected values. Projected values were combined into a single file and we have expressed their technical efficiency scores.

In the next step, we expressed the descriptive statistics for the technical efficiency scores of the projected values. The data are presented in Table 4.

Table 4 Descriptive Statistics – Technical Efficiency Scores of Projected Values

	Mean	Median	Min	Max	Standard deviation
Insurance companies in Slovakia	0.6632	0.6442	0.3874	1.0000	0.2074
Insurance companies in the Czech Republic	0.7900	0.8237	0.2914	1.0000	0.2457
TOTAL	0.7288	0.7393	0.2914	1.0000	0.2331

Source: Own processing in Statistica

The mean of the technical efficiency scores of commercial insurance companies in Slovakia is smaller than the mean of the technical efficiency scores of commercial insurance companies in the Czech Republic. In the case of insurance companies in the Slovak Republic the mean is greater than the median i.e. the majority of reported values is below the mean.

The mean technical efficiency score for the insurance companies in the Czech Republic as well as the mean technical efficiency scores for all analyzed insurance companies is less than the median i.e. majority of the reported values exceeds the mean. Insurance companies in the Czech Republic have greater standard deviation of technical efficiency scores compared to insurance companies in Slovakia.

By using the non-parametric Mann-Whitney U test for two independent sets in the Statistica program we tested the null hypothesis H_0 . The null hypothesis H_0 is stated as: There is not a statistically significant difference in the mean of technical efficiency scores of commercial insurance companies in the Slovak Republic and the mean of technical efficiency scores of commercial insurance companies in the Czech Republic. Alternative hypothesis H_1 is stated as: There is a statistically significant difference in the mean of technical efficiency scores of commercial insurance companies in the Slovak Republic and the mean of technical efficiency scores of commercial insurance companies in the Czech Republic. Sum of the ranks, U-statistic and p-value are reported in Table 5.

Table 5 Mann-Whitney U Test

	Sum of the ranks (SK)	Sum of the ranks (CZ)	U-statistics	p-value
The difference in mean values	173	262	68	0.1063

Source: Own processing in Statistica

Based on the Mann-Whitney U test, we can conclude that the null hypothesis cannot be rejected. At the significance level of 0.05 there is not a statistically significant difference in the mean values of technical efficiency scores of commercial insurance companies in Slovakia and in the Czech Republic. It follows that the analyzed territorial specification does not affect the efficiency of commercial insurance companies.

Efficiency of commercial insurance companies with large and small share in the insurance market.

Next, we divided the 29 analyzed insurance companies into two groups according to their share of earned premiums on earned premiums of all insurance companies. In the first group are insurance companies with earned premiums that exceed 2.4% of earned premiums for all insurers. This group consists of 13 commercial insurance companies, of which there are 3 insurance companies based in Slovakia and 10 insurance companies based in the Czech Republic. In the second group are insurance companies with earned premiums of less than 2.4% of earned premiums for all insurers. This group consists of 16 commercial insurance companies, of which there are 11 insurance companies based in Slovakia and 5 insurance companies based in the Czech Republic. Descriptive statistics of technical efficiency scores in the two groups are presented in Table 6.

Table 6 Descriptive Statistics – Technical Efficiency Score (Size)

	Mean	Median	Min	Max	Standard deviation
Large insurance companies	0.8043	0.8479	0.3448	1	0.2231
Small insurance companies	0.9261	1	0.5769	1	0.1303

Source: Own processing in Statistica

The mean of the technical efficiency scores of small and large insurance companies is less than the median. The standard deviation of technical efficiency scores of large

insurance companies is greater than the standard deviation of technical efficiency scores of small insurance companies.

In each of these groups, we adjusted the values of indicators in accordance with equation (7) and this way we have obtained the projected values. Projected values were combined into a single file and we have expressed their technical efficiency scores. The descriptive statistics for the technical efficiency scores of the projected values is presented in Table 7.

Table 7 Descriptive Statistics – Technical Efficiency Scores of Projected Values

	Mean	Median	Min	Max	Standard deviation
Large insurance companies	0.9145	0.9998	0.5383	1.0000	0.1454
Small insurance companies	0.7382	0.7720	0.4059	1.0000	0.2424
TOTAL	0.8172	0.8891	0.4059	1.0000	0.2203

Source: Own processing in Statistica

The mean of the technical efficiency scores of small insurance companies is smaller than the mean of the technical efficiency scores of large insurance companies. In the case of small insurance companies, large insurance companies as well as all insurance companies the mean is smaller than the median i.e. the majority of reported values is above the mean. Small insurance companies have greater standard deviation of technical efficiency scores compared to large insurance companies.

In the next step, we tested the null hypothesis $2H_0$. The null hypothesis $2H_0$ is stated as: there is not a statistically significant difference in the mean of technical efficiency scores of insurance companies with a small share in the insurance market and the mean of technical efficiency scores of commercial insurance companies with a large share in the insurance market. Alternative hypothesis $2H_1$ is stated as: there is a statistically significant difference in the mean of technical efficiency scores of insurance companies with small share in the insurance market and the mean of technical efficiency scores of commercial insurance companies with large share in the insurance market. Sum of the ranks in both groups, U-statistic and p-value are reported in Table 8.

Table 8 Mann-Whitney U Test

	Sum of the ranks (insurers with large market share)	Sum of the ranks (insurers with small market share)	U	p-level
The difference in mean values	231.5	203.5	67.5	0.1095

Source: Own processing in Statistica

Based on the Mann-Whitney U test, we can conclude that the null hypothesis cannot be rejected. At the significance level of 0.05 there is not a statistically significant difference in the mean values of technical efficiency scores of commercial insurance companies with a small share in the insurance market and commercial insurance companies with a large share in the insurance market.

4 Conclusions

This article uses the method of Charnes, Cooper and Rhodes (1981) for determining the influence of environmental variables on efficiency scores. Our predictions regarding the impact of selected factors on the efficiency of commercial insurance companies were not confirmed. The analysis implies that there is not a statistically significant difference in the

mean of technical efficiency scores of insurance companies in Slovakia and the mean of technical efficiency scores in the Czech Republic; and that there is not a statistically significant difference in the mean of technical efficiency scores of small insurance companies and the mean of technical efficiency scores of large insurance companies.

Our research, however, has certain limitations. Cooper, Seiford and Tone (2006) reported that the number of analyzed DMUs should be at least three times the sum of the number of inputs and outputs. Our analysis includes four parameters, and therefore each group must have at least 12 DMUs i.e. for our sample, we can create a maximum of two groups. It was therefore not possible to use finer classification criteria, for example to classify size of insurance companies as small, medium and large.

Acknowledgements

This article is part of a research project funded by the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak republic and the Slovak Academy of Science VEGA 1/0208/14 Insurance Market and Insurance Companies Efficiency.

References

- Banker, R. D., Morey, R. C. (1986). The Use Categorical Variables in Data Envelopment Analysis. *Management Science*, vol. 1986(4), pp. 513-521.
- Brokešová, Z., Ondruška, T., Pastoráková, E. (2015). Economic and Demographic Determinants of Life Insurance Industry Development. In: *Proceedings of the 12th International Scientific Conference European Financial Systems 2015*. Brno: ESF MU, pp. 61-65.
- Charnes, A., Cooper, W. W., Rhodes, E. (1981). Evaluating Program and Managerial Efficiency: An Application of Data Envelopment Analysis to Program Follow Through. *Management Science*, vol. 27(6), pp. 668–697.
- Chovan, P. (2000). *Theory and Practice of Insurance*. Bratislava: SÚVAHA.
- Cooper, W. W., Seiford, M. L., Tone, K. (2006). *Introduction to Data Envelopment Analysis and Its Uses*. Boston: Springer.
- Czech Insurance Association. (2013). Individual Results of Members. Retrieved from: <http://www.cap.cz>.
- Fandel, P. (2001). Environmental factors in the assessment of efficiency in agriculture. In: *Proceedings of the Economic and management aspects of sustainable agriculture. International Scientific Days*. Nitra: Slovak University of Agriculture in Nitra.
- Grmanová, E., Jablonský, J. (2009). Analysis of the Efficiency of Slovak and Czech Insurance Companies Using Data Envelopment Analysis Models. *JOURNAL OF ECONOMICS*, vol. 57(9), pp. 857-869.
- Insurance Companies. (2013). Annual Reports of Slovak Insurance Companies.
- Jablonský, J., Dlouhý, M. (2004). *Models for Evaluation of Efficiency of Production Units*. Praha: PROFESSIONAL PUBLISHING.
- Vávrová, E. (2015). Insurance Solutions of Covering Agricultural Risks: The Case of the Czech Republic. In: *Proceedings of the 12th International Scientific Conference European Financial Systems 2015*. Brno: ESF MU, pp. 663-669.

Holdings of Government Bonds by Commercial Banks during the Financial and Debt Crisis in Europe

Vladimír Gvozdják¹, Božena Chovancová²

¹University of Economics in Bratislava
Faculty of National Economy, Department of Banking and International Finance
Dolnozemská cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: vgvozdjak@gmail.com

²University of Economics in Bratislava
Faculty of National Economy, Department of Banking and International Finance
Dolnozemská cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: bozena.chovancova@euba.sk

Abstract: *The government bonds of the EU countries were considered a safe investment amongst investors and asset managers. The main motive for their holding by commercial banks was to achieve additional revenue from investing spare funds and to store liquidity in them since they can be quickly sold on the secondary market or used as a collateral in refinancing operations. In this working paper we focus on the current issues related to government bond holdings by commercial banks. With the advent of financial and debt crisis some countries failed to meet their liabilities connected with bonds towards investors. This changed the global view of sovereign bonds as the safest form of investment. Based on the analysis of data provided by the Statistical Data Warehouse of the European Central Bank we focus on the evolution of government bond holdings by commercial banks during the debt crisis in Europe in 2010 – 2014 in selected EU countries. By using the panel data regression we will try to estimate the impact of some of the significant determinants which influenced the volume of the holdings – namely credit rating of the sovereign bonds and their interest rates. This regression suggests that there is a correlation between these independent variables and the holdings by commercial banks.*

Keywords: government bonds, commercial banks, debt crisis

JEL codes: G12, G21

1 Introduction

Government bonds of the EU countries were considered a safe investments. They are an inherent part of all portfolios of securities in banks, insurance companies and other financial institutions. They were used in order to stabilize portfolios with their secure and predictable cash-flow generated by coupons and face value repaid at the maturity.

The current financial and debt crisis has changed this view of investors regarding European sovereign bonds as the most secure asset. Some Eurozone countries were not able to meet their liabilities and that not only led to decreased credit quality of bonds but contributed to the instability of the financial system as well.

The aim of this working paper is to analyse the evolution and impact of government bond holding by commercial banks caused by the selected factors which were affected by the debt crisis – i.e. credit rating of the sovereigns and the interest rates of bonds.

The issue of government bond holdings during financial crisis is dealt with in more working papers. For example Gennaioli, Martin and Rossi (2015) carried out a research in more than 20.000 banks in 191 countries taking into account 20 sovereign defaults over 1998 – 2012. According to their finding, banks hold on average 9 % of their assets in state bonds. More than 75 % of them are domestic bonds. During sovereign defaults, exposure to government bonds increases. As it will be stated later, this finding is consistent with results coming from our model. In view of the above-mentioned authors there are more reasons why banks increase their sovereign holdings during default: their risk appetite, regulation or financial repression issues. They conclude that there are two

main hypotheses for the determinants of bank bondholdings: the "liquidity view" – banks buy bonds during regular business activity because they store liquidity or are used as a collateral in short-term lending. The second one is the "risk-taking view", which means that banks maintain or even increase their bondholdings precisely when they are risky. This is in view of banks' reaching for yield or because of bailout guarantees. The risk-taking view has been most emphasized during the recent European debt crisis, where the large increase in bondholdings has been attributed to banks' search for yield and to moral suasion. This also might include liquidity extensions to banks, and direct purchases of government bonds or conditional commitments to purchase them by the central banks. As the authors showed in their previous works, governments are more willing to repay their debts when domestic banks hold a lot of their bonds. Another reason why commercial banks buy government bonds not fully taking into account their risk level is the preferential regulatory treatment by the current Capital requirement regulation and directive (CRR/CRD IV), according to which the sovereigns are assigned 0 % risk weights. According to Acharya and Steffen (2013) banks hold lower quality government bonds, allowing them to both gain from preferential regulation and to gain high returns without internalizing the systemic consequences of doing so.

The preferential treatment of government bonds as a reason supporting their holdings by commercial banks is documented by Bonner (2014), who by using unique transaction-level data suggests that preferential treatment in both capital and liquidity regulation increases banks' demand for government bonds beyond their own risk appetite. The rationale behind favourable treatment in financial regulation is the view that government bonds are risk-free assets making them a reliable source of liquidity and collateral. He also states that regulation leads to a longer-term increase in government bond holdings. At the same time he claims that there is very little evidence of whether regulatory treatment is truly the main driver of banks' large holdings of government bonds or whether this is not rather caused by banks' own targets and risk management process. To distinguish whether a change in banks' government bond holdings is caused by regulation or by its funding and liquidity needs, one would need detailed information on banks' targets used in their internal risk management frameworks, and such data are not available in a structural form.

The fact that banks increase the government bond holdings even if their credit quality is worsening brings potential problem: government bonds on the balance sheets of banks are the main transmission channel through which weak government finances may affect the banking system and can constitute a systemic risk. This issue is sometimes referred to as the "*doom loop*" between governments and their respective banking sector. Euro-area sovereign bonds accounted for just over 10 percent of banks' assets in the currency area, or 2.73 trillion euros, at the end of 2015, which is an increase of about 300 billion euros compared to the previous year, based on the ECB data. According to a report of European Political Strategy Centre (Issue 03/2015, 9 November) the largest share of government bonds is in most cases held in the form of domestic government bonds. Based on the EBA Stress test data in 2014, the share of sovereign debt held by domestic banks in Eurozone varies between countries from more than 10% (Latvia) to over 90 % (Malta). This reflects some facts like the size of the existing stock of national public debt and its attractiveness to foreign banks. The average for the euro area is very high at 57 % and has been increasing since the beginning of the crisis.

To a certain degree, the excessive demand for government bonds during the debt crisis was partly supported by the ECB, which released trillions of euro via long-term refinancing operations to commercial banks which used this cheap money for buying higher-yielding bonds issued by their national governments in so-called "*carry trades*". According to Christopher Thompson from Financial Times (2013) in view of these operations, over the course of two years from October 2011, the Spanish banks increased government bond holdings as a proportion of their total assets from 5 % to 9,4 %, Italian banks from 6,4 % to 10,3 %, Portuguese banks from 4,6 % to 7,8 % and Slovenian banks from 7,8 % to 10 %. In Germany the banks increased this proportion from 3,8 % to 4,5 %, French and Austrian banks by 1 % respectively. The majority of

the sovereign bond holdings consisted of banks' own domestic government bonds. In view of Groendahl and Black (2016), the treatment of sovereign bonds as risk-free assets exacerbated the debt crisis in the euro area because the balance sheets of banks in countries including Greece, Spain and Portugal were laden with bonds of their individual sovereigns. Bundesbank supports the introduction of risk weights for government bonds as well as exposure limits, which would reduce the preferential treatment and excessive demand for government bonds.

Supporting demand for sovereign bonds by preferential regulation treatment in Basel II and Basel III is confirmed in the work of Lang and Schröder (2015), who proved that the demand is substantially driven by government net issue of securities, and both Basel II (i.e. impact of credit default probability on risk weights) and Basel III (i.e. enhanced capital and new liquidity requirements) have a strong positive impact on banks' for domestic marketable sovereign debt. The primary goal of the Basel framework is to improve the capitalization of the banks and to increase liquidity buffers. Existing bank regulation incentivises banks to purchase more government debt in order to meet these requirements.

According to Asonuma, Bakhache and Hesse (2015), there are more factors which contributed to the "*home bias*" (i.e. the preference of domestic banks for holding domestic sovereign debt instruments compared to other sovereign debt instruments). These were preferential regulatory treatment with a zero risk-weighting. In this context, however, risk weights on other assets, including foreign sovereign debt, might differ significantly between countries which potentially could contribute to cross-country variations of home bias. The increase in home bias during and after the recent crisis period across many countries benefited from the higher importance of domestic sovereign debt for central bank collateral (as well as market funding). The supply of public debt has also increased specially in many advanced economies and led to domestic banks absorbing much of new sovereign debt issuances, when there was a foreign investor retrenchment. In particular, this occurred in an environment of increased global risk aversion. Structural factors, e.g. the availability of other investment opportunities relative to the size of the banking sector could as well affect domestic banks' holding of domestic sovereign debt.

Based on the ECB data from the first half of 2013 banks in some countries held excessive volumes of bonds in relation to the Core Tier 1, thanks to preferential treatment and zero weights risk approach (e.g. Germany 214 %, Italy 204 %, Spain 156 %).

2 Methodology and Data

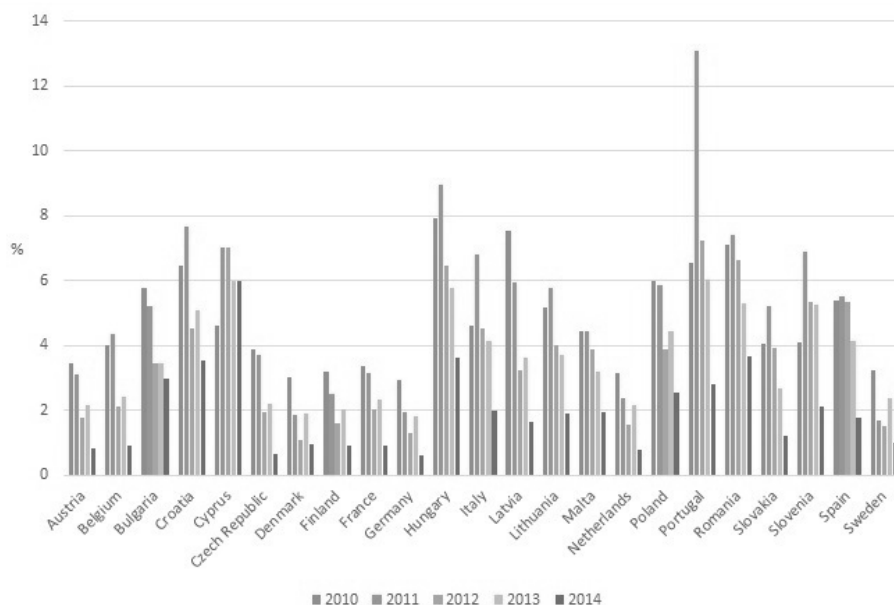
In our analysis we focused on the bondholdings by commercial banks during the years 2010 – 2014 in 23 selected countries of the European Union. The main aim of our research is to analyse the evolution and changes in holdings during the financial and debt crisis. We try to estimate the impact of explanatory variables – in our case the sovereign credit rating, which reflects the creditworthiness of a particular state, and long-term interest rates of bonds as a yield. Government bond holdings represent in our case the dependent variable.

As for the credit rating we used the rating of Standard & Poor's in particular year. Since these values are expressed not as numerals, we used a linear scale transformation following the working paper *Sovereign Credit Ratings and Financial Markets Linkages* (Alfonso, Furceri and Gomes, 2011). In line with this scale, the best rating AAA is 17 and the worst rating D is 1. Credit rating should reflect the ability of a particular state to meet its debt towards investors in time, and thus, generally speaking, should be a factor which influences the decisions of banks to invest or not to invest into this type of assets.

Another independent variable in our model is interest rates of 10-year government bonds as a factor reflecting the yield of this type of asset. In the following figure we can see the evolution of 10-year government bonds interest rates in 2010 – 2014. We can see the

gradual decline in interest rates for each state, which might be caused by the fall of market interest rates in line with the declining ECB key rates.

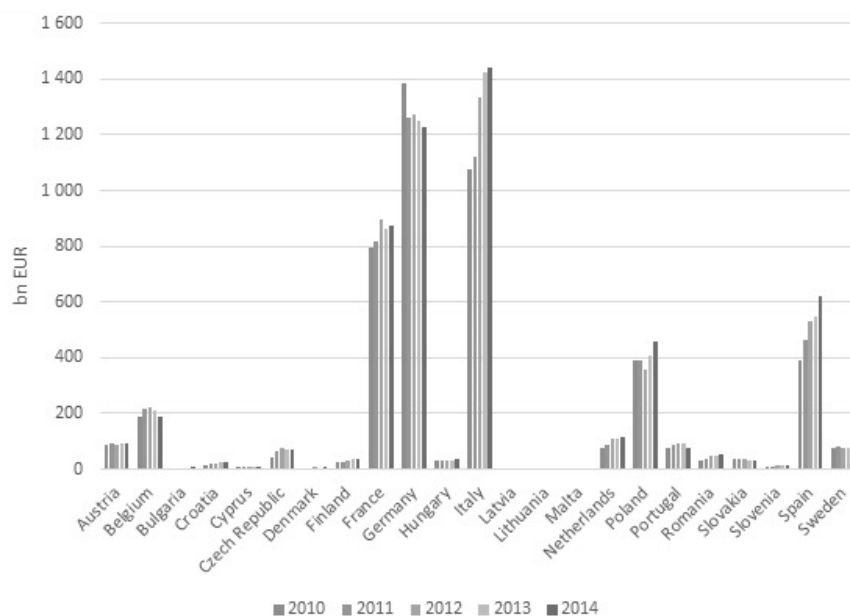
Figure 1 Interest Rates of 10Y Government Bonds of Selected EU Countries in 2010 – 14



Source: Own processing based on ECB Statistical Data Warehouse

The dependent variable in our model is the government bondholdings of monetary and other financial institutions in selected countries of the European Union in 2010 – 2014. The data is provided by the Statistical Data Warehouse of the European Central Bank. We focus only on holdings of domestic government bonds by domestic banks, so that we can analyse the impact of only domestic credit rating and sovereign rates changes during the years of the European debt crisis.

Figure 2 Domestic Government Bond Holdings by Commercial Banks in Selected EU Countries in 2010 - 2014



Source: Own processing based on ECB Statistical Data Warehouse

As seen in the graph, the volume of sovereign bond holdings had mostly an increasing trend in the selected EU countries with only a few exceptions (Belgium, Czech Republic, Germany and Slovakia). We can see that the highest volume of holdings by commercial

banks is in France, Germany, Italy, Poland and Spain. France, Italy and Spain increased their holdings despite the fact that the sovereign bond ratings of these countries downgraded during this period.

Model Specification

In our analysis we used the panel regression with random effects. This method is used for analysing panel data, which in our case represent the evolution of bond holdings, rating and interest rates in 23 countries during 2010 – 2014. The fitness of this model was confirmed by the Hausman test, by means of which we rejected the null hypothesis that both fixed-effects model and random effect model are consistent, suggesting that the random-effect model would be appropriate in our case ($H = 2,5475$ with $p\text{-value} = \text{prob}(\text{chi-square}(2) > 2,5475) = 0,27978$).

3 Results and Discussion

Based on the data of independent variables (credit ratings and interest rates of 10Y government bonds) and dependent variable (government bond holdings by commercial banks) in 23 countries during 2010 – 2014 we got these results of the regression:

Table 1: Panel Regression of Data (Random Effects Model)

	coefficient	std. error	t-ratio	p-value
const	362975	89055,6	4,076	8,60e-05 ***
Rating_transf	-9823,22	2762,59	-3,556	0,0006 ***
Y_interest_rate	-5429,43	2680,19	-2,026	0,0452 **
Mean dependent var	223893,8	S.D. dependent var	385102,8	
Sum squared resid	1,76E+13	S.E. of regression	395003,7	
Log-likelihood	-1644,134	Akaike criterion	3294,268	
Schwarz criterion	3302,503	Hannan-Quinn	3297,61	
Within' variance =		1,60E+09		
'Between' variance =		1,56E+11		
theta used for quasi-demeaning =		0,954728		
corr(y,yhat)^2 =		0,0404669		

Source: Own processing

Following the regression we can see that intercept and coefficients for credit rating and interest rates of 10-year government bonds are statistically significant. In both cases the coefficients are negative. In case of rating it means that the lower the rating, the higher the government bond holdings. As for the interest rates it would mean the lower the rates, the higher the government bonds holdings.

The interpretation of these results might be difficult, because they contradict the logical motivation for buying these assets, i.e. the higher are the rating and rates, the higher are the government bond holdings. In our case it is quite the opposite. This is in our view the result of the financial and debt crisis which changed the view of basic investor's logic. In view of Figure 3 in all selected countries with only few exceptions the commercial banks increased their holdings of bonds during the period in spite of the fact that the credit ratings were downgraded and interest rates declined (see Figure 2). In our opinion, there might be three different reasons which could explain this phenomenon:

- lack of other safer investment opportunities,
- preferential treatment of government bond holdings in line with the capital regulation of the EU (Capital Directive IV), where government bonds of the EU countries are considered risk-free. This means that sovereign bonds under these

conditions have zero risk weight and banks thus have zero credit risk exposure towards these assets and they don't have to increase their own capital,

- moral suasion of commercial banks when they rely on the fact that if a sovereign defaulted, it would be bailed-out and the banks would be redeemed. This hazard could potentially jeopardize the stability of the financial sector.

In line with our regression, the results are consistent with findings of authors mentioned at the beginning of the paper (Gennaioli, Bonner, Asonuma and others). It is quite interesting that there was no statistically significant relationship between sovereign bond holdings on the one hand and ratings and interest rates on the other hand in the period prior to the financial and debt crisis (years 2005 – 2009).

We assume that the current capital regulation is responsible for the evolution of bondholdings during 2010 – 2014. Since the holdings increased in spite of growing default risk we can expect changes in the European capital regulation and preferential treatment of sovereign bonds in a short time in order to avoid potential systemic shock in the future.

4 Conclusions

The aim of this working paper was to assess the impact of sovereign credit rating and 10Y bond interest rates on the bond holdings of commercial banks during 2010 – 2014 in selected 23 countries of the European Union by using panel regression. Based on our results there exists a statistically significant inverse relationship between these variables, which might contradict the basic investors' logic. It is most likely that this phenomenon is caused by preferential treatment of government bonds as risk-free assets supported also by moral suasion and a pledge of bail-out of defaulted sovereigns, especially in the Eurozone area. This might lead to an overexposure of commercial banks to domestic debt, bearing in mind that banks own on average almost 9 % of their assets in the form of domestic government bonds. In case a state defaulted, there could be a potential systemic shock of domestic commercial banks.

These conditions call for a reform of the regulation. In an article by Francesco Guarascio (2015), the European Commission plans to review the banks' sovereign bond holdings to break excessive exposures to national debt, seen as a vulnerability of the Eurozone banking system. In the medium term, it may make sense to review the treatment of bank exposures to sovereign debt, for example by setting large exposure limits. Among the largest Eurozone countries, Italy and Spain would be likely to see the biggest impact on their bond markets, as banks in those countries hold significant amounts of their sovereign debt. A debate is continuing within the European Central Bank on whether a quantitative cap should be preferred to a limit based on the asset risk. There is a proposal of a 25 % equity cap, which would force Eurozone banks to sell bonds worth 1.1 trillion euros, according to a report by credit rating agency Fitch published last year. Banks can now easily offload some of their excessive bonds onto the ECB and in turn help its bond-buying stimulus programme, while increasing the financial stability of the Eurozone. Another possibility to avoid such a concentration of risk would be to buttress the bonds with capital reserves, which would at least make it possible to adequately contain the risk over the medium term.

Acknowledgements

This working paper is a result of the project VEGA (1/0124/14) "The role of financial institutions and capital market in solving problems of debt crisis in Europe".

References

Acharya, V., Steffen, S. (2014). The Greatest Carry Trade Ever? Understanding Eurozone Bank Risks. *NBER working paper 19039*. Retrieved from: <http://www.nber.org/papers/w19039>.

Alfonso, A., Furceri, D., Gomes, P. (2011). Sovereign Credit Ratings and Financial Markets Linkages – Application to European Data. *ECB Working Paper Series no 1347/June 2011*. Retrieved from: <https://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp1347.pdf?af8437707498f9ee33f5da6775c3460f>.

Asonuma, T., Bakhache, S., Hesse, H. (2015). Is Banks' Home Bias Good or Bad for Public Debt Sustainability?. *IMF Working Paper WP/15/44*. Retrieved from: <https://www.imf.org/external/pubs/ft/wp/2015/wp1544.pdf>.

Bonner, C. (2014). Preferential Regulatory Treatment and Banks' Demand for Government Bonds. *DNW Working Paper No.433/July 2014*. Retrieved from: http://www.dnb.nl/binaries/Working%20Paper%20433_tcm46-310158.pdf.

European Political Strategy Centre (2015). *Severing the 'Doom Loop': Further Risk Reduction in the Banking Union*. Five Presidents' Report Series. Issue 03/2015, 9 November. Retrieved from: http://ec.europa.eu/epsc/publications/series/5p_bankexposure_en.htm.

Gennaioli, N., Martin, A., Rossi, S. (2015). Government Default, Bonds, and Bank Lending Around the World: What do the Data Say? Retrieved from: <http://www.econ.upf.edu/~martin/gmr2.pdf>.

Groendahl, B., Black, J. (2016). Forget Basel IV: Bundesbank Says Beware of Banks' Sovereign Risk. *Bloomberg*, 18 January 2016. Retrieved from: <http://www.bloomberg.com/news/articles/2016-01-18/forget-basel-iv-bundesbank-says-beware-of-banks-sovereign-risk>.

Guarascio, F. (2015). EU Plans to Review Rules on Banks' Exposure to Sovereign Bonds. *Reuters*, 24 November 2015. Retrieved from: <http://uk.reuters.com/article/uk-eu-banks-sovereign-idUKKBN0TD1HO20151124>.

Lang, M., Schröder, M. (2015). What Drives the Demand of Monetary Financial Institutions for Domestic Government Bonds? – Empirical Evidence on the Impact of Basel II and Basel III. Frankfurt School of Finance & Management. Retrieved from: <http://www.frankfurt-school.de/clicnetclm/fileDownload.do?goid=000000683018AB4>.

Thompson, Ch. (2013). European Banks Overexposed to Domestic Debt: Feedback Loop Between Banks and Sovereigns is a Concern. *Financial Times*, 23 December 2013. Retrieved from: <https://next.ft.com/content/8290470c-6b17-11e3-8e33-00144feabdc0>.

Foreign Trade Finance: What is the Impact of the Global Financial Crisis of 2007-2009?

Peter Haiss, Franz Binder, Kushtrim Hajzeri, Wadim Kalmykov¹

¹ WU University of Economics and Business
Department of Global Business and Trade, Institute of Export Management
Welthandelsplatz 1, Building D1, A-1020 Vienna, Austria
E-mail: peter.haiss@wu.ac.at

Abstract: *We analyze the impact of the global financial crisis of 2007-2009 on international trade finance. Two different perspectives are covered: the demand side and the supply side of trade finance. Additionally, the implications for trade insurance and Export Credit Agencies are investigated. Furthermore, the role of the state is discussed as the link between trade, finance and GDP growth is of utmost importance for economic policy actors. Our research draws on survey and financial market data and gives a global overview. We find that on the demand side, both the volume of finance and its mix changed. On the supply side, volume and prices were affected as well. The role of the state has risen in course of the crisis in terms of insuring trade via Export Credit Agencies (ECAs). Ever since, the market moved back to normal, and will be more digital soon.*

Keywords: trade finance, foreign trade, financial crisis, ECA

JEL codes: E41, E51, F10, F34, G21

1 Introduction

Trade finance refers to any kind of financing associated with trade credit, trade insurance and guarantees, typically using trade credit as collateral (Ahn, 2011). It covers a broad spectrum of payment arrangements between importers and exporters and is conducted not only through third-party financial institutions, but also through inter-firm transactions. The main objective of trade finance is to bridge the time gap between the delivery and acceptance of a good and thus it deals mainly in short-term maturities of up to 180 days (Auboin and Meier-Ewert, 2003). However it is also used for mid- and longer-term financing when finance for the production and sale of large capital goods is required. Trade finance is a driver for GDP growth, particularly for emerging economies (Bordo and Rousseau, 2011).

According to the World Trade Organization (WTO) about 80 to 90% of global trade relies on trade finance (Auboin, 2009). It is one of many reasons, why this topic is highly interesting and practically important to a variety of institutions.

Managers for example are in particular interested to know how the supply of trade finance changes during a crisis. Are banks willing to supply less? Does it become more costly to get trade finance? Banks on the other hand are interested to know whether exporters and importers will demand more or less trade finance or if during financial crisis companies switch from one option of trade finance to another. To governments it is especially during a crisis a highly relevant topic to focus on keeping trade and the economy going. Trade finance influences both variables and therefore policy makers are highly interested in the implications of trade finance and are motivated to encourage it.

According to the International Chamber of Commerce (ICC) Trade Register, trade finance is predominantly a low risk business characterized by low default rates and a high level of collateralization (ICC, 2013b). From an institutional perspective, the major branches are inter-firm trade credit, bank-intermediated trade finance and export credit insurance.

Inter-firm trade credit plays a particularly important role and accounts for about 60 to 65% of trade finance volume (ICC, 2013b). Especially in developing countries it is a relatively prevalent form of trade finance (Demirgüç-Kunt and Maksimovic, 2001). The two types of inter-firm trade credit transactions are open account arrangements on one side and cash-in-advance arrangements at the opposite side of the spectrum.

Open account transactions constitute the largest share of trade finance arrangements between importers and exporters. It involves the exporter supplying working capital to the importer by extending credit to the importer directly. The exporter then bears the risk in that transaction, such as the credit risk (risk of non-payment). By contrast, the importer has to bear the risk in cash-in-advance arrangements as he pays for the goods before they are shipped (Madura and Fox, 2014). Cash-in-advance financing is estimated to be only about half as common as open account financing (ICC, 2013b).

A significant part of open account transactions are **intra-firm** (trade within the same corporate group), and therefore presumably do not need any bank-financing and insurance (Asmundson et al., 2011). Another significant part of open account transactions are insured by Export Credit Agencies (ECAs) as discussed below.

Alongside importers and exporters, **banks** play a central role in trade finance. They act as intermediaries in the process and provide liquidity in the form of working capital to companies and supply payment mechanisms that reduce the payment and non-performance risks (Love, 2011). Among the intermediated trade finance products, the two most commonly used are letter of credits (L/Cs) and documentary collections (Niepmann and Schmidt-Eisenlohr, 2014). The amount of capital a bank is willing to commit is subject on the bank's assessment of risk i.e. counterparty and country risk, and also on supervisory regulations (i.e. the regulatory minimum capital requirements) (Chauffour and Farole, 2009). In addition, in times of crisis banks tend to become more risk-averse in general and as a result cut down on lending activities altogether (Berman and Martin, 2011). It will be later analyzed to what extent this happened during the Financial Crisis of 2007-2009.

Alongside bank intermediated trade finance, **export credit insurance** is a crucial component in international trade (Auboin and Meier-Ewert, 2003). As an alternative to bank-intermediated trade finance products, export credit insurances represent a different approach to mitigating the risk of non-payment. There are two main ways of obtaining these guarantees. On one hand, from private insurers, which are typically short term guarantees. On the other hand, long term export loans and guarantees can rather be obtained from public export credit agencies (ECAs). They collaborate with commercial banks and provide guarantees and liquidity, i.e. also have a complementary function (Asmundson et al., 2011). The Berne Union is an organization which consists of public and private companies. It was founded 1934 in Berne, Switzerland and has 80 members today. It also founded the Prague Club with the aim to support young export credit agencies. The Berne Union insured USD 1.9 trillion of exports and FDI's in 2009, which constitutes more than 10 percent of international trade (Berne Union, 2010).

In the following we analyze the impact of the global financial crisis 2007 - 2009 on global foreign trade finance up to now. **We focus on the following questions:**

- What were the implications on the demand and on the supply side for bank trade finance?
- What were the changes for trade insurance and export credit agencies (ECAs)?

The remainder of the paper is organized as follows. In the first part the theoretical foundations will be discussed. Thereafter, surveys and other data will be analyzed to answer the above research questions.

2 Methodology and Data

To answer the research questions, we mainly make use of yearly survey data from the International Chamber of Commerce (ICC) as well as the IMF in corporation with the Bankers' Association for the Finance and Trade – International Financial Services Association (BAFT-IFSA). These surveys were conducted in the wake of the financial crisis of 2007-2009 as assessment of trade finance conditions would otherwise not have been possible (Curran, 2009). The ICC Global Trade and Finance survey has since become an important publication published yearly by the ICC. Still, in contrast to trade volume data, coherent data across countries for the trade finance market does not exist

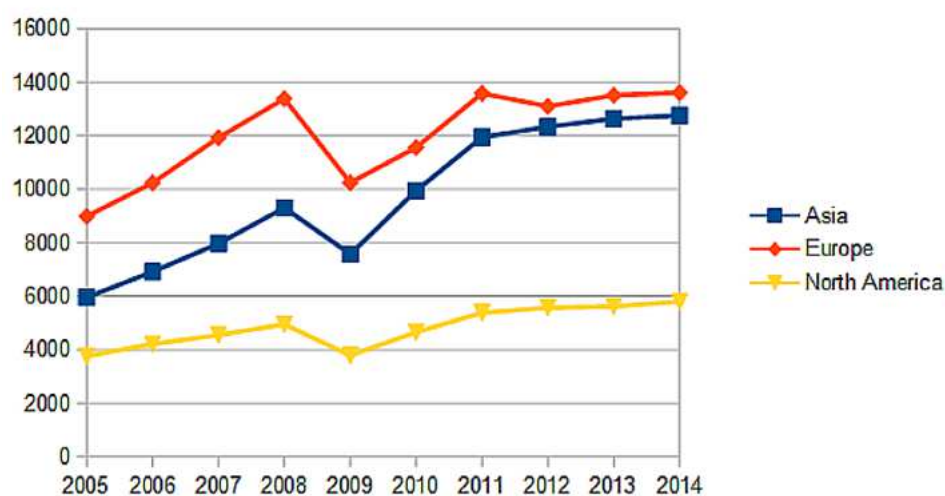
(Asmundson et al., 2011), so we have to rely on the accuracy of the surveys to provide the insights needed to analyze the structure, volume and movements during the period under review. Alongside this, SWIFT data, WTO trade volume data and Berne Union data are the foundation for giving an in-depth analysis on the impact the financial crisis had on trade finance developments during and after the crisis. In addition we also include various literature sources and expert insights in our analysis to present a more detailed analysis. The research gives a broad global overview without focusing on any region specifically. Not only the direct short-term effects are analyzed, but also whether the crisis has had long lasting implications for trade finance up to the year 2015.

3 Results and Discussion

The Financial Crisis and the Great Trade Collapse

Starting in the U.S financial sector, the financial crisis quickly spread around the world and into all sectors that were dependent on credit or other financial products. The world went through a difficult re-balancing, with important economic, social, and political implications for almost all major nations (Frieden, 2009). Since most industries and businesses are financed through banks and equally affected capital markets, the crisis led to a tremendous slow down of the whole economy, especially in world trade. For decades the expansion of global trade had depended on reliable and cost-efficient sources of finance, backed by a deep, global secondary market of fluid and secured financing instruments, and credit insurance products provided by private and public institutions (Auboin, 2009c).

Figure 1 Merchandise Trade Volumes 2005-2014 (Absolute Values in USD Bn)



Source: Baldwin (2009), based on WTO Database

Trade volumes of advanced, emerging, and developing economies were all growing until the sharp decline in the second half of 2008 and early 2009 (figure 1) during which world trade contracted by about 30% (Baldwin, 2009; Chor and Manova, 2012). Accordingly, this period is often referred to as The Great Trade Collapse. The importance of trade finance and credit insurance to support trade flows became apparent (Morel, 2011). After this period economies stabilized in 2009 and started recovering afterwards. However in 2010, in most economies trade was still lower than at the peak in 2008 (Asmundson et al., 2011). The surprisingly fast recovery slowed down in 2011. This development had many reasons for example the Arab Spring, Sovereign Debt Crisis in Europe or natural causes like the earthquake in Japan (ICC, 2012 and 2013a).

These follow-up recovery, though required major institutional efforts. As many economies were facing severe problems in 2007/2008, fears of a new era of protectionism, including total trade bans, were rising. At that point it was crucial for the world to maintain and strengthen an integrated international trading system (Frieden,

2009). The fear of a trade collapse led to the first meeting of the Group of Twenty (G-20) in November 2008. They declared that it was critical to reject protectionism and avoid turning inward in face of a crisis (Tussie, 2012).

Despite their pledge to eschew protectionism for at least 12 months, in 2009 international trade suffered its hardest drop in 70 years. G-20 governments together had implemented as many as 179 measures that harmed foreign trade, investments, workers, and intellectual property (Evenett, 2009). Those discriminatory instruments were mainly financial assistance packages (state aids, bailouts), anti-dumping, countervailing, safeguard actions and tariff increases (Curran, 2009). At the time the WTO recommended increasing the capacity of international financial institutions and exporting credit agencies (ECAs) to take some risks of the private sector partners. Subsequently, regional development banks and the International Financial Corporation (IFC), a member of the World Bank Group encouraging private sector development, doubled the on average capacity under trade facilitation programs. ECAs launched short-term lending programs for working capital and credit guarantees aimed at small and medium businesses. Several countries also used their central banks foreign exchange reserves to supply local banks and importers with foreign exchange through repurchasing agreements (Auboin, 2009).

In order to counter the supply-decrease of trade finance the G-20 leaders proposed a new trade finance "package" at the 2009 London Summit. Its main point was to allow greater co-lending and risk co-sharing between banks and international and national institutions through guarantees against commercial and political risk. This included a reinforcement of the IFC's global trade finance facility through the introduction of a liquidity pool, allowing for a 40-60% co-lending agreement between the IFC and commercial banks. Additionally it was made possible for ECAs to provide more direct funding in the short-run (working capital lending; Auboin, 2009). Those measures introduced by the G-20 in collaboration with the WTO helped to restore the confidence and stabilized trade finance markets fairly rapidly. While the supranational intervention in the market was a major factor in rebuilding international trade itself (Auboin and Engemann, 2013), the crisis still left its imprint on trade finance with regard to volumes, prices and institutions as discussed in the following.

Structural Changes of Trade Finance Triggered by the Crisis

According to ICC surveys, 2/3 of banks reported that their trade credit volumes decreased 2007 and 2008 across the globe (ICC 2010). There was a strong spillover from interbank markets, as 40% of the banks decreased their credit lines for corporates but 52% for financial institutions. The ICC (2010) mainly quoted supply-side reasons for the decline in trade finance, particularly more stringent credit criteria, restrictions in capital allocation, market exits, and reduced inter-bank lending. The IMF-FAFT-IFSTA (2010) rather found demand-side causes, referring to the fall in underlying trade activity, a fall in the price of transactions alongside less credit availability and a shift towards open account transactions. Beginning in the second half of 2010, trade finance rebounded.

From a pricing perspective, the crisis led to an upswing. In the wake of the banking liquidity crisis and global trade collapse, it is indicated in the IMF-BAFT (2010) survey that approximately 90% of banks raised their prices for trade related products (Dorsey, 2009; Asmundson et al., 2011). According to the IMF "the largest banks were much more likely to increase pricing and by larger average amounts..." (Asmundson et al., 2011). Short-term repercussions included in some cases the widening of spreads for letters of credit from 10-15 basis points to levels 250-500 basis points above LIBOR (Auboin, 2009). The ICC (2009) cites banks' higher funding costs, increased capital constraints and greater counterparty risk as the main reasons for the increase in pricing. With the recovery of trade and bank liquidity, markets started to quickly return to normal pricing conditions in 2010 over the next years. "...the average price for L/Cs in large emerging economies fell from 150-250 basis points in 2009 to 70-150 basis points in 2010" (ICC, 2011). The trend continued and resulted in tight prices for trade finance

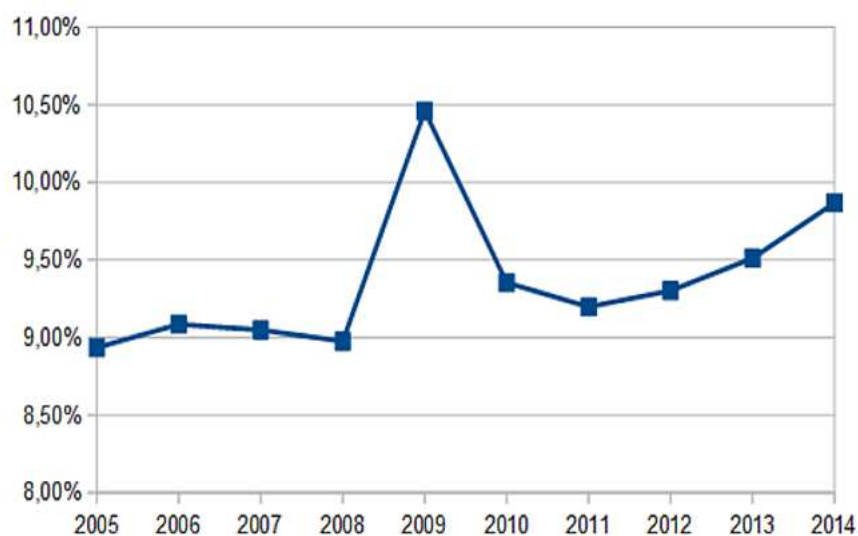
products from in 2013 onwards due to intense competition and abundant short-term liquidity in global markets (Committee on the Global Financial System, 2014).

According to Chauffour and Farole (2009), "... increased risk aversion on the part of importers and exporters increased their willingness to pay for bank trade finance in spite of increased pricing". The increased pricing did not result in a reduced share of bank-intermediated trade finance to world trade. Bank-intermediated transactions gained in relative importance in the wake of the crisis. Their relative share rose from 33% in October 2007 to 36% in January 2009. Even more explicit is the relative reduction of open account transactions from 48% in October 2007 to mere 42% in January 2009. In addition, the ICC surveys (2009, 2010) indicate that the confirmation requests for L/Cs increased considerably between 2007 and 2009 in spite of increased fees for confirmation. Were these changes in demand preferences sustained? Probably not. According to the ICC (2015) the share of open account transactions has returned to its pre-crisis level as the crisis abated.

Banks changed their lending practices, though. As consequence of increased risk and risk-aversion banks became more cautious and limited their exposure, particularly with certain sectors and countries (e.g. small and medium sized enterprises; Chauffour and Malouche, 2011). In addition, "banks have also limited their own risk through expanded insurance, shorter maturities and stronger covenants, and higher cash deposits or other collateral from clients" (Asmundson et al., 2011). The stringent risk management practices have eased, but are likely to have remained somewhat stricter than in pre-crisis years (ICC, 2012 and 2014).

Export credit insurers have already played an active role in supporting international trade prior to the crisis. As a result of the crisis the share of short and long term ECA-covered exports increased dramatically (Morel, 2011). Explanations for this were exiting and newly introduced ECA programs during the crisis (Asmundson et al., 2011).

Figure 2 Short and Long-Term Export Credit Insurance (in % of Global Export Volumes)



Source: Bernue Union (2010) based on WTO Database

In the pre-crisis period 2005 to early 2008, an almost parallel development between credit insurance and exports could be observed (with a share of about 9%. In the course of the financial crisis the ratio changed fundamentally and increased to a level of 10.5%. According to the IMF "this suggests that ECAs may have played an important role in cushioning the downturn (Asmundson et al., 2011)." After the crisis the ratio of export credit insurance and export volumes dropped by more than one percent nearly reaching a pre-crisis level in 2011. Since then a clear upward trend can be observed. This development can be attributed to the fact that credit insurance as a tool for mitigating

risk in international trade has gained in appreciation, which has led to a lasting increase in demand (Morel, 2011).

A similar development can be seen in the ratio between the short term claims and the turnover covered by Berne Union. Short term claims paid more than doubled, from \$1.1 billion in 2008 to \$2.4 billion in 2009. Many claims emerged in the end of 2008 and were paid in 2009 (Morel, 2011). The ratio between short term claims and covered export turnover surged, indicating higher risk during the period. Starting at the end of 2008 at a level of 0.08% it peaked in 2009 at a rate of 0.22%. Thereafter high claims declined in 2010 and stabilized at a level of approximately 0.12% in 2012 (Morel, 2011).

The increased risk perception and increasing claims in 2008 also led to lower supply of private trade credit insurance. While credit limits were reduced and premiums raised by private trade credit insurers (Van der Veer, 2011), public-owned ECAs increased theirs. This was mainly a result of governmental measures supporting ECAs to fill the gap in export credit insurance supply (Berne Union, 2010). The share of ECAs in global short term supply increased in 2009 and 2010 in comparison to previous years. From 2006 to 2010 the share covered by ECAs rose from 15 to 28%. Annual reports of some European countries show the decline in supply of private trade insurers as means to reduce their exposure. Austria for example showed a private supply decline of 15–30% and Sweden of 20–30% (Van der Veer, 2011).

Table 1 Credit Limits of Private and Public Trade Insurance 2006 to 2010 (in Percent)

	<i>2006 - 2008</i>	<i>2009</i>	<i>2010</i>
Private insurers	85.00%	79.00%	72.00%
ECAs	15.00%	21.00%	28.00%

Source: Berne Union (2010)

In the EU public ECAs even began to insure short term marketable risks, which under normal circumstances would have been covered by private trade insurance agencies as ECAs had left these risks to the private market years before. During the crisis ECAs helped especially small and medium-sized enterprises to continue foreign trade by providing trade credit insurance (Berne Union, 2010). While stepping in during the crisis public trade insurance could have had an important role by reassuring the private sector that governmental institutions are prepared to give support through challenging periods (Asmundson et al., 2011). Although credit insurance is not a source of liquidity in itself, it helped to unlock bank financing during the crisis and was able to ensure that liquidity was available for short term and medium to long-term finance (Morel, 2011).

4 Conclusions

This paper provides an overview on the impact of the 2007-2009 global financial crisis on bank trade finance. This period had many implications both for companies on the demand side and banks and trade credit insurance agencies on the supply side. Even statutory regulations were changed as a result of the tremendous impact the crisis had on world trade.

Demand for bank trade finance fell in absolute terms during the crisis as a result of reduced trade in the short term. However, relative to trade volumes there was more demand for bank-intermediated finance and letters of credit (L/Cs), and less demand for open account transactions. As trade recovered, demand in absolute terms also recovered. We could not find lasting changes in relative demand of companies for bank trade finance as a result of the crisis. The pre-crisis trend towards less L/Cs and more open account transactions is likely to have continued.

On the supply side, a decline in the quantity supplied and higher prices were observed in the short term. It seems that those were only temporary effects that subsided in most sectors and regions as the crisis abated. Sustained effects and implications of the crisis include Basel III as response to the crisis, and risk management practices that are likely to have remained somewhat stricter than in pre-crisis years.

Implications for trade insurance and Export Credit Agencies (ECAs) were similarly severe. Short term and overall insurance volumes decreased in the crisis, though in relative terms they decreased less than trade. By contrast, medium to long term insurance increased both in relative and absolute terms during the crisis. One of the causes is the public sectors' intervention, which in turn led to an increased market share of ECAs during the crisis. As a result of the crisis (short term) trade credit insurance has become ever more important for companies and banks, which is reflected in the increasing volumes in the past years.

In a forward-looking mode, global trade continues growing and banks as well as trade credit agencies are essential for this development to continue. New challenges are on the horizon, especially digitization is going to be one of the main trends in the trade finance market. This could lead to a replacement of paper document flows by electronic data flows. Also supply chain solutions, especially for large companies, will gain in importance. As demand and supply changes, the business of trade finance will evolve and support foreign trade and the economy at large.

References

- Ahn, J. (2011). A Theory of Domestic and International Trade Finance, *IMF Working Paper* 2011/262. Retrieved from: <https://www.imf.org/external/pubs/ft/wp/2011/wp11262.pdf>.
- Asmundson, I., Dorsey T., Khachatryan, A., Niculcea, I., Saito, M. (2011). Trade and Trade Finance in the 2008-09 Financial Crisis, *IMF Working Paper 11/16*. Retrieved from: <https://www.imf.org/external/pubs/ft/wp/2011/wp1116.pdf>.
- Auboin, M., Meier-Ewert, M. (2003). Improving the Availability of Trade Finance during Financial Crises, *WTO Discussion Paper XI-2003*. Retrieved from: https://www.wto.org/english/res_e/booksp_e/discussion_papers2_e.pdf.
- Auboin, M. (2009). Trade Finance: G20 and follow-up, *VOX CEPR's Policy Portal*. Retrieved from: <http://www.voxeu.org/article/trade-finance-g20-and-follow>.
- Auboin, M., Engemann, M. (2013). Trade Finance in periods of crisis: What have we learned in recent year? *WTO Staff Working Paper ERSD-2013-01*, WTO Economic Research and Statistics Division.
- Baldwin, R. (2009). The great trade collapse: What caused it and what does it mean? In Baldwin, R., ed.: *The Great Trade Collapse: Causes, Consequences & Prospects*, pp. 1-14. Retrieved from: http://www.voxeu.org/sites/default/files/great_trade_collapse.pdf.
- Bordo, M., Rousseau, P. (2011). Historical Evidence on the Finance-Trade-Growth Nexus. *NBER Working Paper No. w17024*. Retrieved from: <http://ssrn.com/abstract=1833161>.
- Berne Union (2010). *Berne Union Yearbook 2010*. Retrieved from: <http://www.berneunion.org/wp-content/uploads/2013/10/Berne-Union-Yearbook-2010.pdf>.
- Chauffour, J., Farole, T. (2009). Trade Finance in Crisis Market Adjustment or Market Failure? *The World Bank Policy Research Working Paper 5003*, Retrieved from: <https://openknowledge.worldbank.org/bitstream/handle/10986/4195/wps5003.pdf?sequence=1>.
- Chauffour, J., Malouche, M. (2011). *Trade Finance during the Great Trade Collapse*, The World Bank, Washington DC. Retrieved from: <http://econ.sciences-po.fr/sites/default/files/file/pmartin/Trade-Finance-finalpdf.pdf>.

- Chor, D., Manova, K. (2012). Off the cliff and back? Credit conditions and international trade during the global financial crisis. *Journal of International Economics*, vol. 87(1) pp. 117-133. Retrieved from: <http://web.stanford.edu/~manova/crisis.pdf>.
- Curran, L. (2009). The impact of the Crisis on EU Competitiveness in International Trade. In: Forum, *The Impact of the Financial and Economic Crisis on World Trade and Trade Policy*, pp. 264-268. Retrieved from: <http://www.intereconomics.eu/downloads/getfile.php?id=702>.
- Demirguc-Kunt, A., Maksimovic, V. (2001). Firms as Financial Intermediaries: Evidence from Trade Credit Data, *World Bank Working Paper 2696*.
- Dorsey, T. (2009). Trade Finance Stumbles. *Finance and Development*, vol. 46(1), Retrieved from: <http://www.imf.org/external/pubs/ft/fandd/2009/03/dorsey.htm>.
- Evenett, S. J. (2009). Crisis-era protectionism one year after the Washington G20 meeting. In: Baldwin, R., ed., *The Great Trade Collapse: Causes, Consequences and Prospects*, pp. 37-46. Retrieved from: http://www.voxeu.org/sites/default/files/great_trade_collapse.pdf.
- Frieden, J. (2009). Global trade in the aftermath of the global crisis. In: Baldwin, R., ed. *The Great Trade Collapse: Causes, Consequences and Prospects*, pp. 25-30, Retrieved from: http://www.voxeu.org/sites/default/files/great_trade_collapse.pdf.
- IMF-BAFT-IFSA (2010). A survey among banks assessing the current trade finance environment. *Trade finance services: Current environment & recommendations: Wave 3*.
- ICC (2009, 2010, 2011, 2010). *Rethinking Trade Finance*, ICC Annual Global Surveys on Trade Finance, International Chamber of Commerce. Retrieved from: <http://www.iccwbo.org/>.
- ICC (2013a). *Rethinking Trade & Finance 2013: An ICC Private Sector Development Perspective*, International Chamber of Commerce. Retrieved from: <http://www.iccwbo.org/>.
- ICC (2013b). *Global Risks Trade Finance Report 2013*, ICC Trade Register, International Chamber of Commerce. Retrieved from: <http://www.iccwbo.org/>.
- ICC (2014, 2015). *Rethinking Trade & Finance 2014/2015: An ICC Private Sector Development Perspective*, International Chamber of Commerce. Retrieved from: <http://www.iccwbo.org/>.
- Love, I. (2011). Trade Credit versus Bank Credit during Financial Crises. In: Chauffour, J., Malouche, M., eds.: *Trade Finance during the Great Trade Collapse*, The World Bank, Washington DC, pp. 27-40. Retrieved from: <http://econ.sciences-po.fr/sites/default/files/file/pmartin/Trade-Finance-finalpdf.pdf>.
- Morel, F. (2011). Credit Insurance in Support of International Trade: Observations throughout the Crisis, In: Chauffour, J., Malouche, M., eds.: *Trade Finance during the Great Trade Collapse*, The World Bank, Washington DC, pp. 337-356. Retrieved from: <http://econ.sciences-po.fr/sites/default/files/file/pmartin/Trade-Finance-finalpdf.pdf>.
- Niepmann, F., Schmidt-Eisenlohr, T. (2013). International Trade, Risk, and the Role of Banks *Federal Reserve Bank of New York Staff Reports No. 633*, (Revised Nov. 2014). Retrieved from: http://www.newyorkfed.org/research/staff_reports/sr633.pdf.
- Tussie, D (2010). G20 and the multilateral trade impasse, *FRIDE Policy Brief, ISSN: 1989-2667*, FRIDE - A European Think Tank for Global Action. Retrieved from: http://fride.org/download/PB_G20_7_eng_The_G20_and_the_multilateral_trade_impasse.pdf.
- Van der Veer, K. J.M. (2011). Private Trade Credit Insurers during the Crisis: The Invisible Banks. In: Chauffour, J., Malouche, M., eds.: *Trade Finance during the Great Trade Collapse*, The World Bank, Washington DC, pp. 199-212. Retrieved from: <http://econ.sciences-po.fr/sites/default/files/file/pmartin/Trade-Finance-finalpdf.pdf>.

The Influence of the Size of the Region on the Financial Situation of Hospitals

Tatána Hajdíková

University of Economics, Prague
Faculty of Management, department of management
Jarošovská 1117/II, Jindřichův Hradec, Czech Republic
E-mail: hajdikova@fm.vse.cz

Abstract: *The presented paper will focus on selected financial indicators. When selecting indicators, their application for the non-profit sector, particularly hospitals, will be taken into account. The study of literature suggests that there are opinions about the use of specific indicators in the healthcare system. In recent years, many European countries have undergone reforms in the management of the healthcare market to improve the quality of hospital services. Some of the taken measures resulted in the closure of hospitals, which were characterized by worse financial performance, particularly in rural areas. The literature also suggests that hospitals located in rural areas are more economically sensitive, especially to economies of scale. The aim of the research is to determine whether there are differences in the results of selected indicators of hospitals located in different areas. The assumption is that hospitals located in areas with smaller population are characterized by lower profitability, higher debt and by overall lower financial situation. In the paper data from public sources and from annual reports of hospitals for the year 2013 will be used. Hospitals will be chosen according to the division of the Institute of Health Information and Statistics of the Czech Republic.*

Keywords: *public finance, hospitals, profitability, indebtedness, revenue*

JEL codes: H2

1 Introduction

Modern economy is characterized by dynamic changes. Therefore, the forecasting of financial troubles of companies is difficult and has a high importance for all parties examining the company's financial situation. There are a number of indicators dealing with finances and measuring business performance. Synthetic indicators have been the subject of research since the sixties (Beaver, 1966), (Altman, 1968). Indicators should reflect the issues of the industry for which they are used. The health care sector is broad and dependent on many other industries, such as medical equipment manufacturing or pharmaceuticals. Few studies deal with forecasting and financial distress for specific businesses such as hospitals. Extensive research has been led by George H. Pink, et al. (Pink, 2007) at hospitals in Ontario. The collective searched for and determined 37 key indicators, with the help of a team of 30 researchers from the rank of scientists, physicians experienced in hospital management and professional public. Also Zeller et al. (Zeller, 1997) analyzed the financial factors that should define financial measures to prevent a critical condition. His study was conducted on the data of both profit and non-profit hospitals and subsequently it led to identification of six characteristics of financial performance. Another view on the comparison of group of hospitals and group of industrial businesses has been conducted by the team led by Professor Chu (Chu, 1991). Their research determined the existence of the same financial ratios for the group of hospitals in comparison with the situation of group of businesses. With costs, efficiency and the profit efficiency of hospitals deal many studies (Hollingsworth and Street, 2006), (Shen et al., 2005), (Herr et al., 2010), (Hajdíková, 2014a), (Bem, 2015).

Technical advances and demographic changes are the reason for the increasing demand for health care. Health care costs are growing faster than the sources of financing of the health care system. With considerable economic issues are dealing especially small hospitals (Augurzky, 2010). Hospital with less than 100 beds has a higher probability of closing (Williams et al., 1992), (Lillie-Blanton et al., 1992). An opposite view holds Simpson (Simpson, 1995), who carried out a study on smaller sample of California

hospitals in the 90s. McCue (McCue, 1997) finds that hospitals with fewer than 100 beds are less likely to ensure sustained positive cash flow. Augurzky (Augurzky, 2010) analyzed the financial performance of small German hospitals and his findings were that these hospitals have a higher one-year probability of failure and a lower EBITDA profit margin. Smaller hospitals in rural areas don't have worse outcomes than those in urban areas, where there are a number of other hospitals.

In the Czech Republic, the hospitals have various legal forms, which, however, has no significant effect on the net profit of hospitals (Hajdíková, 2013). However, the results show that the impact on the level of net profit may be affected by the size of the hospital of a given legal form (Hajdíková, 2014b).

The aim of this paper is to evaluate and compare the financial situation of hospitals with the following working propositions:

P1: there are differences in the results of indicators of hospitals located in various areas

P2: the financial situation of hospitals with fewer beds will be worse

P3: hospitals with a low number of beds are located in rural areas

2 Methodology and Data

The paper contains an analysis of selected financial indicators. These indicators were selected on the basis of scientific methods (table 1).

Table 1 List of Financial Indicators for the External Evaluation of the Financial Situation of Hospitals

Abbrev. of indicator	Indicator	Formula
U1	ROA	net income / total assets
U2	current liquidity	current assets / current liabilities
U3	indicator of overall debt	total debt / total assets
U4	wage productivity	Employee expenses/operating income (sales)

Source: Author's own expertise

To evaluate the selected indicators, the data from publicly available sources for the year 2013 have been used. Data was acquired from the profit and loss accounts, the balance sheets, from the annual reports of hospitals and from the web portal of Institute of Health Information and Statistics (ÚZIS, 2016) (MFCR, 2016). Given the objective of the article, only data from hospitals in the Czech Republic are processed. In the Czech Republic there were 10.5 million of inhabitants in 2013. The country is divided into 14 regions. Towards the end of 2013 the Czech Republic had 188 hospitals, which are, according to the bed capacity, owned by 50% by the state. The remaining 50% is owned by non-state sector, of which 25% is owned by counties and municipalities, and 25% by private owners. Hospitals are established with the legal form of contributory organizations, limited liability companies, joint stock companies, charitable organizations and church organizations (ÚZIS, 2014).

Figure 1 Hospital in Individual Regions



Source: MFCR (2016), own processing

Comparison of hospitals has been done using two multivariate methods - namely it was a simple sum of a sequence and a method of distance from a fictitious object.

Simple sum of a sequence: for each criterion (here the indicators) the organizations are ordered based on a value of particular criterion. The hospital with the best value of given criterion is assigned the first position, the next in order is assigned second position, etc. This is done for all criteria under consideration. After that the assigned values are summed up and it holds that the lower the total sum, the better the result of the hospital.

The method of distance from a fictitious object is based on measuring a distance of particular organization from a fictitious organization. The latter is constructed as the organization that reaches the best value in all criteria involved in an analysis. It means that in the given set of hospitals the best value for each indicator is identified, and with all of them put together the ideal object is created. Then the distance (d_i) is computed as

$$d_i = \sqrt{\sum_{j=1}^m (v_{ij} - v_{fj})^2} \quad (1)$$

Where v_{ij} is a standardized variable of j -th indicator for i -th hospital, v_{fj} is standardized variable of j -th indicator for fictitious organization; m is the number of indicators. An interpretation of results is based on the fact that the lower the distance the better the position of hospital.

3 Results and Discussion

Data from 106 hospitals was used for comparison. The remaining data was excluded for the lack of accuracy or incompleteness. Minimum, maximum and average values of calculated indicators are shown in Table 2.

Table 2 Average, Minimum, Maximum Values of Calculated Indicators

	Average	Min	Max
U1	0,0496	-0,3073	0,2941
U2	1,7606	0,4466	10,5309
U3	0,4401	0,0374	1,3666
U4	0,5354	0,2034	0,7138

Source: Author's own research and calculations

Hospital Reamedica Žacléř from the Hradec Kralove region reached the lowest in the indicator U1 (ROA). The value of the indicator is negative, which suggests the debts of the hospital are not covered. The highest value in return on assets has reached the Hornická Hospital and Polyclinic Ltd. from the Vysočina region. Minimum and maximum values of the U2 indicator (current liquidity) diverge from common values. The U3 indicator (overall debt) is being kept on the minimum value in the Zlín region by the hospital in Uherský Brod, Ltd. The maximum value is being reached by the PP hospitals, Ltd. in Brandýs nad Labem. The U4 indicator (wage productivity) is maintained on approximately the same value by all hospitals.

Hospitals were tested using the multivariate methods. The table 3 shows best four hospitals with the best and four hospitals with the worst ranking. These hospitals were assigned the number of beds and number of inhabitants in the district in which the hospital are located. The largest district is Prague with 1.246 millions of inhabitants and the smallest is Jeseník in the Olomouc Region with only 40 thousands of residents.

Table 3 Order of Best and Worst Ranked Hospitals

Hospital	Simple sum of the sequence	Number of beds	Number of residents in the district
Hospital Polička (Pardubice region)	17	120	104971
Hospital Podlesí (Moravskoslezský region)	23	167	212448
P-P Klinika Kladno (South Bohemia region)	24	^	159984
Mediterra Sedlčany (Central Bohemia region)	31	103	113905
Kladno hospital (Central Bohemia region)	69	622	159984
Karlovy Vary hospital (Karlovy Vary region)	72	1134	117868
Hospital of st. Zdislava (Vysočina region)	76	106	118646
Rehamedica Žacléř (Hradec Králové region)	99	^	119900

Source: Simple sum of the sequence – author's own calculations; Number of beds (ÚZIS, 2013); Number of residents in the district (CZSO, 2013)

4 Conclusions

The paper analyzed the financial indicators of hospitals in the Czech Republic regarding the return on assets (ROA), current liquidity, overall debt and wage productivity. These indicators have been quantified due to a lack of data for 106 hospitals in 2013. A uniform ranking of hospitals in terms of worst and best result was chosen. It could be assumed that hospitals with the best ranking will score almost the best for all indicators and vice versa. The best hospital, regarding the order of all indicators, ranked 17th and hospital with the worst record ranked the 99th place. It may be due to the selection of indicators or due to the financial situation that might have occurred in the hospital in the period under review.

Results of indicators were tested for the hospital's location in a region. No close match of resulting values of hospitals located in one region has been found. Assumptions of differences existing in the indicator's outcomes of hospitals located in different regions were confirmed. In the research, the regions in the Czech Republic and selected size of the area by population in the district were compared. Mild consensus, however, occurred when comparing the values of the indicators of hospitals to the number of beds. Hospitals with more beds were arranged rather between hospitals with poorer financial results. In contrary, hospitals with fewer beds showed better value indicators. Hospitals with fewer beds are spread throughout the Czech Republic and are located even in districts with a high population density. The surprising finding is that hospitals with fewer beds have satisfactory results. The result is similar to research of Simpson (Simpson, 1995). This finding will be confirmed by further research using other research methods on a longer period of time. The number of hospitals in the surveyed region will be added to the relation with the assessed indicators. It is also necessary to mention the limitations of the research, because some hospitals are grouped in the holding company (South Bohemia Hospitals Holding) and health care concepts of hospitals in this group may be different from a hospital deciding separately with the same number of beds and similar region.

Acknowledgments

This paper was funded from the resources of the project 12/2016, a negotiated contract between the researchers and IGA (Internal Grant Agency), University of Economics in Prague.

References

- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *The Journal of Finance*, vol. 23(4), pp. 589–609.
- Augurzky, B., Schmitz, H. (2010). Is there a Future for Small Hospitals in Germany? *Ruhr economic papers*, vol. 198.

- Beaver, W. H. (1966). Financial Ratios as Predictors of Failure. *Journal of Accounting Research*, vol. 4, pp. 71.
- Bem, A., Michalski, G. (2015). Hospital Profitability vs. Selected Healthcare System Indicators. In: *Central European Conference in Finance and Economics (CEFE2015)*. Košice: Technical University of Košice, pp. 52-61.
- Chu, D. K., Zollinger, T. W., Kelly, A. S., Saywell, R. M. (1991). An Empirical Analysis of Cash Flow, Working Capital, and the Stability of Financial Ratio Groups in the Hospital Industry. *Journal of Accounting and Public Policy*, vol. 10(1), pp. 39-58.
- CZSO (2014). *Statistical Yearbook of the Czech Republic - 2013*. Retrieved from: <https://www.czso.cz/csu/czso/statistical-yearbook-of-the-czech-republic-2013-653m9thdn1>.
- Hajdíková, T., Komárková, L., Pirožek, P. (2013). Financial and operational performance of hospitals in the Czech Republic. In: *Proceedings of the 10th International Scientific Conference*. Brno: Masarykova univerzita, pp. 120-125.
- Hajdíková, T., Komárková, L., Pirožek, P. (2014a). The Issue of Indebtedness of Czech Hospitals. In Deev, O., Kujarová, V., Krajíček, J., ed., *European Financial Systems 2014*. Brno: Masarykova univerzita, pp. 230-235.
- Hajdíková, T., Komárková, L., Pirožek, P. (2014b). Komparace právních forem nemocnic působících v prostředí zdravotnických služeb v ČR. In: *Sborník recenzovaných příspěvků z mezinárodní vědecké konference Hradecké ekonomické dny 2014, Díl I., Ekonomický rozvoj a management regionů*. Hradec Králové: Gaudeamus, pp. 254-261.
- Herr, A., Schmitz, H., Augurzky, B. (2010). Profit efficiency and ownership of German hospitals. *Health Economics*, vol. 20(6), pp. 660-674.
- Hollingsworth, B., Street, A. (2006). The market for efficiency analysis of health care organisations. *Health Economics*, vol. 15(10), pp. 1055-1059.
- Lillie-Blanton, M., Felt, S., Redmon, P., Renn, S., Machlin, S., Wennar, E. (1992). Rural and urban hospital closures, 1985-1988: Operating and environmental characteristics that affect risk. *Inquiry*, vol. 29, pp. 332-344.
- McCue, M. J. (1997). Small hospitals with positive cash flow: Why are they winners? *Medical Care Research and Review*, vol. 54, pp. 32-60.
- MFCR (2016). *ARES - ekonomické subjekty*. Retrieved from: http://www.info.mfcr.cz/ares/ares_es.html.cz.
- Pink, G. H., Daniel, I., Hall, L. M., Mckillop, I. (2007). Selection of Key Financial Indicators: A Literature, Panel and Survey Approach. *Healthcare Quarterly*, vol. 10(1), pp. 87-96.
- Shen, Y. C., Eggleston, K., Lau, J., Schmid, C. (2005). Hospital ownership and financial performance: A quantitative research review. *NBER Working Papers 11662*.
- Simpson, J. (1995). A note on entry by small hospitals. *Journal of Health Economics*, vol. 14(1), pp. 107-113.
- ÚZIS (2013). *Kardexy 2013*. Retrieved from: <http://www.uzis.cz/cr-kraje-z-2013>.
- ÚZIS (2014). *Demografická situace v České republice v roce 2013*. Retrieved from: <http://www.uzis.cz/rychle-informace/demograficka-situace-ceske-republice-roce-2013>.
- Williams, D., Hadley, J., Pettengill, J. (1992). Profits, community role, and hospital closures: An urban rural analysis. *Medical Care*, vol. 30, pp. 174-187.
- Zeller, T. L., Stanko, B. B., Cleverley, W. O. (1997). A New Perspective on Hospital Financial Ratio Analysis. *Healthcare Financial Management*, vol. 51(11), pp. 62-66.

Analysis of Various Entrepreneurial Activities and their Development in the Czech Republic from 2008 to 2015

Eva Hamplová¹, Jaroslav Kovárník², Pavel Jedlička³

¹ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: eva.hamplova@uhk.cz

² University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: jaroslav.kovarnik@uhk.cz

³ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: pavel.jedlicka@uhk.cz

Abstract: *This contribution analyses the number of newly established as well as closed down entrepreneurial units in the Czech Republic between 2008 and 2015 with regard to the legal form of business as well as the field of business activity. The aim is to use the non-public sources of Czech Statistical Office and assess the trend in the number of entrepreneurial units in the Czech Republic. The methods of comparative analysis and trend analysis were used to monitor individual types of business activities as for the number of established and closed entrepreneurial units. The types of economic activities with high entrepreneurial activity were determined by means of net balance and average annual growth rate. The contribution reacts to the conclusions of a European Commission study Flash Eurobarometer (2012), which assesses the Czech Republic as one of four EU countries where a growing number of people prefers self-employment to employment. The authors consider the differences among various entrepreneurial activities and among legal forms of business to be a starting point for a discussion about support to particular fields of business, about private investment and forms of financial flows on both national and international levels.*

Keywords: business, business environment, national economy

JEL codes: L25, L26, O10

1 Introduction

Entrepreneurship satisfies unfulfilled needs of people, supports regional development and builds human and intellectual capital of individuals involved in entrepreneurial activities (Uhlauer, 2010). Moreover, entrepreneurship contributes to employment creation, productivity and economic growth, thus corroborating the relevance of entrepreneurship for the world's economies (Lukes, et al., 2013).

It is common to define entrepreneurship as the occupational choice to work for one's account and risk. At the individual level researchers have examined a variety of questions such as: Who is more likely to become an entrepreneur? Are there particular personality traits, childhood, adolescent or adult experiences of the person, or specific motives that are associated with entrepreneurship (Rauch & Frese, 2007; Gorgievski, 2010)? Why are some entrepreneurs more successful than others? Are entrepreneurs different than other people? Do they have different personalities? Do they act differently?

Entrepreneurs pursue their dreams of developing successful new ventures regardless of all the obstacles and barriers to be faced. One of the interesting questions raised in research carried out on entrepreneurship is, what helps people to undertake entrepreneurial activity, and to continue on with it to achieve its successful outcome, even if it is such a demanding task? Recent analyses suggest that the personality of the

entrepreneur is important for successful business start-up and growth (Laguna, 2010). The entrepreneur needs to be alert, sensitive to market needs and inefficiently used resources, and have the courage to make the decision to seize the opportunity he has just noticed (Lukes, Jakl, 2012).

Since 2008, Europe is suffering from the consequences of the most serious economic crisis that has not been experienced over the past 50 years. For the first time in Europe, there are more than 2.5 million unemployed and small and medium enterprises in most Member States are still unable to get back to its pre-crisis level (Entrepreneurship 2020 Action Plan, 2013). Since 2004, the percentage of people who prefer self-employment to the relationship of employment decreases in 23 of the 27 EU Member States (Entrepreneurship 2020 Action Plan, 2013). While three years ago, 45 % of Europeans preferred the self-employed, now this figure has fallen to 37 % (Eurobarometer Survey on Entrepreneurship, 2012) unlike in the US and China, where the percentage is much higher: (51 % or 56 %). Countries where preferences of self-employment increased during the period 2004-2012 are the Czech Republic (from 30% to 34%), Latvia (from 42% to 49%), Lithuania (from 52% to 58%) and Slovakia (30 to 33%) (Eurobarometer Survey on Entrepreneurship, 2012).

The authors consider the differences among various entrepreneurial activities and among legal forms of business to be a starting point for a discussion about support to particular fields of business, about private investment and forms of financial flows on both national and international levels. The aim is to support both national and European interest based on the European Commission action plan – Reigniting the entrepreneurial spirit in Europe.

2 Methodology and Data

Internal database of Czech Statistical Office was used during the preparation of this article. Records about the number of SMEs in 2008 - 2015 were obtained thanks to Information Services Unit of the Czech Statistical Office and Business Statistics Coordination and Business Cycle Surveys Department of the Czech Statistical Office.

Obtained data about the number of newly established and closed down entrepreneurial units are arranged into time series and consequently evaluated by the analysis of average growth rate and by index of net increase (decrease) in the number of newly established entrepreneurial units during analyzed period 2008 – 2015. For identification of newly established entrepreneurial units has been used an abbreviation EST (established), and for identification of closed down units an abbreviation CLO (closed). For mutual evaluation has been used BALANCE (EST – CLO). For identification of different legal forms of business has been used data in following order:

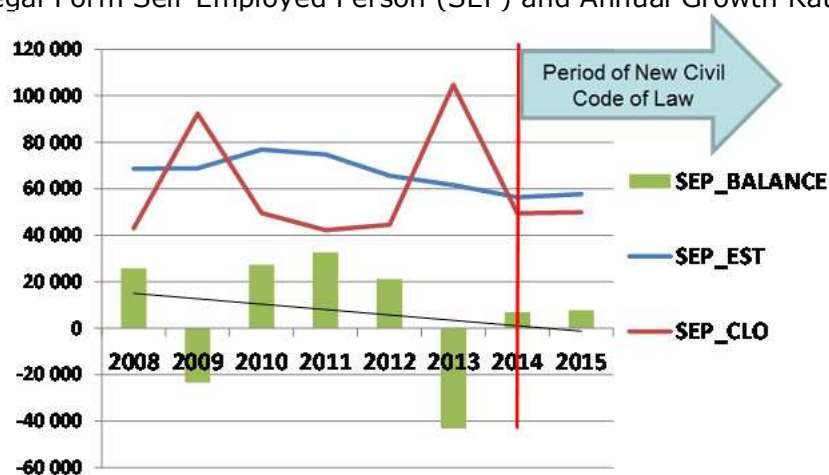
- Self-Employed Person (SEP)
 - (A) Private entrepreneurs in business under the Trade Act
 - (B) Agricultural entrepreneurs – natural persons
 - (C) Others
- Legal Person
 - LLC
 - Joint-stock companies
 - Limited partnerships
 - General commercial partnerships
 - Others

With respect to various entrepreneurial activities have been used statistical nomenclature CZ-NACE on the A – T levels. The methodology used to tackle the subject has the nature of basic theoretical research which is focused on the analysis of the structure, linkages and relations of the studied subject. From the methodology point of view trend, system and qualitative analysis is used to achieve the objective.

3 Results and Discussion

The aim of this paper is to describe business activity of entrepreneurial units in the Czech Republic. The legal form criterion has been used for the analysis in the first part of this article. The legal form is the base for the discussion, whether entrepreneurs establish new units as self-employed persons or as legal persons. As far as self-employed persons are concerned, the huge advantage in the conditions of the Czech Republic is quick and both administratively and financially establishment. The disadvantages are the number of the owners, the size of the unit, and the liability, where the entrepreneur has to be liable also with own personal property, which includes the property of the family too. This risk seems to be really high, which is probably the reason why the number of newly established units of this legal form has significantly lower growth rate than in the case of legal persons. Figure 1 shows that the development of the number of newly established units has relatively steady progress, in contrast with the development of the number of closed down units.

Figure 1 Number of Newly Established and Closed Down Units between 2008 – 2015 in the Legal Form Self-Employed Person (SEP) and Annual Growth Rate of SEP



Source: Own research based on Czech Statistical Office (2015)

Higher activity occurred in 2010, but the number of newly established entrepreneurial units has been decreasing since that year. The average growth rate of newly established units of this legal form presents - 2.18% in analyzed period. With respect to the number of closed down self-employed persons, the development is significantly different. There are higher amounts of closed down units in the years 2009 and 2013, where this development has influenced the average growth rate on 20.41% in the period 2008 – 2015. With regard to different growth rates of newly established entrepreneurial units and of closed down entrepreneurial units, it is possible to see decreasing development of the balance of net newly established entrepreneurial units. However, this development has not yet impact on the decrease of total amount of entrepreneurial units, because net index of the establishment of new entrepreneurial units for all SEP is 111.51% (Table 1). Nevertheless, this situation can change in the following years.

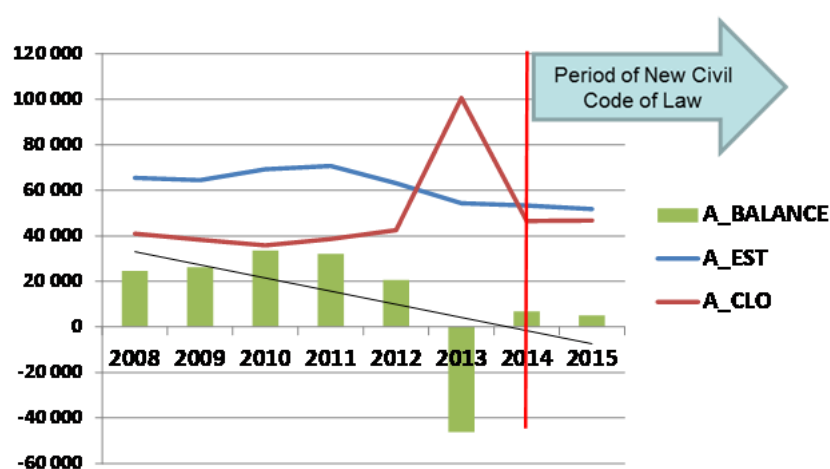
The reality of the establishment of new entrepreneurial units in the legal form of Self-Employed Persons is supplemented by the Figure 2, where it is possible to analyze the development of the most numerous group of SEP in the Czech Republic, namely Private entrepreneurs in business under the Trade Act. This group presents more than 90% of total SEP and its index of net growth is 126.28%. This can be explained that for every closed down unit has been created 1.25 new units in the period 2008 – 2015.

Table 1 Different Legal Forms of Business According to the Creation of Net Balance of Newly Established Entrepreneurial Units (by Index of Net Increase/Decrease)

Self-Employed Person		2008	2014	EST/CLO
		-	-	2008 - 2015
		2015	2015	
A	Private entrepreneurs in business under the Trade Act	1.26	1.13	492 524/ 390 025
B	Agricultural entrepreneurs – natural persons	0.16	3.06	8 571/ 53 773
C	Others	0.92	0.99	29 059/ 31 645
TOTAL		1.12	1.15	530 154/475 443

Source: Own research based on Czech Statistical Office (2015)

Figure 2 Number of Newly Established and Closed Down Units between 2008 – 2015 in the Legal Form Private Entrepreneurs in Business under the Trade Act (A) and Annual Growth Rate



Source: Own research according Czech Statistical Office (2015)

Next group with significant influence on the entrepreneurial environment in the Czech Republic is group of legal persons.

Table 2 Different Legal Forms of Business According to the Creation of Net Balance of Newly Established Entrepreneurial Units (by Index of Net Increase/Decrease)

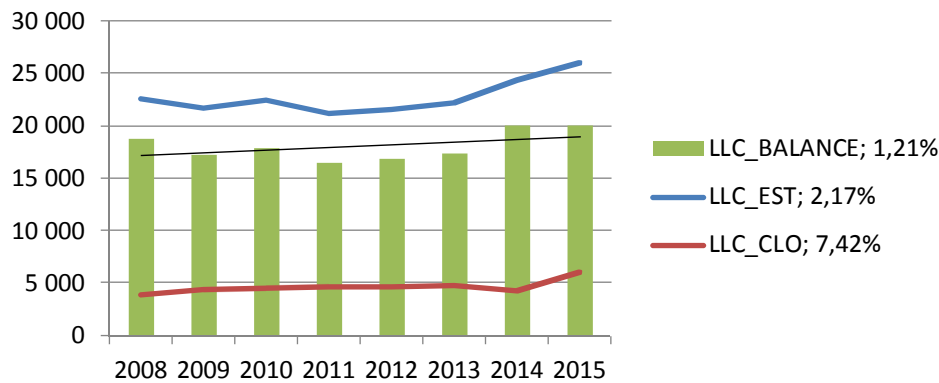
Legal Person	2008 - 2015	2014 - 2015	EST/CLO
			2008 - 2015
LLC	4.88	4.88	182 218/37 330
Joint-stock companies	1.85	1.43	7 716/4 179
Limited partnerships	0.99	0.50	150/152
General commercial partnerships	0.42	0.20	557/1 336
Others			1 573/30
TOTAL	4.47	4.45	192 214/43 027

Source: Own research based on Czech Statistical Office (2015)

The establishment of such kind of unit is administratively more difficult than in case of SEP, there are also more complicated legal and accounting rules. On the contrary, the most frequent legal form, Limited Liability Company, has no requirement on liability with own property, there can be one or more owners, and since 2014 there is no requirement on the beginning contributed capital. The analysis of LLC units shows higher activity in 2013, there are no significant fluctuations in the period 2008 – 2015, and the average growth rate is 2.17%. The tendency of closed down units is stable too, with average

growth rate 7.42%. From Figure 3 is obvious that the amount of LLCs has been growing every year, but with respect to the number of newly established companies is the net balance of newly established companies 488.13% in the period 2008 – 2015. That means that there are almost five new companies on every closed down company.

Figure 3 Number of Newly Established and Closed Down Units between 2008 – 2015 in the Legal Form Limited Liability Company (LLC) and Annual Growth Rate



Source: Own research according Czech Statistical Office (2015)

The second part of this article analyzes the establishment and termination of companies according to economic activity. It is assumed that analyzed activity is the same activity which is declared to be the main activity of the entrepreneurial unit. From the Table 3 is obvious that the field of business Electricity, gas, steam and air conditioning supply has been the most active based on the index of net balance of newly established entrepreneurial units.

Index 11.76 means that during the period 2008 – 2015 have been created 11.76 new companies on every one closed down in this field. Yearly indexes of net balance were significant in this field especially in the years 2008 (12.5), 2009 (48.6), 2010 (18.3), 2012 (21.0), and 2013 (21.3). In the year 2009 were created 1,069 new companies in this field, while only 22 were closed down. Other intensively developing fields are Real estate activities (index 4.47), Arts, entertainment and recreation (2.93), Other service activities (2.79), Information and communication (2.59), and Water supply; sewerage, waste management and remediation activities (2.06). On the other hand, higher number of companies have been closed down in the fields Administrative and support service activities (0.84), Transportation and storage (0.71), Agriculture, forestry and fishing (0.61), and Activities of extraterritorial organizations and bodies (0.31).

Table 3 Different Fields of Business According to the Creation of Net Balance of Newly Established Entrepreneurial Units

		2008 - 2015	EST/CLO
A	Agriculture, forestry and fishing	0.61	40 720/66 695
B	Mining and quarrying	1.49	268/180
C	Manufacturing	1.29	83 273/64 513
D	Electricity, gas, steam and air conditioning supply	11.76	5 220/444
E	Water supply; sewerage, waste management and remediation activities	2.06	4 839/2 350
F	Construction	1.16	86 331/74 711
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	1.31	203 749/155 376
H	Transportation and storage	0.71	12 431/17 598
I	Accommodation and food service activities	1.09	35 586/32 678

J	Information and communication	2.59	19 882/7 682
K	Financial and insurance activities	1.1	27 373/24 947
L	Real estate activities	4.47	72 537/16 213
M	Professional, scientific and technical activities	1.77	104 476/58 971
N	Administrative and support service activities	0.84	11 494/13 604
O	Public administration and defense; compulsory social security	1.25	372/297
P	Education	1.87	11 051/5 907
Q	Human health and social work activities	1.49	10 158/6 819
R	Arts, entertainment and recreation	2.93	18 356/6 262
S	Other service activities	2.79	69 667/25 012
T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use	-	3/0
U	Activities of extraterritorial organizations and bodies	0.31	12/39
TOTAL		1.46	

Source: Own research according Czech Statistical Office (2015)

4 Conclusions

This article used the data from Czech Statistical Office for creation of survey of development of establishment new entrepreneurial units in the Czech Republic in the period 2008 – 2015. The analysis of business activity can be used for revealing disparities among each legal forms, and also for revealing tendencies in fields of business in the Czech Republic in analyzed period. Since 2014, new Civil Code of Law is in charge in the Czech Republic for all entrepreneurs. This change of legislation brought simplification for establishment of one legal form of business, namely LLC.

This article dealt with the relations between newly established companies and closed down companies according to the legal form. For LLCs is the total net balance of newly established entrepreneurial units 4.88. In the years 2014 (5.64) and 2015 (4.34) was the relations between newly established LLCs and closed down LLCs on really high level, therefore it can be assumed that the change of legislation is appreciated by the entrepreneurs. On the contrary, the SEP entrepreneurs have not as high index as LLC. Total index of net newly established units' growth during analyzed period is only 1.12. Moreover, there were years with this index lower than 1 during analyzed period of time. In the year 2009 (0.75) and 2013 (0.59) were the amounts of closed down entrepreneurs higher than the amounts of newly established units. It is obvious that this development has no correlation with the change of legislation. The entrepreneurs have no tendency for closing down their entrepreneurial activity only because of the change of legal form on LLC, where there is no need of beginning contributed capital according to the new legislation, but at the same time there is no need for liability with personal property. This brings the questions for discussion, how are entrepreneurs in the Czech Republic open for entrepreneurship, how they see the entrepreneurial environment, and how are they satisfied with self-employment.

The analysis of entrepreneurial activity according to the field of business shows that during 2008 – 2015 has been very significant field Electricity, gas, steam and air conditioning supply, where on every one closed down unit have been created almost 12 new units. However, this tendency has been stopped in last two years. Other important fields are Real estate activities, Arts, entertainment and recreation, Other service activities, and Information and communication. On the other hand, on the decline are fields Activities of extraterritorial organizations and bodies, Agriculture, forestry and fishing, and Transportation and storage.

Acknowledgments

This article is prepared with the support of the Internal project of Faculty of Informatics and Management at the University of Hradec Králové.

References

- Czech Statistical Office (2015). *Births and deaths of businesses*. Database of the Statistical Business Register. Not public, internal document.
- European Commission, (2012). *Eurobarometer Survey on Entrepreneurship*. Retrieved from: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/eurobarometer/index_en.htm.
- European Commission (2013). *Entrepreneurship 2020 Action Plan*. Retrieved from: http://ec.europa.eu/enterprise/policies/sme/entrepreneurship-2020/index_en.htm.
- Gorgievski, M. J. (2010). Entrepreneurial motivation: Independence, money, self-realization and passion for work. In M. Lukes & M. Laguna (Eds.), *Entrepreneurship, a Psychological Approach*, Prague: Oeconomica Publishers, pp. 55-72.
- Laguna, M. (2010). Positive Psychology Inspirations for Entrepreneurship Research. In M. Lukes & M. Laguna (Eds.), *Entrepreneurship, a Psychological Approach*, Prague: Oeconomica Publishers, pp. 73-88.
- Lukeš, M., Jakl, M., (2012). *Entrepreneurship in the Czech Republic*. Praha: Oeconomica.
- Lukeš, M., Zouhar, J., Jakl, M., Očko, P. (2013). *Factors Influencing Entrepreneurial Entry: Early-Stage Entrepreneurs in the Czech Republic*. *Politická ekonomie*, 61(2), pp. 229–247.
- Rauch, A. & Frese, M. (2007). Born to be an entrepreneur: Revisiting the personality approach to entrepreneurship. In J. R. Baum, M. Frese & R. Baron (Eds.). *The psychology of entrepreneurship*, London: Lawrence Erlbaum Associates, pp. 41-66.
- Uhlaner, L., Thurik, R. (2010). Postmaterialism Influencing Total Interpreneurial Activity Across Nations, In: *Entrepreneurial and Culture*, Berlin: Springer-Verlag Berlin, pp. 301-328.

Development and the Current Situation of the Mortgages for the Czech Households

Martina Hedvicakova¹, Libuse Svobodova²

¹ University of Hradec Kralove
Faculty of Informatics and Management, Department of Economics
Rokitanskeho 62, 500 03 Hradec Kralove III, Czech Republic
E-mail: martina.hedvicakova@uhk.cz

² University of Hradec Kralove
Faculty of Informatics and Management, Department of Economics
Rokitanskeho 62, 500 03 Hradec Kralove III, Czech Republic
E-mail: libuse.svobodova@uhk.cz

Abstract: *The paper is focused on the specialized financial product, esp. on mortgages that are the most often used products in the field of own housing financing in the Czech Republic. These products provide selected banks on the Czech market. The aim of the paper is to analyze the situation on the financial market focused on the mortgages. The organization of the paper is as follows: firstly a theoretical background with a review of the literature is provided, then research methodology is described, the key part brings results of development of mortgages according to the purpose of use since 2005, development of interest rates and the analysis of the current situation on the mortgage market. Interest rates on mortgage loans have on the Czech market downward trend. Statistical data suggest that people are not afraid to borrow money after the economic crisis and invest more in housing funds. Hypoteční banka was classified as the main player on the market closely followed by Česká spořitelna and Komerční banka. The article is based on primary and secondary sources. A detailed research together with the analysis and critical assessment of accessible materials will enable to identify the main objectives in the field of study. The analysis of the initial state will consequently enable to identify the key factors and knowledge.*

Keywords: mortgage loan, interest rate, bank, households

JEL codes: E43, E44, E52

1 Introduction

At the present time, there is stiff competition amongst banks on the financial market based on marketing and information basis. The goal is not only to get new clients but especially to retain the current ones. Traditional banks should beware of new „low-cost“ banks on the Czech market and should maintain their sizeable amount of clients.

Indebtedness is globally enlarging every year and residents take full advantage of loans. Mortgages and loans from building societies are considered to be the most frequent products. Mortgages mature between 5 and 40 years. Most of the consumers conclude a contract for 20 – 30 years. The loans from building societies usually last up to 10 years.

From 1999 to 2013, U.S. mortgage debt doubled before contracting sharply. I estimate mortgage inflows and outflows that shed light on the sources of volatility. During the boom, inflows from real estate investors tripled, far outpacing other segments such as first-time homebuyers. During the bust, a collapse in inflows keyed the debt decline, while an expansion of outflows due to defaults played a more minor role. Inflow declines partly reflect a dramatic falloff in first-time homebuying, especially for low credit score individuals. Bhuttas (2015) analysis helps support the notion that the differential decline by credit score reflects markedly tightened credit supply.

Recourse mortgages increase the cost of default but also lower equity and increase payments. The effect on default is nonmonotonic. Loan-to-value (LTV) limits increase equity and lower the default rate, with negligible effects on housing demand. Combining recourse mortgages and LTV limits reduces the default rate while boosting housing

demand. Together, they also prevent spikes in default after large declines in aggregate house prices. (Hatchondo et al, 2015)

Dia and Menna (2016) find that resource costs explain a large share of bank interest margins, which generates a floor for the interest rate on loans.

At the present time of extremely low interest rates and slow economic growth, the government and central bank of each country strive to boost their economies. In March 2016, The European Central Bank (ECB) also decided to boost the economy and increase a low rate of inflation by an unexpectedly strong mixture of policies. The ECB decreased all of its interest rates, intensified the purchase of bonds and it offered a new cycle of low cost loans to banks. The basic rate was unexpectedly decreased from historical minimum of 0.05 percent to 0 but according to analyst it is basically insignificant. Monthly bond purchases are increased by €20 milliard to €80 milliard (2.2 billion Czech Crowns). Along with the purchase of state bonds, the ECB is going to purchase bonds with a high rating issued by non-bank financial institutions. Banks in the Eurozone will be allowed to opt for a new 4-year programme.

„A bank that is very active in granting loans to the real economy can borrow more than a bank that concentrates on other activities,” ECB President Mario Draghi said. As supposed, the deposit rate was decreased to minus 0.40 per cent from current 0.30 per cent. At the time of negative rates, banks are obliged to pay for deposits parked in the ECB, which should make them lend a higher amount of money. The ECB also decreased the rate on the marginal lending facility which equals 0.25 per cent and offers overnight credit to banks by ECB. (ČTK, 2016)

Whether the real interest rates respond in a different manner to macroeconomic news at the zero lower bound (ZLB) as compared to the case away from the ZLB is essential for assessing the effectiveness of government policies and the validity of the policy implications of New Keynesian models at the ZLB. By using an identification strategy based on heterogeneity, Zhang (2016) find that at the ZLB, monetary policy news is less effective in affecting short- and medium-term real rates and its effect dies off faster.

The goal of the article is to analyse the situation on the Czech mortgage market with an emphasis on the development of mortgage loans from 2005 to the first quarter of 2016.

The overview of the history and use of mortgages in the world is presented together with the operation of national and commercial banks.

2 Methodology and Data

According to the Act No. 190/2004 Coll., as subsequently amended (including the Act No. 137/2014 Coll.), and Article 28, “a mortgage loan is a loan whose redemption, including appurtenances, is secured by a right of pledge over real estate, where the claim arising from the loan does not exceed twice the amount of the mortgage value of the mortgaged real estate. A loan is considered to be a mortgage loan from the day when the right of pledge takes legal effect. For the purposes of coverage of mortgage bonds, the receivable arising from a mortgage loan or a part thereof may be first used on the day when the issuer of mortgage bonds learns about the legal effect of the establishment of the right of pledge over the real estate.”

This paper is based on the analysis of the literature and articles on housing. Important information is available on the official websites of each bank institution, the Czech National Bank, the Czech Statistical Office, as well as of some financially oriented portals like Hypoindex, GolemFinance, Hypoteční banka etc. The obtained data were further sorted, processed in custom tables, clearly charts, and further analysed to provide a basic overview of the relevant problem area.

Mortgage loans are a widely studied subject and there is an extensive literature dealing with mortgages on the Czech market, which enables us to gain insight into the selected areas of mortgages from multiple sources which deepen or complement the issue. The

twenty-year development of mortgage loans in the Czech Republic is included in order to depict the situation on the Czech market.

3 Results and Discussion

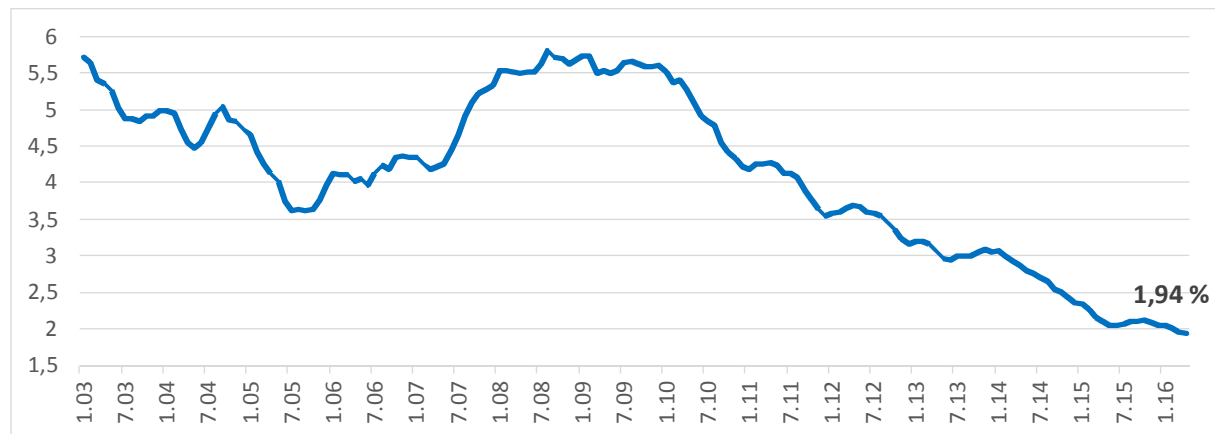
20-year development of mortgages in the Czech Republic

The development of mortgages is possible to divide into four stages:

- The first stage from 1995 to 1999 - It was in 1995 when mortgages entered in banking industry. State subsidies that helped launch mortgages were granted in this period. Distribution of the product and discovering the risks were gradually developed by banks.
- The second stage from 2000 to 2005 - Origin of the mortgage market and competition. Owing to innovation in products and new ways of distribution, mortgages became much more available to clients.
- The third stage from 2006 to 2010 - Recession occurred in the autumn of 2008 after the growth of tens per cent and lasted until September 2010.
- The fourth stage from 2011 to 2015 - The period between 2011 and 2015 is considered to be recovery from the crisis. According to the statistics of Hypoindex, mortgages are commonly used and the interest rates have reached the lowest recorded minimum of 1.97% p.a. It was launched a trend of clients to conclude mortgages on houses that will be leased in the future. The Czech National Bank (CNB) due to record numbers of mortgages and rising risk for commercial banks issued a recommendation that the length of the maturity of mortgage loans do not exceed 30 years. (Hypoindex.cz, April 2016)

The graph below (Fig. No. 1), traces the evolution of mortgage interest rates from the beginning of mortgage loans as a new financial product.

Figure 1 The Development of Average Interest Rate in the Czech Republic (in %)



Source: Hypoindex.cz, 2016, own processing

Currently, according to the CNB there is a total of 46 banking institutions. (Bid) supply and competition is still growing so it is more and more difficult for clients to find the right bank. According to the document Banking Supervision in 2005, there are 36 banks and branches of foreign banks.

Whether the applicant for a mortgage loan chooses between a fixed or variable rate and short-term or long-term fixed-rate mortgage, they will definitely obtain a lower interest rate in comparison to the period before economic crisis. As indicated in the Figure 5, the interest rate has been decreased by 3.5%. The highest interest rate (5.82%) was recorded in August 2008. However, from the perspective of individual months there is no considerable variability in development of interest rates, though there might be significant reduction in mortgage repayments due to the tenths of changes in the interest rates.

Regarding the future development of interest rates, as shown in Figure 1 there has been other decrease of interest rates and was recorded a new historic minimum in April 2016 amounted to 1.97% (Hypoindex 2016). According to chief manager of the company GOLEM FINANCE s.r.o. Mr Libor Ostatek, an ongoing decrease of interest rates is expected even in the future (GOLEMFİNANCE, 2015c) with possibility of breaking historic lows again. We will see, what impact on the interest rates there will be after changes in the new scheduled act of loan. (Hypoindex, Zámečník, 2016).

The analysis of the current situation on the mortgage market

For banks, the year of 2015 was the most successful year in the whole history of the Czech Republic as far as granting mortgages is concerned. According to the Ministry of Regional Development, banks provided almost 102,000 mortgages to their clients for 184.3 milliard Czech Crowns in total. The table 1 shows an apparent growth by 40.9 milliard in comparison with the previous year of 2014. The average interest rate in the year of 2014 was 2.7 percent, whereas, in the year of 2015, it dropped to 2.14 percent. The annual growth rate on the mortgage market in the year of 2015 was equal to 28.6 percent (GolemFinance.cz, Hovorka, 2016a).

Table 1 The Sums of Money Banks Provided to Their Clients Each Year

Year	Total amount
2001	14.7 mld. CZK
2002	22.5 mld. CZK
2003	36.2 mld. CZK
2004	52 mld. CZK
2005	72 mld. CZK
2006	100.8 mld. CZK
2007	142.3 mld. CZK
2008	120 mld. CZK
2009	73.9 mld. CZK
2010	84.8 mld. CZK
2011	119 mld. CZK
2012	121.6 mld. CZK
2013	149.3 mld. CZK
2014	143.4 mld. CZK
2015	184.3 mld. CZK

Source: Zpravy.aktualne.cz, own processing

The Table 2 depicts how much money each bank provided on mortgages in the Czech Republic.

Table 2 The Sums of Money Each Bank Lent in the Year of 2015

Bank	Volume (in mld. CZK)	Annual change
Hypoteční banka	51.221	22,65 %
Česká spořitelna	49.525	39,49 %
Komerční banka	45.804	33,69 %
Raiffeisenbank	15.871	21,48 %
UniCredit Bank	11.336	21,02 %
Wüstenrot HB	6.602	35,85 %
Sberbank	2.287	-15,03 %
GE Money Bank	1.644	-11,21 %
Total	184.293	28,55%

Source: GolemFinance.cz, own processing

Hypoteční banka, which owns more than 25 per cent of market share, dominated the mortgage market in the year of 2015. However, it increased only by 22.65 per cent, which means that it fell behind the average of the growth of the mortgage market. Česká

spořitelna, which reached the 40 per cent annual growth rate in mortgage volume, had the highest annual percentage change in the Czech Republic and took the second place. In terms of mortgage volume, Komerční banka placed third with the annual change of 33.69 per cent. The fourth and fifth place was taken by Raiffeisenbank and UniCredit Bank – both banks reached similar annual growth rate, about 21 per cent. As the Table 2 demonstrates, the biggest Russian bank Sberbank and American GE Money bank suffered the most dramatic drop in mortgages in the Czech Republic (GolemFinance.cz, Hovorka, 2016b – the statistics included in the article on MMR.cz).

Clients' interest in mortgages was supported not only by very low interest rates about 2 percent, but also by the fact that currently investors do not find beneficial to keep and save their money in the conservative instruments like savings accounts, time deposits, etc. It is more profitable for them to decide for fund investment and apply for a "cheap" loan in a bank. Historical success in the number of mortgages granted to clients was backed up by financial analysts' forecasts predicting the growth of rates in the year of 2016. Plenty of people interested in mortgages, therefore, did not hesitate and secured a mortgage loan under optimum conditions.

Nevertheless, the numbers taken from the year of 2016 indicate that interest rates are still dropping and the future will show whether or not they have reached the bottom. Mortgage banks may enjoy another success in terms of granting mortgages in the year of 2016, which is proved by contemporary development.

Within interest rates on new loans to households, overdrafts recorded the biggest change in April 2016. Interest rates on loans to non-financial corporations saw the largest change for loans of up to CZK 7.5 million.

The overall interest rate on consumer credit, loans for house purchase and other loans rose to 4.44%. The interest rate on consumer credit decreased to an all-time low of 10.91% and the interest rate on loans for house purchase rose to 2.40%. Other loans were remunerated at a higher rate than in March (3.36%). The rate on mortgage loans reached its second lowest level since the start of the measurement (2.15%) (Czech national bank, 2016).

Development of mortgages according to the purpose of use since 2005

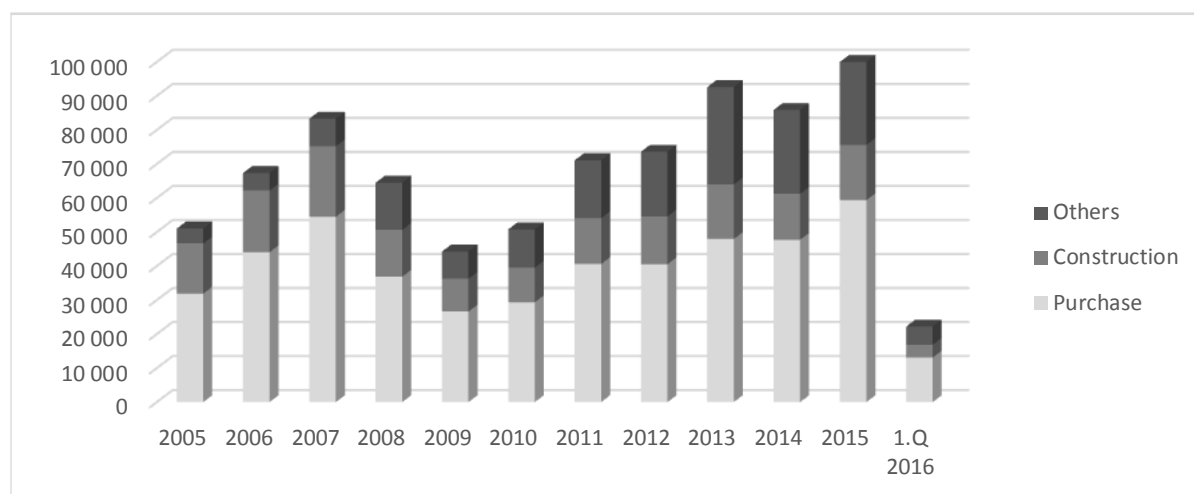
In the years 2005 – 2007 based on the Figure 2 below it is apparent that at the time of growing the economy the demand for buying property formed by citizens grew as well, whereas during the economic downturn, which began in 2008, the issue of housing for citizens fell into the background and the priority was maintaining employment.

However, the economic downturn also had one of its advantage. It was reduction of interest rates to a minimum in order to promote economic growth, which was reflected in the interest rates of mortgage loans enabling the housing issues to be more accessible for many households.

That is why the demand for mortgage loans has increased since 2010. The number of signed mortgage contracts increased in the years 2010-2015 to 51 000 contracts. In 2015, there were 58% of contracts for real estate purchases, almost 16% for the construction and almost 26% for other purposes, which may be non-specific type of American mortgage loan or others.

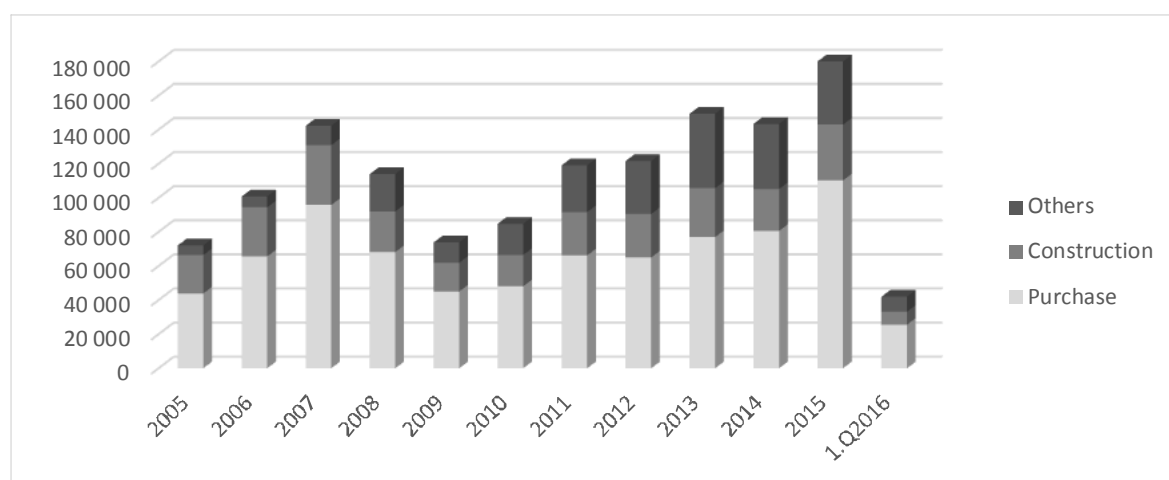
The number of signed mortgage contracts also relates to development in terms of financed money and when there were most funds intended for purchases of real estate, which were increased by 229% per cent (62 milliard Czech Crowns) during the years 2010 – 2015. In case of other (non-purpose) mortgages, there was a significant increase by 225% (almost 23 milliard Czech Crowns) in amount of provided funds. Comparing the years 2010 and 2015, the total amount of borrowed money increased by 217% (see figure 2 and 3).

Figure 2 Development of Number of Mortgage Loans Depending on the Purpose of Use in the Period of 2005 and the First Quarter of 2016 (in Pieces)



Source: MMR.cz, 2016, own processing

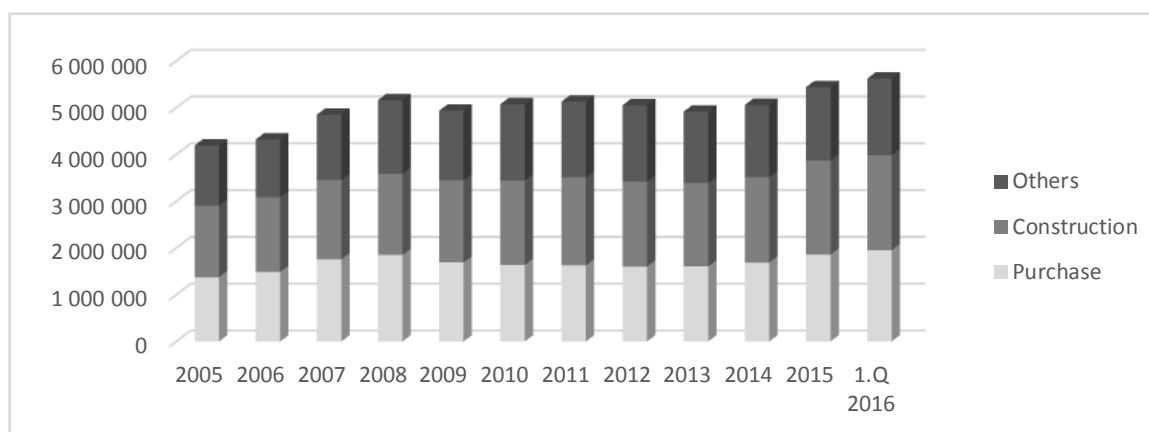
Figure 3 Development of Mortgages According to the Purpose of Use in the Period of 2005 and the First Quarter of 2016 (in Thousand CZK)



Source: MMR.cz, 2016, own processing

Although in the period of 2005 and the first quarter of 2016 there was relatively significant fluctuating progress in number of signed contracts and provided funds for mortgages, there was no dramatic fluctuation in terms of the value of mortgages per one contract. The average value of mortgage per one contract was increased by 476 thousand Czech Crowns, which is by 34% more comparing with the year 2005. Mortgages for real estate purchases influenced the increase in value of mortgages of 42%, increase of 577 thousand Czech Crowns. Mortgages for construction influenced the increase in value of mortgages of 33%, increase of 503 thousand Czech Crowns. The other mortgages had the smallest effect on total growth. The increase in value of mortgages was "only" 27%, which is 348 thousand Czech Crowns while the amount of money was increased by 217% (see figure 4).

Figure 4 Development of the Value of Mortgage per 1 Contract in the Period of 2005 and the First Quarter of 2016 (in CZK)



Source: MMR.cz, 2016, own processing

Discussion

The topic no. 1 in the mortgage market is a new regulatory rules that directed us from the EU. The Ministry of Finance is preparing a new law on loans for consumers. The New Testament comprehensively covers all types of consumer loans - from classic cash loans, credit cards, purchases of goods on installment to mortgages and other loans. The law on consumer credit did not concern it yet (ie. loans on housing and so-called microloans). If we focus on mortgages, there will significantly change the conditions for early repayment of mortgages, which will be easier to repay. Roles and responsibilities of intermediaries will also increase. The quality of services will improve thanks to the certifications for those financial advisors who will want to offer mortgages in the future.

Questions for discussion are whether the possibility of cheaper early repayment of the mortgage loan may be the motive for the banks for offering of more expensive mortgages and to what extent they will respond? What will have higher influence on a possible increase price of mortgage? Regulation and the possibility of early repayment or will be decisive monetary policy of the Czech National Bank and the related value of money? The question arises whether it is appropriate that the EU and the state regulate the credit market?

4 Conclusions

Czech mortgage market achieved record results in 2015. The volume of closed mortgage loans exceeded according to the Ministry of Regional Development 184 billion crowns, which is up about 41 billion more than in the previous year. The average amount of mortgage loan reached 1.87 million last year, 9.3% more than in 2014. It is because of the growing prices of residential real estate. HB Index, which tracks the price development of apartments, houses and land since 2010 had showed an annual increase in prices of flats by 6.2 percentage points, family houses 2.4 percentage points and land 5.3 percentage points. (Hypoteční banka, 2016)

Interest rates on mortgages are currently under two percent, and even fell in April 2016 to a record value 1.94% (see. Fig. 1). The average interest rate has declined, but the number of closed mortgages in April 2016 fell to 9,042. It is 333 less than in March. As well as have declined volumes. People in April 2016 issued a total of 17.06 billion CZK on mortgage loans. The volume was about 846 million CZK higher in March. (Hypindex, 2016)

Interest rates will remain at low levels in 2016 according to predictions. Further decline would occur, however, growth is more expected. Among the reasons why can remain low interest rates in 2017, it may be noted that the Czech national bank confirmed the

commitment to remain in the exchange rate to end 2016 and also left its interest rates unchanged. Czech national bank also had not introduced a negative interest rate as have done the European Central Bank. In further research will be analysed what will have influence on higher and possible increase price of mortgage? New regulation or will be decisive monetary policy of the Czech National Bank and the related value of money?

Acknowledgments

This paper is written with financial support from Internal grant project from Faculty of Informatics and Management at the University of Hradec Králové.

References

- Act No. 190/2004 Coll., (including the Act No. 137/2014 Coll.), Czech Republic.
- Bhutta, N. (2015). The ins and outs of mortgage debt during the housing boom and bust. *Journal of Monetary Economics*, vol. 76, pp. 284–298.
- Czech national bank (2016). *Commentary on MFI interest rates, April 2016*, Retrieved from:
https://www.cnb.cz/en/statistics/money_and_banking_stat/harm_stat_data/mfi_komentar.html
- Czech national bank, ARAD (2016). Retrieved from:
http://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_sestuid=19522&p_uka=6,7&p_strid=AAD&p_sort=2&p_od=200401&p_do=201604&p_period=1&p_des=50&p_format=4&p_decsep=.&p_lang=EN.
- ČTK (2016). *Překvapení pro trhy. ECB podpoří evropskou ekonomiku nečekaně důraznými kroky*. Retrieved from: <http://zpravy.aktualne.cz/ekonomika/prekvapeni-pro-evropske-trhy-ecb-srazil-a-hlavni-urokovou-saz/r~20a5d590e6c411e59c4a002590604f2e>.
- Dia, E., Menna, L. (2016). Productivity shocks, capital intensities, and bank interest rates. *Journal of Macroeconomics*, vol. 48, pp. 155–171.
- Hatchondo, J.C., Martinez, L., Sánchez, J.M. (2015). Mortgage defaults. *Journal of Monetary Economics*, vol. 76, pp. 173–190.
- Hovorka, J. (2016a). Confirmed. Banks have negotiated the most mortgages in history in the last year. *Hospodářské noviny*. Retrieved from:
<http://zpravy.aktualne.cz/finance/potvrzeno-banky-loni-sjednaly-nejvice-hypotek-v-historii/r~4ad89578c9f911e5a8d7002590604f2e/>.
- Hovorka, J. (2016b). Hypoteční banka defended in the last year its leading position on the market. Česká spořitelna after rapid growth get close. *Hospodářské noviny*. Retrieved from:
<http://www.golemfinance.cz/cz/1035.hn-hypotecni-banka-loni-uhajila-pozici-jednicku-na-trhu-ceska-sporitelna-se-ji-ale-po-rychlem-rustu-tesne-priblizila>.
- Hypindex (2016). *Hypindex vývoj*. Retrieved from:
<http://www.hypindex.cz/hypindex-vyvoj/>.
- Hypoteční banka (2016). Komentář Hypoteční banky k vývoji hypotečního trhu. Retrieved from:
<https://www.hypotecnibanka.cz/o-bance/pro-media/tiskove-zpravy/obchodni-vysledky-cr/komentar-hypotecni-banky-k-vyvoji-hypotecniho-trhu>.
- Ministry of Finance (2016). *Macroeconomic Forecast - April 2016*. Retrieved from:
<http://www.mfcr.cz/en/statistics/macroeconomic-forecast/2016/macroeconomic-forecast-april-2016-24521>.
- MMR.cz (2016). Mortgage loans for the years 2002 to 1Q 2016. Retrieved from:
<http://www.mmr.cz/getmedia/0be62756-63a5-4bb0-94f3-2f49c3093e9c/Hypotecni-uvery-za-roky-2002-az-1Q-2016,-k-31-3-16.pdf?ext=.pdf>.
- Ostatek, L. (2010). Mortgage after 15 years: How was born the Czech mortgage market? Prague: Hypindex.cz. Retrieved from: <http://www.hypindex.cz/hypoteky-po-15-letech-jak-se-zrodil-cesky-hypotecni-trh/>.

The Process of Harmonization of Accounting in the Czech Republic

Irena Honková

University of Pardubice
Faculty of Economics and Administration
Studentská 95, 532 10 Pardubice 2, Czech Republic
E-mail: irena.honkova@upce.cz

Abstract: *The article was written in response to the amendment to Decree No. 250/2015 Coll., which came into effect from January 1, 2016. This amendment shows the harmonization of the Czech accounting system with the International Financial Reporting Standards (IFRS), e.g. in reporting of extraordinary income and expenses, of formation expenses, or in valuation of inventory produced internally. Consequently, a survey has been conducted, in which 24 persons having experience with the accounting under the IAS/IFRS commented on how they coped with the differences between the Czech Accounting Standards (CAS) and the IAS/IFRS. It has been found that these companies normally keep the accounts simultaneously in both systems (CAS and IAS/IFRS). However, some companies decided to keep the accounts only in one accounting system, supplemented with the differences between the two systems. It is undisputed that the process of harmonization of accounting systems continues. However, the final unification of our national system with the European one has not happened so far. There is a need to harmonize accounting and tax regulations as well.*

Key words: *International Financial Reporting Standards (IFRS), Czech accounting standards (CAS), harmonization of accounting*

JEL codes: M48

1 Introduction

In Europe, along with economic globalization, there is an ongoing political unification, and in relation to these processes, there is a growing need to harmonize accounting (Dvořáková, 2011).

Also in the Czech Republic, the harmonization of accounting has been taking place. One of the recent steps in adjustment of Czech legislation is the amendment to the implementing Decree to Act on Accounting for Entrepreneurs, effective since January 1, 2016.

There is a clear tendency in the amendment to harmonize Czech legislation with European law, which should help address the accounting differences between the Czech Accounting Standards (CAS) and International Accounting Standards (IAS/IFRS).

The subject of this paper is to describe the current situation of Czech companies which report financial statements under the IAS/IFRS and, at the same time, they have to keep the accounts under the CAS for various reasons, primarily for tax reasons. The objective of the survey is to evaluate how these companies proceed and how they perceive different requirements of national and European accounting standards.

The need for harmonization of accounting

Currently, there are several coexisting systems of financial reporting accepted in global financial markets. The globalization of capital markets also requires a global harmonization of accounting systems. The use of national accounting systems for preparation of financial statements makes gathering information needed for the purposes of comparison very difficult and costly for investors in capital markets (Bohušová, 2008).

The harmonization of accounting means the unification of accounting, valuation and reporting of the same transactions. It is a process that results in a gradual elimination of disparities arising from national processing of accounting transactions that may differ from each other. The main reason is to ensure the comparability of the reported

information for needs of their users, since these statements are often the only source of information about the company, its performance and changes in financial position.

The global harmonization of accounting takes place based on convergence of two main concepts – the European IAS/IFRS and the American – Generally Accepted Accounting Principles in the United States – US GAAP. These issues have been addressed by Peng and Bewley (2010), Liu (2011), Boyle et al (2006).

On the European continent, there is a process of harmonization within the European Union (EU).

The European Union includes countries with different social, economic and political environment, and has 25 different tax regimes. This is the reason why the financial reporting systems in the EU vary (Fox, 2013).

Here, the harmonization has been perceived as part of the single European business environment in order to facilitate comparability of businesses operating in territories where there are unified accounting standards, to alleviate the situation of companies that are expanding their activities outside their home states and to enable an unified understanding and accounting processing of transactions and financial situation of businesses (Šrámková and Janoušková, 2008).

The first efforts to harmonize accounting systems on international level arose from the needs of multinational companies and their increasing pressure. These companies needed to compare their different accounting information (Žárová, 2006).

Today, however, there is an increasing need to harmonize accounting in general, not just in large multinational companies. This is so because the accounting regulations should be the same for all accounting entities, as stated by Jílek:

It is necessary to set up such accounting system that would not be too painful for companies. Accounting must be clear, the same for all accounting entities, transparent, inexpensive and having clear rules of the game. Then, even an average educated person understands it, and costs of accounting and auditing will not be sky-high. At the same time, it supports the competitiveness of companies worldwide (Jílek and Svobodová, 2013).

When creating the Czech accounting standards, it is not necessary to invent anything new, but simply adopt what is common in the world. The best way is to fully apply the International Financial Reporting Standards with all of their interpretations and implementation manuals, without any exception. Then, the development of unified Czech accounting standards would not be difficult at all, as it is claimed sometimes. It is difficult now, for the reason that the financial result represents the starting point for calculating income taxes (lobbying interests) (Jílek and Svobodová, 2013).

Therefore, Jílek does not see a problem in the complexities of transformation of the CAS to the IAS/IFRS, but rather in the tax aspect. It must be noted that in addition to the accounting harmonization on a European scale, there are also differences between the accounting and tax approach in the national level. This difference should be gradually eliminated as well.

In some countries, the accounting and tax reports are identical, in others are not. For example in Germany, financial statements fully comply with tax requirements. On the contrary, in the United States, Great Britain or in our country, the situation is different. Financial statements differ from tax statements that are submitted to tax offices. It means that tax deductible expenses and income are different from accounting expenses and income (Jílek and Svobodová, 2013).

The IAS/IFRS and the US GAAP are similar yet different in some areas. For more see Peng and Bewley (2010), Liu (2011), Boyle et al (2006).

Also, the Czech accounting standards have not fully merged into the IAS/IFRS yet. The process of harmonization of the CAS with the IAS/IFRS still must be done, especially in

the area of reporting of fixed assets, accounting of reserves and contingent assets, in the concept of expenses and income and in the issue of the deferred tax.

The complete harmonization still has not taken place at the national level of accounting and tax regulations, as already stated.

Legislative change

In the 102 Series issue of the Collection of Laws of October 2, 2015, Decree No. 250/2015 Coll. was declared, effective as of January 1, 2016, amending the former Decree No. 500/2002 Coll. This Decree implemented certain provisions of Act No. 563/1991 Coll., On Accounting, as amended, for entrepreneurs as accounting entities who keep double-entry accounting, as amended.

The reason for the amendment of the Decree is primarily to complete the transposition of the Directive 2013/34/EU of the European Parliament and of the Council of June 26, 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC (of July 25, 1978) and 83/349/EEC (of July 25, 1983), in relation to Act No. 221/2015 Coll. (of August 12, 2015) amending Act No. 563/1991 Coll., On Accounting, as amended.

In the amendment, there is a clear tendency to harmonize Czech legislation with European law, specifically in terms of the International Financial Reporting Standards (IFRS) and the International Accounting Standards (IAS).

The amendment includes new financial statements (balance sheet and profit and loss account) both full and summarized including new rearrangement and labeling of entries and new or updated content of entries as well as new attachments in financial statements by categories of accounting entities also introduced by the new Decree.

In the profit and loss account, there is an abolition of separate reporting of extraordinary income and expenses, which are not reported in the income statement by the IAS 1.

The amendment abolishes reporting of formation expenses under the fixed assets. Therefore, formation expenses are no longer considered a real asset of the accounting entity, as with the IAS/IFRS. The reason is the absence of important criterion for recognizing assets, as this asset can be valued by the benefits provided to the accounting entity.

The amendment changes reporting and accounting of a change in inventory produced internally and activation of inventory and fixed assets produced internally. The new legislation in accordance with IAS 2 accounts the change in inventory as well as its activation as the elimination of costs incurred. Interim financial results will no longer be affected by an unrealized production. The amendment also defines to set the own costs in inventory produced internally. The amended provision limits the proportion of the variable and fixed indirect costs, and expressly excludes the sales-related costs, also in accordance with IAS 2.

The above indicates that there is an ongoing process of harmonization of Czech accounting standards, their moving towards the IAS/IFRS.

2 Methodology and Data

Between September and December 2015, 24 respondents, who address the issue of the IAS/IFRS in the Czech Republic, were interviewed by means of semi-structured interview. Their function in the IAS/IFRS, the sector of their activity and information on the placement of their company shares on the stock exchange are included in the Table 1. Interviews' records including contacts are available. However, in order to ensure the anonymity, these persons were coded for the purpose of publication.

Table 1 Information about the Persons Interviewed

Code	Function	CZ-NACE sector classification	Stock Exchange
A1	Auditor	agriculture, forestry, fisheries	in preparation
A2	Auditor	professional, scientific and technical activities	no
A3	Auditor	professional, scientific and technical activities	no
A4	Auditor	professional, scientific and technical activities	no
A5	Auditor	manufacturing industry	no
A6	Auditor	professional, scientific and technical activities	no
P1	project manager	finance and insurance	PSE
P2	project manager	manufacturing industry	PSE
P3	project manager	finance and insurance	no
U1	accountant	manufacturing industry	no
U2	accountant	manufacturing industry	no
U3	accountant	manufacturing industry	no
U4	accountant	manufacturing industry	Frankfurt Stock Exchange
U5	accountant	transport and storage	Luxembourg Stock Exchange
U6	accountant	water supply	no
U7	accountant	finance and insurance	no
U8	accountant	manufacturing industry	no
U9	accountant	production and distribution of electricity, gas, heat	no
U10	accountant	manufacturing industry	no
U11	accountant	finance and insurance	no
U12	accountant	finance and insurance	no
U13	accountant	manufacturing industry	no
U14	accountant	wholesale and retail	Luxembourg Stock Exchange
U15	accountant	production and distribution of electricity, gas, heat	no

Source: Own elaboration

The respondents were asked about the way they deal with different CAS and IAS/IFRS requirements in practice.

3 Results and Discussion

The Czech companies which prepare financial statements in accordance with the IAS/IFRS, and also must meet different accounting and tax regulations, can decide for one fundamental method of accounting, while the second system supplements it, or they can keep the accounts simultaneously in both systems.

Persons who have experience with the accounting primary according to the CAS stated as follows:

A1: "The company keeps the accounts according to our national accounting system. When creating documents, so-called reference keys are added, thanks to which the IFRS reports are generated in specific transactions."

A3: "We keep the accounts under the CAS, and we fill out papers for the IAS/IFRS in a certain application of our parent company."

A6: "In my experience, most companies in the Czech Republic still keep the accounts based on Czech accounting system primarily for tax reasons. Components and systems for creation of the IFRS statements have been extra added into this system."

U3: "Although we are obliged to report under the IAS/IFRS, the basis of everything is to keep the accounts according to Czech accounting standards. This basis has been adjusted with entries required by the IAS/IFRS reporting. According to Czech accounting standards, we have to report not only for purposes of reporting income tax, but also for statistical purposes, for reports to banking entities and, last but not least, for internal purposes, since different premium and other indicators are set according to Czech accounting."

U11: "The company continues to keep the accounts under Czech accounting standards considering this method more effective. We would have to recalculate the result from the IFRS to be applicable to the calculation of tax."

U13: "We deal with the accounting issues using conversion bridges to convert the CAS to the IAS/IFRS."

U15: "We keep the accounts under the CAS. Adjustments for technical preparations of documents for IAS/IFRS reporting have been done in Excel."

Persons whose accounting system is based on the IAS/IFRS stated:

U2: "The major standards are the IFRS, or their corporate interpretation. Once a year, for the purpose of preparing the local financial statements / tax returns, the differences from the CAS have been calculated."

U12: "In our company, there is no concurrence of both systems. We keep the accounts under the IAS/IFRS and make adjustments outside the accounts for tax purposes."

P2: "We keep the accounts under the IAS/IFRS. For the purposes of taxation or statistics, we report the required information outside the accounting system."

Most of the respondents, however, decided for the concurrence of both accounting systems. Following persons commented on parallel accounting systems: A2, A4, P1, P3, U1, U4, U5, U6, U7, U8, U10, and U14. Their comments indicate that some concurrence is necessary due to the need to determine the tax base according to Czech accounting standards. They keep parallel accounting books according to Czech accounting standards.

Software begins to emerge on the market that can handle both accounting software at once:

A5: "At the request of the main investor of the holding, a client has introduced new accounting software. This software allows keeping the accounts under the CAS as well as under the IAS/IFRS."

U9: "The official reporting is under the IAS/IFRS. Within the SAP information system, there is a secured option to display statements under the CAS or the IAS/IFRS."

Table 2 represents a complex structure of used accounting systems.

Table 2 Frequencies of Used Accounting Systems

Accounting system	Number of persons
Primarily CAS, supplemented with IAS/IFRS	7
Primarily IAS/IFRS, supplemented with CAS	3
Parallel concurrence of both systems	14

Source: Own elaboration

The results of the survey have showed that there is no uniformity in how businesses cope with the dual legislation. Most companies preparing financial statements under the

IAS/IFRS keep their accounts in two parallel accounting systems. This condition is very counterproductive as it denies the main objective of accounting. The objective is to truthfully and honestly inform about the economic activities of the accounting entity (Act No. 563/1991 Coll., On Accounting). In the current state, however, there are two truthful and honest approaches. Therefore, clarity has been reduced and demands on the accounting entity are increasing.

U12 user said: "Since there is the need to maintain these adjustments and dual methodology as well as to assess each transaction whether it is important for the tax return, the whole process is more complicated."

Businesses often reach for the method of the lesser evil to be able to satisfy both legislative directions. They seek to find liaison bodies which primarily comply with both systems, as U4 user commented: "In all areas possible, we have adopted the IFRS perspective."

Even a company, which preferred to reconsider its long-term payables to short-term ones in order to avoid discounting and to report payables pursuant to the CAS, is probably no exception.

The result is some kind of travesty, a third system, which will last until the CAS and the IAS/IFRS are fully harmonized.

In the context of harmonization, it is also necessary to unify accounting systems with tax systems, see Figure 1, chap. 1.1.

U14 respondent said in this context "We would appreciate if the IFRS were legally recognized as a basis for calculating the tax base."

Therefore, full harmonization of accounting system means not only the harmonization on the territory level (national & European or worldwide convergence), but also the harmonization of accounting and tax regulations.

This harmonization has already taken place in some European countries, e.g. in Germany. In the Czech Republic, however, some differences in accounting and tax base still persist. See more in Jílek and Svobodová (2016).

4 Conclusions

Employees who prepare financial statements under the IAS/IFRS welcome the change in the amendment to Decree, because it is a step towards the CAS and the IAS/IFRS harmonization.

It is undisputed that the process of harmonization of accounting systems continues. However, the final unification of our national system with the European one has not happened so far.

Accounting of Czech businesses preparing financial statements under the IAS/IFRS is currently somewhat counterproductive. Businesses have chosen different methods to cope with the dual legislation. However, it is evident that it involves great demands on time and personnel and technical support and the associated costs.

References

Bohušová, H. (2008). *Harmonizace účetnictví a aplikace IAS/IFRS: vybrané IAS/IFRS v podmínkách českých podniků*. 1st ed. Praha: ASPI.

Boyle, G., Clyne, S., Roberts, H. (2006). Valuing Employee Stock Options: Implications for the Implementation of NZ IFRS 2+. *Pacific Accounting Review*, vol. 18(1), pp. 3-20.

Dvořáková, D. (2011). *Finanční účetnictví a výkaznictví podle mezinárodních standardů IFRS: aktualizované a rozšířené vydání*. 3rd ed. Brno: Computer Press.

- Fox, A., Hannah, G., Helliard, C., Veneziani, M. (2013). The costs and benefits of IFRS implementation in the UK and Italy. *Journal of Applied Accounting Research*, vol. 14(1), pp. 86-101.
- Hronová, S. (2009). *Národní účetnictví: nástroj popisu globální ekonomiky*. 1st ed. Praha: C.K. Beck.
- Jílek, J., Svobodová, J. (2013). *Účetnictví podle mezinárodních standardů účetního výkaznictví 2013*. 3th ed. Praha: Grada Publishing.
- Kovanicová, D. (2003). *Finanční účetnictví: světový koncept*. 4th ed. Praha: Polygon, 2003.
- Liu, C. (2011). IFRS and US-GAAP comparability before release No. 33-8879. *International Journal of Accounting & Information Management*, vol.19(1), pp. 24-33.
- Peng, S., Bewley, K. (2010). Adaptability to fair value accounting in an emerging economy. *Accounting, Auditing & Accountability Journal*, vol. 23(8), pp. 982-1011.
- Directive 2013/34/EU of the European Parliament and of the Council on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings. The European Parliament, 2013.
- Directive 2006/43/EC of the European Parliament and of the Council, The European Parliament, 2006.
- Council Directive No. 78/660/EEC, The European Parliament, 1978.
- Council Directive No. 83/349/EEC, The European Parliament, 1983.
- Šrámková, A., Janoušková, M. (2008). *IAS/IFRS: mezinárodní standardy účetního výkaznictví: praktické aplikace*. Praha: Institut Svazu účetních.
- Decree No. 250/2015 Coll. The Ministry of Finance, 2015.
- Decree No. 500/2002 Coll. The Ministry of Finance, 2002.
- Act No. 221/2015 Coll. The Ministry of Finance, 2015.
- Act No. 563/1991 Coll., On Accounting. The Ministry of Finance, 1991.
- Žárová, M. (2006). *Regulace evropského účetnictví: aktualizované a rozšířené vydání*. 1st ed. Praha: Oeconomica.

High-Frequency Trading and Price Volatility in the Paris Euronext Stock Market

Juraj Hruška, Oleg Deev

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 60200 Brno, Czech Republic
E-mail: oleg@mail.muni.cz, 206887@mail.muni.cz

Abstract: *Algorithmic trading has become the crucial part of security trading on world equity markets influencing many of its characteristics. In this paper, we consider the effects of high frequency trading on the short term volatility. The aim of the paper is to analyze the relationship between high frequency trading (HFT) and spot volatility in high frequency as well as low frequency data from the French stock market. We employ GMM, GARCH and Markov switching models to estimate the relationship between changes in stock returns and changes in the activities of high frequency traders. We propose our own methodology to proxy changes in the activity of algorithmic traders. We also address the problem of optimal sampling to avoid possible biases in our empirical findings, since high frequency data contain a disruptive volatility component (market microstructure noise), by incorporating Bundi-Russell (2008) test and test of Lagrangian multipliers. Most actively traded stocks listed on the Paris stock exchange are chosen for the empirical analysis. Sampling tests suggest that optimal frequency should be approximately 60 minutes. Results from models confirm the hypotheses of positive impact of high-frequency trading on market volatility.*

Keywords: volatility, high frequency trading, general method of moments, Markov switching model, GARCH

JEL codes: C24, C55, C58, G12

1 Introduction

Trading on the world exchanges have been dominated by computers since the 1980s. Securities exchanges are now fully electronic and floor trading is inevitably coming close to its extinction. Rapid algorithmic trading certainly changed the nature of financial markets with no common consensus whether this change improves market efficiency and liquidity or increases volatility and deteriorates prices in turbulent situations (Kendall 2007). Both academics and practitioners cannot agree on the effects of high-frequency trading. On one hand, high frequency traders (HFT) certainly proclaim that their activities are increasing market liquidity, lowering spreads and reducing transaction costs. On the other hand, there are so called "low frequency traders" (mostly long term institutional investors) who are criticizing HFT traders for scalping their orders, manipulating the market and boosting volatility. Academics are usually inclining to praise benefits of high frequency trading, but there are also some researches confirming the HFT fault in volatility outbreaks. Few minor financial market crashes, such as the 2010 Flash Crash or the case of Knight Capital, are believed to be at least partially caused by algorithmic trading. After such events regulators are calling for responsible behavior of HFT traders and searching for ways and methods to control the HFT market. For example, circuit breaks are now implemented on the markets to shut down trading in case of increased volatility to prevent flash crashes.

In this paper, we focus on the effects of high-frequency trading on the volatility of securities' prices, which is usually considered to be increasing with growing activity of HFT traders. The aim of this paper is to test the link between the high-frequency trading and price volatility both in high frequency and low frequency data. Several issues should be addressed before analyzing this relationship with market microstructure noise being the most important and complex one. Market microstructure noise - high-frequency order book information that reflects fluctuations in supply/demand of the analyzed security -

complicates the estimation of volatility while making standard estimators unreliable. The effect of the market microstructure noise is certainly negligible in the long run, but should be dealt with in the short run.

Connection between the trading activity and volatility was well known even before algorithmic trading took a lion share of overall trading volume. Positive relationship between volatility and volume of trading has been proven by Karpoff (1987). Kyle (1985) documented positive relation between volatility and number of trades and order imbalance before algorithmic trading had been introduced. Easley et al. (1997) confirm positive relationship between trade size and price volatility using competitive models. Jones et al. (1994) show that before high-frequency trading the stock volatility had been affected mostly by the number of trades, while average trade size played no role. The introduction of algorithmic trading changed the impact of the size of average trade on market volatility, which became significant as shown by Chlistalla et al. (2011). Even if significant relationship between volatility and average size of trade indicates and subjectively confirms the influence of high-frequency trading, newer studies suggest that order imbalance, and not a number of trades, initiates an impact of trading volume on volatility. Comparing small and large trades by their effect on volatility, Huang et al. (2003) discover that small trades close to the maximum-guaranteed quoted depth tend to affect the price changes more than big trades. While using realized volatility instead of volatility measured by absolute returns as a measure of market instability, Chan et al. (2000) show that only a number of trades matters and not volume of trading and trade size. Some studies also suggest that high-frequency traders in general and especially market makers tend to reduce market volatility (Kirilenko et al. 2015).

This paper differs from existing studies in three important respects. First, since the majority of studies on the relationship between HFT trading and price volatility is conducted on the US data, we focus on one of the biggest European stock markets - the French stock market during time periods that have not been examined in the literature. Second, we propose the methodology to uncover the high-frequency trading from the volume of trading, trading activity and average trade size. Third, we address the problem of appropriate test procedure selection to detect market microstructure noise and find the optimal test sample with several data frequencies considered.

2 Methodology and Data

Market volatility as a measure of investment risk is calculated in several ways. Most common measure is the standard deviation of market returns, which is largely dependent on returns of previous observations given the sampled data. The most frequent data available for our analysis is minute data. Hence, the best choice for estimating the current market volatility is the logarithm of the ratio of the highest and lowest prices during the given minute (Aldridge 2013).

$$\sigma_{i,t} = \log\left(\frac{high_{i,t}}{low_{i,t}}\right) \quad (1)$$

The best way to measure high-frequency trading activity is by monitoring number of messages send by HFT traders and compare them to overall message traffic. However, such data are not widely available, when some exchanges even do not keep the records about such events or do not distinguish between various types of order submission. Hence, it is necessary to create proxy variables to estimate HFT activity based on its specific characteristics, such as number of small orders and increased number of orders Hendershott (2011). We measure difference in HFT activity as logarithm of reverse relative change of average trade size (in number of shares) multiplied by relative change in number of trades.

$$hft_{i,t} = \ln \left(\frac{\left(vol_{i,t-1} + \overline{\left(\frac{vol}{n} \right)_{i,t,h}} \right) (n_{i,t} + 1) (n_{i,t} + \bar{n}_{i,t,h})}{\left(vol_{i,t} + \overline{\left(\frac{vol}{n} \right)_{i,t,h}} \right) (n_{i,t-1} + 1) (n_{i,t-1} + \bar{n}_{i,t,h})} \right) \quad (2)$$

where is $vol_{i,t}$ volume of trading of share i in time t . It is identified as the sum of volume of market orders ($vm_{i,t}$), volume of limit sell orders ($va_{i,t}$) and volume of limit buy orders ($vb_{i,t}$). Number of orders of share i in time t is denoted as $n_{i,t}$. It is again given by sum of number of trades ($nm_{i,t}$), number of limit sell orders ($na_{i,t}$) and number of limit buy orders ($nb_{i,t}$). One extra trade (calculated as the mean of average sizes of trades in last h observations) is added to the ratio of the change in average size of trade (or order). This will assure that function will be defined even in cases of complete market inactivity. Average number of trades (again calculated from last h observations) is added to second ratio. Without this change, relative change in number of trades would be higher for lower absolute changes. If change of aggressive HFT activity needs to be calculated only volume of market orders ($vm_{i,t}$) and number of trades ($nm_{i,t}$) are used. On the other hand, when changes in defensive HFT activity are needed, it would be calculated only from volume of limit orders ($va_{i,t}$ and $vb_{i,t}$) and number of limit orders ($na_{i,t}$ and $nb_{i,t}$).

After addressing possible problems in the modeling of high-frequency data (excluding market microstructure noise) and choosing the most appropriate way to measure high-frequency volatility and high-frequency trading activity, we can now move to formulate the model and select an estimation procedure to analyze the impact of high-frequency trading on market volatility. We test the relationship in two data frequency designs based on the results of optimal sampling procedures. First, we use higher sampling frequency data, where market microstructure noise is present. Next we run the same models on the data with lower sampling frequency or optimal frequency suggested by LM and Budni-Russel (2008) tests.

The basic model to test the relationship of changes in HFT activity and market volatility has the following form:

$$\sigma_{\{i,t\}} = \alpha_i + \beta_{\{i,1\}}HFT_{i,t} + \beta_{\{i,2\}}RV_{i,t} + \beta_{\{i,3\}}AF_{i,t} + \beta_{\{i,4\}}V_{i,t} + v_{i,t} \quad (3)$$

where $RV_{m,t}$ is estimation of realized market volatility calculated from previous 30 one-minute returns of CAC 40 index, $AF_{i,t}$ is a dummy variable that indicates observations where no trades occurred and $V_{i,t}$ is a volume of trades of stock i during observation t . Control variables were inspired by ones used in Giot et al. (2010). Error in data with high frequency consists of $v_{i,t} = u_{i,t} + \epsilon_{i,t}$, where $u_{i,t}$ is an error term and $\epsilon_{i,t}$ represents market microstructure noise. For low frequency data, market microstructure noise is considered to be insignificant.

We use three different estimation procedures for the analysis. The first, linear estimation employs the generalized method of moments (GMM) method with Newey-West (1994) Bartlett HAC estimator to treat autocorrelation and heteroscedasticity. The second estimation procedure represents Markow switching model techniques with three levels. More regimes brought any improvement to our results. This method helps us gain better explanatory power of the model by estimating coefficients for three different levels of explained and explanatory variables. This levels are random and switching between them is a random process, hence, problems might occur if the coefficients in models will not be consistent. Reduced-form model is used in the second estimation procedure:

$$\sigma_{\{i,t\}} = \alpha_i + \beta_{\{i,1\}}HFT_{i,t} + \beta_{\{i,2\}}RV_{i,t} + v_{i,t} \quad (4)$$

For third estimation method, we use GARCH(1,1) model with intraday adjustments for seasonality. If none of the external regressors are non-significant, we switch to the exponential GARCH(1,1) model. In this case we use the same model as in the first case.

We have used two different sampling of data. The same models were applied on both samples. This was done to test different effects of algorithmic trading on spot volatility under the influence of market microstructure noise and without its presence. For the version with influence of MMN we have chosen one minute data.

Most traded stocks on the Euronext Paris Stock Exchange are picked based on the following criteria: minimal volume of trading, minimal market capitalization, and minimal number of active observations. Only primary issues are selected. After excluding stocks with incomplete data for the chosen period, 65 stocks fulfill the imposed criteria. This might not be the best number for generalization of our results, but as we are working with proxy variables, the stocks should fulfill our strict criteria, or otherwise, our analyses would not give valid results (many other stocks are less frequently traded). The analyzed period starts at April 15, 2015 and ends at October 19, 2015. Daily observations start at 9:06 a.m. and end at 5:23 p.m. to exclude situations usually containing negative spreads and increased volatility caused by opening and closing auctions. This also solves the problem of intraday returns, which can lead to biased estimates of realized volatility. Days with shortened trading time were excluded. The average summary statistics for all stocks is provided in Table 1. We intend to use two type of data sets. First dataset has one-minute frequency, while the observation frequency for the second dataset is established by optimal sampling tests. These tests were test of Lagrangian Multipliers for presence of MMN (Shin 2015) and Bandi-Russel test (Bandi et al. 2008). The second dataset will not thus contain the market microstructure noise. All data were gathered from Bloomberg.

Table 1 Average Summary Statistics for the Studied Shares with One Minute Frequency (from April 15, 2015 to October 19, 2015)

Variable	Mean	Maximum	Minimum	Stand. Dev
Price ($P_{i,t}$)	54.37	58.99	47.5	42584.00
Return ($r_{i,t}$)	-0.00000217	0.02068	-0.045676	0.000588
Number of trades ($nm_{i,t}$)	12.76	247.84	0.51	9.00
Number of sell orders ($na_{i,t}$)	239.04	1912.65	30103,00	152.57
Number of buy orders ($nb_{i,t}$)	239.04	1912.65	30103,00	152.57
Volume of trades ($vm_{i,t}$)	3377.21	63160.82	67.18	2686.74
Volume of sell orders ($va_{i,t}$)	4735.12	810611.9	67.18	4773.03
Volume of buy orders ($vb_{i,t}$)	483591.95	5401812.35	2441.2	387366.29
Spread ($s_{i,t}$)	0.035095	0.131453	0.017	0.007148
Order imbalance ($oi_{i,t}$)	0.225411	0.391466	0.086998	0.039715
Volatility ($\sigma_{i,t}$)	0.000543	0.007404	0.00007	0.000315
Difference of HFT activity ($hft_{i,t}$)	0.001225	1.797952	-1.43853	0.210638

Source: Own elaboration

The analyzed period is rather stable with slow decline of nearly all larger stocks traded on European markets. The mean return is negative with standard deviation being close to mean volatility. This confirms that this two estimations of market volatility gives very similar results. The average number of trades per minute is approximately 13. Approximately 240 limit orders on both side of limit order book, which indicates sufficient activity of market makers for our analysis. The average correlations showed the relation of volatility of the stock returns with the control variables (turnover, volume and volatility of the market). The correlation with HFT activities (0.42) is weaker but still significant.

3 Results and Discussion

First, we provide the results for linear estimations based on full data. In cases, where we use overall changes in activity in submitting market and limit orders, we find the positive relationship between high-frequency trading and market volatility in all cases, as seen in Table 2. Aggressive trading that uses only market orders and reduces liquidity seems to

have smaller effect on market volatility, but nevertheless, is still positive. Defensive market making also seems to produce increased pressure on variability of prices. Majority of cases confirms the hypothesis that increased HFT activity induces volatility.

Table 2 Results of GMM Estimations for All Types of HFT Activity

HFT activity	Mean coefficient	Standard deviation	Max	Min	Number of positive coefficients
Overall	0.000251	0.000103	0.000498	0.000110	64
Aggressive	0.000068	0.000025	0.000124	0.000023	64
Defensive	0.000131	0.000067	0.000280	0.000033	64

Source: Own elaboration

J-tests confirm validity of the results in all cases, and HFT activity coefficients are significant for every stock. These coefficients have been always positive, except for one stock where the effects of HFT were not significant in all 3 cases.

Second method used for estimation of tested relation was Markov switching model with 3 regimes (Table 3). We have also conducted estimations with more levels, but they added no new results. Coefficients of determination were slightly higher, but the coefficient for HFT factor was the same in some regimes. In all three regimes and for all stocks, the relationship between HFT activity and market volatility is significantly positive.

Table 3 Results of Markov Switching Model Estimations for Aggressive HFT Activity

	Mean coefficient	Standard deviation	Max	Min	Average R²
Regime 1	0.000334	0.000235	0.000957	0.000053	0.227678
Regime 2	0.000191	0.000149	0.000649	0.000060	0.208485
Regime 3	0.000221	0.000209	0.000620	0.000001	0.208401

Source: Own elaboration

GARCH(1,1) models confirmed the hypothesis that volatility of residuals in our models is changing over time, but rejected any effects of HFT activity on spot volatility. Seasonal adjustments of intraday volatility have been proven to have no effect in improving efficiency of the modeled explanation power.

Table 4 Results of GMM Estimations for All Types of HFT Activity for Low Frequency Data

HFT activity	Mean coefficient	Standard deviation	Max	Min	Number of positive coefficients
Overall	0.004963	0.001439	0.010109	0.002389	65
Aggressive	0.005240	0.002115	0.013895	0.001265	65
Defensive	0.004901	0.001405	0.009697	0.002264	65

Source: Own elaboration

Next we applied the same methodology on data with one hour frequency. We chose this sampling period after the analysis of tests for presence of MMN results. Influence of HFT on volatility was positive and significant in all cases. In longer run without the presence of MMN aggressive HFT trading seems to have rightfully stronger influence on variability of prices (Table 4).

This might be due to distribution of market orders in time. These results confirms hypothesis that HFT increases volatility in long run and might decrease volatility in short run. But this is more occasional effect than a rule.

Strong influence of aggressive algorithmic trading has been also confirmed by Markov switching model (Table 5). The coefficients of determination suggest that this relationship is indeed really relevant. The results for overall and defensive HFT activity were in

general similar to aggressive. The only difference was again that for aggressive was impact of HFT stronger.

Table 5 Results of Markov Switching Model Estimations for Low-Frequency Data

	Mean coefficient	Standard deviation	Max	Min	Average R²
Regime 1	0.006448	0.007156	0.032528	0.000669	0.689287
Regime 2	0.005301	0.006478	0.038625	0.000539	0.704681
Regime 3	0.005957	0.005732	0.027851	0.000561	0.651948

Source: Own elaboration

For the samples with one hour frequency GARCH(1,1) model estimations accepted effects of HFT on spot volatility in contrary to previous sampling. This can be explained that the technical realization of trading is behind much of the price disturbance in short run, but is smoothed in long run, where other effects such as HFT activity emerge. Table 6 suggests that in all cases researched link was positive. Conclusion that relationship between HFT and volatility is more intensive for aggressive trading activity was apparent again.

Table 6 Results of GARCH(1,1) Estimations for All Types of HFT Activity

HFT activity	Mean coefficient	Standard deviation	Max	Min	Number of positive coefficients
Overall	0.004963	0.001439	0.010109	0.002389	65
Aggressive	0.005240	0.002115	0.013895	0.001265	65
Defensive	0.004901	0.001405	0.009697	0.002264	65

Source: Own elaboration

Intraday seasonality played no role in this case either. These effects might have been more apparent if we did include first and last minutes of trading that were excluded due to presence of opening and closing auctions.

4 Conclusions

Frequent news about manipulative techniques and aggressive trading strategies used by some algorithmic traders may indicate that the high-frequency trading is disruptive for other market participants. In this paper, we analyze the relationship between high-frequency trading activities and market volatility on the French stock market. We provide evidence based on three different estimation procedures that high-frequency trading in fact increases the short-term variability of prices. These effects have also been proven in long term without the presence of market microstructure noise. In our specifications of high frequency trading, the aggressive trading has stronger impact on volatility than the defensive trading, which is with accordance with preliminary hypothesis. Our study supports previous findings and enlarges the geographic evidence of the destabilizing effects of high-frequency trading on market volatility. Further research will show whether these effects are similar on other European markets.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 is gratefully acknowledged.

References

- Aldridge I. (2013). *High-frequency trading: a practical guide to algorithmic strategies and trading systems*. Hoboken, New Jersey: John Wiley & Sons, Inc.
- Bandi, F. M., Russell, J. R. (2008). *Microstructure noise, realized variance, and optimal sampling*. The Review of Economic Studies, vol.75(2), pp. 339-369.

- Chan, K., Fong, W. M. (2000). *Trade size, order imbalance, and the volatility-volume relation*. Journal of Financial Economics, vol. 57(2), pp. 247-273.
- Chlistalla, M., Speyer, B., Kaiser, S., Mayer, T. (2011). *High-frequency trading*. Deutsche Bank Research, vol. 7.
- Easley, D., Kiefer, N. M., O'Hara, M. (1997). *One day in the life of a very common stock*. Review of Financial Studies, vol. 10(3), pp. 805-835.
- Giot, P., Laurent, S., Petitjean, M. (2010). *Trading activity, realized volatility and jumps*. Journal of Empirical Finance, vol. 17(1), pp. 168-175.
- Huang, R. D., Masulis, R. W. (2003). *Trading activity and stock price volatility: evidence from the London Stock Exchange*. Journal of Empirical Finance, vol. 10(3), pp. 249-269.
- Hendershott, T., Jones Ch. M., Menkveld A. J. 2011. *Does Algorithmic Trading Improve Liquidity?*. The Journal of Finance, 66(1), pp. 1-33.
- Jones, C. M., Kaul, G., Lipson, M. L. (1994). *Information, trading, and volatility*. Journal of Financial Economics, vol. 36(1), pp. 127-154.
- Karpoff, J. M. (1987). *The relation between price changes and trading volume: A survey*. Journal of Financial and Quantitative Analysis, vol. 22(01), pp. 109-126.
- Kendall, K. (2007). *Electronic and Algorithmic Trading Technology*. 1st ed. London: Academic Press.
- Kirilenko, A. A., Kyle, A. S., Samadi, M., & Tuzun, T. (2015). *The flash crash: The impact of high frequency trading on an electronic market*. Available at SSRN 1686004.
- Kyle, A. S. (1985). *Continuous auctions and insider trading*. Econometrica: Journal of the Econometric Society, pp. 1315-1335.
- Newey, W. K., & West, K. D. (1994). *Automatic lag selection in covariance matrix estimation*. The Review of Economic Studies, vol. 61(4), pp. 631-653.
- Shin, D. W., & Hwang, E. (2015). *A Lagrangian multiplier test for market microstructure noise with applications to sampling interval determination for realized volatilities*. Economics Letters, vol. 129, pp. 95-99.

The Prediction of Economic Activity Growth by Sovereign Bond Spread in France, Germany and Great Britain

Jana Hvozdenska

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: 174974@mail.muni.cz

Abstract: *The steepness of the bond yield curve should be an excellent indicator of a possible future economic activity. A rise in the short rate tends to flatten the yield curve as well as to slow down real growth the near term. The relationship between the spread and future GDP activity was proved already before. One question remains – which spread is the best for the future prediction? Is it the spread between sovereign 10-year bonds and 3-month bonds or 30-year and 1-year or 10-year and 1-year sovereign bonds? This paper aims to analyze which spread is the most suitable for predicting of future economic growth in France, Germany and Great Britain between the years 2000 and 2016. The natural and probably the most popular measure of economic growth is GDP growth, taken quarterly. We have found out that the best predictive spreads in France, Germany and Great Britain are the spreads of 30-year and 1-year and 10-year and 1-year government bond yields. These findings might be beneficial for investors and provide further evidence of the potential usefulness of the yield curve spreads as indicators of the future economic activity.*

Keywords: bonds, slope, spread, yield curve

JEL codes: E43, E44, E47, G01

1 Introduction

The financial turmoil during 2007-2009 affected the euro area financial sector in ways that differ considerably across market segments and countries. A consequence was a temporary reduction of market activity within national borders. The impact was felt most strongly in the money markets, and relatively less in bond activities. However, economic growth stopped and still many countries are not able to follow Maastricht Convergence Criteria.

On one hand, the integrated financial markets and the common currency may help protect the countries from the negative impacts of a financial crisis, because the countries are part of a large, stable economic unit. On the other hand – financial instability may spread easily from country to country, since barriers to the capital movements have been reduced.

Many market observers carefully track the yield curve's shape, which is typically upward sloping and convex. However when the yield curve becomes flat or slopes downward (the spread between sovereign 10-year and 3-month bond is negative) it may signal GDP decrease (recession). The spread of 10-year and 3-month government bond is widely used and it is the most common measurement of the yield spread.

The yield curve simply plots the yield of the bond against its time to maturity. The yield curve – specifically the spread between long term and short term interest rates is a valuable forecasting tool. It is simple to use and significantly outperform other financial and macroeconomic indicators in predicting recessions four quarters ahead.

This paper builds on a wide range of previous researches, but differs in some ways. Bernard and Gerlach (1998) in their paper showed empirically on eight countries that the slope of the yield curve is a good predictor of the real economic activity. Berk and van Bergeijk (2001) examined 12 euro-area countries over the period of 1970-1998 and found that the term spread contains only limited information about future output growth. Their work is based on the previous theoretical researches of Estrella and Hardouvelis

(1991), Estrella and Mishkin (1996). There was proven the evidence that the slope of the yield curve and the future GDP activity are related together. However it is necessary to say that this rule was true until the end of 20th century and it mostly disappeared at the beginning of 21st century and appeared again during the financial crisis (from 2008) and later on (De Pace, 2011; Giacomini and Rossi, 2006; Chinn and Kucko, 2010). Most of the studies are focused on the relationship of the yield curve and GDP activity of the United States of America. All the authors used as a spread, which was analysed in their works, the spread of 10-year and 3-month government bonds. This relationship was proved to be the best in the past (Estrella and Hardouvelis, 1991, Estrella and Mishkin, 1996).

This paper aims to analyze which spread is the most suitable for predicting of future economic growth in France, Germany and United Kingdom between the years 2000 and the first quarter of 2016 and if this relationship has changed after the financial crisis.

The possible spreads are as follows: 30-year and 1-year, 15-year and 1-year, 10-year and 1-year, 5-year and 1-year, 30-year and 3-month, 15-year and 3-month, 10years and 3-month and finally 5-year and 3-month. Of course there are other possibilities, but it is very hard to get a different data for a chosen time period.

2 Methodology and Data

There are many ways of using the yield curve to predict the future real activity. One common method uses inversions (when short term rates are higher than long term rates) as recession indicators. Obtaining predictions from the yield curve requires a lot of preliminary work. There is the principle which needs to be held: keep the process as simple as possible.

A yield curve may be flat, up-sloping, down-sloping or humped. The standard solution uses a spread (difference between two rates). The problem is to choose the spread between the right terms. The most used spread is between 10-year and 3-month bonds. The problem is that there are rarely bonds which mature exactly in 10 years (or 3 months). In that case the best solution is to use the yield curve, which shows the yield of each maturity. Creating and calculating of the yield curve is a rather difficult task because there are many ways how to do it and every country uses a different model of construction.

The yield curves are constructed by Bloomberg, therefore the data for spreads were gained from Bloomberg. For the spreads 30-year and 1-year, 15-year and 1-year, 10-year and 1-year, 5-year and 1-year, 30-year and 3-month, 15-year and 3-month, 10-year and 3-month and finally 5-year and 3-month government bond rates were chosen. Quarterly data were used for the spreads because the data of the economic activity growth are taken on quarterly basis as well. The data of real GDP growth can be found at Eurostat, OECD statistics or Bloomberg. The data of real GDP obtained and used in this paper are from OECD statistics.

The selected countries are France, Germany and United Kingdom.

There is no recent previous research in European Union which would prove or reject the hypothesis that the spread between 10-year and 3-month government bonds is the best for predicting of the future economic growth.

Model Specification

As a measure of real growth four-quarter percent change in real GDP was used (thus the percent change of the quarter against the last year's same quarter was calculated, e.g. the change from 1Q2004 and 1Q2003 real GDP was used). GDP is standard measure of aggregate economic activity and the four-quarter horizon answers the frequently asked question – what happens the next year?

The sample period starts from 1Q2000 and ends on 1Q2016. This time range covers the period before financial crisis, period of financial crisis and period after financial crisis. The

basic model is designed to predict real GDP growth/decrease four quarters into the future based on the current yield spread (Bonser-Neal and Morley, 1997).

This was accomplished by running of a series of regressions using real GDP activity and the different spreads lagged four quarters (the interest rate spread used for 3Q2001 is actually from 3Q2000).

The last step is to find out which bond spread is the best for which country and to prove the hypothesis that the spread between 10-year and 3-month is the best one.

To generate the GDP predictions with the different spread the regression using the whole sample was run, and later on two divided samples of real GDP and spreads of each selected country (the sample is divided in 4Q2007/1Q2008, because this period preceded financial crisis and should show some changes in prediction of the yield curve spread) were run. Time series data structure and ordinary least squares (OLS) method was used. All calculations were carried out in Gretl software.

The coefficients α and β were estimated for each country:

$$\text{Real GDP}_{t+4} = \alpha + \beta * \text{spread}_t + \varepsilon_t \quad (1)$$

Where:

Real GDP_{t + 4} is a prediction of the future real GDP in time t + 4 quarters

spread_t is spread between 10-year and 3-month state bonds in time t

ε_t is a white noise

3 Results and Discussion

The tests of normality were carried out. For the evaluation of the normality test is probably the easiest to observe the result from graph of the assumed normal distribution in comparison to the actual distribution of residues and analyse p-values of Chi-square test. We test the hypothesis H0: Residuals are normally distributed, against the hypothesis H1: Residuals are not normally distributed, the significance level of α was chosen as 0,01. If the p-value is greater than α then we cannot reject the H0, therefore the residuals are normally distributed. The test contributed that the data have normal distribution.

For the testing of heteroscedasticity we chose the White's test. We test the hypothesis H0: Constant variances of residuals – homoscedasticity, against H1: Heteroscedasticity. The significance level of α was chosen as 0.01. If the p-value is greater than α then we cannot reject H0, therefore it contributes homoscedasticity.

Results of Regression – Whole Sample

The whole sample of dataset contains the real GDP from 1Q2000 to 1Q2016. A regression of the whole sample was run and we got the results as seen in Table 1.

Surprisingly we have got different results of spreads for all countries (France – 5-year and 1-year spread, Germany – 5-year and 3-month spread and Great Britain 15-year and 3-month spread).

We can say that models for France and Germany are statistically significant, because the p-values are under 1% (***) or 10% (*), however the R² are very low. The model for Great Britain cannot be used as predictive due to high p-value.

Table 1 Results of All Countries and Whole Sample from OLS Regression

1Q00 – 1Q16	Constant	Spread	P - value	R ²
France (5Y-1Y)	0.00706371	0.670837	0.0705 *	0.050980
Germany (5Y-3M)	-0.0001300	1.54804	0.0019 ***	0.142821
Great Britain (15Y-3M)	0.0213558	-0.20809	0.2110	0.024717

Source: Author's own calculations

The R^2 coefficients (coefficients of determination) show us how many percent of the sample can be explained by these models.

For example we can say that future real GDP of Germany will be:

$$\text{Real GDP}_{\text{Germany } t+4} = -0.00013 + 1.54804 * \text{spread}_{\text{Germany } t}$$

By this model we can predict future real gross domestic product for Germany four quarters ahead.

We can test the hypothesis that the behavior of the spread and gross domestic product has changed during the financial crisis, therefore the sample was divided into two samples in order to prove this hypothesis.

Results of Regression – Divided Samples

The research continued as follows – the whole sample was divided into two samples. The first one is from 1Q2000 to 4Q2007, the second one is from 1Q2008 to 1Q2016 in order to show if there is any change of behavior and dependency between the variables before or after the financial crisis.

Regressions of the first sample and the second sample were run. The results for the time span of 1Q2000 – 4Q2007 (first sample) are possible to see in Table 2, the results for the period of 1Q2008 – 1Q2016 (second sample) are in Table 3.

In the first period again we cannot judge which spread is the best because in every country we have got different results (France – 30-year and 3-month, Germany 10-year and 1-year, Great Britain 30-year and 1-year).

Table 2 Results of All Countries and Sample from 1Q2000 to 4Q2007

1Q00 – 4Q07	Constant	Spread	P - value	R^2
France (30Y-3M)	0.0116757	0.479692	0.0578 *	0.114793
Germany (10Y-1Y)	0.0269465	-0.877121	0.0771 *	0.100484
Great Britain (30Y-1Y)	-0.00013005	1.54804	0.0019 ***	0.142821

Source: Author's own calculations

We can say that all models are statistically significant, because the p-values are under 1% (***) or 10% (*). R^2 are higher than in the time period of whole sample – 1Q2000 – 1Q2016, but still it is not anything special.

In the second period the best results were gained for spreads mentioned in the Table 3 – 30-year and 1-year (France and Great Britain), 10-year and 1-year (Germany). We can say that in this case the best spread is a spread of 30-year and 1-year.

All models are statistically significant. R^2 are higher than in the previous time span, which is interesting. This change in prediction possibility may be caused by different behavior of financial markets after the financial crisis (after year 2008). The results show that the models have much higher explanatory power after the year 2007.

Table 3 Results of All Countries and Sample from 1Q2008 to 1Q2016

1Q08 – 1Q16	Constant	Spread	P - value	R^2
France (30Y-1Y)	-0.0149132	0.791468	0.0011 ***	0.293714
Germany (10Y-1Y)	-0.0220346	2.24746	0.0001 ***	0.384775
Great Britain (30Y-1Y)	-0.0140444	0.927291	0.0003 ***	0.349980

Source: Author's own calculations

At the end we can summarize the new theoretical finding according to which spread is the best for predicting of the future GDP growth. We proved that in these selected countries the best spread is a spread of 30-year and 1-year government bonds (we have added all results together and this spread showed up three times in total). The second best spread is spread of 10-year and 1-year bonds (totally twice in our calculations). The results showed that dividing of the sample made a difference between pre-crisis and

after-crisis period and it showed the different relationship of spreads and the models. The finding that the best spread is spread of 30-year and 1-year eventually 10-year and 1-year is in contradiction with the theoretical background when almost everybody who predicts the future GDP growth uses a spread of 10-year and 3-month government bonds. This was found out on data of United States of America (from 1970 to 2000). We must say that to collect data of 10-year and 3-month government bonds is the easiest possible way, when you want to use them for calculations, because they are all published in Bloomberg database, however to get data for 20-year, 6-month and 1-month yields are almost impossible in demanded time period and a good quality (there are many blind values from 1Q2000 to 1Q2016).

4 Conclusions

The 10-year and 3-month spread has substantial predictive power and should provide good forecast of real growth four quarters into the future (this was proved in USA). We showed that after the year 2000 the best predictive spreads in France, Germany and Great Britain are the spreads of 30-year and 1-year and 10-year and 1-year government bond yields. The results presented above confirm that these spreads have a significant predictive power for real GDP growth and the behaviour of the models changed during and after the financial crisis. The results show that the dividing of the sample made a difference in use of the best predictive spread.

The simple yield curve growth forecast should not serve as a replacement for the predictions of companies, which deal with predicting of many economic indicators, it however does provide enough information to serve as a useful check on the more sophisticated forecasts.

Future research could be extended to a wider examination of the best spreads in more countries around the world and especially in European Union. It would be interesting to see if there is the rule which would prove the hypothesis that the spread of 10-year and 3-month bond yields is the best for predicting future GDP growth in the countries of the European Union.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 *Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development* is gratefully acknowledged.

References

- Berk, J., van Bergeijk P. (2001). *On the Information Content of the Yield Curve: Lessons for the Eurosystem?* Kredit und Kapital, vol. 34, pp. 28–47.
- Bernard, H. J., Gerlach, S. (1998). *Does the Term Structure Predict Recessions? The International Evidence.* CEPR Discussion Papers, vol. 1892.
- Bloomberg (2016). *30-year, 15-year, 10-year, 5-year, 1-year, 3-month Government Bond Yields.* Retrieved from: Terminal Bloomberg.
- Bonser-Neal, C., Morley, T. R. (1997). Does the Yield Spread Predict Real Economic Activity? A Multicountry Analysis. *Economic Review: Federal Reserve Bank of Kansas City*, vol. 5(3), pp. 37-53.
- Chinn, M., Kucko, K. (2010). *The predictive power of the yield curve across countries and time.* NBER Working Paper Series.
- De Pace, P. (2011). *GDP Growth Predictions through the Yield Spread: Time – Variation and Structural Break.* Euro Area Business Cycle Network. Retrieved from: <http://ssrn.com/abstract=1401752>.

Estrella, A., Hardouvelis G. A. (1991). The Term Structure as a Predictor of Real Economic Activity. *Journal of Finance*, vol. 46(2), pp. 555-576.

Estrella, A., Mishkin, F. S. (1996). The Yield Curve as a Predictor of U.S. Recessions. *Current Issues in Economics and Finance*, vol. 2(7), pp. 1-6.

Giacomini, R., Rossi, B. (2005). How stable is the Forecasting Performance of the Yield Curve for Output Growth. *Oxford Bulletin of Economics and Statistics*, vol. 68(1), pp. 783-795.

Mishkin, F. (1990). Yield curve. NBER Working Papers Series, vol. 3550.

OECD statistics (2016). *Quarterly National Accounts: Quarterly Growth Rates of Real GDP, Growth rate compared to the same quarter of previous year*. Retrieved from: <http://stats.oecd.org/index.aspx?queryid=350>.

Szarowská, I. (2013). Fiscal Discipline as a Driver of Sovereign Risk Spread in the European Union Countries. In: 22nd IBIMA Conference on Creating Global Competitive Economies: 2020 Vision Planning & Implementation. Rome: IBIMA, pp. 793-804.

Difference in Financial Knowledge of Finance Students in the Czech Republic

Barbora Chmelíková¹, Martin Svoboda²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 60200 Brno, Czech Republic
E-mail: barbora.chmelikova@gmail.com

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 60200 Brno, Czech Republic
E-mail: svoboda@econ.muni.cz

Abstract: *The aim of this article is to analyze the results of the study regarding financial literacy topics. The study was implemented at Masaryk University among the students of the Faculty of Economics and Administration. The paper presents the results of empirical study conducted in two consecutive years 2013-2014 testing the students' knowledge in the areas of personal budgeting, numerical literacy, price literacy, payment methods, how to search for relevant information, breach of a contract and its consequences, indebtedness, right and obligation of consumers in the financial markets. The results of data gathered from the studies over the time enable an insight into the shift of the financial knowledge of the surveyed target group.*

Keywords: financial literacy, university students, financial education

JEL codes: A10, A22, A23, I23

1 Introduction

Financial literacy is an integral part of today's skill set essential for the harmonic functioning of an individual in the financial markets. It is not only about literacy anymore, but about financial literacy emphasizing the importance of such a significant role the money plays in human life. Financial literacy research identifies groups which might have low levels of financial literacy (Atkinson & Messy, 2015), and these groups include also youth. Yet age is not the only factor influencing the level of financial literacy. The level of education plays important role as well (Xu & Zia, 2012). Positive correlation between the achieved level of education and the level of financial literacy exists based on the international surveys (Atkinson & Messy, 2012). Financial literacy was tested in three areas – financial knowledge, financial behavior and attitudes. For this reason, paper examines the financial knowledge among university students, in particular, students majoring in the fields of economics and finance. This paper builds on the results of study showing not only the lack of knowledge regarding financial matters of finance students (Chmelíková, 2015a), but also of students of other disciplines (Chmelíková & Svoboda, 2014). Furthermore, finance students did not demonstrated considerable exceptional performance in the study testing their personal money management either (Chmelíková, 2015b). Therefore, this paper presents data collected in years 2013-2014 with university students majoring in finance related fields as a target group to see whether there is any difference in knowledge concerning financial topics in this period.

2 Methodology and Data

The survey questionnaire was based on the "Empirical verification of university students' literacy" project following the research conducted at the University of Economics (Hradil et al., 2012) to identify the level of financial literacy of university students which appeared to be higher to the certain extent than the adult's financial literacy (Ministry of Finance, 2010). The Faculty of Economics and Administration joined the project through the Institute for Financial Market and contributed to the formation of the questionnaire and its modification in accordance with the standard international best practices.

Questions regarding measuring the level of financial literacy (Lusardi et al., 2010) were added to the questionnaire set as well.

This paper concentrates on the shift of the financial knowledge between two years. The established hypothesis is whether there is a positive change in financial knowledge of students studying in finance related major. University students were selected as a target group which was further narrowed to the students of the Faculty of Economics and Administration at Masaryk University. The questionnaire was presented mostly to the students of the course Basic Finance which is generally taught in the first year of study.

The analyzed data was collected during the two-year period in the year 2013 and 2014. Respondents differ in each year. Also, the sample in the first year (n = 885) is larger than the second year sample (n = 393). The number of respondents to each question varies within the sample according to the number of already answered questions as well as the complexity of the question. The study was conducted by online survey consisting of 100 questions giving respondents more options on the condition that one option is correct. On the other hand, some questions were open-ended with the necessity to write the response. Minority of questions more than one answer was correct.

Table 1 The Topics of the Areas Tested in the Questionnaire

Topic of the question's block	Number of questions in each block
Price and financial literacy	13
Household finance management and debts	8
Investments	4
Loans and interests	7
Insurance	4
Law Literacy	8
Social system and benefits	18

Source: Author's own work based on survey results

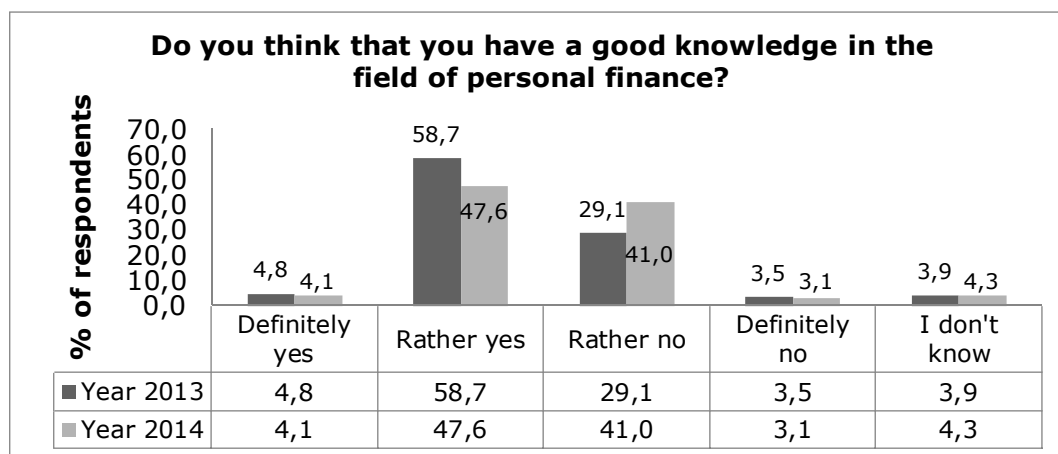
Table 1 provides the topics of the areas tested in the questionnaire and number of questions in each block which were analyzed in this paper. The questionnaire structure is designed in order to test different areas of financial knowledge such as price and financial literacy including questions about pricing, payment methods in domestic and foreign currencies, macroeconomic situation and inflation. Next block consisted of questions regarding household finance management and debt management testing personal finance. Third block of question tested knowledge about investments, fourth block focused on loans, credit products, and interest rates. Following areas covered was insurance and its basic principles as well as fraudulent behavior. The law literacy block included questions of understanding contract arrangements, fraud, who to contact in case of financial difficulties. Last tested area involved knowledge of Czech social benefit system and its current state.

In order to test established hypothesis the data was analyzed using mainly the descriptive statistics method due to the nature of collected data. Scores in each question block were calculated as a mean of the percentage of correct answers weighted by number of respondents. For the purpose of comparison, in each year the same questions were presented to the respondents hence the collected data are comparable and suitable for analysis. The data analysis conducted in this paper follows the previous research and results for the year 2014 are adapted from previous study (Chmelíková & Svoboda, 2015).

3 Results and Discussion

First of all, we will look closely on the self-assessment questions in which the students were asked if they think that they have a good knowledge in the field of personal finance. As we can observe from the Figure 1 the confidence of students between the year 2013 and 2014 rather declined. The percentage of confident students decreased, whereas the percentage of not confident students increased.

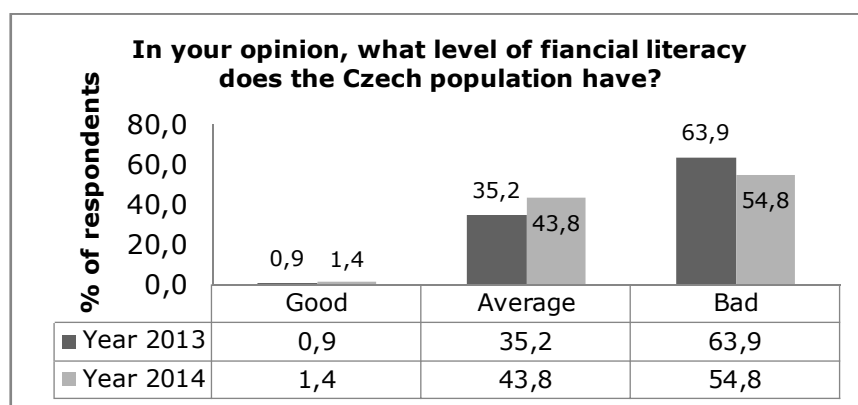
Figure 1 Confidence about Personal Finance Knowledge



Source: Author's own work based on survey results

In contrast, students' opinion about the financial literacy level of the Czech population increased between the year 2013 and 2014 as it is shown in Figure 2 where we can observe a decreasing shift in negative opinion which might indicate optimistic opinion of the financial literacy level in the Czech Republic.

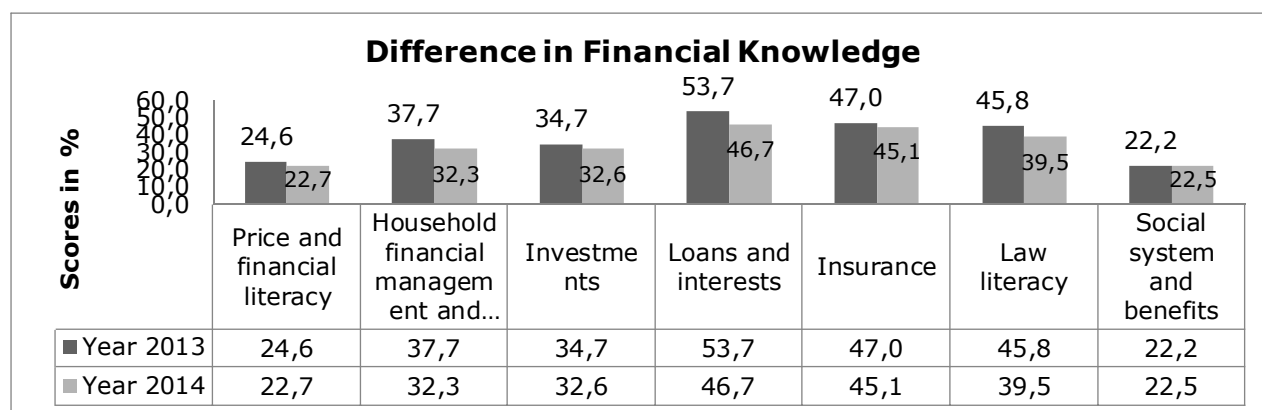
Figure 2 The Level of Financial Literacy of Czech Population according to the Students



Source: Author's own work based on survey results

The shift of students' opinion in self-assessment questions might explain also the shift in the financial knowledge scores. There is visible decrease in financial knowledge in each individual block of questions with one exception. The calculated results are illustrated below in Figure 3.

Figure 3 Difference in Financial Knowledge of Finance Students



Source: Author's own work based on survey results

Provided graph illustrates the differences in financial knowledge according to the tested areas. Darker columns present the scores in percentage for the year 2013, whereas the lighter-coloured columns represent data for year 2014. The calculated scores are shown in the bottom of the Figure 3 for each year and each block of questions. Presented graph shows decreasing pattern in measured financial knowledge of students between the year 2013 and 2014. The exact difference in scores is provided below in Table 2. The highest drop in scores by 7% is witnessed in the topic of loans and interest, followed by the drop of 6.3% in law literacy and decrease of 5.5% in household finance management and debt management. Minor, but still negative, change is occurred in the tested area concerning investments (-2.1%), insurance (-1.9%), price and financial literacy (-1.9%). Only positive difference in knowledge is observed in the topic of social system and benefits, where there is an increase in score by 0.3%.

Table 2 The Change in Financial Knowledge during the Period 2013-2014

Financial Knowledge Topics	Difference in %
Price and financial literacy	-1.9
Household finance management and debts	-5.5 *
Investments	-2.1
Loans and interests	-7.0 *
Insurance	-1.9
Law Literacy	-6.3 *
Social system and benefits	+0.3

Source: Author's own work based on survey results

In Table 2 the actual change in financial knowledge between the year 2014 and 2013 is calculated and the difference in each area is shown in percentage. In all areas, except one, the change is negative when the students in the year 2013 achieved higher scores than the students in the year 2014. Table 2 shows how large the difference is. Difference larger than 5% is marked with asterisk (*).

4 Conclusions

The results demonstrated the decrease in financial knowledge of participating students between the year 2013 and 2014 implying the conclusion that the education concerning financial literacy, personal finance, debt management, financial products is needed even among the students studying in finance related fields. This might have further implications since these students are likely to have carrier in the finance sector or advising others on personal finance matters which if this decreasing effect continues, it may have larger negative effect. For this reason, the financial education in the area of financial literacy should be further developed.

Acknowledgments

Support of Masaryk University within the project MUNI/A/0916/2015 is gratefully acknowledged. The authors want to thank the Citi Foundation for the support.

References

- Atkinson, A., Messy, F. A. (2015). *Financial Education for Migrants and their Families*, Paris: Organisation for Economic Co-operation and Development.
- Chmelíková, B. (2015a). Financial Literacy of Students of Finance: An Empirical Study from the Czech Republic. *International Journal of Social, Behavioral, Educational, Economic, Business and Industrial Engineering*, vol. 9, pp. 4000–4004.
- Chmelíková, B. (2015b). Personal Money Management of Finance Students. In: *Proceedings of 32nd International Business Research Conference*. Melbourne: World Business Institute Australia, pp. 11.

Chmelíková, B., Svoboda, M. (2015). Comparative Study: The Financial Literacy of Students of Economics and Finance versus Students of Law. In: *Proceedings of the 12th International Scientific Conference European Financial Systems 2015*. Brno: Masaryk University, pp. 66–72.

Hradil, D., Křížek, T. and Dvořák, P. (2012). *Empirické ověření gramotnosti student vysokých škol*, akademický výzkumný projekt, IGA 27/2012, IG102032, Praha.

Lusardi, A., Mitchell, O. and Vilsa C. (2010). Financial Literacy Among the Young. *Journal of Consumer Affairs*, vol. 44(2), pp 358-380.

Messy, F.A., Atkinson, A. (2012). Measuring Financial Literacy: Results of the OECD/International Network on Financial Education (INFE) Pilot Study. Paris: Organisation for Economic Co-operation and Development.

Ministry of Finance (2010). *Národní strategie finančního vzdělávání*. Retrieved from: http://www.mfcr.cz/cps/rde/xbcr/mfcr/Narodni_strategie_Financniho_vzdelavani_MF2010.pdf.

Xu, L., Zia, B. (2012). Financial Literacy around the World: An Overview of the Evidence with Practical Suggestions for the Way Forward, The World Bank.

The Use of Financial Advisory in Czech Republic: Self-confidence

Věra Jančurová¹, Petra Formánková²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: 321156@mail.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: 420853@mail.muni.cz

Abstract: *The study of behavioral finance and decision making, especially in finance, have grown on importance during last decades. There were conducted many studies of decision making at financial markets all around the world. This study was conducted to analyze financial decision making and behavioral characteristics of Czech population. The purpose of this study is to show how people in Czech Republic control their financial affairs; one of the studied areas is if they use the help of financial advisors, especially, if this is influenced by gender, the level of education or even by the self-evaluation of own financial skills and knowledge. There was conducted a field research based on electronic and printed questionnaire that was answered by 302 respondents. Based on the results of the testing it was confirmed that level of education is significant for both self-evaluation and the use of financial advisors. However the hypothesis that higher education level increase the probability of self-evaluation and decreases the need to use the help of financial advisors was not confirmed. One of possible explanation could be the overconfidence of individuals that is strongly shown by the sample; 70,52% of total respondents consider their financial knowledge better than average and only 3,32% of the respondents consider them worse than average. And only 29,6% of the respondents use for their financial decisions the help of financial advisor.*

Keywords: *behavioral finance, financial advisory, overconfidence, self-evaluation, financial decision*

JEL codes: *G110, G190, G020, I20*

1 Introduction

The growing importance of behavioral finance and financial advisory are obvious at financial markets. Financial advisory is nowadays highly discussed topic. The orientation at financial markets is complicated, often requests the assistance of financial advisors. The range of issues individuals have to solve in the context of finance is significant and influence often the quality of their life.

Behavioral finance emphasizes the role of psychology in finance in guiding individual investor's decisions and influencing financial market. Behavioral finance aims to explain behavior of individuals and financial market movements based on psychology-based theory. The general assumption of behavioral finance is that the individual's characteristics and information structure influence significantly financial markets. Despite the fact that human decisions are often influenced by human psychology, even in determining economic or financial decision, classical theory insist on fully rational individuals and efficient market. However although the behavioral finance theory and the research in this field is young, its origins go back to Adam Smith. Smith found out that people decide based on impressions and believer, rather than on rational data analyzes.

This article provides an analysis of human decision making in the context of use of the help of financial advisors. The goal of the study is to verify whether there can be found connection between using the assistance of financial advisors and gender, reached level of education or self-evaluation of own skills.

- The first hypothesis concentrates on how people handle with their money and how to control this handling. Do the respondents use the help of financial advisor or do they rely on own skills and knowledge?
- Second hypothesis concentrates on the influence of gender, level of education and self-evaluation of financial skills on the use of financial advisory.
- Third hypothesis tests self-evaluation, itself, and its dependency on gender and level of education.

Theoretical Backgrounds

For the purpose of this study the background of financial advisory and self-confidence or overconfidence has to be mentioned. For the needs of this study financial advisory is considered to be service offered to people to help them with financial decision, especially insurance, savings and investments. Every person needs to make such decisions disregarding on gender or education level. Financial advisor is a person who provides financial advices and guidance to the clients.

Self-evaluation is the evaluation of own skills and knowledge at financial markets. It is closely connected to overconfidence, the tendency to overestimate own predictive abilities and the precision of information individual have. Individuals generally overestimate their skills and knowledge, the perceived level of own skills and knowledge is typically high, higher that actual skills and knowledge.

In this framework "one of the greatest services a financial advisor can provide to clients is helping to ensure that in times of market turbulence, reason, discipline and objectivity triumph over emotions such as fear, greed, and market regret."

2 Methodology and Data

The data for the purpose of this study were collected in a controlled field research, based on a questionnaire proving inclination to behavioral biases and information about financial advisory used by respondents. The survey was divided into two separate parts, altogether 40 questions. First the respondents were asked personal information; e.g. age, gender, highest level of education reached.

Second part contained questions asking respondents questions regarding financial decisions – especially use of financial advisors. Within this part respondents were asked to evaluate their own knowledge and skills in finance.

The sample consists of 302 respondents, the age between 18 and 70 years.

Sample characteristics:

- Gender: 70% women, 30% men
- Age: 18-30: 50%; 31-50: 30%; 51-65: 17%, more than 65: 3%
- Education: secondary school: 2%, high school with school leaving exam 45%, high school without school leaving exam 11%, higher school 4%, university 38%
- Marital status: single/divorced 50%, mate 10%, married 39%, widow/widower 1%

3 Results and Discussion

The results of the study show that the sample can be considered strongly biased, at least by the overconfidence. First there was tested if there is a difference in use of financial advisory by gender. The zero hypotheses were not rejected.

Table 1 Financial Advisory Usage Based on Gender

P-value (t - test)	P-value (F-test)
0,246	0,620

Source: Own based on conducted research

This table summarizes differences between the group of respondents who use/ do not use financial advisors. The use of financial advisors seems not to be influenced by the gender. Received p-value of t-test is higher than the significance level. Moreover, this test does not comply with one of the requirements - the normal data distribution. High p-value rejects a statistical difference between the groups.

Based on received results there are no differences between gender in the use of financial advisors. 30,91% of women answered that they use for their financial decisions the help of financial advisors and 26,96% of men answered the same. However the statistical testing shows that the normality assumption is not fulfilled. Therefore the test cannot be taken into consideration.

Further test was taken to study if there can be found any connection between the use of self-evaluation of own financial knowledge and the use of financial advisors.

Table 2 Usage of Financial Advisory Based on Own Evaluation of Financial Knowledge

P-value (t - test)	P-value (F-test)
0,291	0,012

Source: Own based on conducted research

High p-value rejects a statistical difference between the groups. Despite the fact that this tests complies with all assumptions, normal data distribution, as well as homoscedasticity are fulfilled, the effect of self-evaluation of own financial knowledge on use of financial advisors is not statistically significant.

Reached education level was tested as another criterion for the use of financial advisors.

Table 3 Usage of Financial Advisory Based on Education Level

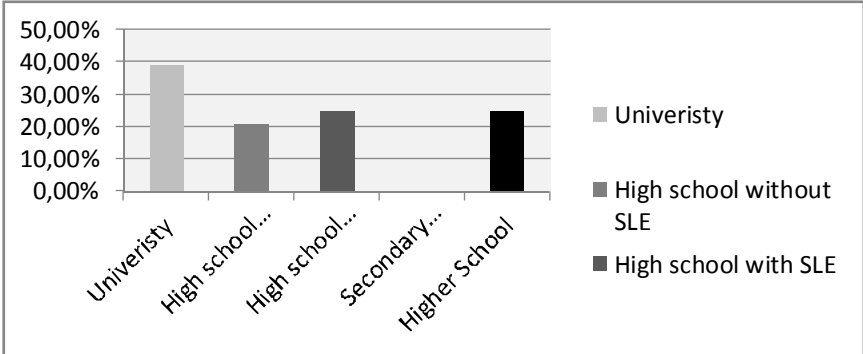
P-value (t - test)	P-value (F-test)
0,011	0,045

Source: Own based on conducted research

A significant gap is spotted in terms of the usage of financial advisory based on reached level of education. The computed p-value rejects the null hypothesis (claiming that the education has no impact on the use of financial advisory).

Low p-value confirms a statistical difference between the groups. In the right column, there is p-value of F-test providing us with verification of model correctness. Current situation at financial market, especially high number of products and their complicated structure, built up the hypothesis that people with lower education level use more often the help of financial advisors. Following graph shows that this hypothesis is not correct.

Figure 1 Usage of Financial Advisors by Reached Level of Education



Source: Own, based on conducted research

From the graph it is visible that the lowest level of use of financial advisors has been identified by people whose education level is the lowest, secondary school. However this result can be influenced by the number of respondents from this group. On contrary the

help of financial advisors is mostly used by people with highest education level, over 35% of respondents with university education use the help of financial advisors. A significant gap can be found between respondents with high school education depending on the type of high school, with or without school leaving exam. Respondents with school leaving exam tend to use the help of financial advisors more than their colleagues without the school leaving exam.

To conclude the study of use of financial advisors by individuals, it has to be stated that from the total sample only 29,6% of respondents use the help of financial advisors. This can be caused by the situation at Czech financial advisors market. The following two tests were taken to analyze how do respondents evaluate their skills and knowledge in general financial issues, as insurance, savings, investments etc. First test examines if there is any connection between evaluation of own financial skills and gender of respondents.

Table 4 Own Financial Skill Evaluation (by Gender)

P-value (t - test)	P-value (F-test)
0,950	0,022

Source: Own based on conducted research

High p-value declines a statistical difference between the groups. Despite the fact that this tests complies with all assumptions, normal data distribution, as well as homoscedasticity are fulfilled, the effect of this bias is not statistically significant. This characteristic of respondents is not a statistical significant difference, since p-value exceeds the set significance level.

As gender seems to have no impact on evaluation of own skills, the second test was considering the reached level of education's impact on self-evaluation.

Table 5 Evaluation of Own Skills Based on Education

P-value (t - test)	P-value (F-test)
0,046	0,162

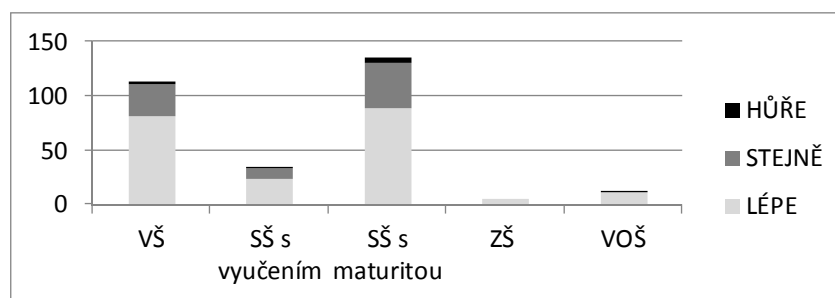
Source: Own based on conducted research

Low p-value confirms a statistical difference between the groups. In the right column, there is p-value of F-test providing us with verification of model correctness. Based on conducted test education level was confirmed to be significant for evaluation of own skills.

As the education level was confirmed to be statistically significant for self-evaluation of financial skills and knowledge further analyses was done to confirm/decline if higher educational level means better self-evaluation. This logically set hypothesis was tested and showed the contrary.

Following figure shows that respondents with lower level of education, especially respondents with the lowest level of education, seem to over-evaluate their skills. This result could be caused by overconfidence.

Figure 2 Usage of Financial Advisors by Reached Level of Education



Source: Own, based on conducted research

In total 70,52 of total respondents consider their financial knowledge to be better than average and only 3,32% of the respondents consider them to be worse than average.

To conclude, it is obvious that financial advisory is not used enough and that there is also need to explain people with lower level of education the benefits of such a service. It could be the goal of future studies to investigate on why the financial advisory in Czech Republic not broadly used is and how to improve that. The comparison with other countries could be also interesting.

4 Conclusions

The first hypothesis tested how people handle with their money and how to control this handling. Based on the received data only 29% of respondents use the help of financial advisors, it seems to be obvious, that most of them rely on own skills and abilities. Second hypothesis concentrated on the influence of gender, level of education and self-evaluation of financial skills on the use of financial advisory. Gender and Self-evaluation of own skills were not confirmed to be significant for the use of financial advisor. On contrary reached level of education was confirmed to be significant. However the result is surprising because with higher level of education increases the use of financial advisor. The research shows that people with lowest level of education do not use financial advisors. Third hypothesis tested self-evaluation, itself, and its dependency on gender and level of education. Gender was again not confirmed to be significant, however level of education seems to influence the evaluation of own skills. However, the hypotheses that higher education increase the self-evaluation was rejected. Respondents with lowest education evaluate them better then respondents with higher education level.

Acknowledgments

Support of Masaryk University within the project MUNIA/0916/2015. "Behavioral and knowledge aspects of trading and evaluation of financial assets" is gratefully acknowledged.

References

- Baker, H. K., Vctor, R. (2014). *Investor Behavior: The Psychology of Financial Planning and Investing*. 1st ed. New Jersey: Wiley.
- Goldberg, K., Nitzsch, R. (2004). *Behavioral Finance: Gewinnen mit Kompetenz*. 1st ed. Muenchen: FinanzBuch Verlag GmbH.
- Green, H. (1993). *Econometric Analysis*. 2nd ed. New York: Macmillan.
- Howard, T.C. (2014). *Behavioral Portfolio Management*. 1st ed. London: Harriman House.
- Nofsinger, J. R. (2011). *The Psychology of Investing*. Boston: Pearson Education.
- Pompian, M. (2006). *Behavioral Finance and Wealth Management*. 1st ed. New Jersey: John Wiley & Tamp; Sons, Inc.
- Seppala, A. (2009). *Behavioral Finance of Investment Advisors*. Master's thesis. Helsinki: Helsinki School of Economics, pp. 1-72.
- Shefrin, H. (2002). *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*. 1st ed. New York: Oxford University Press.

Face Nominal Effect on Capital Market Transactions. The Case of Poland

Magdalena Jasiniak

University of Lodz
Faculty of Economics and Sociology, Corporate Finance Department
Rewolucji 1905 No 39, Lodz, Poland
E-mail: magdalena.jasiniak@uni.lodz.pl

Abstract: *Psychological features have an important role in evaluation processes. Studies indicate that investment decisions are strongly determined by behavioral factors. As a result investors behave irrationally. One of parameters that influence purchasing decision is price. Perceiving price as high generally discourage the purchase. As a consequence, goods at lower price are more attractive to bought what creates higher demand and influence companies' revenues. Following paper analyze whether the face nominal effect observed at consumer market also occur in stock exchange market. The main aim of this article is to verify whether investors are influenced by face nominal values on stock market exchange. Author state that cheap assets characterized by nominally lower prices are more attractive to buy and bring higher profits (as a consequence of increased demand) in comparison to assets described as expensive. In order to verify the hypothesis, database of 13789 quotations from 1.07.1999 to 30.12.2013 was created. The sample was divided into three groups – cheap, average and expensive stocks. Finally the statistical analysis was conducted among 2924 records including only cheap and expensive units. Statistical analysis confirm that assets defined as "cheap" generate higher profits and lower losses.*

Keywords: face nominal effect, behavioral finance

JEL codes: G02, G11

1 Introduction

The final effect of investment process is determined not only on strictly economic factors but also on psychological aspects. Emotions and risk tolerance affect human behavior and determine the investment decisions. Economic psychology is focused mainly on consumer behavior and explains the processes that are related with purchasing goods and services. These analysis are mostly used in marketing strategies. However, the aspects of behaviorism are also observed on stock exchange market.

The theory of rational behavior assumes that consumers choices are made on the basis of rational reasons. In the process of investment, the rational behavior means that investor analyses all possible choices, assigns importance to possible options and choose the best one. In predicting future event people are impartial and objective. This procedure maximize the subjective expected utility. However, due to certain limitations of time and in limited access to information, investors avoid rational methods and use faster and simpler procedures. Additionally, they are influenced by behavioral biases which sometimes cause irrational and contradictory decisions.

Perceiving price as high generally discourage the purchase. This phenomenon is commonly observed at consumer market. As a consequence, goods at lower price are more attractive to bought what creates higher demand and influence companies' revenues. The question is whether stock market investors are also fragile on stocks' nominal value. Following paper analyze whether the face nominal effect observed at consumer market also occur in stock exchange market. The main aim of this article is to verify whether investors are influenced by face nominal values on stock market exchange. Author state that cheap assets characterized by nominally lower prices are more attractive to buy and bring higher profits (as a consequence of increased demand) in comparison to assets described as expensive. Paper presents the results of preliminary study focused on the relation between nominal values of stock prices, investors'

willingness to purchase and profits achieved. It is assumed that investors are more willing to buy stocks at lower prices. The increase in demand is one of determinants that influence stock price increase and finally rates of return. As a consequence, it is expected that low priced stocks generate higher profits than high priced stocks.

2 Methodology and Data

How prices affects consumers' decisions

According to micro theories, prices have a strong influence on people's purchase decisions. The theory of demand generally explains the relation between the consumers' demand on particular product at given price and time. The general relation between the price and demand is negative – higher prices cause the decrease of consumers' willingness to products purchase. Consumers who behave rationally generally choose products with lower prices. However, the assumption of consumer rational behavior is neglected. Studies focused on consumers behaviour let to highlight some paradoxes' in price and demand relation.

Table 1 Paradoxes in Demand Theory

Giffen paradox	Related with basic products – despite price growth, consumers are still willing to buy these products.
Veblen paradox	Increase of luxury products purchase despite their price increase.
Scene effect	Purchase of goods despite price value, only because product is bought by others.
Snob effect	Purchase of goods is the more attractive the less people have them.
Income effect of price decline	The price decrease of substitute products cause similar results to income increase
Bolt effect	Maintenance of current consumption despite price increase.
Shock and effect domestication	After price rapid increase customers decline consumption and after some time return to the previous level.
The phenomenon of shopping anticipation	Despite price increase, consumers are still buying products in case of future price growth.
Speculative paradox	Reaction on price increase by buying goods in order to future sold at a profit.

Source: K. Mazurek – Łopacińska, *Zachowania nabywców jako podstawa strategii marketingowej*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław 1997, s.61

In the field of economic psychology, there are many examples of limited utility of normative models based on human rational decisions. For example: sudden and impulsive purchase decisions, excessive risk aversion, risk overestimating in less known situations and risk underestimating in better known situation (Zaleśkiewicz, 2015).

According to H. Simon (1979) people's decision are not optimal but rather satisfying and include psychological context. H.Shefrin and M.Statman (1985) state that investors are motivated by willingness to achieve profits but this aim is balanced between the fear of loss and hope of spectacular profit.

People are sensitive to prices, especially when they have to bear higher costs. Perception of high prices generally discourage the purchase (Falkowski, Tyszka, 2006). This is strongly used on consumer market and marketing actions.

Price perception is determined by many factors. Anchor theory is one that explains how consumers perceive product price. Numbers, their informational value and influence on human behavior is a subject of many studies.

The effect of left – side number is most commonly used in price strategies. This is strongly related with human simplified perception of reality. More concentration is focused on left side values while the right are ignored. As a result, prices set at 9.99 are perceived as 9.0 not as 10.0. This influence the rationality of buying decisions what has been used in marketing strategies for many years. This simple method cause that certain prices are perceived as much lower than they really are. The highest influence of this effect is observed in case of threshold prices. In case of euro currency – f.e – 0.99 (less than 1 eur), 4.99 (less than 5 eur), 99.99 (less than 100 eur). As a result, the price decrease from 2.0 to 1.99 is perceived as higher than from 2.50 to 2.19 despite nominally the difference is higher in second case.

Behavioral biases on stock exchange market

Literature describes many investors' behaviors that are driven by non – rational factors. The most popular is the theory of perspective described by Tversky and Kahnemann (1979). This theory is an alternative to theory of expected utility and explains that the perception of risk differs depending on previously experienced profits or losses. According to this theory, experienced loss drives investors to more risky behavior.

In contrast Johnson and Thaler (1990) explained the risk tolerance by previous experiences in following way: previously experienced loss increase the fear of risk and prior earning increase risk appetite.

Samuelson and Zeckhauser (1988) observed that investors are more willing to maintain stock they previously bought, being convinced that they it will ensure them profits and focusing only on these market information that confirm this assumption.

Anchoring effect is also described on stock exchange market and is perceived as one of most important that influence stock prices. Investors made decisions on the basis of recent quotations (Kahneman, Tversky, 1979). According to this theory consumers made the decisions on the basis of previously noticed information that influence further interpretation. This effect is strongly used in marketing strategies by positioning product price with the previous price of the same product or similar products.

Experienced loss, that was too strongly encoded in human memory might limit future engagement on financial market. This phenomena is called snake bite effect. However, the need of equal opportunities aiming to fast compensation occurs regardless of risk (Nofsinger, 2006).

Face nominal effect has been not widely studied on financial markets. Low priced stocks (valued less than 1 PLN) are usually perceived as "junk stocks". Low priced stocks are often related with companies at bad financial conditions. Therefore "junk stocks" are perceived as risky and highly speculative. Low priced stocks are usually the result of splits which are conducted to improve stocks liquidity. They usually attract novice investors.

However, there are studies indicating that nominals may affect human decisions in financial transactions as well.

According to T. Odean (1999), investor have higher willingness to sell assets with higher prices than those with lower prices. However, this phenomena was strongly related with the disposition effect and the effect of such behavior appeared to be negative. The high stock could bring higher benefits than the low ones.

Low price effect is an anomaly which consist in that stocks with low prices bring higher return rates that stocks with high prices. This phenomena was observed by Goodman and Pevy (1986) and Branch and Chang (1990). This phenomena is usually related with stock split. It was illustrate by catering theory (Baker et all. 2009). When investors prefer stocks at low nominal value, manager do stock split and deliver assets at expected

prices. This is based on assumption that nominal value of stocks do matter for the investors and as a result the expected rate of return is related with stock price.

Studies conducted on Polish Stock Exchange by Zaremba and Żmudziński (2014) stay in contrast. In that case the low price effect was diverted. It was observed that stocks with high prices generate higher profits than low priced stocks. Studies conducted by Biegańska et al. (2016) on the example of M&A transactions proved that in case of stocks at lower prices the probability of profits is higher than in case of high valued stocks. The question is whether this phenomena might be observed in wider extend.

3 Results and Discussion

Face nominal effect on capital market – research results

Research was conducted on data collected from Polish Stock Exchange Market. In order to verify the hypothesis, database of 13789 quotations from 1.07.1999 to 30.12.2013 was created. At first, database was divided into two groups – those with positive brokerage recommendation (buy or accumulate) at t moment (date of recommendation issue) and those with negative recommendations (sell or reduce) at moment t . Next, the sample was divided into three groups – cheap, average and expensive stocks. Cheap stocks were defined as those characterized by single – digit prices – below 1 PLN per unit. Expensive stocks were those with four – digit prices – more than 1000 PLN per unit. Neutral stocks were excluded from the analysis.

Author verified the rate of return after one year measured by 250 trading sessions. The analysis was conducted separately in the group of positive and negative brokerage recommendations.

The results of analysis conducted among the group of positive recommendation is presented below.

Table 2 Rate of Return (%) of Low and High Prices – Positive Recommendations

	Low prices	High prices
Mean	0.721046	0.350316
Standard error	0.218695	0.067061
Median	0.230882	0.201948
Standard deviation	1.956066	0.632657
Variance	3.826192	0.400255
Range	13.2	2.616643
Minimum	-1	-0.91028
Maximum	12.2	1.706362
Sum	57.68366	31.17815
Number of units	80	89

Source: Own elaboration

The descriptive statistics indicate that the average rate of return in case of low priced stocks is higher than in case of high priced stocks (respectively 0,72 vs 0,35). In case of low priced stock the rate of return is characterized by higher variance and the range of minimum and maximum rates is definitely higher. The highest return rates amounted 12,2% in case of low priced stocks and only 1,7% in case of high.

The statistical significance of means was verified. The zero hypothesis assumed that the difference between average return rates of low and high priced stocks is equal 0.

Zero hypothesis: the difference between both means = 0

Sample 1:

N=80, mean = 0,721046, std. error = 0,218695

Residual std. error = 0,0244508

95% confidence interval for the mean from 0,672378 to 0,769714

Sample 2:

N=89, mean = 0,350316, std. error = 0,0670615

Residual std. error = 0,0071085

95% confidence interval for the mean from 0,33619 to 0,364443

The test statistic: $t(167) = (0,721046 - 0,350316)/0,0243572 = 15,2205$

Double – sided critical area $p = 2,25e-033$

One – sided critical area = $1,125e-033$

Test confirms that means are different. This allows to conclude that on Polish stock exchange market low priced stocks generate higher profits than high priced stocks.

The results of analysis conducted among negative recommendations is presented in table 3.

Table 3 Rate of Return (%) of Low and High Prices – Negative Recommendations

	Low prices	High prices
Mean	-0.05847	-0.12629
Standard error	0.031235	0.030257
Median	-0.00437	0.016502
Standard deviation	0.615262	0.643273
Variance	0.378548	0.4138
Range	5.164841	4.963525
Minimum	-3.94481	-3.85496
Maximum	1.220028	1.108567
Sum	-22.6874	-57.0816
Number of units	388	452

Source: Own elaboration

As descriptive statistics show, in both cases rate of return is negative. However, in case of low priced stocks the loss is lower than in case of high priced stocks (respectively - 0,05% versus -0,13%). The variance of both samples is similar. Despite visible differences, this relation is not statistically significant.

Zero hypothesis: the difference between both means = 0

Sample 1:

N=358, mean = -0,0623703, std. error = 0,610748

Residual std. error = 0,032279

95% confidence interval for the mean from -0,125851 to 0,00111063

Sample 2:

N=452, mean = -0,126287, std. error = 0,643273

Residual std. error = 0,030257

95% confidence interval for the mean from -0,185749 to -0,0668244

The test statistic: $t(808) = (-0,0623703 - -0,126287)/0,0445101 = 1,436$

Double – sided critical area $p = 0,1514$

One – sided critical area = 0,0757

The zero hypothesis is positively verified. It means that statistically both means are equal.

4 Conclusions

Studies conducted on consumer market have already verified that prices affect human decisions. In the processes of evaluation, psychological features have an important role. Studies conducted in the area of behavioural finance proved that investors do not behave rationally and made decisions influenced by psychological factors. However, the question is whether perceiving price is one of those factors that strongly influence investors decision. The face nominal effect is not verified widely on capital market conditions. On the one hand, the low price anomaly indicates that low priced stocks are attractive to buy and generate higher profits. On the other, market analytics communicate that purchase of low priced stocks is more risky and are usually issued by companies in bad financial condition.

Presented study has a preliminary character. On the basis of conducted analysis it may be concluded that low priced stocks generate higher profits. It was also observed that losses generated by low priced stocks are lower in comparison to the high stock, but this cannot be statistically verified. It is necessary to verify this phenomena in further analysis.

References

- Baker M., Greenwood, R., Wurgler, J. (2009). Catering through nominal share prices. *The Journal of Finance*, vol. 64(6), pp. 2559-2590.
- Biegańska, K., Jasiniak, M., Pastusiak, R., Pluskota, A. (2016). Efekt zakotwiczenia w transakcjach fuzji i przejęć na przykładzie Polski. *Finanse, Rynki Finansowe, Ubezpieczenia*, vol. 1(79), pp. 585-593.
- Branch, B., Chang, K. (1990). Low price stocks and the January effect. *Quarterly Journal of Business and Economics*, pp. 90-118.
- Falkowski, A., Tyszka, T. (2006). *Psychologia zachowań konsumenckich*. Gdańsk, GWP.
- Goodman, D. A., Peavy, J. W. III. (1986). The interaction of firm size and price-earnings ratio on portfolio performance. *Financial Analysts Journal*, vol. 42(1), pp. 9-12.
- Hersh, S., Statman, M. (1985). The disposition to sell winners too early and ride losers too long: Theory and evidence. *The Journal of finance*, vol. 40 (3), pp. 777-790.
- Kahneman, D., Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, vol. 47, pp. 267-291.
- Mazurek-Łopacińska, M. (1997). *Zachowania nabywców jako podstawa strategii marketingowej*, Wydawnictwo Akademii Ekonomicznej im. Oskara Langego we Wrocławiu, Wrocław.
- Odean, T. (1999). Do investors trade too much?. *The American Economic Review*, vol. 89 (5), pp. 1279-1298.
- Samuelson, W., Zeckhauser, R. (1988). Status quo bias in decision making. *Journal of risk and uncertainty*, vol. 1 (1), pp. 7-59.
- Simon, H. A. (1979). Rational decision making in business organizations. *The American economic review*, pp. 493-513.
- Thaler, R. H., Johnson, E. J. (1990). Gambling with the house money and trying to break even: The effects of prior outcomes on risky choice. *Management science*, vol. 36 (6), pp. 643-660.
- Tykocinski, O. E., Israel, R., Pittman, T. S. (2004). Inaction inertia in the stock market. *Journal of Applied Social Psychology*, vol. 34, pp.1116-1175.
- Zaleśkiewicz, T. (2015). *Psychologia ekonomiczna*. Warszawa: PWN.
- Zaremba, A., Żmudziński, R. (2014). The Low Price Effect on the Polish Market. *Financial 22 Internet Quarterly „e-Finanse”*, vol. 10 (1), pp. 69-85.

Compensation for Income Lost – Long-term Effects on the Victim's Personal Finance

Anna Jędrzychowska¹, Ewa Poprawska²

¹ Wrocław University of Economics
Faculty of Management, Computer science and Finance, Department of Insurance
ul. Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: ewa.poprawska@ue.wroc.pl

² Wrocław University of Economics
Faculty of Management, Computer science and Finance, Department of Insurance
ul. Komandorska 118/120, 53-345 Wrocław, Poland
E-mail: anna.jedrzychowska@ue.wroc.pl

Abstract: *The purpose of the article is to estimate the consequences that can arise in the household of the injured person, when they discontinue to pay social security insurance contributions because disability caused by motor accident. If the accident causes inability to work arose from someone's guilt, the offender shall bear the cost to repair the damage. If the damage is long-term, this compensation should be based on the payment of annuity, where there can be used two concepts: lifetime annuity, the value of the first payment at the level of net salary of the injured person, term life annuity paid till retirement age, the value of the first payment at the level of the gross salary of the injured person (including contributions to retirement insurance) and indexed by eg. the rate of inflation. In the second case, it is assumed that the injured person receives greater amount and spend it on pension contributions. The authors will make a comparison, which of these two methods of compensation for lost income is more favourable for victims of different age categories from three European countries: Czech Republic, Germany, Poland.*

Keywords: personal injuries, annuities, MTPL insurance, technical provisions

JEL codes: G22, G28, J17

1 Introduction

Theory of personal injuries and types of compensations

After the end of the professional activity the person who retires receives a benefit, which is paid from capital which is accumulated in pension systems - voluntary, mandatory and mixed. This capital should be collected from the start of professional activity until the end, so that was a hedge on the further life of the person who finishes professional activity. Unfortunately, during the life there may be an event of accidents that cause interruption of professional activity, and thus the accumulation of capital for retirement (whether compulsory contributions, or associated with private financing decisions).

If the accident causes inability to work arose from someone's guilt, the offender shall bear the cost to repair the damage. In addition, if the damage is long-term (eg. permanent incapacity for work), this compensation should be based on the payment of pension, which for many years is the compensation of lost income for the victim. In determining the amount of such annuity there are two concepts:

1. Lifetime annuity, the value of the first payment at the level of net salary of the injured person, indexed for example by the rate of inflation;
2. Term life annuity paid till retirement age, the value of the first payment at the level of the gross salary of the injured person (including contributions to retirement insurance) and indexed by eg. the rate of inflation. In the second case, it is assumed that the injured person receives greater amount and spend it on pension contributions.

The authors make a comparison, which of these two methods of compensation for the loss of income, is more favourable for victims of different age categories from three

European countries: Czech Republic, Germany, Poland. The main criteria is the present value of annuities calculated using both methods. In the study are used data characterizing the realities of individual economies - life tables, the gross and net salary, and net the replacement rate. The first part a methodology for determining the present value of annuity benefits paid to the victim for loss of income is presented, supplemented then by simulation and comparison of the results for selected countries. The last part of the article summarizes the results and conclusions.

In insurance theory there is a distinction between damage to property and personal injury. In damage to property, insurance benefit takes the form of indemnity and its size refers to material losses which occurred. In contrast, personal injury should be covered as part of the indemnity and the part constituting the compensation for pain and suffering (not in all countries provided in legal solutions, in some countries, like Germany not included in civil law, but can be found in jurisdiction). Indemnity should refer to the financial losses incurred by the victim (directly or indirectly injured), such as medical expenses, hospitalization costs, costs of care, rehabilitation costs and loss of incomes (more in Jędrzychowska et al, 2014, pp. 280-287). The determination of the amount of the damage is very important, it is the basis for calculating the amount of insurance compensation and calculating the size of adequate reserves (more in: Jędrzychowska et al, 2011 A, p. 237-262; Jędrzychowska et al 2011 B, p. 52-62). The necessity of covering personal injuries may occur due to personal insurance (health accident, life insurance) and liability insurance for the employer with respect to employee for accidents, medical liability insurance, liability insurance for the product or, the most popular, motor third party liability insurance (more in: Jędrzychowska et al, 2015, pp. 238-245; Jędrzychowska, 2015, p. 230-237). The rules on compensation of personal injuries are included in the civil law of each country. For the analyzed countries are: in Germany – art. 249–253 of Bundesgesetzblatt (BGB), in Czech Republic – Czech Civil Code, art. 2958–2967 and in Poland - Polish Civil Code, art. 444-446. Categories of compensatory benefits for personal injuries exemplified by Polish civil law, are contained in the table 1.

Table 1 Types of Compensation for Personal Injuries according to Polish Civil Code

Claims of directly injured	Claims of indirectly injured
<p>A) Pecuniary damage (art. 444) - reimbursement of:</p> <ul style="list-style-type: none"> • medical expenses, medical visits, rehabilitation, necessary prostheses, medicines, additional nutrition to enhance treatment processes, rehabilitation equipment, • costs of preparing for another profession, • costs of travel for medical appointments and consultations, travel costs of persons close to the victim, • annuity, which will be the equivalent of earnings lost as a result of that accident. <p>B) Non-pecuniary damage (art. 445) - compensation should include all the physical and mental suffering experienced by the victim, and those that will be suffered in the future, granted at once</p>	<p>Includes reimbursement of (art. 446 and 448):</p> <ul style="list-style-type: none"> • medical and funeral expenses, • annuity to supplement the incomes of relatives of the lost part of the revenue paid to the household by the deceased person, • appropriate compensation in case of deterioration of the living conditions of a close relative (spouses, children, stepchildren, parents and other persons forming a common household with the direct victims), • compensation for the death of a close relative (since 2008).

Source: Polish Civil Code

Because annuities are the main area of interest of the authors, the rules for granting annuities will be summarized. The claim for annuity are entitled, therefore to:

Table 2 Cases for Which Civil Law Provides the Payment of Compensation Benefits for Personal Injuries in the Form of an Annuity

Directly injured party:	Indirectly injured party (persons close to the deceased):
<ul style="list-style-type: none"> • supplementary annuity to compensate loss of income; • in case of decreased chances of success for the future, which may be expressed in the damage, which involves the loss of other benefits to property, the injured due to their individual characteristics (eg. high qualifications, special abilities) could achieve with full functionality of the body; • annuity for the increased needs (constantly recurring expenditures on maintaining a permanent treatment, rehabilitation, special nutrition, the need for care by third parties, etc.). 	<ul style="list-style-type: none"> • in respect of which the deceased had a legal duty to maintain, • for other people close to the deceased, to whom the deceased were permanently and voluntarily providing livelihoods, and that is required by the rules of social coexistence.

Source: Polish Civil Code

2 Methodology and Data

There is no clear interpretation of which calculation methodology should be used when determining the amount of the benefit to the victim. General premise states that the benefit should be the replacement of the income previously received by the injured and those which would have received it if the accident did not happen. Remains open the following issues:

- the amount of the benefit,
- whether include the contributions for health and social insurance,
- duration of payments,
- indexation,
- form - periodically or at one time.

In determining the amount of annuity there are two concepts:

1. **Lifetime annuity** - in this case, the annuity payments base is the net salary received by the victim in recent times before the accident.

Whole life geometrically increasing lifetime annuity due for the first payment equal to 1 unit can be expressed as follows:

$$I\ddot{a}_x = \sum_{k=0}^{\omega-x} (1+i)^{k-1} v^k {}_k p_x \quad (1)$$

where: ${}_k p_x$ – probability that x-year-old person will survive another x years

$v = \frac{1}{1+r}$ – discounting factor, where r is the technical interest rate,

i – annuity indexation rate,

ω – maximum age in life tables.

2. **Term life annuity** paid till retirement age, the value of the first payment at the level of the gross salary of the injured person (including contributions to retirement insurance). It is assumed that the injured person receives greater amount and spend it on pension contributions. This annuity can be calculated as a sum of term life geometrically increasing annuity due and m year deferred life annuity-due:

Term life geometrically increasing annuity due for the first payment equal to 1 unit:

$$I\ddot{a}_{x:\overline{m}|} = \sum_{k=0}^{m-1} (1+i)^k v^{k+1} {}_k p_x \quad (2)$$

Lifetime geometrically increasing annuity-due, m year deferred for the first payment equal to 1 unit:

$${}_m|I\ddot{a}_x = v^m \cdot {}_m p_x \cdot I\ddot{a}_x \quad (3)$$

where: ${}_k p_x$ – probability that x-year-old person will survive another x years
 $v = \frac{1}{1+r}$ – discounting factor, where r is an interest rate,
i – annuity indexation rate,
 ω – maximum age in life tables,
n – number of annuity payments,
m – time to retirement age (=retirement age-x).

In this case it is assumed that the victim provide the equivalent of pension contributions to the social security system, and then, after reaching retirement age (Table 3) receives a pension from the system. Then in the first annuity, the amount of the payment is equal to the net salary earned before the victim recently before the accident, plus the pension contributions (Table 4). In the second annuity, the amount of annuity payments is the value corresponding to the retirement pension (calculated as the product of the average net replacement rates in the country and the amount of the last annuity payment just by reaching retirement age.

Table 3 Retirement Age in Czech Republic, Germany and Poland (in 2016)

Country	Retirement age for women	Retirement age for men
Czech Republic	Age 61 and 8 months gradually rising by four months each year (six months in 2019) until reaching the retirement age for men, thereafter, by two months each year with no upper limit	Age 62 and 10 months gradually rising by two months each year with no upper limit
	Age 65 and 5 months (gradually rising to age 67 by one month each year until 2024 and by two months until 2029)	
Poland	Age 60 and 11 months gradually rising by one month in January, May, and September each year until reaching age 67 in 2040	Age 65 and 10 months gradually rising by one month in January, May, and September each year until reaching age 67 in 2020

Source: Social Security Programs Throughout the World: Europe, 2014, <https://www.ssa.gov>

In the second approach, of course the present value of the two annuities represents the total present value of benefits obtained by the beneficiary of annuity (directly or indirectly injured). From the insurance company point of view, the costs connected with this annuity consists only on the first part (term life annuity). The second part is paid from the social security system.

The next problem is connected with **the amount of annuity payments**. Is considered that the victim should receive their current salary, therefore, the basis for calculating the monthly benefit may constitute in case of:

- employed person - their current salary, or loss of salary in case of loss of its parts,
- person working on the basis of civil law agreements, self-employed, running their own business or agricultural holding - their average monthly income from this activity (eg. the average income from the last year),
- persons without income (eg. unemployed, without qualification) - minimum wage,
- minors, studying - the average wage in the economy.

In case of unemployed people, it seems reasonable to use a minimum wage in the economy for the long term unemployed but for ones with short-term break in employment - the average salary, eg. in the last period of employment. As for minors and learners which have not yet taken employment, it is not possible to determine even the approximate size of the income which they would achieve. It cannot be also assumed that these people would receive income at the lowest level, so it seems reasonable to use the average wage in the economy. In the situation of indirectly injured the share of personal consumption in the salary should reduce the amount of benefit.

Table 4 Net and Gross Average Monthly Salaries, Pension Contributions and Net Replacement Rates in Czech Republic, Germany and Poland in 2014

Country	Average monthly salaries [EUR]		Pension Contributions		Gross replacement rates	
	Net	Gross	% of gross salaries	Monthly in EUR	Women	Men
Czech Republic	726	945	28%	264,46	64%	64%
Germany	2 315	3 829	19%	723,74	50%	50%
Poland	635	844	19,52%	164,68	53%	53%

Source: Eurostat and National Statistics Offices, and WHO data

In the calculations provided in the article, only one case is analysed – annuity payments are equal to the average wage in the economy. Taking consideration the way of indexing - an increase in benefits, it should be noted that indexation should maintain the real value of pension benefits as well as reflect the future potential growth in incomes. The benefit should therefore be indexed by the inflation rate, and it must be also included that the income the victim would vary, in particular in increase of its real value. It should therefore be included the real wage growth in the economy. The **inflation rate was equal to 1%** (value close to the EU average). Similarly discounting interest rate was based on the EU average rate of return on 10 year treasury bonds (**r=2,5%**).

The calculations has been provided for annuity payments paid monthly, so as to calculate probability of surviving the probability of survival part of the year, the assumption of Uniform Distribution of Deaths (UDD) at each year were used.

3 Results and discussion

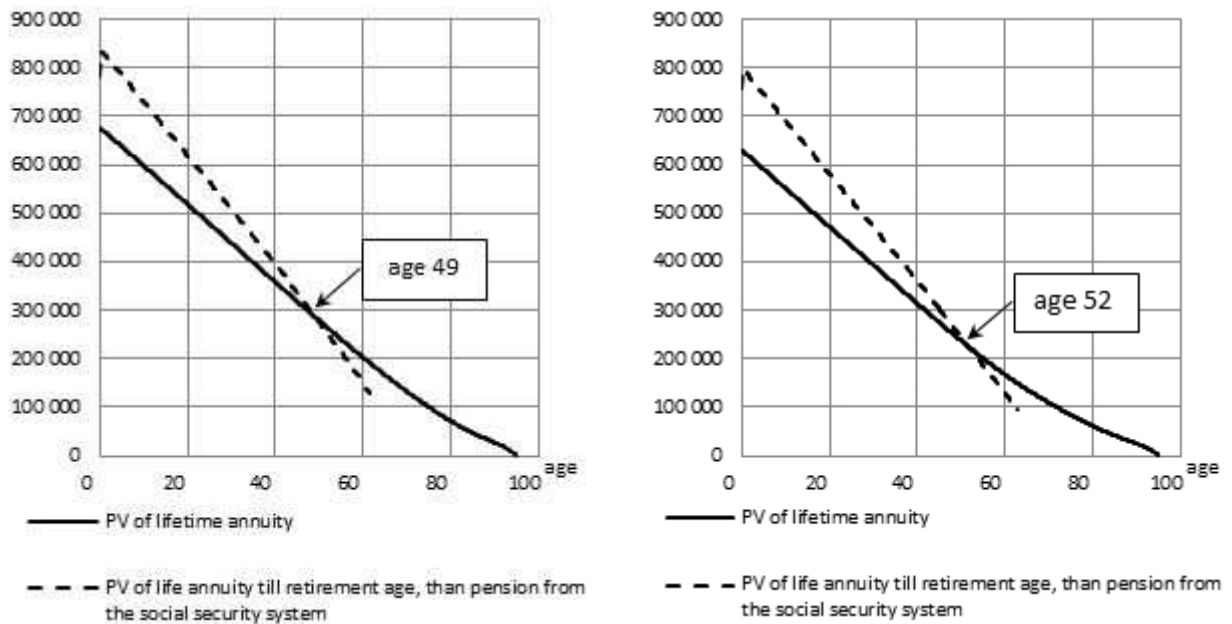
The resulting amounts (present values of annuities) are not amounts that the victim spent directly on consumption. In both versions of annuities for direct consumption, the victim receives only the net salary. In the second variant the present value of annuity represents not only to continuously consumed funds in the amount of net wages, but also the pension contributions, which should be provided to the system. Thus, the PV annuities must be understood as the financial resources allocated to the victim for direct consumption as well as on account of his/her participation in the social insurance system.

Present value of analysed annuities for different age categories are presented on Figures 1-3. The results indicate that one should take into account the age of the victim when choosing a method of determining the amount of annuity payment, and the duration of its payments. For young people it is preferable to obtain a benefit increased by the pension contributions and after a retirement age to receive benefit from the social security system. For the elderly it is more advantageous to receive an annuity of net wage. The decision to choose a variant of annuity also depends on gender, women slightly later should choose a variant of a lifetime annuity.

Due to the lowest replacement rate, the decision about choosing whole life annuity should be taken at the earliest for the citizens of Poland and Germany. For women in Poland whole life annuity is preferred over the age of 39,5, and for men 46,5 (Figure 2). In Germany women over the age of 41 should decide to lifetime annuity, while men over 45,5 (Figure 3). At the latest among the countries analysed, the decision to choose

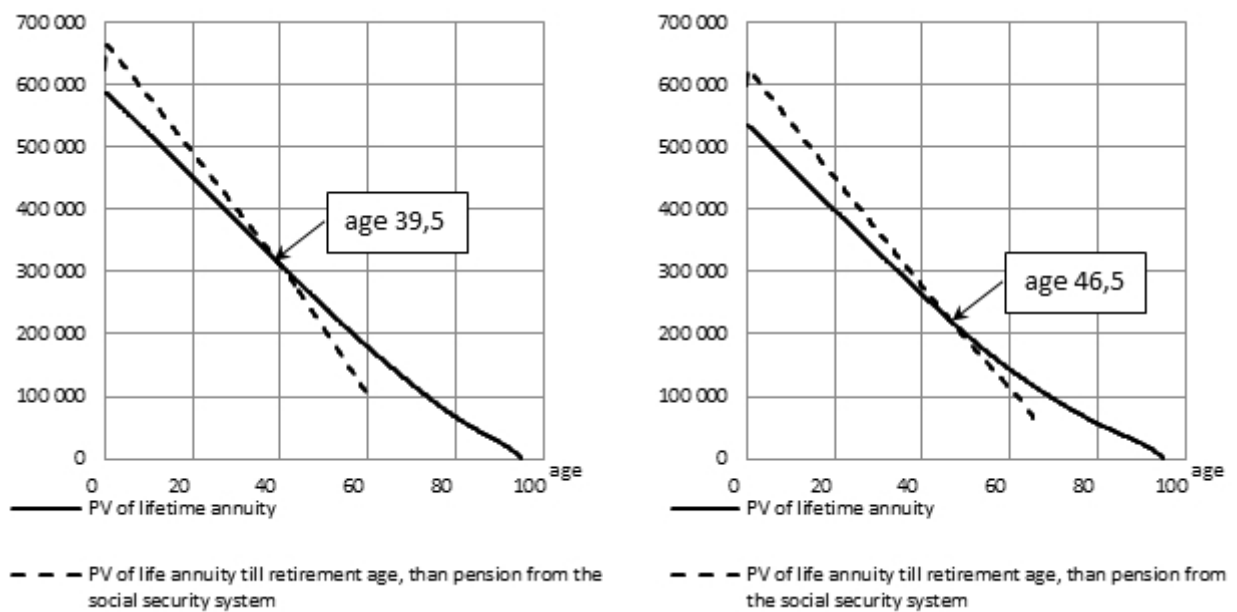
lifetime annuity should take women in the Czech Republic (at age of 49), and men at the age of 52 (Figure 1).

Figure 1 Present Value of Annuities for Czech Republic in EUR (Women – Left Chart, Men – Right Chart) Depending on Age



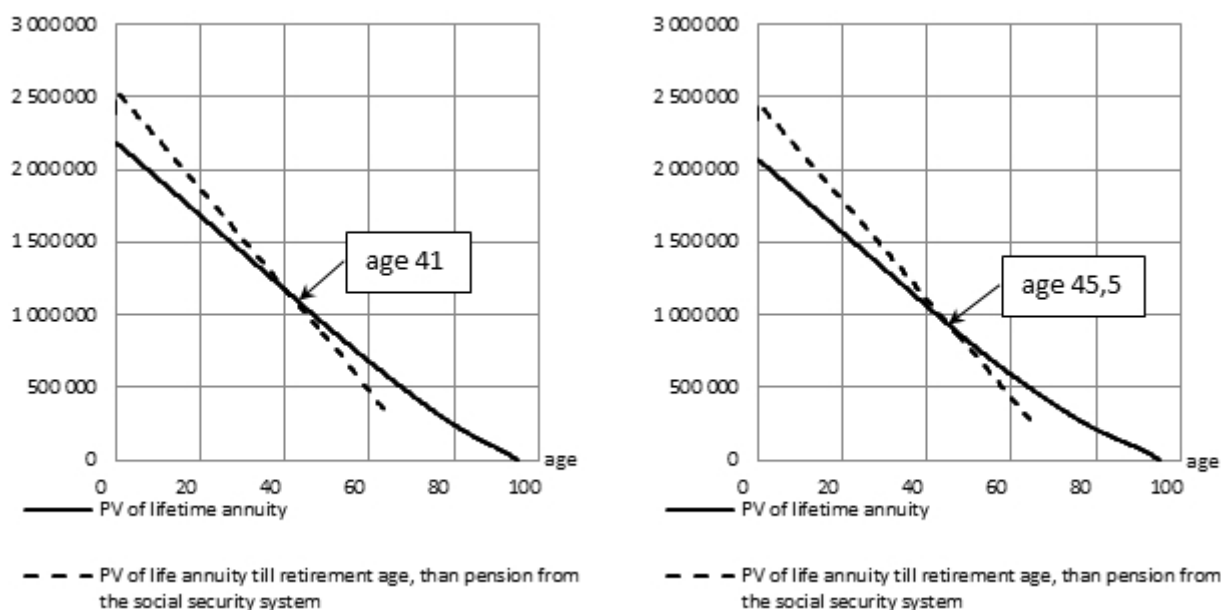
Source: Author's own calculations

Figure 2 Present Value of Annuities for Poland in EUR (Women – Left Chart, Men – Right Chart) Depending on Age



Source: Author's own calculations

Figure 3 Present Value of Annuities for Germany in EUR (Women – Left Chart, Men – Right Chart) Depending on Age



Source: Author's own calculations

Net replacement rates used for calculation are calculated for people retiring in 2014. In the simulation should also be included the predicted replacement rates, the ones in the analysed countries are falling.

Table 5 The Age at Which Changes the Profitability of Variant of the Method of Calculation PV of Annuities Simulations for Different Values of Replacement Rates

		net replacement rates						
		30%	35%	40%	45%	50%	55%	60%
Czech Republic	women	37	39,5	40	43	45	46	48
	men	43,5	44,5	45,5	47	48	49,5	50,5
Poland	women	26	28,5	31,5	34,5	37,5	40,5	43
	men	37	39,5	41,5	43,5	45,5	47,5	49,5
Germany	women	30,5	33	35,5	38	41	43,5	46
	men	37	39	41,5	43,5	45,5	47,5	50

Source: Author's own calculations

Table 5 shows how much moves to the moment of change decisions about which of the methods of calculating the present value of annuity, gives the injured party more funds. For example, for the lowest replacement rate in Poland should a woman decide to change the variant of the calculation annuity at age 26, while for the highest of the analyzed replacement rates, changing decision should be made 17 years later. Likewise a large discrepancy (17 years) for men can be seen in Germany. For Czech citizens changing the replacement rate is the least important.

4 Conclusions

As indicated by the results of a study on the value of the of annuity received has considerable influence its model. From the obtained results it can be concluded that for younger people (up to about 40 - 50 years of age), the higher present value of annuity are determined based on the 2 variant (annuity term with the pension provided under the social security system). It should be remembered that the moment of a decision about which option is more cost-effective, depends on the size of the replacement rate adopted for calculation. It should be emphasized that currently the courts and insurance

companies do not use such a method of calculating annuities for victims, and as a basis for of annuity recognize the net salary of the victim.

It should be noted that the two compared solutions carry risks which victims must be aware of. Variant of whole life annuity is strongly related to the situation on the capital market. Thus, the risk associated with it is mainly the risk that the insurance company will remain in this market and will continue to be solvent, to pay annuity to the victim.

The second variant also is affected by risks, especially important here is political risk. An example of big changes introduced in 2013 is to raise women's retirement age of 7 years, men of two years (subsequent changes, this time on lowering the retirement age, are announced by the current Polish government). Similar reforms were carried out in other countries due to demographic changes. Also, the demographic situation is the risk that affects the annuity established in the second variant.

References

Czech Civil Code - Law No. 89/2012 Coll. *Civil Code*. Retrieved from: <http://www.czechlegislation.com/en/89-2012-sb>.

Eurostat. Retrieved from: <http://epp.eurostat.ec.europa.eu>.

German Civil Code - Civil Code in the version promulgated on 2 January 2002 (Federal Law Gazette [Bundesgesetzblatt] I page 42, 2909; 2003 I page 738), last amended by Article 4 para. 5 of the Act of 1 October 2013 (Federal Law Gazette I page 3719). Retrieved from: http://www.gesetze-im-internet.de/englisch_bgb/.

Jędrzychowska A, Poprawska E. (2011). Szkody osobowe z ubezpieczenia komunikacyjnego OC a gospodarka finansowa ubezpieczycieli. *Szkody osobowe kompensowane z ubezpieczenia komunikacyjnego OC. Analiza rynku / Kwiecień Ilona (red.)*, 2011, Wydawnictwo Poltext, ISBN 978-83-7561-197-7, pp. 237-262.

Jędrzychowska A., (2015). Size of compensation for personal injuries offered by the current coverage plans in Medical Liability Insurance. *European Financial Systems 2015. Proceedings of the 12th International Scientific Conference, Masaryk University*, ISBN 978-80-210-7962-5, pp. 230-237.

Jędrzychowska A., Kwiecień I., (2015). Classification of work-related accidents as the basis of analysis of employers liability risk and insurance decisions. *European Financial Systems 2015. Proceedings of the 12th International Scientific Conference, Masaryk University*, ISBN 978-80-210-7962-5, pp. 238-245.

Jędrzychowska A., Poprawska E. (2011). Ubezpieczenia komunikacyjne i ich wpływ na gospodarkę finansową zakładów ubezpieczeń. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, Uniwersytet Ekonomiczny we Wrocławiu*, nr 175/2011, pp. 52-62.

Jędrzychowska A., Poprawska E., (2014). Disability Benefits for Victims of Traffic Accidents - Size of Compensations Offered by the Current Amount of Coverage in MTPL Insurance. *European Financial Systems 2014. Proceedings of the 11th International Scientific Conference / Deev Oleg, Kajudochodrová Veronika, Krajíček Jan (red.)*, Masaryk University, ISBN 978-80-210-7153-7, pp. 280-287.

Polish Civil Code – Ustawa Kodeks Cywilny, Dz.U. 1964 nr 16 poz. 93, Retrieved from: isap.sejm.gov.pl.

Social Security Programs Throughout the World: Europe, 2014. Retrieved from: <https://www.ssa.gov>.

Crop Insurance as the Instrument for Risk Financing in Polish Farms

Monika Kaczała

Poznań University of Economics and Business
Department of Insurance
Al. Niepodległości 10, 61-875 Poznań, Poland
E-mail: m.kaczala@ue.poznan.pl

Abstract: Risk management is one of the main priorities in the Common Agricultural Policy (CAP) for 2014-2020. Crop insurance belongs to the three CAP indicated types of instruments for financing risks, along with mutual funds and income stabilization tool. In Poland crop insurance is the only available instrument and despite its obligatoriness and subsidizing the market penetration amounts to 40%. The aim of this paper is to present development of agricultural insurance in quantitative terms and its main contributory factors. The answers were provided based on the qualitative and quantitative analysis. The data come mainly from the official statistics and information provided by The Ministry of Agriculture and Rural Development. The results show that apart from very high costs of crop insurance, resulting from a long-term loss ratio of more than 100% for , a very important determinant affecting crop insurance purchasing decisions is the subjective assessment of prosperity in agriculture as well as the scope and type of state aid (investment-related benefits are stimulating while revolving loans are inhibitive).

Keywords: agricultural insurance, crop insurance, state aid, risk management, financing of risk

JEL codes: Q14, G22, H84

1 Introduction

In Poland, agriculture plays an essential role, both socially and economically. It accounts for roughly 3 % of the GDP, similarly to other highly developed countries and provides employment for approx. 16 % of the population, which is a relatively high level (CSO, 2015a). One of the major functions of numerous state interventions is to foster agriculture. The EU Common Agricultural Policy limits the scope of these interventions while emphasizing the need for risk micro-management in farms.

As early as the 1950s, in Polish farms crop and property insurance was obligatory and therefore very common. However, in 1990 crop insurance became voluntary and the terms and conditions of insurance policies deteriorated, parallel to a rise in prices. This resulted in a dramatic decline in the number of insurance contracts. It was only in 2005 that the act Act on Agricultural Crops and Farm Animals Insurance (ACAIA) was passed and has been amended several times since then. This is the reason for a renewed interest in crop insurance. The purpose of this act was, among other things, to reduce the subsidies derived from the governmental and other public financial institutions when it came to natural disasters. Also, it was aimed at disseminating crop insurance, particularly in the context of climate change (Sejm of the Republic of Poland, 2005). Today it is estimated that despite obligatory crop insurance only as few as 40 % of crops are covered by insurance, which is by far below the expected level. Therefore, the aim of this paper is to present development of agricultural insurance in quantitative terms and its main contributory factors.

2 Methodology and Data

The answers were provided based on the qualitative and quantitative analysis. A relatively short time for which the subsidised insurance cover has been available prevents complex statistical analysis. The study was conducted with reference to correlations between annual changes in the number and value of the signed contracts, the level of the written premium, the size of insured acreage and the annual changes in

the prosperity indicators used for agriculture in Poland, the value of compensation for particular types of risk, the number and value of contracts signed within the scheme of "restoration of agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention measures", the number and value of loans allocated for resumption of agricultural production in farms and special sectors of agricultural activity (investment and revolving loans). Detrendisation, in turn, increases credibility of the analysis as it makes it possible to assess whether the correlations are only ostensible (such ostensible correlations may result from trends occurring in time series which are not connected by cause and effect). For conclusions, a 95% confidence level was assumed. The data come from the official statistics and information provided by The Ministry of Agriculture and Rural Development. Tests were performed in Statistica 10PL and in Excel 2013.

Crop insurance in Poland on 2006-2015

Subsidised crop and livestock insurance was introduced as a response to the Commission Directive (EC) No 1857/2005 of Dec 15 2006 regarding application of the Treaty articles 87 and 88 concerning state subsidies for SME farms and which changed the directive (EC) No 70/2001. Sales of these policies were launched in the autumn of 2006, and the system has been modified several times since then. Initially, the Act covered only the most popular crops in Poland: cereals, corn, colza, agrimony, potatoes and sugar beets. As of 2007 subsidies started covering a wider range of crops, which currently results in an almost complete cover including fruits and vegetables. Except for the initial period, subsidized insurance covered the following perils: hurricane, flood, excessive rain, hail, lightning, landslide, avalanche, drought, winterkill and spring frost. At first, all these perils were covered collectively as a single package. It was only in April 2007 that it was made possible to split the insured perils. Mid-2008 saw the obligation to insure at least 50 % of the arable land against at least one peril. In April 2007 the scope of subsidized insurance was restricted to farms which did not exceed the area of 300 ha. In the case of bigger farms it was possible to insure the surplus area within commercial insurance or resign from insurance altogether. This restriction was removed in August 2008. Additionally, only SME farms were eligible for the subsidy, according the EU regulations. Consequently, all the large farms owned by the Agricultural Property Agency or belonging to capital groups were excluded from the programme. In 2015 the above restriction was removed and large farms were also admitted into the system (after meeting certain criteria). Initially, the level of the subsidy amounted to 35 or 40 % of the total premium paid to the insurance company. In 2008 it was increased to 50 %, and very recently, in 2016, to 65 % of the premium. The subsidy was only possible if the insurance company-generated tariff rates did not exceed 3.5 or 5 % of the insurance cover but not more than 6 % of the insurance cover.

When the subsidised insurance system was being introduced, it was assumed that the minimum of the insured land should amount to 7m hectares of crops. In fact, the penetration level (understood as the quotient of the actually insured area to the assumed area of 7 m hectares) did not exceed 50 % (table 1). With reference to the crops of 2014, only 25% of cereals and corn were insured, 86% of rapeseed, 31% of sugar beets, 10% of ground vegetables and 2% of fruit (Rojewski, 2015). After an initial surge in the number of contracts, which was primarily caused by the introduction of mandatory insurance of at least half of the acreage, now the market has stagnated for approx. two years. The trend also refers to the average amount of insurance, whose former growth resulted both from the increase in the insurance rate and the raising of the maximum amount of insurance. Additionally, popularity of fruit and vegetable insurance (especially against hail) could not be overlooked. During this time, the structure of the risks insured changed as well (table 2). It can be seen most clearly after 2008 when the obligation to insure at least half of the acreage was introduced. To this day, this duty has been usually fulfilled in the form of an insurance contract against hail, which is the cheapest option. The second most popular choice is an insurance contract against three perils, i.e. hail, spring frost and winterkill.

Table 1 Subsidized Crop Insurance in Poland in the Years 2006-2014 – Basic Data

	Insured area (in ha)	Penetration level (in %)	Value of all contracts signed (in Tsd PLN)	The number of contracts signed	Average sum insured per 1 ha (in PLN)	Average area insured in one contract (in ha)
2006	311 740	4.5	N.A.	10 738	N.A.	29.0
2007	575 029	8.2	N.A.	28 412	N.A.	20.2
2008	1 832 036	26.2	N.A.	87 150	N.A.	21.0
2009	2 808 104	40.1	6 490 380	144 080	2 311	19.5
2010	2 845 777	40.7	7 843 806	134 986	2 756	21.1
2011	3 032 634	43.3	10 238 599	138 425	3 376	21.9
2012	2 751 438	39.3	12 087 100	135 707	4 393	20.3
2013	3 398 811	48.6	14 232 425	151 101	4 187	22.5
2014	3 269 871	46.7	13 326 951	142 492	4 076	22.9

Source: Author's own calculation based on (CSO, 2015b; Sejm of the Republic of Poland, 2015; Prime Minister, 2016).

Table 2 The Structure of Risks Covered by Subsidized Crop Insurance in 2006-2015 (in %)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
drought	9.1	9.0	4.5	3.0	0.4	0.2	0.1	0.0	0.0	0.0
flood	9.1	9.0	4.2	0.6	0.6	0.2	0.1	0.1	0.1	0.0
winterkill	10.9	11.1	21.8	14.7	15.0	16.8	18.6	18.1	17.2	27.3
spring frost	10.3	11.3	21.9	22.3	21.7	21.7	22.9	20.8	22.1	28.9
hurricane	9.1	9.2	4.2	0.4	1.4	1.5	1.9	3.1	3.7	1.2
excessive rain	9.1	9.2	4.2	0.4	1.4	1.5	1.9	3.1	3.7	1.2
hail	15.3	14.1	26.9	57.3	55.5	53.4	50.2	50.1	48.1	39.7
lightning	9.1	9.0	4.1	0.4	1.4	1.5	1.4	1.5	1.7	0.5
landslide	9.1	9.0	4.1	0.4	1.4	1.5	1.4	1.5	1.7	0.5
avalanche	9.1	9.0	4.1	0.4	1.4	1.5	1.4	1.5	1.7	0.5

Source: Author's compilation according to data from (Sejm of the Republic of Poland, 2015; Prime Minister, 2016).

3 Results and Discussion

Factors affecting the use of subsidized crop insurance

The reasons for lower than expected sales of subsidized crop insurance come from both the supply and demand on the market. For insurance companies the cost of crop insurance is very high because of accumulation of risks, complex loss settlement, large number of disputes and the implications of information asymmetry. Between 2006 and 2015 the total value of the paid compensation amounted to PLN 2.161m and the amount of the collected premiums – PLN 2.293m (Rojewski, 2012; Janc, 2016). Due to winterkill, it is estimated that in 2016 the compensations will amount to approx. PLN 600m and the premiums collected – PLN 320m (Janc, 2016). This means that in the long term, subsidised crop insurance is not profitable and in the years 2006-2015 the loss ratio stood well above 100 % three times (in 2008 it was 121% because of drought, in 2011 –

134% as a result of winterkill and spring frost, while in 2012 as much as 252% due to winterkill). In 2016 it is estimated for the loss ratio to be approx. 190% (Janc, 2016). As a response to the level of compensation due to drought which was particularly high in 2008 a special purpose subsidy was launched in mid-2008 for insurance companies which offer insurance against drought (subsidized or not). It functions like an excess claims agreement. Despite this, the number of contracts including the risk of drought (and also flood) has fallen down nearly to zero. It is worth mentioning that government reinsurance is only offered for the risk of drought, although other types of risk, such as winterkill cause a high level of damage (table 3). Correlation indicators between financial means allocated for insurance premium subsidies and the total number and value of the signed contracts for crop insurance are irrelevant. It happens because within the whole period considered the utilisation level of the planned subsidies never exceeded 90%, and what is more, in the first three years of its functioning it was never higher than 14-16%. Because of the aforementioned difficulties crop insurance is offered only by three domestic insurance companies, i.e. about 10% of the companies which are based in Poland.

Table 3 The Structure of Subsidized Crop Insurance Compensation in 2006-2015

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Drought	0	1	82	1	1	1	0	0	0	0	8
Flood	7	0	0	1	4	1	0	1	0	0	1
Winterkill	31	3	0	2	32	44	82	9	4	5	38
Spring frost	1	64	2	27	8	38	1	2	50	17	19
Hail and others	61	32	16	68	54	17	17	88	45	78	35
Total	100	100	100	100	100	100	100	100	100	100	100

Source: Author's compilation according to data from (Prime Minister, 2016; the Ministry of Agriculture and Rural Development).

From the point of view of a farmer, the available insurance cover is limited in scope while loss settlement and assessment stages (especially total loss and deduction of the so called avoided costs) are questionable. Availability of insurance against some occurrences (drought, flood) or crops (some vegetables and fruit) is limited due to the insurance rate which prevents access to the subsidy. Research on the factors affecting the probability of using crop insurance by individual farmers indicate that the most important factors are: location and size of the farm, rape cultivation, having very good or good type of soil, previous use of crop insurance, historical record of losses connected with flooding or hail, perception of risk connected with losses resulting from winterkill (Kaczała and Wiśniewska, 2015b). If the farmer had experienced a loss and more or less often had received compensation (i.e. it was at least partially funded by indemnity) this led to a significant growth in probability of signing a crop insurance contract. Probability of signing an insurance deal is twice as much linked with financing the loss by indemnity than solely with the occurrence of a given phenomenon (e.g. hail or flood) (Kaczała and Wiśniewska, 2015b). To corroborate the findings of research conducted on a micro level, one should mention the relationship between the total number and value of crop insurance contracts and the level of compensations in the previous year. The correlation coefficient between annual changes in the number of contracts and the value of compensations for drought in the previous period amounts to 0.83 (p-value 0.02). On the other hand, the annual changes in the value of the signed crop insurance contracts are correlated with annual changes in the level of compensation for all occurrences at the level of 0.87 (p-value=0.056), including the changes within compensations for winterkill at 0.9 (p-value=0.04). The indicated correlations are therefore very strong.

The relations between prosperity in agriculture and demand for crop insurance were examined by analyzing the correlation between annual changes in the number and value

of the insurance contracts, the level of written premium and the size of the insured acreage and the change in the average general prosperity index (GPI) as well as the synthetic prosperity index for agriculture (SPIA). The general prosperity index is estimated as an arithmetical mean of the monetary revenue change rate and confidence index. The monetary revenue rate is calculated on the basis of answers to questions about achieved and predicted revenue of a given farm from two most recent questionnaires. The share of this rate within the GPI is almost twice as large as the confidence index share. Confidence index, in turn, is calculated on the basis of the farmers' responses to the question about their feelings concerning prospects of further farming operations (more: Grzelak and Seremak-Bulge, 2014). SPIA, in turn, is a quantitative index, which synthetically illustrates the changes in market-related factors of agricultural production. It is calculated as an arithmetical mean of the margin squeeze index and the potential demand index. The SPIA encompasses complex conditions relating to supply and demand as well as price related factors of the agricultural market which are evened out with a 6-month moving average (Grzelak and Seremak-Bulge, 2014). No connections were detected between the value or annual change in SPIA and the number and value of subsidized crop insurance contracts, the amount of collected premium or the acreage insured. However, such connections can be seen in the case of the GPI. The annual change in the number of signed contracts shows a strong correlation with the annual change in the GPI ($r=-0.82$, $p\text{-value}=0.012$), while the acreage insured is correlated on a medium level ($r=-0.68$, whereas $p\text{-value}=0.062$ so it is slightly higher than the assumed maximum error level). Hence, it is the subjective, not objective, evaluation of prosperity by farm managers that is strongly correlated with positive or negative decisions concerning the purchase of crop insurance. GPI is created in 66% by partial revenue ratio. Considering the r-Pearson correlation coefficient's plus/minus sign, one can arrive at a conclusion that it is the rise in revenue (both achieved and expected) that is linked to decreasing number of signed contracts. This shows coherence with declarations of farm managers who claim that losses in crops are financed in 70% from their own resources (Kaczała and Wiśniewska, 2015b).

The element which must be taken into account when considering quantitative changes in crop insurance is the access to other sources of loss financing than compensation or farmers' own financial means. In Poland these mainly amount to bank loans and various forms of financial support from the state (Kaczała and Wiśniewska, 2015b). In the case of losses in crops, the access to so called "disaster loans" is one of the many forms of government aid intended for agriculture, followed by discounts payment in instalments or remittances on such liabilities as health or social insurance, or, finally, payments due for the Agricultural Property Agency (e.g. for the leased land).

In the period discussed here the support for farmers took on mainly two forms: within the Rural Development Programme for 2007-2013 which was aimed at restoring agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention measures (a.k.a. action 126), as well as subsidizing loans for resuming production in farms and special sectors of agricultural production. Action 126 co-financed in 75% from the 2nd pillar of CAP using the means of the European Agricultural Fund for Rural Development (EAFRD) was launched in September 2010 because of intense precipitation (including hail) which led to numerous floods and landslides. 2011 saw an increase in the number of listed occurrences within the discussed action which made farmers eligible for state aid: hurricane, excessive rain, hail, lightning, avalanche, drought, winterkill and spring frost. The scope of these occurrences is identical as the scope of the subsidised crop insurance. Aid was offered in the form of partial reimbursement of the eligible costs incurred for operations exclusively encompassing investments concerning agricultural activity. One of the conditions for obtaining the subsidies was that the level of loss in crops, livestock or fish amounted to 30% of the average annual production. By the end of 2014 there had been seven application recruitments. The number and value of the signed contracts is presented in fig. 1.

Figure 1 The Number and Value (in PLN) of Contracts Signed under the Restoration of Agricultural Production Potential Damaged by Natural Disasters as Part of Rural Development Programme for 2007-2013



Source: ARMA, 2014

On the other hand, an interest subsidy to the so called “disaster loans” (loans for restoring production in farms and special sectors of agricultural production) was offered within the state subsidy framework throughout the whole discussed period (table 4). Subsidies encompassed both investment loans and short-term revolving loans for restoring production in farms and special sectors of agricultural production where damage occurred because of drought, hail, excessive rain, winterkill, spring frost, flood, hurricane, lightning, landslide or an avalanche. Additionally, farmers could postpone the repayment of principal instalments, could be offered a grace period in the loan repayment and there was no required contribution from the borrower. In September 2013 a possibility was created for farmers to apply for a disaster loan if the level of losses in the farm or a special sector of agricultural production caused by flood, hurricane, hail or excessive rain did not exceed 30 % of the average annual agricultural yield. In this case an interest subsidy was offered as “de minimis” type of assistance in agriculture and fishery.

Table 4 Number and Value of the Loans Offered to Resume Farming Production and Special Sectors of Agricultural Production Including ARMA’s Interest Subsidy in 2006 - 2014

	Investment loan		Working capital loan	
	Number	Value (in PLN)	Number	Value (in PLN)
2006	103	1 870 950	136 164	1 772 336 960
2007	167	3 298 220	84 375	1 164 696 800
2008	162	3 072 260	39 903	1 043 695 170
2009	36	855 240	40 581	792 567 310
2010	29	2 290 430	8 512	244 074 730
2011	42	2 179 660	18 957	677 510 030
2012	60	7 783 390	8 241	456 915 780
2013	32	1 623 590	4 945	266 335 200
2014	16	627 460	5 198	243 373 720

Source: Author’s compilation according to data from (ARMA, 2007-2015).

There is a very strong correlation between the increase in the value of the contracts signed within the framework of action 126 (restoration of agricultural production potential damaged by natural disasters and catastrophic events and introduction of appropriate prevention measures) and the change in the scope of the acreage insured in

the following year (r -Pearson=0.94, p -value=0.017). This correlation is also strong with regard to the change in the number of insurance contracts signed in the following year (r -Pearson=0.86 and p -value=0.060, which is slightly higher than the assumed boundary). This means that the decision about insurance is significantly affected by the fact itself (not the value) of being granted a subsidy for restoration of production potential. It may result from the obligation to insure the restored orchards and perennial plantations within five years of receiving the subsidy. At the same time it must be remembered that there is a possibility to be exempt from this obligation and the resources allocated to action 126 may be and often are granted for investments of a different kind (buildings, plant etc.). As regards "disaster loans", a correlation can be seen between the annual change in the number of granted revolving loans and the change in the number of signed crop insurance contracts as well as the acreage insured in the following period of time. Correlation coefficients amount to -0.34 (p -value=0.005) and -0.57 (p -value=0.005), respectively. The reversed dependency probably is down to competitive relation between crop insurance and revolving disaster loan. The loan is intended for purchase of tangible working assets used for production in order to restore productivity, e.g. qualified seeds, mineral fertilisers, plant protection products, fuel for agricultural purposes etc. The amount of interest subsidies to the revolving loan is limited, among other things, by the level of indemnity paid for insurance contract on the risk of losses caused by adverse weather phenomena. On the other hand, it is interesting that the granting of a revolving loan in the previous period of time, not the loan's value, had a definite effect on the decision to sign an insurance contract and its value. Low importance of the value and number of investment loans probably results from the fact that their number and value in the discussed period of time was rather low. Since 2010 the interest on the revolving loan has depended on whether at least half of the farmer's land has been insured. The level of fulfilment of this obligation is most likely to be low enough to exert little if any influence on stimulating relation between these instruments (there is no correlation between the number and value of granted revolving or investment loans and the number of signed crop insurance contracts as well as the acreage insured in the same year).

4 Conclusions

The data show that both the amount and value of crop insurance contracts as well as the size of the insured acreage has been stabilizing. However, the level of the stabilization is much lower than expected. A rapid growth was seen in the year when the premium subsidy was increased and it became possible to insure crops against single risks. Due to the increase in subsidy in 2016 and a broadened subject-matter of subsidized insurance, another upturn can be expected. Nevertheless, additional solutions are indispensable as the loss ratio is over 100%. The structure of the risks insured implies that crops are hardly ever insured against drought and flood. Considering that these phenomena are rather commonplace in Poland, steps taken in order to introduce index-based crop insurance against drought should be evaluated as very positive (Kaczała and Wiśniewska, 2015a; Kaczała and Łyskawa, 2012).

A very strong relationship has been noticed between the annual change in the number of the signed contracts and the annual change in the general prosperity index (r =-0.82. p -value = 0.012). This is an endogenous indicator and it is based on farm managers' subjective assessments. This means that it is precisely the subjective opinion that is highly correlated with making a positive or negative decision about crop insurance. Taking into account the structure of this factor, one can suppose that the cause of falling numbers of insurance contracts is connected with the growth in income (both earned and predicted). This is consistent with the findings of the research on insurance purchases in farms on micro level (Kaczała and Wiśniewska, 2015b).

Another very strong correlation has been noticed between the annual changes in the acreage insured and state aid for agriculture. The granting of the subsidy (not its value) which is aimed at restoration of the production potential and is investment-related has a huge impact on decisions about buying crop insurance. It may result from the obligation

to insure restored orchards and perennial plantations within five years of the subsidy reception. At the same time, one should remember that this is just one of the aims of granting such subsidies. As for the so called "disaster loans", one can clearly see a connection between annual changes in the number of granted revolving loans and the number of signed crop insurance contracts and the acreage insured in the subsequent period of time. A negative correlation suggests competitiveness of the tools discussed here. Since the intended effect is to increase the level of crop insurance penetration, a decline in granting preferential revolving loans should be perceived as positive.

References

ACAIA. The Act on Agricultural Crops and Farm Animals Insurance of 7 July 2005 (with further amendments) consolidated text of 6 June 2016 (J.L. of 2016 item 792).

ARMA (2007-2015). *Sprawozdanie z działalności agencji restrukturyzacji i modernizacji rolnictwa*. Department of Analysis and Development.

CSO (2015a). *Statistical Yearbook of the Republic of Poland*. Central Statistical Office, Warsaw: Statistical Publishing Establishment.

CSO (2015b). *Statistical Yearbook of Agriculture*. Central Statistical Office, Warsaw: Statistical Publishing Establishment.

FRD. The Act on Fostering Rural Development with the Funds of the European Agricultural Fund for Rural Development of 7 March 2007 (J.L. of 2013 item 173 with further amendments).

Grzelak, A., Seremak-Bulge, J. (2014). The Comparison of Selected Methods for Testing Business Outlook in Agriculture in Poland. *Problems of Agricultural Economics*, vol. 4, pp. 117–130.

Janc, A. (2016). Challenges in functioning of crop insurance in Poland in 2006-2016. In: *The 10th International Conference "Insurance and the Challenges of the 21st Century"*, 16-18 May, Rydzyna, Poland.

Kaczała, M., Łyskawa, K. (2012). The Concept of Index Policies and their Possible Application in the System of Compulsory Subsidised Crop Insurance in Poland. In: *International Conference "Trends in Agricultural Insurance in Europe. Drought Insurance in Poland"*, 5 November, Warsaw, Poland, pp. 64-78.

Kaczała, M., Wiśniewska, D. (2015a). Factors Influencing Farmers' Decisions on Drought Index Insurance in Poland. In: *The Third World Risk and Insurance Economics Congress (WRIEC)*, 2-6 August 2015, Munich.

Kaczała, M., Wiśniewska, D. (2015b). Risks in Farms in Poland and their Financing – Research Findings. *Research Papers of Wrocław University of Economics*, vol. 381, pp. 98-114.

Prime Minister (2016). *Draft Law Amending the Act on Subsidies to Insurance of Agricultural Crops and Farm Animals with Draft Implementing Legislation*. Paper No. RM-10-19-16. 25 April 2016.

Rojewski, K. (2015). Polish system of agricultural insurance. In: *IFC Conference*, 9-11 June, Kyiv, Ukraine.

Rojewski, K. (2012). The History and Current State of Agricultural Insurance in Poland. In: *International Conference "Trends in Agricultural Insurance in Europe. Drought Insurance in Poland"*, 5 November, Warsaw, Poland, pp. 17-28.

Sejm of the Republic of Poland (2015). *Justification to Draft Law Amending the Act on Subsidies to Insurance of Agricultural Crops and Farm Animals*. Paper No. 3247, 12 March 2015.

Sejm of the Republic of Poland (2005). *Justification to Draft Law of Act on Subsidies to Insurance of Agricultural Crops and Farm Animals*. Paper No. 408, 17 May 2005.

The Influence of a Low Interest Rate on Life Insurance Companies

Silvie Kafková¹, Dagmar Linnertová²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: 175424@mail.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: dagmar.linnertova@mail.muni.cz

Abstract: *A protracted period of low interest rate threatens the stability of the life insurance industry, especially in the countries, where life insurance with comparatively high guaranteed returns disposed in the past represents a major portion of the total portfolio. The aim of this paper is to provide an introduction to evaluation of the effects of the actual low interest rate period on the balance sheet of a representative life insurance company. Firstly the balance sheet of insurance companies is introduced. We show the valuation of the assets and liabilities. Then the Solvency Capital Requirement and risk margin is defined. Finally the solvency situation of insurers is valued.*

Keywords: life insurance, low interest rates, guaranteed returns

JEL codes: G22, G17, E47

1 Introduction

The present low interest rates cause problems to life insurers. They must pay guaranteed rates of return to their clients and keep strong profitability in the long period. The minimum return sets at the beginning of the contract cannot be changed in the course of the contract. The result of this product attribute is the contemporary occurrence of contracts with various minimum returns in the portfolio. Moreover, continuously low interest rates would be harmful for the solvency position of subgroup of insurance companies.

According to Holsboer (2000) the duration incompatibility between the asset and the liability side have main impact. When the predominant interest rates are significantly lower than they were in the beginning of the contracts, current value of liabilities becomes more expensive to finance.

Berdin and Gründl (2015) investigate the effect of prolonged period of low interest rates on the solvency situation of the average German life insurer. The insurance companies in Germany face not only an expensive stock of products sold with a high minimum guaranteed return, but they also face poor investing results because of extraordinarily low interest rates, especially for German sovereign bonds.

The aim of our paper is to evaluate the influence of prolonged period of low interest rates on the solvency situation of life insurance companies. We describe a balance sheet model that includes several features affecting the solvency situation.

2 Methodology and Data

We distinguish the book value and market value balance sheet of average life insurance company. The book value enables us to identify the yearly profit of the insurer and the final payout of the cohort maturing at time t . However, Solvency II regulation requires market valuation of asset and liabilities to give market-consistent evaluation of the solvency situation.

In the Figure 1 we could see the book value balance sheet and the market value balance sheet of the insurance company at time t . A_t^{BV} and L_t^{BV} denote book value of assets and

liabilities respectively. E_t indicates the equity capital endowment and CB_t is a capital buffer. OF_t denotes the market value of the own funds, which represents the deviation between the market valuation of assets and liabilities. RM_t is risk margin and L_t^{BE} is the best estimate of liabilities.

Figure 1 Book Value and Market Value Balance Sheet at Time t

Book Value		Market Value	
Assets	Liabilities	Assets	Liabilities
A_t^{BV}	E_t	A_t^{MV}	OF_t
	CB_t		RM_t
	L_t^{BV}		L_t^{BE}

Source: Berdin and Gründl, 2015

The Assets

According to the Data Series System ARAD, the book value of aggregated asset portfolio of insurers operating in Czech Republic amounte 483 733 332 000 CZK in 2015. The investments were valued at 348 722 616 000 CZK. The main part of investments is comprised by bonds and debentures (almost 80 %). Other major components are stocks (around 7 %), deposits with financial institutions (around 5.5 %), participating interests in affiliates (around 5.3 %) and real estates (around 1.4 %). Due to the lack of available data for life insurers we consider the above mentioned shares of investments for them.

We consider that all bonds are bought in face value and the stocks and real estates are bought for their market value at time t . The book value of the k -th cohort of bonds $B^{k,BV}$ at the time of purchase t equals its face value $B^{k,FV}$ and its market value $B^{k,MV}$. If we denote T its maturity time we get

$$B_{(t,T)}^{k,BV} = B_T^{k,FV} = B_{(t,T)}^{k,MV}. \quad (1)$$

Similarly, the book value of the l -th cohort of stocks $S^{l,BV}$ at the time of purchase t is equal to its purchasing cost $S^{l,FV}$ and its market values $S^{l,MV}$. We get

$$S_t^{l,BV} = S_t^{l,FV} = S_t^{l,MV}. \quad (2)$$

If during the holding period the market value of asset falls below the book value, it must be later reduce too. Hence we need to know the market value of assets. The market value for the k -th cohort of bonds is given by

$$B_{(t,T-\tau)}^{k,BV} = \sum_{j=\tau+1}^T \left(\frac{B_{(T-\tau)}^{k,FV} \cdot i_{c,(T-\tau)}^k}{1 + i_{d,(t,j-\tau)}} \right) + \frac{B_{(T-\tau)}^{k,FV}}{1 + i_{d,(t,T-\tau)}} \quad (3)$$

where i_c is the coupon, i_d is the discount rate applied to the cohort of assets and τ is the life time of the bond that has gone by at time t .

The market value of the cohort of stocks follows the Geometric Brown motion. We consider the market value equals book value at time $t = 0$. But gradually the market values are modified according to Geometric Brown motion. The market value of l -th cohort of stocks is given by

$$S_t^{l,BV} = \begin{cases} S_{t-1}^{l,MV} + (1 - \vartheta) \cdot (S_t^{l,*} - S_{t-1}^{l,MV}), & \text{for } S_t^{l,*} > S_{t-1}^{l,MV} \\ S_t^{l,*} & \text{otherwise} \end{cases} \quad (4)$$

where $S_t^{l,*}$ is assets values given by the Geometric Brown motion in time t and ϑ indicates a portion of a cashed-in dividend payment. Book values of bonds could be express as

$$B_{(t,T-\tau)}^{k,BV} = \begin{cases} B_{(t,T-\tau)}^{k,MV}, & \text{if } B_{(t,T-\tau)}^{k,MV} < B_{(t-1,T-\tau)}^{k,BV} \\ B_{(t,T-\tau)}^{k,MV}, & \text{if } B_{(t-1,T-\tau)}^{k,BV} \leq B_{(t,T-\tau)}^{k,MV} \leq B_{(T-\tau)}^{k,FV} \\ B_{(T-\tau)}^{k,FV}, & \text{if } B_{(t,T-\tau)}^{k,MV} > B_{(T-\tau)}^{k,FV} \end{cases} \quad (5)$$

The book value of k -th cohort is adjusted to the market value if it declines under the face value. When the market value of k -th cohort exceeds the face value, the book value is adjusted to the face value. We have analogous equation for stocks and real estate

$$S_t^{l,BV} = \begin{cases} S_t^{l,MV}, & \text{if } S_t^{l,MV} < S_{t-1}^{l,BV} \\ S_t^{l,MV}, & \text{if } S_{t-1}^{l,BV} \leq S_t^{l,MV} \leq S_{t-n}^{l,FV} \\ S_{t-1}^{l,FV}, & \text{if } S_t^{l,MV} > S_{t-n}^{l,FV} \end{cases} \quad (6)$$

In the end of this section we can define the aggregate book value of assets at time t

$$A_t^{BV} = A_t^{k,BV} + A_t^{l,BV} \quad (7)$$

where

$$A_t^{k,BV} = \sum_{k=1}^{N^k} \sum_{\tau=0}^T B_{(t,T-\tau)}^{k,BV} \quad (8)$$

$$A_t^{l,BV} = \sum_{l=1}^{N^l} S_t^{l,BV} \quad (9)$$

For aggregate market value we get

$$A_t^{MV} = A_t^{k,MV} + A_t^{l,MV} \quad (10)$$

where

$$A_t^{k,MV} = \sum_{k=1}^{N^k} \sum_{\tau=0}^T B_{(t,T-\tau)}^{k,MV} \quad (11)$$

$$A_t^{l,MV} = \sum_{l=1}^{N^l} S_t^{l,MV} \quad (12)$$

N^k indicates the number of bond cohorts and N^l indicates the number of stock cohorts.

The Liabilities

Current regulatory framework in the Czech Republic permits a maximum technical interest rate for discounting policy reserves. It means that when the insurer makes a choice on the rate to use, no less than this technical interest rate have to be credited to clients' accounts every year. The technical interest rate is determined by Czech national bank. The performance of technical interest rate we can see in the Table 1.

Table 1 Technical Interest Rate in the Czech Republic

Year	2000	2004	2010	2013	2015
Interest rate	4.0 %	2.4 %	2.5%	1.9 %	1.3 %

Source: *Finance: Vývoj TUM* [online], [cit. 2016-05-10]. Retrieved from: <http://www.finance.cz/pojisteni/osoby/zivotni-pojisteni/tum/>

Unlike some other countries (e.g. Germany) the allocation of profit shares is not provided by law in the Czech Republic. Therefore the technical interest rate is only the transparent security for clients.

We consider that the duration of typical endowment policy is 12 years and the duration of the typical annuity product varies from 17 to 24 years, see Berdin E. and Gründl H. (2015). It depends on characteristics of the product. Consider that the insurer sell only homogeneous product. As the cohorts of contrasts mature, they are constantly rolled

over by new cohorts of contracts. These cohorts hold the maximum guaranteed interest rate in effect at the time of beginning of the contract.

Assume the typical product that allows to insurer to decide how much additional return could be divided based on regulatory limitation and financial information obtainable up to determination moment. Development of client's account is given by

$$l_t^{i,p,BV} = l_{t-1}^{i,p,BV} \cdot [1 + \max(r_t^{i,g}, r_t^p)] + P_t^i \quad (13)$$

where $l_{t-1}^{i,p,BV}$ is the book value of account at time $t - 1$, i indicates the tariff generation which is connected with the minimum guaranteed return fixed at the contract beginning, $r_t^{i,g}$ is the regulatory minimum rate of return, r_t^p is a rate of return with additional return and P_t^i is the annual premium which the client must pay for the entire duration of the contract. The aggregate book value of liabilities can be determine as

$$L_t^{p,BV} = \sum_{i=1}^{N^Z} l_t^{i,p,BV} \quad (14)$$

where N^Z is the number of cohorts in the portfolio.

Finally, we define the market value of liabilities. We need the best estimate of liabilities that is a discounted minimum final payment which the insurer has to pay at the end of the contract. The present value for each cohort at time t can be expressed as

$$l_t^{i,BE} = \frac{l_t^{i,p,BV} \cdot (1 + r^i)^{T-\tau}}{(1 + i_{d,(t,T-\tau)})^{T-\tau}} \quad (15)$$

where T is the maturity time, $T - \tau$ is the remaining time to maturity of cohort i and $i_{d,(t,T-\tau)}$ is the discount factor used for the last payoff, where $(t, T - \tau)$ expresses the point in time t and the appropriate $T - \tau$ maturity. By aggregating all unfinished contrasts at time t , we get the best estimate of the technical reserves

$$L_t^{BE} = \sum_{i=1}^{N^Z} l_t^{i,BE}. \quad (16)$$

Then we get the market value of liabilities

$$L_t^{MV} = L_t^{BE} + RM_t. \quad (17)$$

where RM_t is the risk margin estimated at time t . RM_t is defined as a function of the solvency capital requirement.

The Solvency Position

The coordination between the asset and the liability side identifies the solvency position of the insurer each year. According to Solvency II regulation it is required the calculation of the Solvency Capital Requirement (SCR). It is given by

$$SCR_t := \arg \min_x \left\{ P \left(OF_t - \frac{OF_{t+1}}{1 + r_{f,(t,1)}} > x \right) \leq 1 - \alpha \right\}, \quad (18)$$

where α signifies the confidence interval, $r_{f,(t,1)}$ signifies the one year maturity risk free interest rate and OF_t is the market value of the own funds. Equation (13) provides that the probability of loss over one year overlaps the SCR is less or equal to $1 - \alpha$. To estimate OF_t we need to know risk margin (RM). The Solvency II regulation defines the calculation of RM as

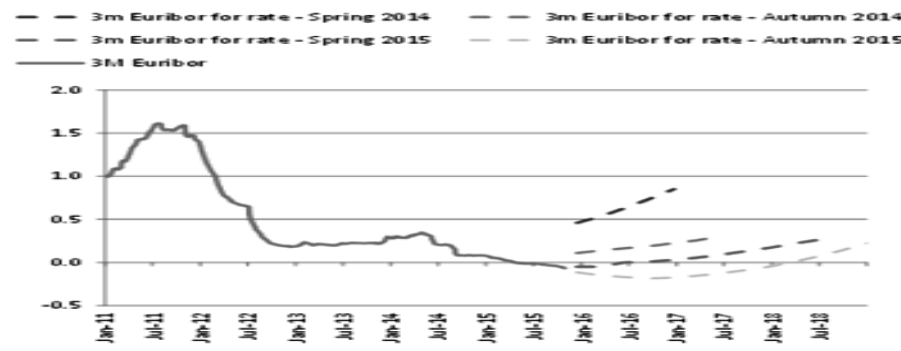
$$RM_t = \frac{\sum_{t \geq 1}^T SCR_t}{1 + r_{f,(t,t+1)}} \cdot CoC \quad (19)$$

where $\sum_{t \geq 1}^T SCR_t$ denotes the prediction of the solvency capital required to cover the whole life (T) of the liability portfolio discounted to the contemporaneity using the risk free term structure. CoC indicates the Cost-of-Capital rate that returns the RM_t of the whole portfolio at time t .

3 Results and Discussion

According to the Final Stability Report of EIOPA (2015) low yields and following reinvestment risk is the main problem in the insurance sector. Insurers have troubles reinvesting their assets at an acceptable level. Furthermore, monetary policy in Europe can further extend the actual low return environment. In the Figure 2 we can see the evolution of 3 month EURIBOR. At the beginning of the year 2016 it has even reached negative value.

Figure 2 3M EURIBOR

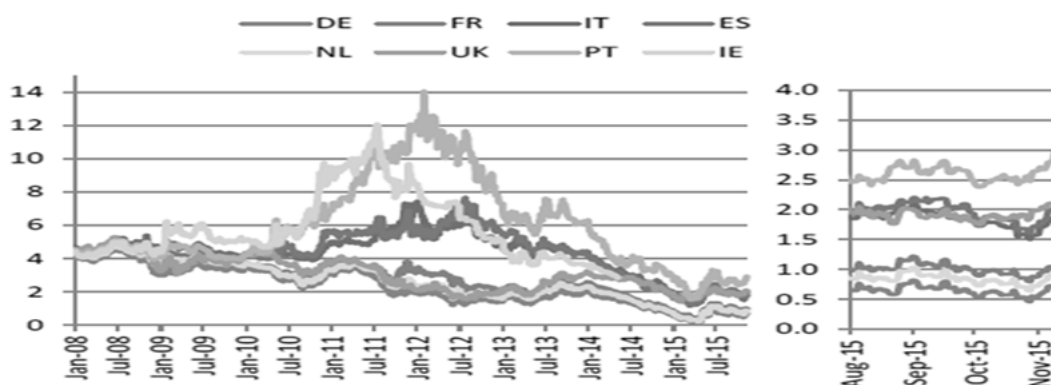


Source: Final Stability Report of EIOPA (2015)

The evolution of the government bond's yields can be observed in the Figure 3. Their returns are at very low levels. After the turbulence made by the conditions in Greece in June and July 2015, euro area government bond returns have at that temporarily decreased. The present market situation will continue to push the insurers' profit down and put pressure on balance sheets. Comparably, Euro area corporate yields stay largely at very low levels.

As stated above, bonds represent 80 % of the assets of insurance companies in the Czech Republic. However, current evolution of bond's yields is very unfavorable. Due to this situation the stocks of old policies has expensive guarantees for insurance companies. A protracted period of low interest rate could distinctly affect the solvency situation of life insurers, especially the less capitalized companies. Such insurance companies might default if interest rate stays at the current low level.

Figure 3 10-year Government Bond Yields (%)



Source: Final Stability Report of EIOPA (2015)

4 Conclusions

In the recent low yield situation it is still more and more difficult to maintain profitability. This is relevant particularly for life insurance companies who have guaranteed returns on their contracts and some of these old contracts guarantee the maximum rate of return between 4% and 5%. In this situation they don't have any possibility to change the terms and conditions of these contracts, e.g. in Belgium, Germany or France. In the Czech Republic the insurance companies use the technical interest rate which is determined by Czech National Bank. The value of this rate is between 4%- 1.3%.

Now we work on quantification of the effects of a prolonged period of low interest rate on life insurers. We want to model a different initial capital endowments and then we want to compare the results of the simulations.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development is gratefully acknowledged.

References

ARAD - Time Serie System - Czech National bank: *Insurance undertakings, total*. Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_SESTAVY?p_strid=BCB&p_sestuid=&p_lang=EN.

Berdin, E., Gründl, H. (2015). The Effects of a Low Interest Rate Environment on Life Insurers. *The Geneva Papers on Risk and Insurance-Issues and Practice*, vol. 40(3), pp. 385-415.

EIOPA (2015). *Financial Stability Report - December 2015*. Retrieved from: <https://eiopa.europa.eu/Pages/Financial-stability-and-crisis-prevention/Financial-Stability-Report-December-2015-.aspx>.

Finance: Vývoj TUM [online]. Retrieved from: <http://www.finance.cz/pojisteni/osoby/zivotni-pojisteni/tum/>.

Holsboer, J. H. (2000). The impact of low interest rates on insurers. *The Geneva Papers on Risk and Insurance - Issues and Practice*, vol. 25(1), pp. 38-58.

Impact of the REPO Rate on Commercial Rates in the Czech Republic

František Kalouda

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: kalouda@econ.muni.cz

Abstract: *The paper is focused to further description and analysis the new aspects of behavior of Czech banking as a cybernetic system. The aim of the paper is analysis of the managing system relations (regulator – central bank) to managed system (controlled system – commercial banks) as relationships between operational indicator (REPO rate) and regulated indicator (commercial rates). Methodology of the paper is strategically focused to the time series methods (first of all correlation) and trends analysis. The usual analytic-synthetic methods, literary research, description and comparison are used here as well. The main expected result of the paper are working conclusions related to the fundamental linkages (still not explored) between REPO rate and the commercial rates.*

Keywords: banking system, cybernetics, REPO rate, commercial rate

JEL codes: C67, E58, G21, G38

1 Introduction

There is still the opinion between the financial theorists that the market interest rate is highly influenced by the central bank and by its discount and REPO rates.

According to (Revenda, 1999) „The main aim of discount rate changes ... caused by central bank ... is affection of movement, resp. of other interest rates level in economy and therefore influence on subjects' loans demand.”.

These central bank tendencies are in market economies quite analogic. This fact can be supported by an example from the USA “... as the instrument of FED serves **discount rate** – that is interest rate related to loans granted by FED to banks.” (Mankiw, 2000).

Previous analysis of the behavior of the banking system in the Czech Republic have therefore focused on processes for controlling the commercial rate (market interest rate) by using the discount rate (Kalouda, 2014a).

The general conclusion for the central bank is devastating - their series of regulatory measures lead to a situation in which the regulatory tool, i.e. the discount rate, stopped having any effect (Kalouda, 2014a), (Kalouda, 2014b), (Kalouda, 2015).

However there is a second option – REPO rate. „ it is expected that the central bank may/can influent interest rates of client loans relatively well influence through the development of REPO rate.” (Revenda et al., 1999).

This paper is therefore focused to analysis of the Czech National Bank (regulator – control element) and the system of commercial banks (controlled system) as relationships between operational indicator (REPO rate) and regulated indicator (commercial rates).

The main aim of the paper is therefore the analysis of REPO rate impact on market interest rate.

To reach this aim there will be investigated following problem areas:

- fundamental applicability of cybernetic approaches in selected area
- linearity of the Czech banking system
- regulation accuracy of the Czech banking system.

2 Methodology and Data

Methodology

The REPO rate influence on market interest rate is in this paper conceptualized in general terms as a problem of communication and of management. Therefore it is suitable to apply methodical apparatus of theoretic discipline in these terms that was in the Czech Republic used for these intensions only marginally. This theoretic discipline is "cybernetics ... as a science about general laws of origination, transmission and processing of information in complex systems" (Kubík et al., 1982).

From these methodical instruments of cybernetics (more exactly of technical cybernetics) there will be further used:

- static function (Kubík et al., 1982),
- theory of hysteresis function (Švarc, 2003).

The area in which we are applying these methodological tools is usually designated as „economic cybernetics“ (Švarc et al., 2011).

Model Specification

The real-life object which we shall be modelling in this paper is the banking system of the Czech Republic. We shall model the processes of managing the price of capital at a business level (commercial rate) through the use of the REPO rate. The model for this real-life system is the static characteristics, one of the deterministic methods for identifying systems (Fikar and Mikleš, 1999).

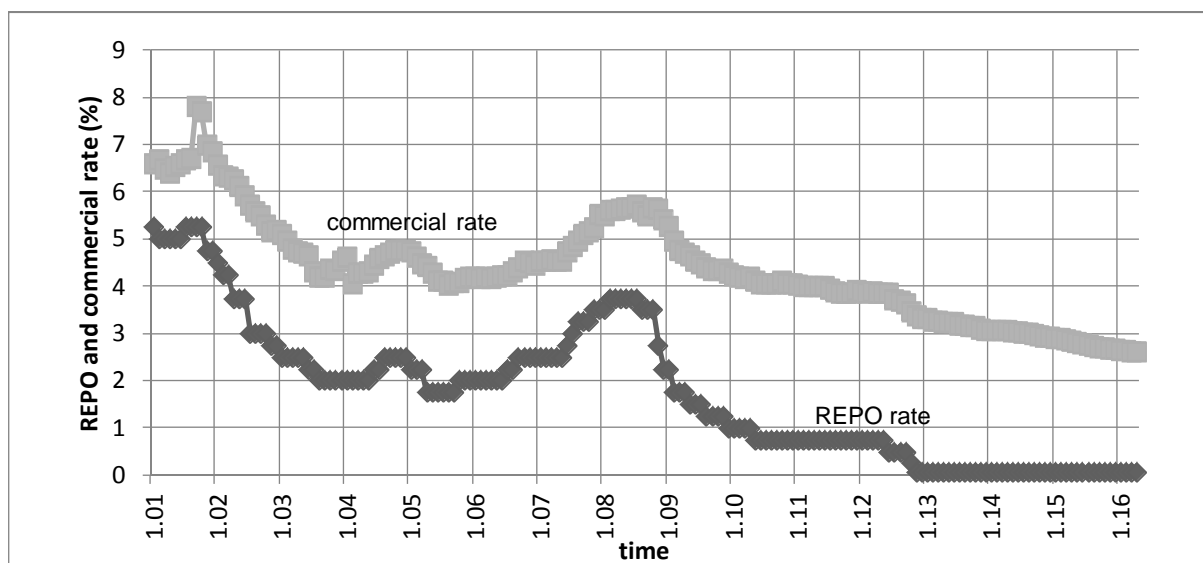
This is a relatively simple model, based on the linearity of the modelled system (Švarc et al., 2011). The relative simplicity of the model used does not prevent it from being used for primary identification, for acquiring the indicative characteristics of the analyzed system (Fikar and Mikleš, 1999).

Data

This paper draws on data published by the Czech National Bank (CNB) at <http://www.cnb.cz>, to which we link here (to save space).

The basic file values of the variable - REPO rate and commercial rate - are monitored (see Figure 1 Correlation commercial rate - REPO rate).

Figure 1 Correlation Commercial Rate - REPO Rate ($r = 0,957345$)



Source: Own construction of the author by using <http://www.cnb.cz>

3 Results and Discussion

Fundamental applicability of cybernetic approaches in the selected area

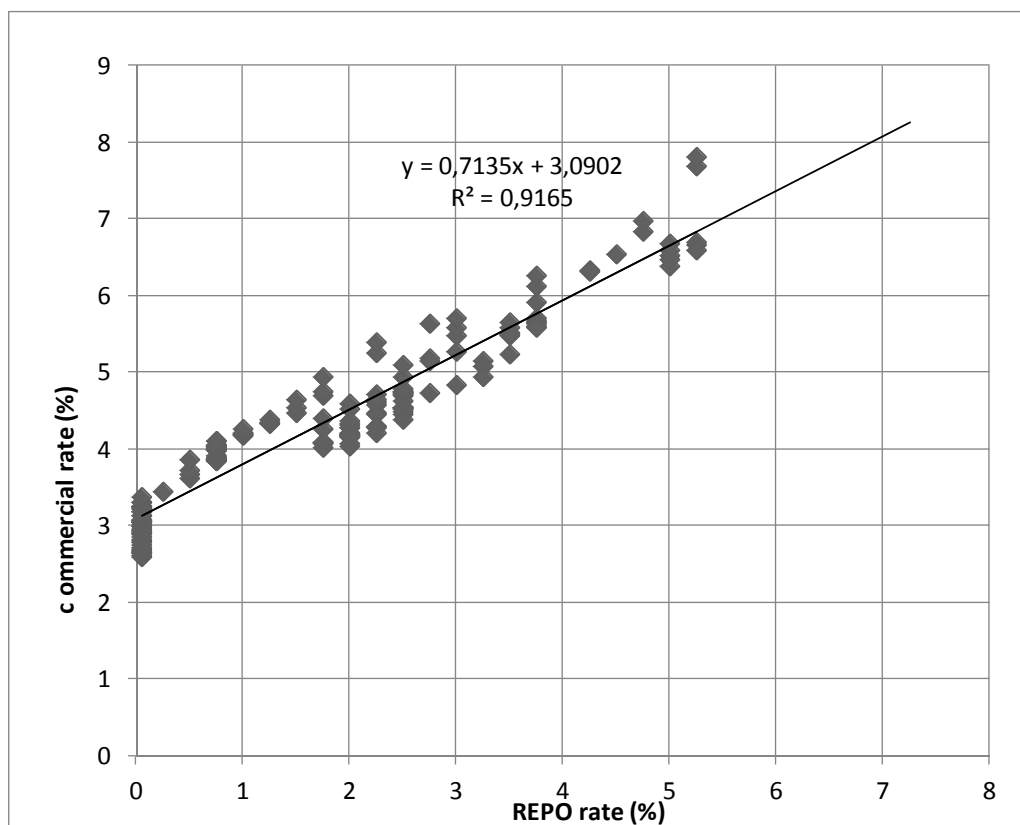
The source Allen (1971) emphasizes in these terms unequivocal opinion: „There is necessary only the formal similarity to anticipate that the methods used in technics will be suitable for economic models too.” This condition is met in our case.

Nevertheless, the same source mentions an important problem with application of methods that have been successfully proved in technical sphere on the economic sphere – the linearity of the models. „Linear models can be generally suitable for technics where everything can be accurately managed. Be sure that they are not suitable up to the same extent for the economic models.” However, there is accepted the possibility of linearization.

Linearity of the Czech banking system – static function of commercial banks

The static characteristic of the Czech banking system for all available data are presented in Figure 2. From here it is obvious, that this data file is for our purposes not applicable. Its uncertainty is excessive.

Figure 2 Static Characteristics (REPO Increasing and Decreasing) – All Available Data



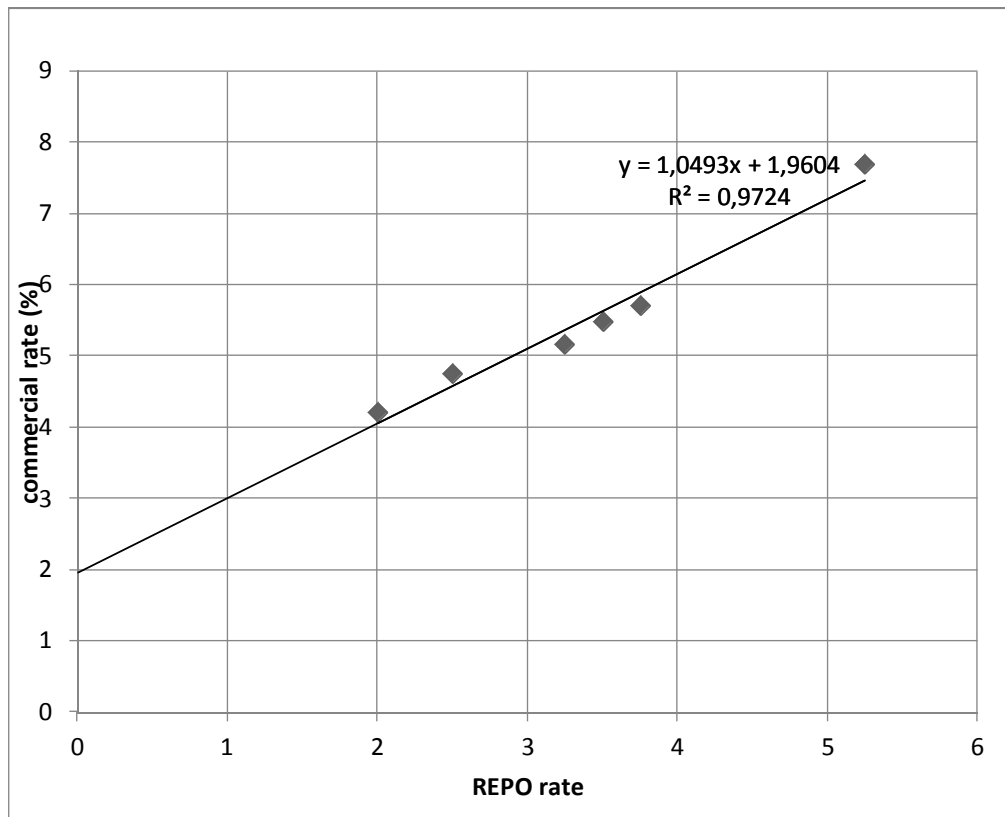
Source: Own construction of the author by using <http://www.cnb.cz>

Above that, the cybernetic approach requires data in stabilized state. “Static characteristics of control members are mostly expressed by the static function, i.e. the dependence between the output indicator in stabilized state and entry indicator in stabilized state.” (Švarc, 2003). That means, according to our expert opinion, the values constant during the time period long at least three months. This view is supported (using the regression) by source Šerý (2010).

It is obvious that the system of commercial banks can be with acceptable inaccuracy rate recognized for linear (see Figure 2 and 3). For comparison – dependence quite same in type is presented as a linear one in source Balátě (2004) too.

Here we are only analyzing in the sources those reactions of the system that are usually considered, i.e. the reactions to a rise in the REPO rate.

Figure 3 Static Characteristics (Increasing REPO) – Stabilized Data Only



Source: Own construction of the author by using <http://www.cnb.cz>

Regulation accuracy of the Czech banking system (central bank and commercial banks)

From Figure 1 it is clear that meaningful data (for REPO increasing and decreasing) appears in the interval 9/2005 – 9/2012.

Interaction between central bank and commercial banks leads to negative synergies when there the non-linearity of the hysteresis type occurs (see Figure 4). This state eventuates in conclusion that REPO rate is in fact not able to manage value of commercial rate. In its implications it means that after certain cycles of "increase-decrease" type the REPO rate will lose its ability to regulate commercial rate.

4 Conclusions

With consideration of theoretic knowledge and according to stated available data processing there can be on the discussion basis formulated succeeding paper conclusions:

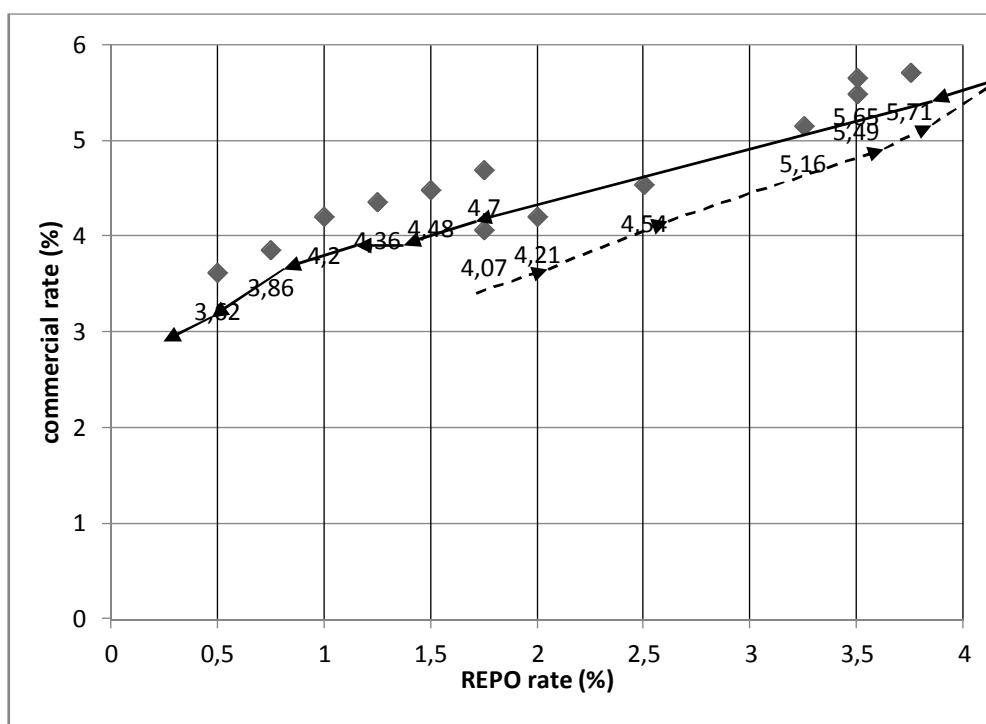
Fundamental applicability of cybernetic approaches in selected area

Cybernetic approaches are for the settled task (inquiry into economic processes) undoubtedly utilizable. The possible problems with disputable linearities can be in the first approximation solved by linearization of tackled problem.

Linearity of the Czech banking system – static function of commercial banks

Commercial banks conduct themselves as a linear system in principle. The rate of the current identifiable nonlinearities is so low that the linearization does not bear any major problems.

Figure 4 REPO Hysteresis (REPO Increasing and Decreasing) – Stabilized Data Only



Source: Own construction of the author by using <http://www.cnb.cz>

Regulation accuracy of the Czech banking system (central bank and commercial banks)

The nonlinearity of hysteresis type is typical for coexistence of central bank with commercial banks even in this case. It in fact means the loss of applicability of REPO rate as cost of capital (bank loan) management instrument at the level of commercial rate. Present level of REPO rate (0,05 %) confirms this in praxis.

The paper results can be surprising in a certain manner. They theoretically confirm limited possibilities of REPO rate as an instrument for regulation of the market interest rate. In this relation there can be clearly seen management potential of the monobank (Kalouda and Svítíl, 2009), (de SOTO, 2009) even if there are taken into account all disadvantages resulting from this variant of banking sector organizational order (Revenda, 1999).

References

- Balátě, J. (2004): *AUTOMATICKÉ ŘÍZENÍ*, Praha: BEN.
- Fikar, M., Mikleš, J. (1999). *Identifikácia systémov*. Bratislava: STU Bratislava.
- Kalouda, F., Svítíl, M. (2009). The Commercial Bank such as the Cybernetic System in Conditions of the Global Financial Crisis. In: *Management, Economics and Business Development in European Conditions*. Brno, FP VUT, pp. II.24-II.31.
- Kalouda, F. (2014a). Cost of capital management by central bank like the cybernetic model. In: Jedlička, M., ed., *HED2014 (Hradecké ekonomické dny), Hradecké ekonomické dny 2014*. Hradec Králové, ČR: Gaudeamus, Univerzita Hradec králové, pp. 428-434.
- Kalouda, F. (2014b). The Impact of Discount Rate on Commercial Rates in the Czech Republic: The Cybernetic Approach. In: Deev, O., Kajurová, V., Krajíček, J., ed., *European Financial System 2014*. Brno, ČR: Masaryk University, pp. 307-313.

- Kalouda, F. (2015). The Banking System of the Czech Republic as a Cybernetic System – a Unit Step Response Analysis. In: Deev, O., Kajurová, V., Krajíček, J., ed., *European Financial System 2015*. Brno, ČR: Masaryk University, pp. 253-261.
- Kubík, S., Kotek, Z., Strejc, V., Štecha, J. (1982). *Teorie automatického řízení I, Lineární a nelineární systémy*, Praha: SNTL.
- Mankiw, N. G. (2000). *Zásady ekonomie*, Praha: Grada Publishing.
- Revenda, Z. (1999). *Centrální bankovníctví*. Praha: MANAGEMENT PRESS.
- Revenda, Z., Mandel, M., Kodera, J., Musílek, P., Dvořák, P., Brada, J. (1999). *Peněžní ekonomie a bankovníctví*, 2nd ed. Praha: Management Press.
- SOTO de, J. H. (2009). *Peníze, banky a hospodářské krize*. Praha: ASPI a Liberální institut.
- Šerý, M. (2010). Vliv diskontní sazby na úrokové sazby komerčních bank v České republice (bakalářská práce). Brno, Mendelova univerzita v Brně, Provozně ekonomická fakulta.
- Švarc, I. (2003). *Teorie automatického řízení*, Brno, FS VUT.
- Švarc, I., Matoušek, R., Šeda, M., Vítečková, M. (2011). *Automatické řízení*, 2nd ed. Brno: CERM.

The Interaction between Venture Capital and Innovation in Europe

Özcan Karahan

Bandirma Onyedi Eylül University
Faculty of Economics and Administrative Sciences, Economics Department
Yeni Mahalle, No:77, 10200, Balıkesir, Turkey
E-mail: okarahan@bandirma.edu.tr

Abstract: *Venture Capital (VC) has been a significant source of finance for technology-based investments. Thus VC has played a key role in fostering innovative entrepreneurship and technological progress in new economies. Accordingly, it is generally argued that there is a positive causal relationship from venture capital to innovation, which called "venture capital-first hypothesis". However, some studies in literature indicates an opposite causality that innovation stimulates venture capital, which called "innovation-first hypothesis". The aim of this paper is to test these hypothesis to determine direction of causality between Venture Capital and Innovation in European countries. We use dynamic panel data analysis in order to investigate the direction of causality between innovation and venture capital based on annual data set related to European patent applications and venture capital investment. Empirical results of our study provide a strong evidence in favour of "innovation-first hypothesis" that innovation induces venture capital investment in Europe. This result presents significant implications for innovative entrepreneurship capacity of Europe. It seems that, although policy-makers aim to make more financial resources available for innovation, the absence of innovative ideas is the big issue rather than the lack of available fund for innovative entrepreneurships in Europe.*

Keywords: venture capital, innovation, Europe

JEL codes: G24, O31, O32

1 Introduction

Innovation as the basic source of competitiveness in global economy increases the significance of technology-based firms which are mostly young and dynamic entrepreneurships. Technology-based firms are basic dynamic of the new developed economies since this kind of firms are closely related to technology based investments. Indeed, improvements of new economies based on productivity growth has been dominated by the high market performance of technology-based investment. Most of the academic researchers have determined the role of the technology-based firms and their investment aiming to produce innovation in the development of new economies.

Thus, advocating of technology-based investments become a significant aim for the policy-makers to stimulate productivity growth. The basic challenge from this policy framework arises from the matters concerning with the finance of technology-based investments. So that there is big challenge for the financing of technology-based investment in new economy since these kinds of investments have distinctive features like high risk profile and high degree of uncertainty. Besides these kind of investments have long term growth potential derived from research and development activities. Therefore, compared to other types of investment, technology-based firms are constrained by different or additional financing problems in the financial markets. In other words, technology-based investments suffer from the extreme difficulties in order to get enough funds for their projects. That means the conventional patterns of financial intermediation cannot adequately finance the technology-based investment. In conclusion, the perceptions about how finance the new economy dominated by technology-based firms should be totally different from the financial methods in the past. Consequently, the path of the new economy progress is basically depend on the effectively distribution of financial resources towards technology-based investments. In fact, the relationship between finance and economic growth becomes always popular interest in the literature. However, this interest is much more vital to understand and

manage the basic dynamics of new economies. Because of the characteristics of technology-based investment, this kind of activities aiming to innovation as basic source of new economies cannot be adequately financed by traditional channels. In other words, technology-based investments suffer from the extreme difficulties in order to get enough funds for their projects. Thus, the allocation of financial resources to technology-based enterprises is very significant for improving of new economy (Karahana, 2007, 50-52). At this stage, it seems that most effective way in order to fill the financing needs of technology based firms is venture capital. Indeed there are a lot of difficulties indicated literature to finance technology based investment. However, venture capital creates a model to finance of innovative activities which cannot be financed by traditional methods in the markets (Ueda, 2010, 304-308).

Consequently, venture capital becomes a significant factor of examine the financial sector preconditions for the successful development of New Technology Based Firms in United States. Indeed, popular firms in the new economies mostly financed by Venture Capital like Apple Computer, Cisco System Microsoft, Netscape and Genentech. Indeed, funds organized in the form of venture capital supported to technology-based firms and caused to the establishment of entirely new industries advocating productivity growth in United States (Gompers and Lerner, 2001, 49). That means venture capital as a specific type of finance acts a crucial role enhancing the high-risk investment projects of technology-based companies. From the point of view of policy implications, it seems that creating stronger venture capital industry is crucial to provide adequate finance for technology-based firms which are the important component of new economies (OECD, 1996, 4).

The purpose of this paper is to examine the role of venture capital in the development of new economy in Europe. Thus, our study points out the performance of the venture capital investments in Europe. The paper is structured as follows. In the second section, we review the studies focusing on the relationship between Venture Capital and innovative or economic performance. Third section presents data, methodology and empirical results. Final section concludes and makes some policy implications concerning with venture capital.

2 Literature Review

Venture capital has a quite well-established business sector separated among the developed world. However, it can be argued that VC investment mostly concentrated geographically across United States. Nearly half of the VC investment have been realized in United States. This does not come as a surprise because VC as a special financial tool raised and developed in the United States. American Research and Development Corporation started as the first VC firm in 1946. Later United States government showed significant effort to develop own VC as part of the Small Business Act of 1958 (Metrick and Yasuda, 2011, 9-10). Accordingly, in the literature, experience of United States of America has been the most significant experience to show the relationship between VC and innovation. Thus, VC has been accepted as an effective financing method of technology-based investment generating most of the significant innovation in United states. Kenney (2011) historically analysed how VC evolved and advocated the national system of innovation in United States. He clearly indicated that most of the innovation activities performing by Information and Communication Technology and Biocenology Industries have been mostly financed by VC in the first development stages. Thus, venture capital has become an important financial intermediary for financing of technology-based investment resulting in innovation. Accordingly, he argued that Venture Capital has been one of the components of the US national system of innovation. Focusing on firm-level study, most comprehensive empirical study on the relationship between VC and innovation in United States has been performed by Kortum and Lerner (2000). They analysed annual data for 530 VC-backed and non-VC-backed firms in twenty manufacturing industries between 1965 and 1992. The findings of their study indicated that increases in VC activity in an industry are associated with significantly higher patenting rates. Hellmann and Puri (2000) also examined the role of venture capital financing in Silicon Valley by using dataset based on a survey of 149 recently

established firms. They specially tried to indicate the interrelationship between the type of investor and aspects of the product market behaviour of start-up firms. They found that firms financed by VC pursue an innovative strategy compared to non-VC backed firms pursuing imitator strategy. Thus they made a direct contribution to literature arguing that venture capital financing has an impact on the development path of a start-up company. Dushnitsky and Lenox (2005) focused on the potential innovative benefits to corporate venture capital in entrepreneurial ventures by incumbent firms to explore the relationship between corporate venture capital incumbent firm innovation rates. They analysed a large panel of 2289 public firms over period from 1969 to 1999. The findings indicated that increases in corporate venture capital investments are associated with subsequent increases in firm patenting. Accordingly, they concluded that corporate venture capital programs may be instrumental in harvesting innovation as a vital part of a firm's innovation toolkit.

Besides directly focusing on the innovation impact of VC on firms, some studies examined the relationship between VC and different productivity performance of firms. Dushnitsky and Lenox (2006) explored the relationship between corporate venture capital and firm value creation by using the panel data of United States public firms during the period 1900-1999. They presented evidence that corporate venture capital investment is associated with the creation of firm value. Thus, they concluded that VC may be an important financial tool to enhance firm value by providing a valuable window on novel technologies. Peneder (2010) has examined the relationship between VC and firm's innovation performance using Austrian data. He found that VC-financed firms are generally more innovative and grow faster in terms of employment and sales revenue than other firms. Despite putting some reservation on the effectiveness of VC, he concluded that accessing VC remains an important pillar of well performing innovation system. Guo and Jiang (2013) examined the contributions of VC to entrepreneurial firms in China based on a panel dataset of manufacturing firms. Thus they compared to performance of VC-backed and non-VC-backed firms during the period 1998 to 2007. The results of empirical study showed that VC-backed firms outperform non-VC-backed firms in terms of profitability, sales growth and Research and Development investment. They concluded that VC in China enhances entrepreneurial firms to provide more value-added.

Some studies also concerned with the European experience to analyse the relationship between VC and innovative and economic performance of firm. Croce et al. (2013) aimed to indicate the impact of European venture capital-backed firms in high-tech industries. They used data on entrepreneurial firms operating in seven European countries (Belgium, Finland, France, Germany, Italy, Spain and the United Kingdom). Their findings showed that productivity growth is not significantly different between VC and VC-backed firms before the first stage of VC financing. However significant difference between them are found in the first years after the investment. In spite of the limitation, from a policy perspective, they concluded that VC financing is a valid tool for improving the performance of European entrepreneurial firms in high-tech industries. Lastly, Bertoni and Tykvova (2015) explored whether public venture capital spur innovation in young biotech companies in Europe. They used the dataset of all companies in the VICO database between 1984 and 2004. Findings did not show any impact of public VC on invention and innovation of biotech companies in Europe. Thus, they couldn't find the positive effect of government VC established throughout Europe on innovation performance of biotech sector.

From the macroeconomics policy point of view, economists need to broaden the scope of examination the relationship between VC and innovation. Thus, studies started to focus on the interaction among VC investment and innovation or economic performance at national level. Romain and Potterie (2004) attempted to determine the economic impact of venture capital based on a panel of 16 OECD countries from 1990 to 2001. Empirical results showed that VC investment plays a more important role compared to business or public R&D in order to stimulate innovation. The findings also indicated that VC funding has a positive effect on the total factor productivity. In addition they indicated that VC intensity also makes it easier to absorb the knowledge stock generated by universities

and firms. Tang and Chyi (2008) provided a new explanation of total factor productivity growth of Taiwanese industry based on venture capital. They found that development of the venture capital industry significantly promotes productivity growth between 1985 and 2001 in Taiwan. Their findings also specifically indicated that venture capitalist in Taiwan not only support start-ups financially but also provide them guidance and expertise, which promotes internal knowledge diffusion channel resulting in total factor productivity growth.

In the macroeconomic framework, some economists have also analysed the interactions between VC and innovative and economic performance in Europe. Empirical results found from European experience don't indicate the strong casualty relationship from VC investment to innovative or economic performance. Popov and Roosenboom (2012) provide cross-country evidence of the effect of venture capital investment on patented innovation. They used a panel of 21 European countries covering period 1991-2005. They founded that the impact of VC on innovation is quite weak and varies widely across European countries. The relation between VC and innovation is relatively stronger in countries with lower barriers to entrepreneurship and have adopted a tax and regulatory environment friendly to VC. Thus, Popov and Roosenboom recommend "policymakers in Europe to be careful not to see VC as a panacea to spur innovation". Faria and Barbosa (2014) examined the role of VC in promoting innovation by using panel data of 17 European Union countries over the period 2000-2009. They showed that only late-stage VC has an impact on innovation in Europe. That means European venture capitalist are more willing to support innovation only after the least risky initial stage. Thus, their findings indicated that VC in Europe enhanced the commercialization of innovation rather than fostering its creation. Finally, Faria and Barbosa indicated that this result don't show what not to expect from European venture capitalists regarding their role in supporting innovation.

Looking at the literature, it seems that performance of VC investments in Europe is not enough to finance of technology-based investment or innovative entrepreneurs. Furthermore, some economists indicated the presence of reverse causality from innovation to VC investment. This reverse causality called "innovation-first hypothesis" while the argument that VC investments stimulate innovation called "VC-first hypothesis". Accordingly, Geronikolaou and Papachristou (2012) tested these hypothesis based on annual data covering the period 1995-2004 for 15 European countries. Empirical findings showed that causality from innovation to VC exists rather than from VC to innovation in Europe, which confirms "innovation-first hypothesis". That means the causality runs from patents to venture capital and not the other way around. Thus, they concluded that effectiveness of venture capital activity in Europe can be attributable to the absence of value creating innovative ideas or entrepreneurship. Similarly, Hirukawa and Ueda (2011) found same results in the United States manufacturing industry. They analysed the causality between VC and innovation symbolized by total factor productivity growth in the manufacturing industry over the period 1968-2001. Their findings also confirmed "innovation-first hypothesis" indicating the causality from total factor productivity growth to VC investment. Thus, they showed that the relationship between VC and innovation is not as simple as generally accepted form arguing the causality from VC to innovation. That means positive relations between VC and innovation cannot be always interpreted as evidence that VC stimulates innovation.

3 Data, Methodology and Empirical Results

In this section, we examined empirically the causal relationship between the venture capital referring to the total amount of venture capital finance at seed, start-up and expansion stages and innovation referring to number of patent applications to European Patent Office. We used annual data covering the period 2000-2013 for 12 European Countries Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and, United Kingdom. The number of patent applications

are sourced from the European Venture Capital Association (EVCA) while venture capital data are obtained from EUROSTAT Database.

In order to investigate the relationship between VC and innovation, dynamic panel data methodology developed by Holtz-Eakin et. al (1988) and Arellano and Bond (1991) will be applied. Accordingly, the model can be shown below:

$$y_{it} = \beta_0 + \sum_{j=1}^n \beta_j y_{it-j} + \sum_{j=1}^n \alpha_j \Delta x_{it-j} + F_t + \varepsilon_{it} \quad (1)$$

(y) and (x) symbolize variables while (F) and (ε) represent individual fixed effect and error term, respectively. Besides, (i) refer to panel unit, (t) represents time, and finally (j) shows the lag number. In order to eliminate the unobserved country-specific effects, equation (1) is differenced to derive the model below:

$$\Delta y_{it} = \sum_{j=1}^n \beta_j y_{it-j} + \sum_{j=1}^n \alpha_j \Delta x_{it-j} + \Delta \varepsilon_{it} \quad (2)$$

In the estimation process of Equation (2), Generalized Method of Moments (GMM) is performed by using the appropriate lags of the dependent and the independent variables as instruments. By using Wald Test procedure, the null hypothesis that x does not cause y and that y does not cause x are also jointly tested. Accordingly, based on methodology concerning panel causality model indicated equation (2), we specified and estimated two regressions shown in Equation (3) and (4) below.

$$\Delta PA_{it} = \sum_{j=1}^n \gamma_j \Delta PA_{it-j} + \sum_{j=1}^n \lambda_j \Delta VC_{it-j} + \Delta u_{it} \quad (3)$$

$$\Delta VC_{it} = \sum_{j=1}^n \theta_j \Delta VC_{it-j} + \sum_{j=1}^n \delta_j \Delta PA_{it-j} + \Delta e_{it} \quad (4)$$

where, i : 1, 2, ..., 12, number of countries, t : 2000, 2001, ..., 2013, time period (year) and j: 2 (lag number). PA represents the number of patent applications while VC symbolizes the total amount of venture capital.

Before proceeding to panel data analysis we applied the Augmented Dickey-Fuller (ADF) and the Im, Peseran and Shin (IPS) panel unit root tests. The results of the panel unit root tests for the variables of venture capital (VC) and patent applications (PA) are presented in Table-1. Both the panel unit root tests concluded that the variables in level terms are non-stationary and become stationary only in first-differences. These results let us proceed to panel data analysis.

Table 1 Panel Unit Root Test

Variables	ADF		IPS	
	Levels	Differences	Levels	Differences
PA	6.153 (0.47)	61.814 (0.00)*	3.121 (0.18)	-2.101 (0.01)*
VC	8.718 (0.35)	58.347 (0.00)*	9.328 (0.29)	-1.918 (0.00)*

Note: p-values in parenthesis and (*) indicates significance at the 1 per cent level.

The coefficients estimated by Generalized Method of Moments (GMM), the results of Wald Causality Test and diagnostic tests for Equation (3) and Equation (4) are presented in the first and second columns of the Table.2. As seen from the Table.2, we employed the lagged values of the variables as instruments in levels for the first difference equations, for 2 and earlier. Wald X^2 test shows that both models have significant individual coefficients. Two basic types of diagnostic tests are also conducted. The Arellano-Bond (AR) test is operated for indication of serial correlation in the residuals. Sargent Test is also applied for indication whether the instruments are correlated with the error term. The AR (1) and AR (2) tests indicate applicability of models as we expect that first order statistic is significant while the second order is insignificant. Sargent test rejects that the instrumental variables are correlated to some set of residuals, which indicates the validity of the set of instruments in all equations. In conclusion, the results of diagnostics tests

show that the models are well specified and two lags is appropriate for the panel GMM estimator.

Concerning with the relationship between variables, the empirical findings shown in Table-2 that Venture Capital don't have a significant effect on patent applications in Europe. However, it seems that patent applications effect the level of venture capital investment. In other words, causality operates from patent applications as measure of innovation to venture capital. Thus, we find evidence that supports the "Innovation-first Hypothesis" instead of the "Venture Capital-first Hypothesis". European experience does not confirm the generally accepted form of causality from venture capital to innovation. Instead of this, the causality runs from innovation to venture capital. This reverse causality indicates that innovation creates a demand for VC but not VC supplies for innovation in Europe. This causality can operate like the process proposed by Hirukawa and Ueda (2011). Firstly, increasing innovation opportunities stimulate new firm start-ups to exploit such opportunities. Later, these start-ups demand and thus stimulate venture capital improvements in Europe. In conclusion, the relationship between venture capital and innovation is not as simple as we thought, since innovation are not only a consequence of venture capital but also likely be a cause. This results also show that European countries generally suffer from lack of innovative ideas or entrepreneurships rather than lack of funds to finance new ideas.

Table 2 GMM Estimation and Causality Test

Independent Variables	Dependent Variables	
	ΔPA	ΔVC
ΔPA_{it-1}	2,106 (0,00)*	0,913 (0,00)*
ΔPA_{it-2}	1,178 (0,00)*	0,389 (0,01)*
ΔVC_{it-1}	0,171 (0,34)	3,767 (0,00)*
ΔVC_{it-2}	0,083 (0,47)	2,125 (0,01)*
Wald χ^2	28.79 (0.02)**	54.11 (0.00)*
AR (1)	-2.34 (0.00)*	-3.14 (0.00) *
AR(2)	-0.64 (0.21)	-0.29 (0.39)
Sargan Test	23.73 (0.467)	21.56 (0.389)
Wald Causality Test	1.04 (0,43) ($H_0 = \lambda_{t-1} = \lambda_{t-2} = 0$)	10,85 (0,00)* ($H_0 = \delta_{t-1} = \delta_{t-2} = 0$)

Note: P-values in parenthesis and (*), (**), indicate significance at the 1 and 5 per cent levels, respectively.

4 Conclusions

In order to generate an innovative idea and utilize it as a commercially viable entity, there needs fund enough to finance all of this process. Given the fact that innovative activities are very risky to get the positive results in the end, the money is very scarce in the financial markets to finance this kind of economic activities. This shows why the venture capital is so important as a financial method providing fund for developments of new economies depending on technological progress. Accordingly, "Venture Capital-first Hypothesis" argues that there is strong causality from venture capital to innovation. We examined empirically the impact of the venture capital on innovation in Europe by using dynamic panel data analysis for the period 2000-2013. Empirical results of study provide evidence in favour of "Innovation-first Hypothesis" that the causality runs from

innovation to venture capital rather than generally accepted form of causality argued by "Venture Capital-first Hypothesis".

This result arising from European experience showed that the relationship between venture capital and innovation is not as simple as generally accepted form of causality argued by Venture Capital-first Hypothesis. Instead of this, in the framework of Innovation-first Hypothesis, the causality may run from innovation to venture capital. From the perspectives of public policy aiming to increase innovation, as Popov and Roosenboom (2012) recommended, our results also indicated that "policymakers in Europe to be careful not to see venture capital as a panacea to spur innovation". In other words, improving venture capital sector will not be the most significant precondition for the successful development of national innovation systems. It seems that European countries generally suffer from lack of innovative ideas or entrepreneurs rather than lack of well-functioning venture capital sector to finance new ideas. Thus, the absence of innovative idea should be big issue rather than the lack of available funds for policy-makers aiming to make more financial resources available for innovation in Europe.

References

- Arellano, M., Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *The Review of Economic Studies*, vol. 58 (2), pp. 277-297.
- Croce, A., Marti, J., Murtinu, S. (2013). The Impact of Venture Capital on the Productivity Growth of European Entrepreneurial Firms: Screening or Value Added Effect. *Journal of Business Venturing*, vol. 28, pp. 489-510.
- Bertoni, F., Tykvova, T. (2015). Does governmental venture capital spur invention and innovation? Evidence from young European biotech companies. *Research Policy*, vol. 44, pp. 925-935.
- Dushnitsky G., Lenox J., M. (2005). When do incumbents learn from entrepreneurial ventures? Corporate venture capital and investing firm innovation rates. *Research Policy*, vol. 34 (5), pp. 615-639.
- Dushnitsky G., Lenox J., M. (2006). When does corporate venture capital investment create firm value? *Journal of Business Venturing*, vol. 21 (6), pp. 753-772.
- Faria, P., A., Barbosa, N., (2014) Does Venture Capital Really Foster Innovation? *Economics Letters*, vol. 122, pp. 129-131.
- Geronikolaou, G., Papachristou, G. (2012). Venture Capital and Innovation in Europe, *Modern Economy*, 3, 454-459.
- Gompers P., Lerner J. (2001). The Venture Capital Revolution. *The Journal of Economic Perspectives*, vol. 15 (2), pp. 145-168.
- Guo, D., Jiang K. (2013). Venture Capital Investment and the Performance of Entrepreneurial Firms: Evidence from China. *Journal of Corporate Finance*, vol. 22, pp. 375-395.
- Hellmann, T., Puri, M. (2000). The interaction between product market and financing strategy: The role of venture capital. *Review of Financial Studies*, vol. 13, pp. 959-984.
- Hirukawa, M., Ueda, M. (2011). Venture Capital and Innovation: Which is First? *Pacific Economic Review*, vol. 16 (4), pp. 421-465.
- Holtz-Eakin, D., Newey, W., Rosen, H. (1988). Estimating Vector Autoregressions with Panel Data. *Econometrica*, vol. 56 (6), pp. 1371-1395.
- Kenney, M. (2011). How venture capital became a component of the US National System of Innovation. *Industrial and Corporate Change*, vol. 20 (6), pp. 1677-1723.
- Metric, A., Yasuda, A. (2011). *Venture Capital & the Finance Innovation*. Second Edition, John Wiley & Sons, Inc. United States.

OECD (1996). *Venture Capital and Innovation*, OECD/GD(96)168, Paris.

Peneder, M. (2010) The Impact of Venture Capital on Innovation Behavior and Firm Growth. *Venture Capital*, vol. 12 (2), pp. 83-107.

Popov, A., Roosenboom, P. (2012). Venture Capital and Patented Innovation: Evidence from Europe, *Economic Policy*, July, pp. 447-482.

Romain, A., Pottelsberghe, B. (2004) The Economic Impact of Venture Capital. *Discussion Paper Series: Studies of the Economic Research Centre*, 18, Deutsche Bundesbank.

Tang, M-C., Chyi, Y-L. (2008). Legal Environments, Venture Capital and Total Factor Productivity Growth of Taiwanese Industry, *Contemporary Economic Policy*, vol. 26 (3), pp. 468-481.

Ueda, M. (2010). Venture Capital and Innovation, in Douglas Cumming (Eds), John Wiley&Sons, Inc. New Jersey, pp. 299-314.

Preventing Crises in the Banking Sector and the Role of Internal Audit in Corporate Governance

Mária Klimiková¹, Martina Muchová²

¹ University of Economics in Bratislava
The Faculty of National Economy, Department Banking and International Finance
Dolnozemska cesta 1, 852 35 Bratislava, Slovakia
E-mail: klimikova@centrum.sk

² University of Economics in Bratislava
The Faculty of National Economy, Department Banking and International Finance
Dolnozemska cesta 1, 852 35 Bratislava, Slovakia
E-mail: flymatus@gmail.com

Abstract: *Analysis of the causes of the financial crisis led to define different views and to seek factors triggering the crisis. The financial crisis has revealed that there has been no effective system of governance of financial institutions in crisis, and that there are very few measures that should be adopted by banks in the event of a banking crisis. At the same time, the fall of a number of major financial institutions turned his attention to the Corporate Governance. The attention of the professional public has focused on revising of the Corporate Governance's role and thereby increasing the role of Internal Audit in the Corporate Governance. This paper focuses on implementation of the Corporate Governance in financial institutions as well as on impact of the updated rules of Corporate Governance and the role of Internal Audit in Corporate Governance.*

Keywords: corporate governance, internal audit, financial crisis, management, financial sector

JEL codes: G01, G10, G018, G21, M42

1 Introduction

The way of doing business has changed unrecognizable since the time when the first corporations were created. It has changed substantially even during the last 20 years. The recent financial crisis has led to a loss of trust in corporate governance and in particular on remuneration practices and the propensity for these to create excessive risk-taking, particularly in the financial sector.

System of corporate governance was in its beginnings focused only on maximizing of a profit without taking into account the maintaining of such evolution. The necessity for improvement of management of the company has led to the emergence of different platforms, which have defined new principles for the definition of the relationships between share-holders, management and other participants (employees, clients, others).

Principles of corporate governance firstly appeared in 1992 in the Great Britain, therefore, in the environment of an advanced market economy. Later on, in 1999, the OECD issued a set of corporate governance standards and guidelines to assist governments in their efforts to evaluate and improve the legal, institutional and regulatory framework for corporate governance in their countries.

The importance of the professional background for efficient requirement of knowledge, assessment and implementation of principle of corporate governance into practice was emphasized by constituting of company with name Central European Corporate Governance Association (CECGA).

After updating of Corporate Governance OECD Principles in 2004, CECGA released the Corporate Governance Code for Slovakia to regulate internal company relations and environmental matters, based on the principles of openness, integrity and accountability.

The focus of this paper is the challenge to analyze the development of corporate governance in the scientific literature, in research and in economy practice. The question

of interest is to how internal audit contributes to the better corporate governance of bank and to the whole financial system. The question of internal audit's quality therefore extends also on the providing of assurance and on the practical application of "Three lines of Defense Model" due to prevention of crises in banking sector.

2 Methodology and Data

The paper will deal with the corporate governance as well as with the internal audit in bank and his role in corporate governance. The methods of description, analysis, synthesis and deduction will be applied. The conclusion will include the current problems and trends in the field of corporate governance, especially in the area of internal audit with describing of the new tools to be used.

3 Results and Discussion

It is also necessary to identify the main knowledge of corporate governance in the literature. During the last decade, new approaches of the corporate governance, totally confirmed the board's responsibility for ensuring the effectiveness of their organization's internal control framework. These theories stressed the key role that internal audit can play in supporting the board in ensuring adequate oversight of internal controls and in doing so form an integral part of an organization's corporate governance framework. The key role of internal audit is to assist the board and/or its audit committee in discharging its governance responsibilities.

Theoretical background of Corporate Governance

The essence of the whole issue of corporate governance lies in the separation of ownership and executive decision-making in a public company (Keasey K. et al., 1997). This creates space for the management of the public company, which, in its decision-making, and due to information asymmetry and divergent interests, may refrain from the ideals of profit maximization and cost minimization in the public company, and resort to various redistribution strategies (Klimiková and Muchová, 2013).

According to the definition "*corporate governance includes a group of relations between the company's management, its board of directors, shareholders and other stakeholders*"(OECD, 2015). Corporate governance also establishes the structure by means of which the company goals are set and the means to achieve them are determined. Corporate governance should establish appropriate incentives to the board and management for promoting the goals which are in the interests of the company and shareholders, and should facilitate effective supervision or inspection, and thus facilitate more efficient use of resources on the part of the bank"(Klimiková et al., 2012).

The concept of corporate governance was defined by several authors:

Sir A. Cadbury defined the report of the company as "a system of governance and control" (Cadbury, 1992).

The authors Keasey, Thompson and Wright are of the opinion that "from a closer perspective, the message can be the company understood as the formal system of accountability of senior management in relation to the shareholders (Keasey et al., 1997).

The authors Cochran and Wattrick define the message of the company as "the relationship between shareholders, administrative bodies, top management and other financially interested parties, the lenders, the banks and other entities" (Cochran and Wattrick, 1998).

B. I. Tricker defines corporate governance as the branched-chain relations of critical stakeholders (Tricker, 1993).

F. Okruhlica stated the most appropriate characteristics as the approach to the definition of B. I. Tricker - it is the issue of "property relations and systems, such owners exercise their rights of ownership and control towards the management area of the company.

At the same time, corporate governance includes processes, structures and relationships through which authority oversees the activities of its executive's workers (Okruhlica, 2013).

Corporate governance is a means for the promotion of economic efficiency, sustainable growth and financial stability. In 1999, the OECD published corporate governance codex, which is created on the principles of openness, accountability and honesty. It has to avoid non-ethical behavior, the submission of false financial statements, not taking responsibility of the board of directors and the supervisory board for their actions. This is in the interest of the company that is adhering to the principles of corporate governance easier it gets to credit and attract investors. In 2002, the OECD issued a document intended for public's comment with the aim of safe and healthy management of the company. This effort should also contribute to the development of a culture of values, professional and ethical behavior on which well-functioning markets depend, see Figure 1.

Figure 1 Risk Culture Framework



Source: <https://www.theirm.org/knowledge-and-resources/thought-leadership/risk-culture.aspx>

The Principles have been adopted as one of the Financial Stability Board's key standards for sound financial systems, and have been used by the World Bank Group in more than 60 country reviews worldwide. They also serve as the basis for the guidelines on corporate governance of banks issued by the Basel Committee on Banking Supervision. The Corporate Governance Principles were drawn up in 1998 by representatives of the central banks affiliated with BIS and were previously revised in 2006 and 2010. After a public consultation procedure (October 2014 - January 2015), the third revision was published on 8 July 2015. The revised Corporate Governance Principles are part of a broader trend towards an increased focus on the governance of financial institutions. This is one of the pillars of CRR/CRD IV, the European project which as at 1 January 2014 raised the Basel III agreements to the level of legislation.

Compliance with the principles of corporate governance is one of the factors which increases the confidence of the investors against the management and contribute to the protection and development of their investments. Corporate governance reflects an acceptable framework of the business of the bank and destines by and the focus and procedures of control mechanisms, especially internal audit.

The Role of Internal Audit in Corporate Governance

Internal audit as part of the control mechanism in the bank currently understands comprehensively, with an emphasis on advice and consultation. A more differentiated approach to areas with a different severity of risk. Over the years internal audit in

banking has migrated from inspection towards adding value and helping organization to develop a better culture.

The essence of internal audit is given in its definition, which is adopted by internal auditors in the year 1999, where it is defined: *"independent, objective, assurance and consulting services aimed to add value and improve processes within an organization. Internal audit helps the organization to accomplish its aims by bringing a systematic disciplined approach to the system of risk assessment and management, internal management and control system of the organization and corporate governance"* (Kašparovská, 2006).

Internal audit has a role in assessing and critiquing management's preparedness to be able to react to any changes. Internal audit should be looking at how well-positioned management is to identify that a currency movement or commodity price drop has occurred and the impact of that on the business, but also how to respond to that. For internal audit, it is crucial to assess management's assumptions, especially when they form the basis for strategic planning and investment decisions. This means critiquing whether those assumptions are reasonable, how they are validated and how often they are updated to reassess investments and strategy. Reviewing payroll and accounts payable is one thing, but challenging the board about the planning assumptions in its strategic process is a bit close to home for some senior directors. It is in adding value by assuring the organization's or bank's global strategy as well as its controls and governance where internal audit can really prove its worth.

Internal audit and assurance

The value of internal auditing can be described by these three very important words: assurance, insight and objectivity. Management and governing bodies can look to their internal auditors to provide assurance on whether policies are being followed, controls are effective, and the organization is operating as management intends. Internal auditors have unique insight on which risks might lead to disaster; how to improve controls, processes, procedures, performance, and risk management; and ways to reduce costs, enhance revenues, and increase profits. Internal auditors view the organization with the strictest sense of objectivity that separates them from - but makes them integral to - the business.

Internal audit is a key source of independent assurance. The regulators exerted great influence in the development of the IIA's code for effective internal audit in financial services (July 2013). For the code to be implemented effectively, we need to appreciate the assurance network, so that stakeholders work collaboratively across all lines of defense and optimize collective risk intelligence. The code reinforces the link between risk management and risk assurance, and requires a more conscious approach to seeking and providing assurance across the risk spectrum. This link is consistent with the drive in corporate governance to align risk management and assurance across boundaries, and these expectations are found in the emerging practices of integrated assurance. Whether these help to minimize gaps and duplication in assurance plans or facilitate discussions about risks and the control environment, integrated assurance is encouraging a more conscious approach - and internal auditors have an opportunity to be the guiding light (Muchová and Klimiková, 2016).

Three Lines of Defence Model

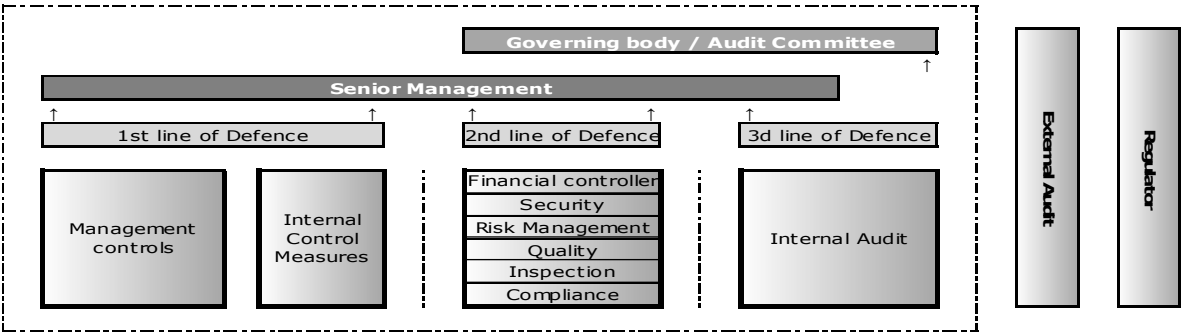
A framework with which the board can understand the role of internal audit in the overall risk management and internal control process of an organization provides a model called "Three Lines of Defence Model", see Figure 2. To ensure the effectiveness of an organization's risk management framework, the board and senior management need to be able to rely on adequate line functions - including monitoring and assurance functions - within the organization. In order to conceptualize these line functions, the ECIIA endorse the use of the "Three lines of Defence" model. It is already widely adopted within the financial industry, but can also be productively utilized in a wide range of sectors.

The "Three Lines of Defence Model" structure is a conceptual delineation of an organization's internal control levels:

- first line of defense for risks - is the line of business unit;
- second level monitoring controls - is independent risk management (compliance, operations risk, etc.);
- third line independent assurance - is the independent audit function.

The Three Lines of Defence Model is a strategy much beloved by banks as a risk management filter. The "Three Lines of Defence" model for risk management has been accepted as a best practice by regulators and the Basel Committee on Banking Supervision (Risk Culture, 2016). Therefore, it is now "non-optional" for compliance risk management programs in regulated financial institutions. Each line of defence has a monitoring and/or testing responsibility. This is the area where there is often a great deal of overlap and not as much coordination as would be optimal (ValueWalk, 2015).

Figure 2 Three Lines of Defense Model



Source: <http://riskoversightsolutions.com/wp-content/uploads/2011/03/Risk-Overight-Solutions-for-comment-Three-Lines-of-Defense-vs-Five-Lines-of-Assurance-Draft-Nov-2015.pdf>

It also provides a framework with which the board can understand the role of internal audit in the overall risk management and internal control process of an organization. The revised Principles assign a central role to the "Three lines of Defense" model. This is not surprising because it has been the leading model used by supervisors around the world for some time, as the Basel Committee concluded in its 2011 publication "Principles of the Sound Management of Operational Risk". In connection with the revision of these Principles an extensive compliance investigation was carried out in 2014 into the degree of compliance with the "Three lines of Defense" model.

The first line of defence owns regulatory quality control of its products, services, and operations. It should have built-in procedures in all of its processes that ensure that regulatory requirements are followed for all of its product lines. The first line should consult with the second - and they should then reach agreement in the interpretation and implementation of all regulations. Disclosures must be provided, deadlines must be met.

Compliance, as *the second line*, has the responsibility to monitor and test periodically for every regulation to determine the level of compliance. Compliance testing is conducted on a risk-based priority schedule, because everything cannot be tested every year without a huge staff. The second line is responsible not only to the bank's board but to the regulatory agencies for compliance risk oversight. The second line is there to provide a check on the advice of the first line.

Finally, the independent audit *as the third line* should have an audit schedule that also tests the level of compliance within the business units as well as the compliance program within the first and second lines.

Each line of defence should be independent of the other. So, while the quality control function of the business line should be a daily process, the testing that Compliance and Audit do should be risk-based and conducted on a schedule so that the widest scope is

covered in a reasonable time period. Coordinating these three approaches can do a lot to make the overall compliance performance of the institution comprehensive and efficient. One issue that has surfaced is that the three lines have had difficulty coordinating the required responsibilities without overlapping each other and being inefficient (Muchová and Klimiková, 2016).

3 Results and Discussion

The worldwide trend clearly shows the increasing demands in corporate governance, risk management, internal control, ethics and compliance. Companies are trying to be more global, and therefore need to manage the processes of corporate governance better, without which it is impossible to compete in global markets. National regulators and supranational institutions promote greater transparency and compliance with best practice of corporate governance. The main emphasis is on the establishment of a fully independent audit committee, reliable risk management and effective internal audit.

The role of internal audit in the staff training is also important. A rapidly developing area of internal audit is ethics and compliance. For this area, it will be necessary to adapt the methods and procedures so that is possible to detect and limit the potential threats arising from the failure of ethical behavior at work and in business meetings.

The trends in development of corporate governance are: management of social and psychological aspects of behavior of members of the board, and inclusion of soft criteria in the nomination process, leadership based on shared values as the key to building an authentic cooperation and internal cohesion, systematic objective analysis of drivers, outcomes of work behavior throughout the entire company, including members of the governing board.

In internal audit, the first such trend is the expanding role of internal audit and a greater scope of audits. Today, the role of internal audit expanded, particularly in:

- risk assessment and management,
- process optimization and design of cost reduction,
- regulatory compliance,
- cooperation in managing changes which lead to enhancement of the performance of organizations
- evaluation of established instruments for preventing and detecting fraud.

A key trend is also continuing evaluation of performance and quality, or evaluation of the effectiveness and efficiency of key processes and functions.

Another key point is to create an organizational structure conducive to greater accountability, transparency and better cooperation. The aim is to create such organizational structures that facilitate cooperation and promote the flow of information between the auditors and the audited.

The final key trend is the shift towards the audit based on assessment of risk management. Assessment of risk management is becoming a priority because risks have a greater and faster impact on the company than before. Furthermore, the internal auditors are expected to assure that a comprehensively performed risk assessment served as a basis for planning and implementation of the key activities of the organization (Klimiková et al., 2012).

4 Conclusions

The recent financial crisis has been a particularly severe wake-up call, because it has adversely affected employment, consumer spending, pensions, the finances of national and local governments worldwide, and the global economy. Weaknesses in corporate governance structures within companies and banks were cited as reasons for excessive risk taking, skewed incentive compensation for senior managers, and the predominance of a board culture that values short-term gains over sustained, long-term performance.

However, these crises are manifestations of several structural reasons why corporate governance has become more important for economic development and a more significant policy issue in many countries. More generally, poor corporate governance can affect the functioning of a country's financial markets and the volume of cross border financing.

Our main finding can be summarized as follows:

A number of recent cases where the governance system has failed have triggered an intensive search for rules, methods, processes and institutions that could prevent similar failures from occurring in the future. A successful corporate governance system should successfully channel aspirations of experts in these different fields within the organization to the benefit of the organization as a whole. Good corporate governance is not just about an impressive architectural edifice of rules or a facade of institutional framework. The critical elements are processes and outcomes.

We can conclude that the internal audit represents an important management tool which assists and supports management in order to identify and manage the risks bringing extra value for company activities. From our perspective the future of internal audit is to move entirely to risk-based audit to enhance shareholder value, assess the business improvement opportunities and even the earnings per share in the areas which they are auditing – and indeed to encourage and develop awareness of the role of the audit function across the entirety of the business.

Acknowledgments

This paper is the output of a scientific project VEGA 1/0124/14 "The Role of Financial Institutions and Capital Market on the Solution of Debt Crisis".

References

- BIS (2010). Basel Committee on Banking Supervision, *Principles for enhancing corporate governance* (October 2010 – revised July 2015). Retrieved from: www.bis.org/publ/bcbs176.pdf, A revised version of this document was published in October 2014: <http://www.bis.org/publ/bcbs294.htm>.
- BIS (2015). Basel Committee on Banking Supervision, *Guidelines: Corporate governance principles for banks* (July 2015). Retrieved from: <http://www.bis.org/bcbs/publ/d328.pdf>.
- Cadbury, A. (1992). *The Financial Aspects of Corporate Governance: Report of the Committee on the Financial Aspects of Corporate Governance*. Gee Publishing, London. Retrieved from: <http://www.ecgi.org/codes/documents/cadbury.pdf>.
- Cochran, P. L., Wartick, S. L. & Financial Executives Research Foundation, (1988). *Corporate Governance: A review of the literature*, New York, Morristown.
- Kašparovská, V. (2006). *Řízení obchodních bank: vybrané kapitoly. 1st ed.*, Praha: C. H. Beck.
- Keasey, K., Thompson, S., Wright (1997). *Corporate Governance: Economic and Financial Issues*. Oxford University Press.
- Klimiková, M., Schwarzová, M., Vovk, M., Tašková, J., Sabolová, A. (2012). *Bankový manažment a marketing I*. Bratislava: IRIS, pp. 314-334.
- Klimiková, M., Muchová, M. (2013). *Nové výzvy interného auditu v corporate governance*. In: *Aktuálne otázky finančných trhov: rec. zborník vedeckých statí* (el. source). Bratislava: Fin Star, pp. 1-9.
- Klimiková, M., Muchová, M. (2016). *Assurance – a vital tool of guiding the internal audit*. In conference: *Evropsky fiskální dialog*, NEWTON College, a.s.

Klimiková, M., Muchová, M. (2016). *Building of values from the view of corporate governance* In: *15th International Conference of Doctoral Students and Young Scholars Economic, Political and Legal Issues of International Relations 2016*.

OECD (2015). *G20/OECD Principles of Corporate Governance*. Retrieved from: <http://www.oecd.org/corporate/oecdprinciplesofcorporategovernance.htm>.

Okruhlica, F. (2013). *Vlastnícke práva spoločnosti (Corporate Governance)*. Bratislava: Iura Edition, vol. 336, pp. 19 - 22.

Drawing a line under the 3 lines of Defence in Banking (2014). Retrieved from: <https://www.theirm.org/media-centre/published-articles/drawing-a-line-under-the-3-lines-of-defence-in-banking/>.

Risk Culture (2016). Institute of Risk Management. Retrieved from: <https://www.theirm.org/knowledge-and-resources/thought-leadership/risk-culture.aspx>.

Three Lines of Defense vs Five Lines of Assurance (2015). Retrieved from: <http://riskoversightsolutions.com/wp-content/uploads/2011/03/Risk-Oversight-Solutions-for-comment-Three-Lines-of-Defense-vs-Five-Lines-of-Assurance-Draft-Nov-2015.pdf>.

Tricker, B. I. (1995). *International Corporate Governance*. Text, Reading and Cases. Singapore: Prentice Hall College Div.

ValueWalk (2015). *Bank's Risk Governance Framework Needs Three Lines Of Defense: BIS*. Retrieved from: <http://www.valuwalk.com/2015/07/banks-risk-governance-framework-needs-three-lines-of-defense-bis/>.

Mobile Technology on the Retail Banking Market

Monika Klimontowicz¹, Karolina Derwisz²

¹ University of Economics in Katowice
Faculty of Finance and Insurance, Department of Banking and Financial Markets
ul. 1 Maja 50, 40-287 Katowice, Poland
E-mail: monika.klimontowicz@ue.katowice.pl

² University of Economics in Katowice
Faculty of Finance and Insurance, Department of Banking and Financial Markets
ul. 1 Maja 50, 40-287 Katowice, Poland
E-mail: kderwicz@gmail.com

Abstract: *For the last few decades, the retail banking market has been influenced by many economic, political, legal, technological and social factors. Mobile technology has changed both the information and communication sharing, and customers' market behaviour. The social revolution has already happened and changed customers' expectations concerning banking services. Today there are 2,6 billion smartphone subscriptions globally. It is estimated that by 2020 the number of smartphone users will reach 6,1 billion. Mobile phones have increasingly become tools that consumers use for banking, payments, budgeting and shopping. Today they enable using a different kind of financial applications offered not only by banks but also by other providers as telecoms or FinTech enterprises. The increasing number of offerings makes the choice much more difficult for customers. The purpose of the paper is to present global and regional trends relating to mobile technology application on the retail banking market, customers' expectations and selected factors influencing the adoption of this technology. The paper includes desk research of existing data. The authors try to answer the question if the implementation of mobile technology on retail banking market means the future of retail banking or just new distribution channel.*

Keywords: *mobile banking, mobile service suppliers, banking market, consumer expectations, mobile technology adoption*

JEL codes: *G21, G23, E42, F65, D84*

1 Introduction

Under the influence of economic, political, legal, technological and social factors the world's economies have evolved from the industrial economy into the network economy. The network economy is based on information technology, connectivity, and human knowledge. The ease of information sharing and networking have changed the process of goods and services' creation and trade. Electronic commerce and electronic services have become one of the fastest developing fields of economy. Concurrently new category of finance called electronic finance has been created and implemented.

As a result, the economic transactions between countries and their citizens have substantially risen, and financial transactions have grown remarkably. Today's economy is subordinated to money circulation. Money has become the condition and the basis of goods' creation, gathering, division and exchange. Both, the economic and social sphere, rely on the access to cash and cash equivalents. The finance is increasingly embedded in contemporary social, political and economic life and play a crucial role in the domestic and international economies (Epstein, 2005; Montgomerie, 2008; Freeman, 2010; Dolphin, 2012).

The development of digital transactions has caused changes in the way of life, consumer behaviour on the markets and companies' business models. All these processes are strengthened by increasing usage of mobile technology. The purpose of the paper is to present the overview of the global and regional trends relating to mobile technology application on the retail banking market.

2 Methodology and Data

The paper methodology applied includes analysing data gathered by desk research. It starts with the overview of mobile technology application on retail banking market. The data analysis shows the mobile technology usage in different regions and countries with the special focus on banking and changes of customers' needs and expectations. The next section characterises the market structure and presents the variety of contemporary financial services providers. The last section discusses current trends and tries to answer the question if the implementation of mobile technology on retail banking market means the future of retail banking or just new distribution channel.

3 Results and Discussion

Mobile technology application on retail banking market

The retail banking is usually defined as a banking that provides services for individual consumers (Harasim, 2005; Klimontowicz, 2013). Retail banks usually offer personal accounts, savings accounts, consumer loans, mortgages and payment services including credit transfers, debit transfers, and payment cards. The term is used to distinguish this banking from investment banking, commercial banking, and wholesale banking.

Since the 1990s retail banking market has changed remarkably all over the world. Many external factors have influenced retail banks and customers' market behaviour (see Figure 1). As a result of last economic crisis, the number of new acts, directive, and supervisory recommendations has significantly increased. For many authors, the regulatory pressure is the most important factor influencing not only the retail banking market but the whole economy (Marcinkowska et al., 2014; Kasiewicz and Kurkliński, 2012; Kalicki, 2012). For others, the most important are those that influence banks' ability to create sustainable competitive advantage. Creating, delivering and capturing value for customers is mostly influenced by social and technological factors (Sullivan, 2008; Świtalski, 2005, Ernst & Young, 2016).

Figure 1 External Factors Influencing Retail Banking Market

Economic factors	Political factors	Social factors	Technological factors	Legal factors
<ul style="list-style-type: none"> <input type="checkbox"/> economic development <input type="checkbox"/> changes in economy <input type="checkbox"/> market price fluctuations <input type="checkbox"/> periods of growth and decline (bull and bear market) 	<ul style="list-style-type: none"> <input type="checkbox"/> monetary policy <input type="checkbox"/> fiscal policy 	<ul style="list-style-type: none"> <input type="checkbox"/> demographic changes <input type="checkbox"/> customer needs and expectations' changes <input type="checkbox"/> changes in the life style 	<ul style="list-style-type: none"> <input type="checkbox"/> communication technologies' development <input type="checkbox"/> mobile technologies' development <input type="checkbox"/> changes in technological support models 	<ul style="list-style-type: none"> <input type="checkbox"/> acts <input type="checkbox"/> resolutions <input type="checkbox"/> directive

Source: Klimontowicz, M. (2016), Knowledge as a Foundation of Resilience on Polish Banking Market. *The Electronic Journal of Knowledge Management*, vol. 14(1), pp. 60-74.

The development of telecommunication and information technology has impacted banking products and distribution channels. The history of electronic banking (e-banking, online banking, digital banking) started in the 1980s. The online banking referred to the use of a terminal, keyboard, and television or computer monitor to access one's bank account using a landline telephone (Sarreal, 2016). Today the e-banking means conducting a range of financial transactions through the financial institution's website. Contemporary electronic banking services include mobile internet banking technology. Mobile financial services are among the most promising mobile applications in the developing world. Mobile money could become a universal platform that transforms

entire economies, as it is adopted across commerce, health care, agriculture and other sectors (Donovan, 2012).

As a result, new kind of banking, called mobile banking (m-banking) has appeared. Mobile banking is a service provided by a bank or other financial institution that allows its customers to conduct a range of financial transactions remotely using a mobile device such as mobile phone or tablet and using software, usually called application (app), provided by the financial institution for the purpose.

The type of mobile technology used by retail banks determines the range of products available for customers (see Table 1).

Table 1 The Range of Banking Services Enabled by Technology

Technology	A range of banking services
SMS (Short Messaging Service)	<ul style="list-style-type: none"> · information about the balance on the bank account · information about last few operations · money transfers for accounts defined in bank's outlet or via internet access
WAP (Wireless Access Protocol)	<ul style="list-style-type: none"> · information about the balance on the bank account · money transfers · bank deposits
Lite Website	<ul style="list-style-type: none"> · information about the balance on the bank account · the operations' history browsing · money transfers · mobile phone prepaying · cards' activation · cards' cancelling
Mobile Applications based on JAVA, Android,	<ul style="list-style-type: none"> · information about the balance on the bank account · the operations' history browsing · money transfers · bank deposit · loans' repayment · credit cards' service · ATM and branches' location browser
NFC (Near Field Communication)	<ul style="list-style-type: none"> · POS payments · P2P payments
QR Codes	<ul style="list-style-type: none"> · online payments · POS payments · check sending · P2P payments
RWD (Responsive Web Design)	<ul style="list-style-type: none"> · information about the balance on the bank account · online payments · mobile phone prepaying · saving account · deposits · credit card repayment · taking out a loan · cards' order

Source: Own work based on Wolna, 2015; Zalewska-Bochenko, 2013, Swiecka, 2007; Ślęzak and Borowski, 2007; Janc and Kotliński, 2004

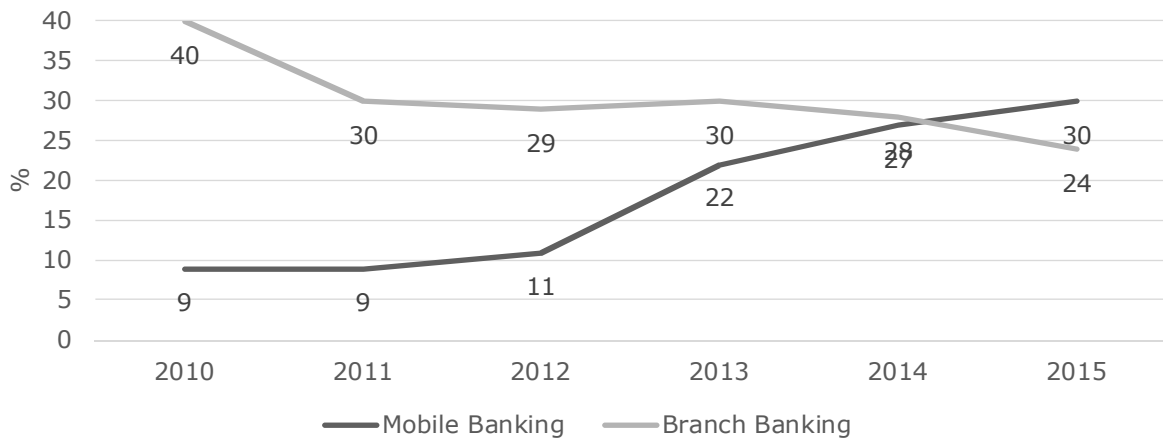
The analysis of banking services available by mobile banking shows that the contemporary technology enables offering the broad range of banking products and services and full access to banking products available via providers' websites. The technology potential is quite impressive, but it is only one of determinants of mobile banking market success. The further development of mobile banking depends on its ability to fulfil customer needs and expectations and customers willingness to use it.

Customers adoption of mobile banking

Mobile banking has become the most important touchpoint, with clients using banking applications an average of 30 times a month (Arnfield, 2016). It is estimated that in

2015 weekly mobile bankers exceed the number of weekly branch bankers for the first time (Van Dyke, 2015) – see Figure 2.

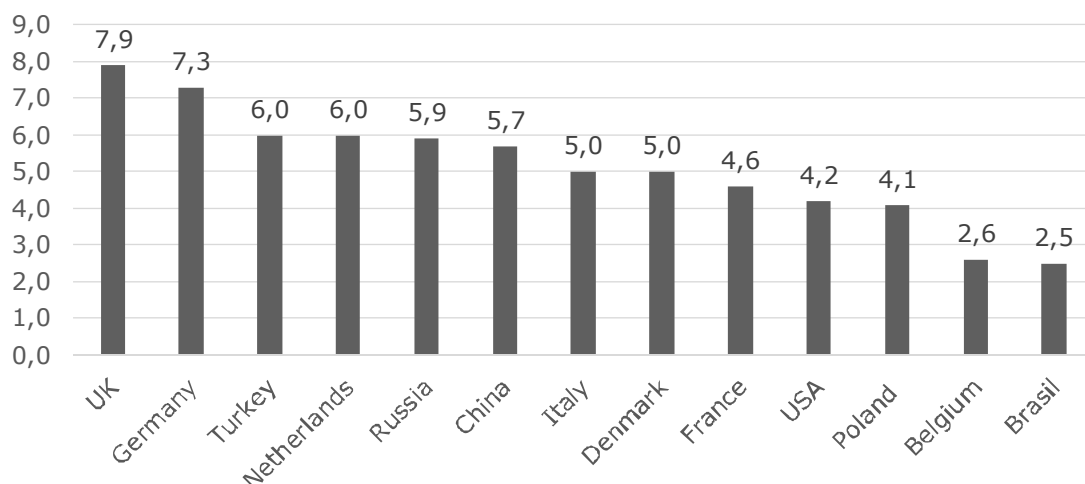
Figure 2 Mobile Bankers vs. Branch Bankers



Source: Van Dyke, 2015.

Mobile banking development is strictly correlated with m-commerce and should be considered as a part of customer value chain. The M-commerce share in e-commerce differs across countries (see Figure 3). Estimates suggest that it will be growing very fast in the nearest future. More than 20 percent of customers are already said to shop on mobiles (EBA, 2014). As the overall e-commerce market near doubles from a value of €755 billion in 2014 to an expected €1,460 billion in 2015, mobile payments will account for a significant share of that growth. Undoubtedly, it is correlated with increasing usage of smartphones. Today there are 2,6 billion smartphone subscriptions globally. It is forecasted that by 2020 the number of smartphone users will reach 6,1 billion. Mobile phones have increasingly become tools that consumers use for banking, payments, budgeting and shopping (Lunden, 2015). As a result one of the fastest growing mobile banking services is mobile payments. Their share in e-payments is still low, but their value and number are systematically increasing (Worldpay, 2014).

Figure 3 M-commerce as a Percentage of E-commerce by Selected Countries



Source: Worldpay, 2014.

The willingness of using mobile banking depends on customer needs and expectations. Thus, the generation is the next factor influencing mobile banking adoption (see Table 2).

Table 2 Characteristics of Financial Needs and Expectations across Generations

Generation	Characteristics
Generation X: born between 60's to 80's, aged 35-55	<ul style="list-style-type: none"> · prefer personal interactions and communication · used to ingrained status quo banking · some find their bank's existing mobile interface difficult to work with · display some willingness to adopt mobile banking but they lack the enthusiasm of next generations · security concerns concerning new technology · declare the openness to the idea of mobile banking
Generation Y: born between 80's to 90', aged 25-35	<ul style="list-style-type: none"> · commonly use communication via telephones and the internet · active on social networking sites · a half of them would switch banks to mobile payments capability from their primary bank
Generation Z: born after 1995, aged 21-25	<ul style="list-style-type: none"> · use mostly mobile devices as smartphones, tablets and laptops for communication · expect everything to be digital · expect seamless cross-channel customer service

Source: Own work based on ATM Marketplace, Crittercism, 2015, Arnfield, 2015, Rozzo, 2016

The representatives of Generation X still prefer in-person branch banking and face-to-face consulting service, but they are open to online and mobile banking. However, they will expect a high degree of personalization in their digital banking experience. The generation Y and Z adopt mobile banking easily. Especially, as a transaction-rich segment, Generation Z should be treated as crucial customer segments for mobile banking (Arnfield, 2015, Arnfield, 2016). Despite the generation, customers have a core set of requirements that are unlikely to change over the next few years. Among them are: simplicity, mobility, free or low costs, security, real-time immediacy, flexibility and choice, preferences specialization and refunds (EBA, 2014).

The rapid adoption of technology by consumers is changing their needs and the way they interact with banks (CFSA, 2015). Mobile channels will probably become the "first screen" through which customers interact with a bank. Banks will need to innovate to meet customers' expectations and compete with nonbank institutions. Entering the market by FinTech startups and other vendors creates more options for customers. Banks should offer mobile apps different from every other mobile banking apps so as to keep the customer engaged and provide them an experience similar to that of using the Amazon, Google or Apple apps (CFSA, 2015, Arnfield, 2016).

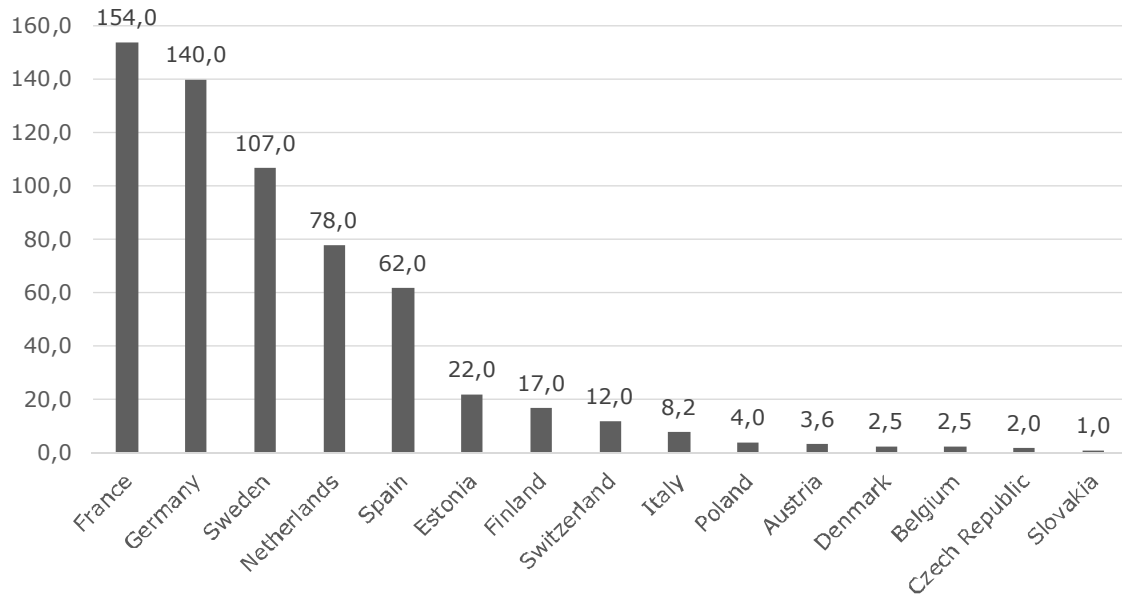
The characteristic of mobile banking market

The mobile banking is not just usage of mobile devices and technology. It needs a cash-in, cash-out infrastructure, usually accomplished through a network of cash merchants (or agents), who receive a small commission for turning cash into electronic value (and vice versa). Because the mobile money industry exists at the intersection of finance and telecommunications, it has a diverse set of stakeholders, with players from different fields in competition (Donovan, 2012). The mobile banking market's structure include traditional financial institutions as banks, mobile network operators, and new market players as payment card firms, FinTech companies, and other vendors.

Traditional financial institutions usually are quite conservative ones. Their size, organizational structure and culture, the necessity of fulfilling all legal regulations and recommendations and other features make the flexible reaction to fast changing customers' expectations difficult. As banks have been slow to respond these changes, some nonbanks players have grabbed the opportunity to meet rapidly evolving customer needs. The threat of new entrants is looming and expected to accelerate (CFSA, 2015). Nonbanks are targeting the most profitable retail banking market segments now such as payments, personal finance management, lending, investments and core banking. The state of European online alternative finance available is strong. In 2014 the total transaction volume was 2957 million euro. It means an impressive average year growth

of 146% comparing with 2013. The United Kingdom is an innovative leader in Europe and dominates the European market with some of the most advanced online platforms and instruments. Its transaction volume constitutes 79% of the European market. Among other markets the most developed are France, Germany and Sweden (Baek et al., 2014, Wardrop et al., 2015, Agnew, 2015) -see Figure 4.

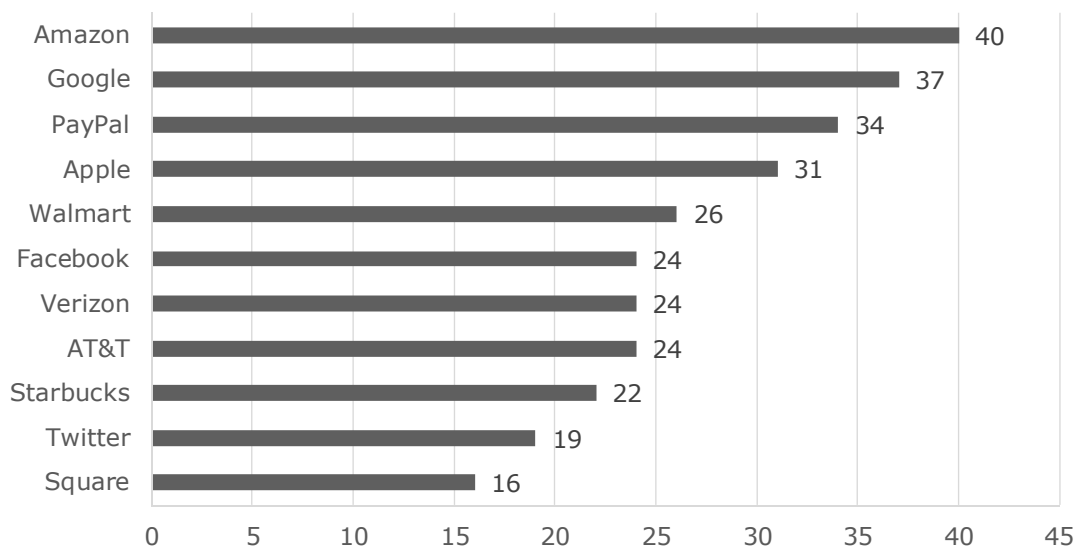
Figure 4 The Alternative Finance Transactions' Value in Selected Countries



Source: Own work based on Wardrop (2015).

New market entrants have already made banks to face a challenge to convince their customers that their products and service is still valuable for them. It causes the necessity to continue creating innovative offerings. It is especially important concerning new generations entering the market. According to Norcross' survey (2016), Millennials are open to using non-traditional organisations for banking services (see Figure 5). They are focused on their needs and choose the providers whose products meet them in the best way even if it means abandoning traditional suppliers.

Figure 5 The Millennials' Willingness to Use Non-traditional Financial Services Providers



Source: Norcross (2016).

The changes in mobile banking market structure and customer openness for changing banking service provider remain a challenge for retail banks. The solution might be the engagement with emerging FinTech companies and view them rather as potential partners than competitors (BNY Mellon, 2015).

4 Conclusions

Undoubtedly, the mobile technology development is one of the most significant drivers of change on retail banking market. It allows creating new distribution channels and new ways of transactions' acceptance. They follow changes in consumers' behaviour including demand for multichannel platforms.

As a result, traditional banking services' suppliers start to become just one of the possible option for customers. Today they have to compete with non-bank companies. Among customers' decision factors user-friendly smartphones' applications are crucial. They are changing the way customers utilise banking services. The mobile applications enable using the different kind of financial services and access to full range of product available by bank's website. They allow evolving customer expectations by using innovations concerning both, the products and process of serving them.

The attitude to mobile banking and mobile technology adoption differs across generations. Today, as Generation X is the most profitable customer segment banks can still focus on traditional distribution channel but electronic channels as a layer for them will not be enough in the nearest future. Banks need to prioritize and critically address the areas of digitalisation, simplification, agility, insights and data to enhance the ability to provide enriching customer experience.

Retail banking market growth opportunities and profit margin for banks are declining due to industry fragmentation. Nonbanks are targeting the most profitable retail banking market segments now such as payments, personal finance management, lending, investments and core banking. Some of them will surely become crucial market players and strong competitors for traditional financial institutions. Concerning the generation Z openness for switching financial services providers, it should be treated as a threat. Meeting all these challenges might require a co-opetition with the FinTech companies.

Trends presented in the paper show that mobile technology will probably be the future of banking. Its further development needs implementing innovations. Concurrently, banks' sustainable development require meeting these innovations with sufficient demand from customers. A host of supporting businesses, such as agents and liquidity management firms, are also necessary. Finally, all of this must happen in an environment with appropriate government regulations, as well as adequate safeguards for consumer protection.

References

- Agnew, H. *European market for online alternative finance surges*. Retrieved from: www.ft.com/cms/s/0/5c61bfca-baad-11e4-8447-00144feab7de.html#axzz3XPDpXY10.
- Arnfield, R. (2015). *The Customer's Journey: Transforming the Branch Network*. *ATM Marketplace*. Networld Media Group, pp. 2-7.
- Arnfield, R. (2016). *Transforming the bank customer experience for the digital revolution*. *ATM Marketplace*. Networld Media Group, pp. 3-9.
- Baek, P., Collins, L., Zhang, B. (2014). *Understanding Alternative Finance*. The UK Alternative Finance Industry Report 2014. Nesta, London 2014, pp. 21-22.
- BNY Mellon (2015). *Innovations in Payments: The Future is Fintech*. *The Bank of New York Mellon Corporation*, pp. 13-17.
- CFSA (2015). *Top 10 Trends in Banking in 2016*. Capgemini Financial Services Analysis, pp. 4-5.

- Dolphin, T. (2012). Don't bank on it. The financialisation of UK economy. *Report of Institute for Public Policy Research*. London.
- Donovan, K. (2012). Mobile Money for Financial Inclusion. In: *Maximizing Mobile. Information and Communication for Development*, pp. 61-74.
- EBA (2014). Opinion Paper on Next Generation Alternative Retail Payment (e-AP) User Requirements. Euro Banking Association, pp. 4-9.
- Epstein, G. (2005). Introduction: Financialization and the world economy. In: Epstein, G., ed., *Financialization and the world economy*. Cheltenham: Edward Elgar Publishing, pp. 3-16.
- Ernst & Young (2016). *Building the bank of 2030 and beyond The themes that will shape it*, pp. 21-32. Retrieved from: www.ey.com.
- Freeman, R. (2010). It's financialisation! *International Labour Review*, vol. 149(2), pp. 163-183.
- Harasim, J. (2004). *Strategie marketingowe w osiągnięciu przewagi konkurencyjnej w bankowości detalicznej (Marketing strategy in gaining competitive advantage in retail banking)*. Wydawnictwo Akademii Ekonomicznej w Katowicach, Katowice, pp. 22-24.
- Janc, A., Kotliński, G. (2004). *Nowe technologie we współczesnym banku*. Wydawnictwo Akademii Ekonomicznej w Poznaniu, Poznań, pp. 335.
- Kaisewicz, S., Kurkliński, L. (2012). *Szok regulacyjny a konkurencyjność i rozwój sektora bankowego*, Warszawski Instytut Bankowości, Warszawa.
- Kalicki, K. (2012). *Wpływ Bazylei III/CRD4 na sytuację sektora bankowego*. Retrieved from: www.alterum.pl/pdf/Dr_hab_Krzysztof_Kalicki.pdf.
- Klimontowicz, M. (2013). *Aktywa niematerialne jako źródło przewagi konkurencyjnej banku (Intangible assets as source of bank's competitive advantage)*. Wydawnictwo CeDeWu, Warszawa, pp. 137.
- Klimontowicz, M. (2016). Knowledge as a Foundation of Resilience on Polish Banking Market. *The Electronic Journal of Knowledge Management*, vol. 14(1), pp. 60-74.
- Lunden, I. (2015). *6.1B Smartphone Users Globally By 2020, Overtaking Basic Fixed Phone Subscribers*. Retrieved from: <http://techcrunch.com/2015/06/02/6-1b-smartphone-users-globally-by-2020-overtaking-basic-fixed-phone-subscriptions/>.
- Marcinkowska, M., Wdowiński, P., Flejterski, S., Bukowski, S., Zygierewicz, M. (2014). Wpływ regulacji sektora bankowego na wzrost gospodarczy – wnioski dla Polski, *Materiały i Studia NBP nr 305*. Warszawa, pp. 35-52.
- Montgomerie, J. (2008). Bridging the critical divide: global finance, financialisation and contemporary capitalism. *Contemporary Politics*, vol. 14(3), pp. 233-252.
- Norcross (2016). Millennials: Financial Insights. *Georgia-based Synergistics Research*.
- Rizzo, T. (2016). Extending the Mobile Enterprise. Building Effective & Profitable M-Commerce Apps. *Blue Hill Research and Aptelligent*, pp. 2-9.
- Sarreal, R. (2016). History of Online Banking: How Internet Banking Became Mainstream. Retrieved from: <http://www.gobankingrates.com/banking/history-online-banking/>.
- Ślązak, E., Borowski, K. (2007). Bankowość elektroniczna. In: Zaleska, M., ed., *Współczesna bankowość*. Difin, Warszawa, pp. 247-249.
- Sullivan, M. B. (2009). Post Crisis, Innovation Will Rule. *ABA Banking Journal*, pp. 30-32.
- Świecka, B. (2007). *Bankowość elektroniczna*. CeDeWu: Warszawa, pp.57-59.
- Świtalski, W. (2005). *Innowacje i konkurencyjność*. Wydawnictwo Uniwersytetu Warszawskiego, Warszawa, pp. 78-81.

Van Dyke, D. (2015). *Mobile Banking, Smartphone, and Tablet Forecast, Javelin Strategy & Research*. Retrieved from: www.javelinstrategy.com/node/22711#sthash.8dgLCQUX.dpuf.

Wardrop, R., Zhang, B., Rau, R., Gray, M. (2015). Moving Mainstream. *The European Alternative Finance Benchmarking Report*. University of Cambridge, London, pp. 15-16.

Wolna, J. (2015). Rozwój systemów płatności mobilnych w Polsce, *Studia ekonomiczne, Zeszyty naukowe 239 Uniwersytetu Ekonomicznego w Katowicach*. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice, pp. 169.

Worldpay (2014). *Your Global Guide to Alternative Payments*, London.

Zalewska-Bochenko, A. (2013). Bankowość telefoniczna i jej wpływ na bankowość elektroniczną. In: Pyka, I., Cichy, J., ed., *Innowacje w bankowości i finansach*. Studia ekonomiczne, Zeszyty Naukowe Wydziałowe 173. Wydawnictwo Uniwersytetu Ekonomicznego w Katowicach, Katowice, pp. 301.

The Role of Accounting Policy in Management of Polish Hospitals

Magdalena Kludacz-Alessandri

Warsaw University of Technology
The College of Economics and Social Sciences
Łukasiewicza 17, 09-400 Płock, Poland
E-mail: m.kludacz@pw.plock.pl

Abstract: *The Polish accounting Act is not able to create an ideal accounting model for all organizations which carry out diversified activities in various economic conditions. Therefore, managers have the right to choose their own legally accepted accounting principles, in order to present a true and fair view of their financial results in financial statements. However, the freedom to choose accounting principles may also lead to use such tools of accounting policy that have a direct impact on the manner of recognizing revenues and costs and allow the creation of financial performance and other elements of financial statements. The aim of the article is to describe the essence of the accounting policy and analyze the use of selected instruments of material accounting policies in management of Polish hospitals that have impact on financial results and other components included in financial statements. The article presents the results of an empirical survey conducted in selected Polish hospitals in the years 2012 - 2013. The respondents gave information regarding various instruments of accounting policy used in their hospitals and evaluated their use in creating financial performance. The study showed that accounting policy is not the essential tool in the management of the hospitals in Poland. From one point it is good because it means that accounting policy isn't the tool of any manipulative practices in hospitals. On the other hand the managers don't use their possibilities and rights to choose the accounting methods to achieve the most desirable financial results. They don't try to optimize the financial statements of their hospitals using the instruments of accounting policy which don't violate the balance sheet law.*

Keywords: accounting policy, hospitals, accounting rules, balance sheet policy

JEL codes: M41, M48, I18

1 Introduction

The Polish balance sheet law is not able to create an ideal accounting model for all entities which carry out diversified activities in different economic conditions. Therefore, management staff of each entity have the right to choose their own legally accepted accounting principles in order to present a reliable picture of their financial condition in financial statements. On the other hand they have to be careful, not to use this freedom to choose such accounting principles that lead to creating an unreliable image and presenting a false picture of the condition of entity (Stępień, 2012). Sometimes it happens that that accounting policy is the hub of many manipulative practices.

According to the Polish Accounting Act also hospitals have a free hand in choosing the method of valuating and accounting for assets and ongoing economic operations. Those methods are a constituent part of hospital's accounting policy. If a hospital is given a free hand to choose its accounting methods, it may adjust them in such a way as to achieve the most desirable financial results. Such individually chosen methods are considered correct if they operate within the boundaries set by the provisions of the law. According to the Polish Accounting Act the choice of valuation methods of assets and liabilities depend on their conformity with the balance sheet law, it means whether they are provided for in this Act.

According to IAS 1, accounting policy is defined as a set of rules and methods for estimating conventional values, and procedures regarding the presentation of financial statements (IAS1 -*Presentation Of Financial Statements*). The principles adopted by hospital as part of its accounting policy depend on the following factors:

- 1) objectives set by the entity's owner,
- 2) conformity with the current legal interpretation of the balance sheet law and the adopted standards of accounting (Michalczyk, 2012).

The accounting policy comprises general principles, methods and features of accounting designed for the organization of accounting and financial accountability of the economic entity. Main aspects of accounting policy are organizational aspects, technical aspects and methodical aspects (Adomaitienė, 2004).

The accounting policy is an important element of the entity, and its use is possible thanks to the fact that the legislation does not regulate all possible issues and allow to choose and use permitted by law various alternatives in accounting system. In this context, the accounting policy is often referred to as a balance sheet policy. There is no agreement among authors, whether these terms can be identified and used interchangeably.

In Polish accounting literature the terms "balance sheet policy" and "accounting policy" are commonly used. The problem is that various authors have various opinions regarding their meaning and their relations with each other. According to many opinions accounting policy and balance sheet policy represent the same meaning and scope (Grabowski, 2010). In other opinions balance sheet policy is only a part of accounting policy because it does not cover actions taken to achieve the objectives of the entity and its owners and it doesn't influence the recipients of financial statements. However the professional literature is dominated by the opinions that the two meanings can not represent the same issues because the accounting policy is a broader concept. For instance the issues of accounting policy include not only issues related to the creation process of reporting information, but also the technical elements of accounting, which does not affect the image of the financial statements (Kaczmarek, 2008).

The discussion over the differences between accounting policy and balance policy is also reflected in the geographical definitions. Accounting policy refers to the accounting systems of the Anglo-Saxon tradition, while balance sheet policy is more closely related to German accounting. However the two terms most often are seen as synonymous in everyday accounting practice

For the purposes of this study, it was assumed that the term of accounting policy will be understood not only as a set of rules, methods, solutions, principles and procedures of accounting adopted by the hospital in the framework of the law, but will also include all activities, arrangements and procedures related to the creation of financial information to achieve the objectives of the entity and its owners.

The article presents the part of results of an empirical study relating to the instruments of accounting policies used in Polish hospitals. The author conducted a survey regarding cost accounting used in hospitals (Kludacz, 2015). One part of this survey included the questions regarding accounting policy. The purpose of this part was to examine the extent to which Polish hospitals use instruments of accounting policy. The empirical study was used to verify the hypothesis that Polish hospitals do not apply any instruments of accounting policy, or apply them in a limited scope.

2 Methodology and Data

The study involved managers of hospitals who responded to questions regarding the use of selected instruments of material accounting policies in shaping the information content of financial statements for the purpose of achieving the objectives of the entity.

The survey was conducted in 2012-2013. In the survey group were mainly public hospitals, however, two questionnaires were sent back by two non-public hospitals. The request for participation in the study was addressed to 100 Polish hospitals from the ranking list "Safe Hospital", which are characterized by high quality of performed health services. The questionnaire was sent by e-mail together with a cover letter. The completed questionnaires were collected mainly by e-mail and via the website with electronic version of questionnaire. Replies were received from 30 Polish hospitals. The

research materials were interpreted and analysed using descriptive statistics. Most of the replies came from the directors, deputy directors or chief accountants.

The first part of the questionnaire regarded the characteristics of the hospital. Respondents answered the questions on the hospital status, the type of the founding body, the level of employment, the number of hospital beds and wards, education and experience of a hospital manager.

As previously mentioned, the hospitals that participated in this study were mainly public hospitals - their representatives has sent back 28 questionnaires. Most of respondents has represented provincial hospitals (about 53%), whose founding body is the marshal office or the provincial government. The remaining group consisted of the hospitals controlled by the counties and city councils. The non-public hospitals were conducted in the form of a civil partnership.

The largest share of surveyed hospitals (40%) is located in medium-sized towns with a population between 51,000 - 150,000. Other hospitals are located in the towns with a population:

under 50,000 - 27%,

between 151,000 -300, 0000 - 20%,

above 301,000 - 13%.

The majority of surveyed hospitals employed more than 50 physicians (28 units and half of them employed more than 151 physicians), more than 150 nurses (22 units, and 12 hospitals employed more than 300 nurses) and more than 50 non-medical employees (28 units and half of them employed 50-150 people). The two smallest hospitals taking part in the survey employed less than 50 doctors, nurses and non-medical staff.

All hospitals differed from each other mainly in terms of size. The largest group of surveyed hospitals were large units, with more than 19 wards (47%) and 500 beds (53%). The two smallest units involved in the study, had less than 100 beds and less than 6 wards.

Directors of most of the hospitals (67%) have an university degree in economics. On the other hand, 20% of hospitals is managed by directors of medical education. The average period of experience as director of the hospital was just over 11 years.

The degree of computerization of economical part of a hospital was well or very well assessed by all respondents and 87% of them gave the same assessment to the degree of computerization of medical part. On the other hand, the degree of software integration regarding the medical and administrative part of a hospital was not sufficient according to almost half of respondents. It is worth noting that the lack of integration of the administrative and medical software can generate problems with data access.

It can be concluded that the average hospital included in the survey is represented by large public hospital, that has over 500 beds, and over 19 wards, is located in medium-sized town and is managed by the director of economic education with considerable experience.

3 Results and Discussion

The aim of second part of the questionnaire was to analyze the use of selected instruments of accounting policies in Polish hospitals that have impact on financial results and other components included in financial statements. The aim of the instruments of accounting policy which follows also the definition of balance sheet policy is to achieve a certain level of information in the financial statement and obtain expected assessment of this information by the recipients of financial statement and other reports, as well as to induce them to perform the desired behavior. For instance the values presented in the expenses reports of hospital can be used in negotiations with a payer of health care

services (Cygańska, Gierusz, 2007). Such instruments typically involve operations affecting:

- 1) the financial result – maximising or minimising the reported financial performance,
- 2) the goodwill of a hospital– adjusting it to the strategic objectives in management process (Michalczyk, 2012),
- 3) financial liquidity and other financial ratios used in the assessment of the entity.

In the private entities they affect also the tax result. For instance the aim of accounting policies can be to maximize the financial result. In such situation the entity will select such instruments of accounting policies that concern the rules that lead to lower costs in the income statements (Gurau, 2014). The examples of instruments of accounting policy that aim to minimize costs are as follows:

choice of straight-line instead of degressive depreciation method to not increase the costs in the first period of asset use;

decisions regarding the expenses related to renew fixed assets; if they are above the limits of repair and maintenance costs, they will be recognized as a modernization costs and activated in fixed assets;

purchase of items which have an input value less than the limit established by legislation (3500 PLN in Poland.); in such case they won't be recognized as a component of fixed assets and they will be recognized as expenses;

choice of output costing inventory method first in - first out (FIFO), which can ensure lower costs; it is worth noting that material costs are one of very important indicators determining optimal solution for maximising profit (Walczak, 2014).

use of the right to create prepayments.

The basis for defining the instruments of the accounting policy is the right to choose between various accounting solutions. There are many instruments of accounting policy influencing on financial reports of hospitals that are used to achieve the objectives of entity. Most frequently they are divided into:

material instruments;

time instruments;

formal instruments (Weber, Kufel, 1993).

The second part of the questionnaire was designed to find out which instruments of material accounting policy are used by Polish hospitals and in which scope. Analysis was conducted in two areas, namely taking into account the distribution of instruments of material accounting policy on (Kamiński, 2001):

shifting the economic operations in time e.g. purchases of materials, goods, capital goods, services, or sale of services.

using the right to choose the method of valuation of assets and liabilities, revenues and expenses, gains and losses.

The first kind of instruments may include activities that shift business operations, such as the choice of the moment of the planned purchases of tangible fixed assets, goods and materials, postponement of projects entailing the current costs (e.g. external services), undertaking of the projects based on off-balance sheet financing (e.g. use of rented or leased assets). Most of these solutions can be economically justified (as they may, for instance, help to shifting in time the tax liabilities). The answers of respondents regarding the selected instruments of material accounting policies shifting the economic operations in time are presented in Table 1.

Table 1 Instruments of Accounting Policies Shifting the Economic Operations in Time

Instruments	The scale of assessment				
	1	2	3	4	5
shifting in time maintenance and repairs of fixed assets in relation to the balance sheet date	18	4	8	-	-
making modernization of fixed assets instead of maintenance and repairs	14	6	2	6	2
shifting in time the purchase of low-value items that are charged as expenses	12	6	6	4	2
shifting in time the sales of services in relation to the balance sheet date	17	8	4	-	1
shifting in time the procurement of materials and goods	12	5	9	2	2

* the scale of assessment: 1 (definitely not applicable) – 5 (definitely applicable)

Source: Own work

The results show that Polish hospitals do not use properly selected instruments of accounting policy shifting the economic operations in time. In most cases (according to 40 - 60% of respondents), the assessment of the use of these instruments to shape the information contained in the financial statements, in order to achieve specific objectives, was insufficient. The most popular are instruments postponing current costs to future periods, such as:

making modernization of fixed assets instead of maintenance and repairs - according to 27% of directors the use of this instrument is good or very good;

shifting in time the purchase of low-value items that are charged as expenses - according to 20% of directors the use of this instrument is good or very good.

The second kind of instruments may include activities that use the right to choose the methods of assessing individual items of the financial statements, such as assets and liabilities, revenues and expenses, gains and losses. Such possibility exists because various kind of assets might be valued at the various costs e.g. at cost of purchase, the cost of acquisition, the net selling price, or the cost of manufacture. The choice of valuation rules depends on whether the valuation is made at the balance sheet date or before it (Czubakowska, 2009).

The rights to choose occur when a certain valuation problem may be solved in at least two different ways. Each hospital specifies the selection of selected principles and methods in its accounting policy. They also have to choose the methods regarding:

- 1) calculation of depreciation value (Michalczyk, 2007),
- 2) creating, calculating and releasing provisions,
- 3) calculating prepayments and accruals.

They have the right to choose the date of cost settlement over time, the right to choose the manner in which to account for the provisions, reserves, interim settlements, amortization and depreciation write-offs and revaluation amounts (Kamiński, 2012).

The answers of respondents regarding the selected instruments of material accounting policies using the freedom of choice with respect to valuation methods, are presented in Table 2.

Table 2 Instruments of Accounting Policies Using the Choose Rights of Valuation Methods

Instruments	The scale of assessment				
	1	2	3	4	5
the right to choose the methods of assessing individual items of the financial statements (e.g. intangible fixed assets)	12	4	12	2	-
the right to choose the depreciation method, including the right to choose a one-time depreciation low value fixed assets	14	4	6	4	2
The right to choose the type of inventory records and valuation methods of materials expenses	14	6	6	4	-
Using the right to create write-offs of assets (fixed assets, inventories, receivables)	16	2	8	4	-
Using the right to create accruals and prepayments and accrued revenues	6	8	6	4	6

* the scale of assessment: 1 (definitely not applicable) – 5 (definitely applicable)
Source: Own work

Again, the results show that most of Polish hospitals do not use instruments of accounting policy using the right to choose the method of valuation of assets and liabilities, revenues and expenses. According to 40-53% of respondents, the assessment of the degree of use of such instruments is insufficient. Unfortunately, only few hospitals are interested in these instruments of material accounting policies, that have the greatest impact on the image of the entity, so the methods of valuation and depreciation that directly affect the value of assets and the financial results presented in the financial statements. The most popular instrument is the right to create prepayments (activate costs) and accruals and deferred revenues. According to 33% of directors, the use of this instrument is good or very good. Prepayments are created when a hospital pays for services in advance but has not yet received them. This might be something like paying for contracted services which has not been performed yet. They are treated as an asset because they are effectively owed to the hospital. Accruals are created when a revenue or expense has not been recorded at the end of the accounting period. Accruals are normally the result of revenue being earned or an expense being incurred before any cash is received or paid (Maxwell, 2007).

4 Conclusions

The main goal of this study was to analyze the use of selected instruments of material accounting policies in Polish hospitals that have impact on financial results and other components included in financial statements. This article presented also an analysis of the meaning and scope the accounting policies and provided explanation of existing opinions regarding differences between "accounting policy" and "balance sheet policy".

The aim of using the instruments of accounting policy is to facilitate the attainment of its economic objectives and influence the recipients of financial statements so as to encourage behaviour conforming to the entity's expectations (Sawicki, 1998). The study confirmed the hypothesis according to which the hospitals operating in Poland do not apply any instruments of accounting policy to support management processes, or apply them in a limited scope. The information contained in financial statements of various hospitals largely derives from their accounting policy, but the shape of this policy is not determined by the hospital's objectives.

The results indicate that most of the analysed hospitals apply insufficient instruments of material accounting policy that have the greatest impact on the image of the hospital. In this context it can be concluded that the ability of these hospitals to shape the

information content of financial statements for the purpose of achieving the hospital objectives is considerably limited.

Most of hospitals use the same accounting policy for long period of time, it means the same methods of measurement and presentation of financial statement information. The directors are not interested at all to change their accounting methods at the start of the next accounting period and to use other instruments of accounting policy. Most of them accept the solutions that can be considered as the most popular, least complicated and comply with the law.

Whatever the impact that the instruments of accounting policy have on the performance of hospital presented in financial statement, the necessity of assurance of continuity and consistency in the application of accounting policies has to be taken into consideration. This is necessary for the financial statements to provide true and fair view of financial position, result and changes in financial position (Baran, Stanisiz, 2005).

References

- Adomaitienė, G. (2004). Methodological Aspects of Accounting in Lithuanian Companies. *Acta Universitatis Lodzianis. Folia Oeconomica*, vol. 173, pp. 5-13.
- Baran, W., Stanisiz, B. (2005). Wewnętrzne mechanizmy kształtowania wiarygodności finansowej. In: *Sprawozdawczość i rewizja finansowa w procesie poprawy bezpieczeństwa obrotu gospodarczego*. Centrum Promocji i Rozwoju Akademii Ekonomicznej w Krakowie, Kraków, pp. 12-18.
- Czubakowska, K. (2009). Wybór metod wyceny zapasów w polityce bilansowej. *Zeszyty Teoretyczne Rachunkowości*, vol. 49 (105), pp. 31-40.
- Cygańska, M., Gierusz, J. (2007). Ewolucja zasad kontraktowania usług zdrowotnych w Polsce na tle wybranych krajów. *Prace i Materiały Wydziału Zarządzania Uniwersytetu Gdańskiego*, vol. 4, pp. 15-27.
- Goyal, S. K. (2007). An integrated inventory model for a single supplier-single customer problem. *International Journal of Production Research*, vol. 15(7), pp. 107-101.
- Grabowski, R. (2010). Relacje pomiędzy polityką bilansową a polityką rachunkowości w świetle różnych modeli rachunkowości. *Współczesna Ekonomia*, vol. 4(4), pp. 175-185.
- Gurau, M. (2014). Three Types of Accounting Policies Reflected in Financial Statements. Case Study for Romania. *Global Economic Observer*, vol. 2(1), pp. 209.
- IAS 1. Presentation of financial statements. IASB, 2014.
- Kaczmarek, M. (2008). *Polityka bilansowa jako narzędzie rachunkowości*. Wydawnictwo Naukowe Uniwersytetu Szczecińskiego, Szczecin.
- Kaminski, R. (2012). Investor Relations as a Determinant of the Company's Accounting Policy. *China-USA Business Review*, vol. 11(5), pp. 686-696.
- Kamiński, R. (2001). *Polityka bilansowa w kształtowaniu wartości księgowej przedsiębiorstwa*. Wydawnictwo Naukowe UAM, Poznań.
- Kludacz, M. (2015). *Rachunek kosztów i jego wykorzystanie w zarządzaniu szpitalem*. Research Papers of the Wrocław University of Economics/Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu, vol. 389, pp. 60-171.
- Maxwell, J. C. (2007). *The 21 irrefutable laws of leadership: Follow them and people will follow you*. Thomas Nelson Inc.
- Michalczyk, L. (2007). Rola umorzenia aktywów trwałych w powstaniu różnic w wyniku finansowym. *Zeszyty Naukowe TD UJ. Seria: Ekonomia i Zarządzanie*, vol. 1.
- Michalczyk, L. (2012). The Role of Accounting Engineering in Shaping the Balance Policy of a Company. *e-Finanse*, vol. 8(4), pp. 44-52.

Polish Accounting Act - Ustawa z dn. 29 września 1994 r. o rachunkowości (Dz.U. 2013 poz. 330).

Sawicki, K. (1998). *Wybrane zagadnienia polityki bilansowej*. Zeszyty Teoretyczne Rady Naukowej SKWP, t. 49, Warszawa.

Stępień, K. (2012). Polityka rachunkowości jako instrument kreowania wizerunku przedsiębiorstwa w okresie kryzysu gospodarczego. *Zeszyty Naukowe/Polskie Towarzystwo Ekonomiczne*, (13), pp. 289-298.

Walczak, R. (2014). Production management analysis using Monte Carlo method. *Journal of International Scientific Publications: Economy & Business*, pp. 1062-1069.

Weber, J., Kufel, M. (1993). *Wprowadzenie do rachunkowości spółek: Bilansowanie majątku i kapitałów*. Poland: Bielsko-Biała, Park.

Revenue Efficiency in European Banking

Kristína Kočíšová¹

¹ Technical University of Košice
Faculty of Economics, Department of Banking and Investments
Nemcovej 32, 04001 Košice, Slovakia
E-mail: Kristina.Kocisova@tuke.sk

Abstract: *This paper analyses revenue efficiency of banking sectors in the European Union countries over the period 2008-2014. The Data Envelopment Analysis (DEA) method is applied. The results show decrease of the average revenue efficiency in the whole sample. The results of DEA analysis, by country, indicate that the efficiency ranged from 52.47% in case of Romania to 100% in case of Germany, United Kingdom, Netherlands, Sweden, Malta, and Luxembourg. The revenue efficiency was also analyzed in three groups of banking sectors, classified according to the volume of total assets. Large banking sectors seem to be most efficient, where the average revenue efficiency during the whole analyzed period was 97.11%. On the second place, there were banking sectors within the medium-sized group (85.3%) and the least efficient were banking sectors in the small sized group (71.6%). In the last part of our analysis there were determined four main European "regions" and the average revenue efficiency was analyzed within them. According to the results of analysis, levels of efficiency in case of Northern (89.4%) and Western European (89.5%) banking sectors were higher than the average in the whole sample (79.8%); on the other hand, the average revenue efficiencies in case of Southern (76.7%) and Eastern European (63.5%) banking sectors were under the total average.*

Keywords: banking sector, revenue efficiency, DEA

JEL codes: G21, C14, C6

1 Introduction

The efficiency of banks and banking systems is one of the most important issues in the financial market, as the efficiency of banks ultimately affect the effectiveness of a whole monetary system. In modern society, there exists a number of approaches how to define efficiency. Our definition is based on the study of Farrell (1957), who stated that the efficiency of a firm consists of two components: technical efficiency and allocative efficiency. Technical efficiency reflects the ability of a firm to obtain maximal output from a given set of inputs. On the other hand, allocative efficiency reflects the ability of a firm to use the inputs in optimal proportions, given their prices and the production technology. These two types of efficiency are then combined into an overall economic efficiency, which can be examined from the perspective of input or output based models. Then, we can talk about overall cost efficiency (input perspective) or overall revenue efficiency (output perspective). Farrell's (1957) paper led to the development of many approaches of measuring the input and output efficiency. Greatest importance was assigned to a Stochastic Frontier Approach (SFA), created by Aigner, Lovell and Schmidt (1977); and Data Envelopment Analysis (DEA) developed by Charnes, Cooper and Rhodes (1978).

According Bader et al. (2008) commercial banks make profits from the spread between the interest rate received from borrowers and interest rate paid to depositors. Profit efficiency than indicates how well a bank is predicted to perform in terms of profit in relation to other banks in the same period for producing the same set of outputs. We can also define cost efficiency and revenue efficiency. Cost efficiency gives a measure of how close a bank's cost is to what a best-practice bank's cost would be for producing the same bundle of output under the same conditions. Revenue efficiency indicates how well a bank is predicted to perform in terms of revenue relative to other banks in the same period for producing the same set of outputs.

This paper deals with DEA method and describes its application in measuring revenue efficiency. The structure of the paper is as follows. The review of relevant literature is described in section 2. Used methodology is discussed in detail in section 3. Section 4 contains the practical application of DEA method for measuring revenue efficiency in European banking sector during years 2008-2014 using the R software. Finally, the paper ends with some concluding remarks.

Literature Review

Data envelopment analysis (DEA) is a non-parametric mathematical (linear) programming approach to frontier estimation. The basic DEA model developed by Charnes, Cooper and Rhodes (1978) was based on the assumption of a constant return to scale. This basic model has been modified by Banker, Charnes, and Cooper (1984) and based on the assumption of a variable return to scale. Both these DEA models have been created in both forms – the input and output oriented.

Sherman and Gold (1985) applied DEA to banking as the first. They used DEA analysis to evaluate technical efficiency of 14 saving bank branches. As the result of the analysis, they not only measured the level of efficiency but also defined how to eliminate inefficiency by adjusting input and output of inefficient bank branches. Motivated by the DEA results, management indicated that the service outputs and the resources used to provide these would be further evaluated as distinct from the liquidity issues.

Most studies have focused on the input side, estimating cost efficiency. Only few studies have examined the output side evaluating revenue and profit efficiency, but they preferred to use SFA methodology.

Bos and Kolari (2005) employed SFA to measure cost and profit efficiency of large European and U.S. banks between the 1995 and 1999. They found out that the large U.S. banks had higher average profit efficiency than European banks on average. They applied intermediation approach. As the bank outputs were defined loans, investments and off-balance sheet activities. As the input variables were used number of employees, interest expenses and operating expenses. They conclude that their empirical results tend to support the notion that potential profit efficiency gains are possible in cross-Atlantic bank mergers between European and U.S. banks.

Rouissi (2011) investigated the efficiency levels of commercial domestic versus foreign banks in France during the period 2000-2007 by comparing the use of the stochastic cost and profit frontier analysis. He found out that foreign banks exhibit higher cost and profit efficiency than domestic banks. Analysis of the determinants of banking efficiency in France suggested that revenue efficiency was more important than cost efficiency for domestic banks.

In the case of authors from the Slovakia as well as from the Czech Republic, efficiency of financial institutions was examined for example in works of Stavárek (2006), Pančurová and Lyócsa (2013), Řepková (2013), Boďa and Zimková (2015), and Zimková (2015).

Pančurová and Lyócsa (2013) measured bank cost and revenue efficiencies using DEA. They estimated efficiencies and their determinants for a sample of 11 Central and Eastern European Countries over the 2005-2008 period. They adopted the intermediation approach and assumed that banks produce two outputs: total loans and other earning assets. The prices of those outputs were represented by the ratios of interest received on loans to total performing loans and noninterest income to other earning assets, respectively. Total deposits and total costs represented the two inputs. The prices of those inputs were total interest expenses to total deposits and total costs to total assets, respectively. They found out no dramatic changes in the average cost and revenue efficiencies during the analyzed period, although cost efficiency declined slightly and revenue efficiency increased. The average cost efficiency was higher for the Baltic countries and the Czech Republic. Lower values were observed for Romania and Hungary.

Řepková (2013) estimated the cost and profit efficiency of the Czech commercial banks in the period 2001-2010 using SFA. The average cost efficiency ranged the value 78-91% and the average profit efficiency ranged 64-99%. The highest average cost efficiency achieved the group of the medium-sized banks following by the group of small banks and the highest average profit efficiency achieved the group of small banks. The largest banks were the lowest efficient in the case of the cost and profit efficiency. The reason for the inefficiency of the Czech banks was mainly an excess of client deposits in the balance sheet of banks and improperly chosen size (range of operation) of individual banks (especially the largest one).

Bodá and Zimková (2015) used three approaches: the services-oriented approach, intermediation approach and the profit oriented approach to investigated efficiency of the Slovak banking industry over the years 2000-2011. They used DEA models to measure technical efficiency of eleven commercial banks in three sub-periods: 2000-2003, 2004-2008 and 2009-2011. In each of these periods, banks were pooled together in one data frame.

2 Methodology and data

In this paper, we discuss some extensions of basic DEA models. If price data are available then it is possible to measure allocative, technical efficiency as well as overall cost, revenue, or profit efficiency. To calculate these main types of efficiency, a set of linear programs should be solved.

The output-oriented DEA model under the assumption of variable return to scale can be used for calculation of output-oriented technical efficiency and revenue efficiency. Output-oriented model under the assumption of variable return to scale can be written in the following form (Coelli et al., 2005):

$$\begin{aligned}
 \text{Max} \quad & \phi_q & (1) \\
 \text{s.t.} \quad & \sum_{j=1}^n x_{ij} \lambda_j \leq x_{iq} & i = 1, 2, \dots, m \\
 & \sum_{j=1}^n y_{rj} \lambda_j \geq \phi_q y_{rq} & r = 1, 2, \dots, s \\
 & \sum_{j=1}^n \lambda_j = 1 \\
 & \lambda_j \geq 0 & j = 1, 2, \dots, n
 \end{aligned}$$

Where ϕ_q is output-oriented technical efficiency (TE_q) of the Decision Making Unit (DMU_q) in the output-oriented DEA model, y_{rq} is produced amounts of r^{th} output ($r = 1, 2, \dots, s$) for DMU_q , x_{iq} is consumed amounts of i^{th} input ($i = 1, 2, \dots, m$) for DMU_q , y_{rj} is produced amounts of r^{th} output ($r = 1, 2, \dots, s$) for DMU_j ($j = 1, 2, \dots, n$), x_{ij} is consumed amounts of i^{th} input ($i = 1, 2, \dots, m$) for DMU_j ($j = 1, 2, \dots, n$), λ_j is weight assigned to the DMU_j ($j = 1, 2, \dots, n$).

To calculate revenue efficiency the following revenue maximisation DEA problem is necessary to solve (Coelli et al., 2005):

$$\begin{aligned}
 \text{Max} \quad & \sum_{r=1}^s p_{rq} y_{rq}^* & (2) \\
 \text{s.t.} \quad & \sum_{j=1}^n x_{ij} \lambda_j \leq x_{iq} & i = 1, 2, \dots, m
 \end{aligned}$$

$$\sum_{j=1}^n y_{rj} \lambda_j \geq y_{rq}^* \quad r = 1, 2, \dots, s$$

$$\sum_{j=1}^n \lambda_j = 1$$

$$\lambda_j \geq 0 \quad j = 1, 2, \dots, n$$

Where prq is a vector of output prices of DMU_q and y_{rq}^* is the revenue maximising vector of output quantities for DMU_q, given the output prices prq and the input levels x_{iq} .

The overall revenue efficiency (RE_q) is defined as the ratio of observed revenue to maximum revenue for the DMU_q (Coelli et al., 2005):

$$RE_q = \frac{\sum_{r=1}^s p_{rq} y_{rq}}{\sum_{r=1}^s p_{rq} y_{rq}^*} \quad (3)$$

The overall revenue efficiency can be expressed as a product of technical and allocative efficiency measures. Therefore, the allocative efficiency of the DMU_q can be calculated as the ratio of revenue efficiency (RE_q) to output-oriented technical efficiency (TE_q) of the DMU_q . These three measures (technical, allocative and overall revenue efficiency) can take values ranging from zero to one, where a value of one in case of TE , AE and RE indicates full efficiency. If the production unit is fully technically efficient ($TE_q=1$) and displays allocative efficiency ($AE_q=1$); it is also overall revenue efficient ($RE_q=1$). This production unit achieve the maximum possible outputs at given inputs, while the proportion of outputs will guarantee the maximum possible revenues. If the production unit is technically efficient ($TE_q=1$) but doesn't demonstrate allocative efficiency ($AE_q<1$), it isn't also overall revenue efficient ($RE_q<1$). This production unit achieves the maximum possible outputs using a given inputs, but the proportion of inputs will not guarantee the maximum possible revenues. If the production unit fails to demonstrate any of these three types of efficiency ($TE_q<1$; $AE_q<1$; $RE_q<1$), then the value of overall revenue efficiency can be interpreted as potential revenue increasing that can be achieved if the production unit uses the outputs in optimal combination. Potential revenues increasing can be calculated by subtracting the value of overall revenue efficiency from the number one.

3 Results and Discussion

This section describes the practical application of DEA method for measuring revenue efficiency in the European banking sector during years 2008-2014 using the R software (R core team, 2013). In our analysis the package "Benchmarking", prepared by Bogetoft and Otto (2013) was used. This package contains methods to estimate technologies and measure efficiency using DEA while supporting different technology assumptions (free disposability hull, variable return to scale, constant return to scale, decreasing return to scale, increasing return to scale), and using different efficiency measures (input based, output based, hyperbolic graph, additive, super, directional).

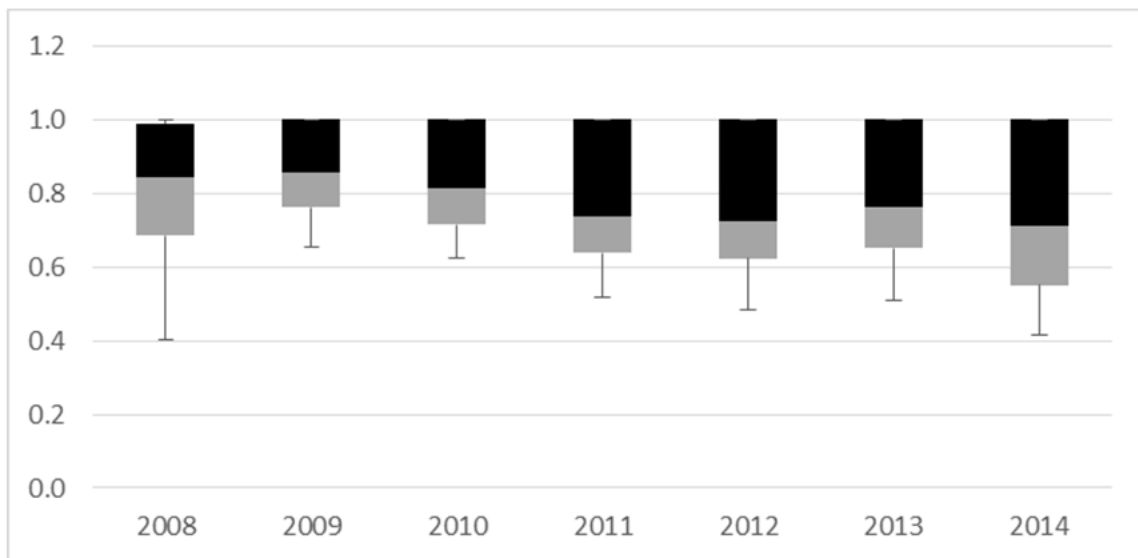
The study evaluates a cross-country level data of 28 European Union (EU) banking sectors for the period 2008-2014 compiled from the database of European Central Bank. To evaluate banking sectors the intermediation approach was used. This approach views bank as an intermediary of financial services and assumes that banks collect funds (deposits and purchases funds) with the assistance of labor and capital and transform them into loans and other assets.

For each banking sector in the sample, it was necessary to select inputs, outputs, and output prices. Input and output variables, and selected types of revenues are measured in thousands of EUR. We consider three inputs, namely, total deposits (x_1), the number of employees (x_2) and fixed assets (x_3). On the output side, we consider two types of outputs: total loans (y_1) and other earning assets (y_2), which refer to non-lending activities. Each of these outputs generates revenues. Therefore, we can easily calculate prices for each output as a ratio of the particular revenue to the selected output. The income generated by first output is interest income, so the output price (p_1) is defined as the ratio of interest income to a value of loans. The price of second output (p_2) is defined as the ratio of total non-interest income to other earning assets.

To solve the revenue maximalization problem using R, we first load the data from MS Excel file that must be saved in the CSV (comma-separated values) format. The solution of the revenue maximalization DEA model requires using the procedure revenue.opt from the Benchmarking package. This command estimates the optimal output vector that maximizes revenues in the context of the DEA technology. The part of the command is to define which variables will act as inputs (the matrix of inputs, x), outputs (the matrix of outputs, y), output prices (as a matrix, p) and used technology (variable return to scale "vrs") of applied model. To calculate overall revenue efficiency, we have to find the actual revenues and the optimal revenues. By dividing these values we obtain overall revenue efficiency of evaluated production units.

Figure 1 shows the development of average revenue efficiency of the EU banking sector during years 2008-2014. We observed no dramatic changes in the average revenue efficiency during the analyzed period (see Panel A in Table 1), but we can see notable differences among observed countries (see Panel B in Table 1). During the whole analyzed period, the revenue efficiency was skewed towards lower values, which reflected in the Figure 1 by moving the median values (horizontal line in the rectangle a restrictive value of 25th percentile and 75th percentile) down. This fact was also confirmed by the descriptive statistics of the average revenue efficiency. The difference between the median value and the 25th percentile value was lower than the difference between the median value and the 75th percentile value.

Figure 1 Revenue Efficiency of European Union Banking Sector



Source: Author's calculations

Figure 1 and Table 1 show the results of average revenue efficiency obtained relative to the whole sample during the analyzed period. The minimum average value was reached in 2014, the maximum average value in 2009. Results showed that the average revenue efficiency decreased from 86.1611% in 2009 to 74.1869% in 2014 which can be a result of financial crisis.

The average revenue efficiency in the beginning of the analyzed period was 81.0642% indicating that on average banking sectors could increase their revenues by 18.9358% by producing the outputs in optimal combination while maintaining a given output prices. In average the European banking sector didn't produce maximum amount of outputs by using of given inputs, and the proportion of outputs didn't guarantee the maximum possible revenues. When we looked at the revenues of European banking sector we can see, that the average observed value of revenues was EUR 86.759 billion and the average optimal value of revenues was EUR 96.645 billion. The potential revenue increasing could be achieved by increasing total loans on average by 14.27% and by increasing other earning assets on average by 122.46%, while maintaining a given output prices. This optimal combination of outputs allowed to achieve maximum revenues and shift on efficiency frontier. In the end of the analyzed period, the average revenue efficiency was 74.1869% indicating potential revenue increasing equal to 25.8131%. This potential revenue increasing could be achieved by increasing total loans on average by 51%, and by increasing other earning assets on average by 40.94%, while maintaining a given output prices.

The results of DEA analysis, per country, are shown in Table 1 (see Panel B). The average revenue efficiency ranged from 52.47% in case of Romania to 100%. The highest revenue efficiencies were recorded in case of countries like the Germany, United Kingdom, Netherlands, Sweden, Malta, and Luxembourg. On the other hand, the lowest revenue efficiency scores were observed in the case of countries like Romania, Greece, Cyprus, Croatia and the Czech Republic. In case of twelve countries the average revenue efficiency was higher than the average in the whole sample (79.8293%), in other sixteen countries the average revenue efficiency was lower.

Table 1 Revenue Efficiency of the European Union Banking Sector

Panel A	2008	2009	2010	2011	2012	2013	2014	2008-2014
Mean	0.810642	0.861611	0.834380	0.783060	0.774768	0.788321	0.741869	0.798293
Median	0.843322	0.853667	0.810999	0.735578	0.722657	0.763884	0.711938	0.796981
Min.	0.402809	0.651472	0.623007	0.515971	0.482277	0.509327	0.415330	0.402809
Max.	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000	1.000000
St. Dev.	0.169886	0.123954	0.138854	0.176962	0.191033	0.180432	0.218723	0.175757

Panel B	Mean	Median	Min.	Max.	St. Dev.
Austria	0.761320	0.706807	0.679256	0.873372	0.088293
Belgium	0.696436	0.681019	0.610723	0.865997	0.095043
Bulgaria	0.656394	0.639852	0.560616	0.748627	0.060697
Cyprus	0.590383	0.585955	0.470551	0.679190	0.079565
Czech Republic	0.576386	0.555183	0.457150	0.669543	0.079491
Germany	1.000000	1.000000	1.000000	1.000000	0.000000
Denmark	0.930526	0.949097	0.820499	1.000000	0.075433
Estonia	0.927226	1.000000	0.490585	1.000000	0.192541
Spain	0.788067	0.792184	0.716992	0.840581	0.038226
Finland	0.744732	0.758671	0.601057	0.971140	0.117490
France	0.913401	0.920220	0.851211	0.955801	0.036221
United Kingdom	1.000000	1.000000	1.000000	1.000000	0.000000
Greece	0.577043	0.515971	0.415330	0.740036	0.127810
Croatia	0.610065	0.610065	0.558215	0.661915	0.073327
Hungary	0.630116	0.633786	0.509813	0.721024	0.080890
Ireland	0.958296	1.000000	0.731482	1.000000	0.100395
Italy	0.851251	0.865421	0.778939	0.892220	0.043570
Lithuania	0.970582	1.000000	0.801542	1.000000	0.074592
Luxembourg	1.000000	1.000000	1.000000	1.000000	0.000000
Latvia	0.701093	0.697101	0.658406	0.762358	0.037419
Malta	1.000000	1.000000	1.000000	1.000000	0.000000
Netherlands	1.000000	1.000000	1.000000	1.000000	0.000000
Poland	0.710316	0.700779	0.524998	0.846063	0.105895
Portugal	0.714926	0.630625	0.467252	0.945261	0.186107
Romania	0.524729	0.512266	0.402809	0.651472	0.096446
Sweden	1.000000	1.000000	1.000000	1.000000	0.000000
Slovenia	0.716253	0.686907	0.643596	0.810722	0.067032
Slovakia	0.754670	0.756162	0.640523	0.834672	0.066455

Panel C	Mean	Median	Min.	Max.	St. Dev.
Large	0.971134	1.000000	0.851211	1.000000	0.046297
Medium-sized	0.852958	0.867984	0.467252	1.000000	0.142891
Small	0.715769	0.679891	0.402809	1.000000	0.173248

Panel D	Mean	Median	Min.	Max.	St. Dev.
Northern Europe	0.894274	1.000000	0.601057	1.000000	0.136513
Western Europe	0.895193	0.977901	0.610723	1.000000	0.134693
Southern Europe	0.767112	0.791191	0.415330	1.000000	0.162108
Eastern Europe	0.634714	0.650389	0.402809	0.846063	0.107362

Source: Author's calculations

An improvement in revenue efficiency over the analyzed period can be seen in Denmark, Estonia, Finland, Latvia, and Romania. While the decline of efficiency in Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Spain, France, Greece, Croatia, Hungary, Ireland, Italy, Lithuania, Poland, Portugal, Slovenia, and Slovakia. The countries like the Germany, United Kingdom, Luxembourg, Malta, Netherlands and Sweden were revenue efficient through the whole analyzed period. The greatest decrease between the years 2008 and 2014 occurred in case of Portugal, where the revenue efficiency decreased from 92.5575% to 46.7252%. On the other hand, the greatest increase recorded Estonia, where the revenue efficiency increased from 49.0585% to 100%.

In the next part of our study, we calculated average revenue efficiency scores derived from the model for three groups of banking sectors classified according to the volume of total assets. We adopt part of the methodology to determine significant banking sectors applied by the European Central Bank. We divided banking sectors into three groups: large, medium-sized, and small banking sectors. Large banking sectors are defined as the three most significant banking sectors in the EU. It means, that these three banking sectors have three highest shares of total assets in the European banking sector. Medium-sized banking sectors are defined as banking sectors with share of total assets on the total assets of the European banking sector higher than 1%, but not involved in the group of large banking sectors. The last group of small banking sectors is defined as the banking sectors with share of total assets on the total assets of the European banking sector less than 1%. In the first group, there are three banking sectors: in Germany, France, and in the United Kingdom. In the second group, there were involved eleven banking sectors: Austria, Belgium, Denmark, Spain, Finland, Ireland, Italy, Luxembourg, Netherlands, Portugal, and Sweden. In the last group, there were banking sectors of Bulgaria, Cyprus, Czech Republic, Estonia, Greece, Croatia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, and Slovakia. Large banking sectors seem to be the most revenue efficient, where the average revenue efficiency during the whole analyzed period was 97.1134% (see Panel C in Table 1). On the second place, there was average revenue efficiency within the medium-sized banking sectors, where the average efficiency reached 85.2958%. The least efficient were banking sectors in the last group, where the average revenue efficiency during the whole analyzed period was only 71.5769%. The greatest volatility was evident in the group of small banking sectors.

The development of the average efficiency in three groups of banking sectors is practically stable. A relative stable development was evident in the case of large banking sectors group, where the average revenue efficiency decreased insignificantly from the value 98.5267% in 2008 to the value 98.1199% in 2014. A greater decrease can be seen within the group of medium-sized banking sectors, where the average revenue efficiency decreased from 89.08% in 2008 to 83.0468% in 2014. The largest decrease can be seen in small banking sectors group, where the average revenue efficiency decrease from 71.748% in 2008 to 62.0972% in 2014.

In the last part of our analysis there were determined the four main European "regions" (Northern, Western, Southern and Eastern Europe) and we analyzed the average revenue efficiency within them (see Panel D in Table 1). The United Nations defines Northern Europe as consisting of the following eight EU countries: Denmark, Estonia, Finland, Ireland, Lithuania, Latvia, Sweden and the United Kingdom. The Western Europe is created of next six EU countries: Austria, Belgium, France, Germany, Luxembourg, and Netherlands. Countries that are part of the Southern Europe are Croatia, Greece, Italy, Malta, Portugal, Slovenia and Spain. The Eastern Europe is defined as consisting of seven countries: Bulgaria, Cyprus, Czech Republic, Hungary, Poland, Romania, and Slovakia. As can be seen in the table, levels of average revenue efficiency in case of Northern (89.4279%) and Western Europe (89.5193%) banking sectors were higher than the average in the whole sample (79.8293%); on the other hand, the average revenue efficiencies in case of Southern (76.7112%) and Eastern Europe (63.4714%) banking sectors were under the total average. The Western Europe banking sectors appeared as the most efficient. On the other hand, the last place was mainly occupied by banking sectors from Eastern Europe. The explanation of generally lower efficiency of Eastern Europe banking sectors can be found in a couple of factors. Above all, imprudent mortgage lending, non-performing loans of the past, lack of transparency and accountability in mortgage financing, shadow banking activities, failure of risk management systems, no systematic risk regulations and other reasons which led to the financial crisis in American and European financial markets.

The development of the average efficiency in four groups of banking sectors indicates a decline in efficiency in case of Western, Southern and Eastern Europe while the efficiency in Northern Europe insignificantly increased. There can be seen a decrease of the average revenue efficiency within the Western European banking sectors from 92.1506% in 2008 to 87.4452% in 2014. The decrease can be also seen within the group of Eastern European banking sectors, where the average revenue efficiency decreased from 67.2728% in 2008 to 51.3796% in 2014. The largest decrease can be also seen within the group of Southern European banking sectors, where the average revenue efficiency decreased from 85.407% in 2008 to 67.9513% in 2014. A relative stable development was evident in the case of Northern European banking sectors, where the average revenue efficiency increased no dramatically from 87.0592% in 2008 to 88.1782% in 2014.

4 Conclusions

The efficiency of banks and other financial institutions is very frequently discussed topic in literature. Most studies have analyzed only the basic technical efficiency (e.g. Sherman and Gold, 1985, Stavárek, 2006, Boďa and Zimková, 2015, and Zimková, 2015), or have focused on the selected sample of countries (e.g. Pančurová and Lyócsa, 2013, Řepková, 2013).

As a contribution of our study compared to previous studies can be considered the analysis of revenue efficiency on a sample of 28 banking sectors in all EU member states. In our analysis we try to present the DEA method and show how this method could be used to measure revenue efficiency. One of the advantage of this measurement compared to SFA is, that the DEA brings recommendations how the inefficient banks, or banking sectors could become an efficient one by the optimal usage of inputs and outputs. This optimal usage can help them to get minimal cost or maximum revenues and move to the cost or revenue efficiency frontier.

We analyzed the development of the average revenue efficiency of the EU banking sector during years 2008-2014. We observed no dramatic changes in the average revenue efficiency during the analyzed period, but we can see notable differences among observed countries. The results of DEA analysis, by country, indicated that the average revenue efficiency moved from 52.47% in case of Romania to 100% in case of Germany, United Kingdom, Netherlands, Sweden, Malta, and Luxembourg. The results according the size of banking sectors show that the large banking sectors seem to be most revenue

efficient, and the least efficient were banking sectors in the small size banking group. In the last part of our analysis were determined four main European "regions. The results of analysis pointed to the fact, that levels of average revenue efficiency in case of Northern and Western European banking sectors were higher than the average in the whole sample; on the other hand, the average revenue efficiencies in case of Southern and Eastern European banking sectors were under the total average.

We are aware of the fact that the paper be influenced by several limitations. First, the analysis may suffer from a sample selection bias problem resulting from the fact that the analysis is performed using data of whole banking sector. The selection of variables and analyzed period are determined by the availability of data (data only for the period since 2008 were available). Therefore, we couldn't analyze the impact of financial crisis on the revenue efficiency in the European banking sector, as well as in the banking sectors of individual countries. In our study, we also used only one methodology, DEA. Maybe it would be interesting to check whether a similar progress in the revenue efficiency scores would be obtained through a parametric method, SFA. As a continuation of this work, it would be interesting to analyze the determinants which affected revenue efficiencies in analyzed countries as a whole, or partially in defined groups of countries (according to total assets, or according to their location in European regions), or analyze the banking sector using bank level data.

Acknowledgments

This work was supported by the Slovak Scientific Grant Agency as part of the research project VEGA 1/0446/15.

References

- Aigner, D. J., Lovell, C. A. K., Schmidt, P. (1977). Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics*, vol. 6 (1), pp. 21-37.
- Bader, M. K. I., Mohamad, S., Ariff, M., & Hassan, T. (2008). Cost, Revenue, and Profit Efficiency of Islamic Versus Conventional Banks: International Evidence Using Data Envelopment Analysis. *Islamic Economic Studies*, vol. 15(2), pp. 23-70.
- Banker, R.D., Charnes, A., Cooper, W.W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, vol. 30(9), pp. 1078-1092.
- Bodá, M., Zimková, E. (2015). Efficiency in the Slovak banking industry: A comparison of three approaches. *Prague Economic Papers*, vol. 24(4), pp. 434-451.
- Bogetoft, P., Otto, L. (2013). *Package „Benchmarking“*. Retrieved from: <http://cran.r-project.org/web/packages/Benchmarking/Benchmarking.pdf>.
- Bos, J. W. B, Kolari, J. W. (2005). Large Bank Efficiency in Europe and the United States: Are There Economic Motivations for Geographic Expansion in Financial Services? *Journal of Business*, vol. 78(4), pp. 1555-1592.
- Charnes, A., Cooper, W., Rhodes, E. (1978). Measuring the Efficiency of Decision Making Units. *European Journal of Operational Research*, vol. 2(6), pp. 429-444.
- Coelli, T., Rao, D. S. P., O'Donnell, CH.J, Battese, G. E. (2005). *An Introduction to Efficiency and Productivity Analysis*. USA: Springer.
- Farrell, M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society*, vol. 120(3), pp. 253-290.
- Pančurová, D., Lyócsa, Š. (2013). Determinants of commercial bank`s efficiency: evidence from 11 CEE countries. *Finance a úvěr*, vol. 63(2), pp. 152-179.
- R Core Team. (2013). *R: a language and environment for statistical computing*. Retrieved from: <http://www.r-project.org/>.

Řepková, I. (2013). Cost and profit efficiency of the Czech commercial banks. *International Journal of Mathematical Models and Methods in Applied Sciences*, vol. 7(3), pp. 286-294.

Rouissi, B.R. (2011). *Cost and Profit Efficiency of French Commercial Banks*. Retrieved from: <http://mpa.ub.uni-muenchen.de/34245/>.

Sherman, D., Gold, F. (1985). Bank Branch Operating Efficiency: Evaluation with Data Envelopment Analysis. *Journal of Banking and Finance*, vol. 9(2), pp. 297-315.

Stavárek, D. (2006). Banking Efficiency in the Context of European Integration. *Eastern European Economics*, vol. 44(4), pp. 5-31.

Zimková, E. (2015). Technical efficiency and super-efficiency of the insurance sector in Slovakia. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, vol. 65(6), pp. 2205-2211.

Impact of Transfer Pricing Regulation on MNEs' Behaviour

Michal Kolář¹

¹ University of Economics in Prague
Faculty of Business Administration, Department of Strategy
nám. W. Churchilla 4, 130 67 Prague 3, Czech Republic
E-mail: xkolm43@vse.cz

Abstract: *Tax administrations worldwide provide taxpayers with favour and offer them the opportunity to set up transfer pricing system according to pre-agreed criteria. When taxpayer's system complies with, tax administrator does not dispute the transaction. Any predefined arrangement leading to the recognition of transfer pricing system by tax administrator can be defined as a safe harbour. During the review process of current sources, it was found out that there is no relevant research available focused on assessing the appropriateness of introducing safe harbour system for both businesses and government. At the same time even the OECD does not work with data that would conclusively prove the impact of transfer pricing regulation on companies' behaviour. For this reason, a research was conducted in this area with focus on the potential of safe harbour to affect tax contributions of enterprises. Financial data were rendered from Amadeus database. The impact of safe harbour system was observed on the time series development of taxation of particular cluster. Cluster analysis was selected as the most suitable method for grouping companies.*

Keywords: *transfer pricing, safe harbour, Amadeus database, factor analysis, cluster analysis*

JEL codes: *F23, H25*

1 Introduction

Trading between international companies within the group (hereinafter 'MNEs') is regulated by globally established arm's length principle. According to this principle the transfer pricing method has to be in accordance with the way in which independent companies agree on prices for products or services. Over the last few years the area of transfer pricing has significantly developed.

International tax regulation is mainly a reaction to the behaviour of companies in the international environment. They aim to maximize profits (market capitalization) and for this purpose use the legislative framework in all its extreme range. This approach is known as tax aggression and as such is regarded as a targeted abuse of the tax system in favour of MNEs leading up to litigation with the tax administration. How individual companies approach tax planning issues depends on their attitude (sensitivity) to risk.

Provisions on transfer pricing has been implemented into Czech law in 1993 in the form of the Income Tax Act no. 586/1992 Coll., Section 23 (7). There can be found the definition of arm's length principle coming from Article 9 of the OECD Model Tax Convention. Czech Republic has further concluded agreements on avoidance of double taxation with different countries, in which there is also stated a provision of the market price and based on which the taxation of international transactions is regulated.

This paper deals with the real impact of transfer pricing regulation on taxation of related companies. The first objective of this work is to determine, based on appropriately chosen scientific methods, whether the abuse of transfer pricing tools really occurs.

Furthermore, when examining the available literature and scientific articles the author came to the conclusion that there is no relevant research assessing the appropriateness of introducing a safe harbour system for both businesses and government. It was therefore decided to carry out a research in this area focused on the currently used safe harbour approaches in the world, and on their potential impact on tax payments.

The following research hypotheses were formulated:

H1 hypothesis: Related companies decrease their tax base through related transactions.

H2 hypothesis: Countries that use the concept of safe harbour record higher profitability at the side of related companies.

2 Methodology and Data

In order to prove the first hypothesis, the following approach was selected:

Appropriate criterions such as independency, industry etc. were used to search for companies in Amadeus database. Arm's length profitability was calculated using independent companies' data. Profitability of related companies was subsequently compared with arm's length profitability. Based on the above, it is assumed that it might be possible to determine whether the profitability rate of dependent companies is different when compared with independent companies and whether there is any potential for additional tax revenue.

Profitability of selected companies was determined in the years 2011 - 2014 using the ratio of operating profitability. Mathematical notation of profitability calculation is as follows:

$$\text{Operating profitability} = \frac{\text{Operating profit}}{\text{Operating revenue}}$$

In order to prove the second hypothesis, the following approach was selected:

Safe harbour concept falls into the category of instruments of government to regulate and also support tax environment. In order to assess whether the introduction of such a concept has a measurable impact, and whether it makes sense to deal with it (introduce), behaviour of related companies in such an environment was assessed in terms of the development of the amount of their taxation as compared with independent companies. Data for this research were obtained from the Amadeus database, which seems to be the most suitable from the viewpoint of the basic distribution of companies into dependent and independent. Factor and cluster analysis were used to classify objects into comparable groups.

It was decided that, before the analysis, all companies will be appropriately arranged into groups that will have some common elements (properties). For this purpose, the most appropriate tool seemed to be cluster analysis. Before its actual implementation, however, it was necessary to determine which variables will enter into the model, which was processed by factor analysis.

Basic (classical) mathematical model of factor analysis is as follows:

$$X_j = a_{j1}F_1 + a_{j2}F_2 + \dots + a_{jm}F_m + e_j$$

X_j is the vector of variables,

a_{jm} factor load matrix,

F_m score of general factors and

e_j score of specific factors.

For the formation of components matrix, a method of factor extraction using principal component method was used in SPSS, for rotation Quartimax method was chosen.

On the basis of cluster analysis, companies were divided into four clusters. Within these clusters behavioural tendency of related companies was assessed and compared with the behaviour of independent companies. Distinction of companies between dependent and independent was done according to participation of another company on the own capital. This information provides the Amadeus database.

The choice of financial indicator was also important. The goal was to select indicator that incorporates some form of tax burden and can be compared between companies. The ratio of tax paid and operating revenues seems to be appropriate. The indicator was calculated for each company in each year under consideration. Median, as a representative of overall trend, was observed. Two medians were calculated, separately for dependent and independent companies, and then compared in the period considered, which was five years (two before the introduction of duties, two after the introduction and the actual year of introduction).

3 Results and Discussion

One question arises before assessing the impact of mandatory documentation to the taxation of dependent companies. Is it really necessary to implement such a regulation? In other way: are there any related companies whose profitability is lower than the profitability that can be expected in the independent relationships, and at the same time that this profitability is lower for reasons, that would not occur in the case of independent companies? This chapter will lead to assessment the validity of the first hypothesis, namely that the related companies lower the tax base through related party transactions. Only affirmative answer to this question should allow consideration of the introduction of certain legislative elements that could lead to the assumption of higher tax revenue to the state. In all other cases it must be necessarily a disproportionate administrative burden levied on taxpayers.

Tax potential calculation

For all companies was computed the average operating profitability over the period calculated as a ratio of operating profit and operating income. Based on these, independent profitability interquartile range for particular sector was calculated. This was instrumental in assessing whether profitability of related company is at least on the lower edge of independent interquartile range (first quartile) or it is lower. If a lower profitability is identified, then such a company is qualified to be a member of a group of companies, for which it can be assumed, that their economic activity does not correspond to economic activity performed under the usual business conditions. And because these companies are considered to be related, their financial results may be affected by transactions within the group and for such company there exists a hidden tax potential. This potential is numerically detected in the way that a particular company was assigned a minimum level of profitability in a line with the arm's length profitability. Operating profit was subsequently adjusted (increased) according to this profitability and then an additional tax calculated under the currently applicable tax rate.

Sample of calculation table is shown below. Specific company names were deleted, because it is only a simulation, based on which we cannot directly declare that any of the companies simply intentionally shift profit through transfer pricing.

Table 1 Tax Potential Calculation

Com- pany	Country	NACE	Average profitability	1. quartile independent	Tax base increase (CZK/Year)	Additional tax (CZK/Year)
A	Slovakia	18	-1.31%	1.15%	34,567,889	7,604,936
B	Czech Republic	10	-1.84%	0.78%	136,076,364	25,854,509
C	Hungary	28	0.17%	2.97%	72,122,214	13,703,221
D	Poland	46	-4.33%	0.85%	12,570,650	2,388,424

Source: Amadeus database, own calculation

The results of the entire calculation with the distribution according to particular countries presents another table below. At first glance it is obvious that the structure of the identified related companies corresponds to the size of each country. The first examined indicator relates to the first hypothesis, which seeks to answer the question of whether

there is a possibility of potential tax revenue on the side of related companies. When looking at the total tax potential it is obvious that in all countries there are related companies, which profitability is lower than the profitability of independent companies. Annual tax potential in the Czech Republic is among assessed companies worth more than 5 billion CZK.

Table 2 Tax Potential

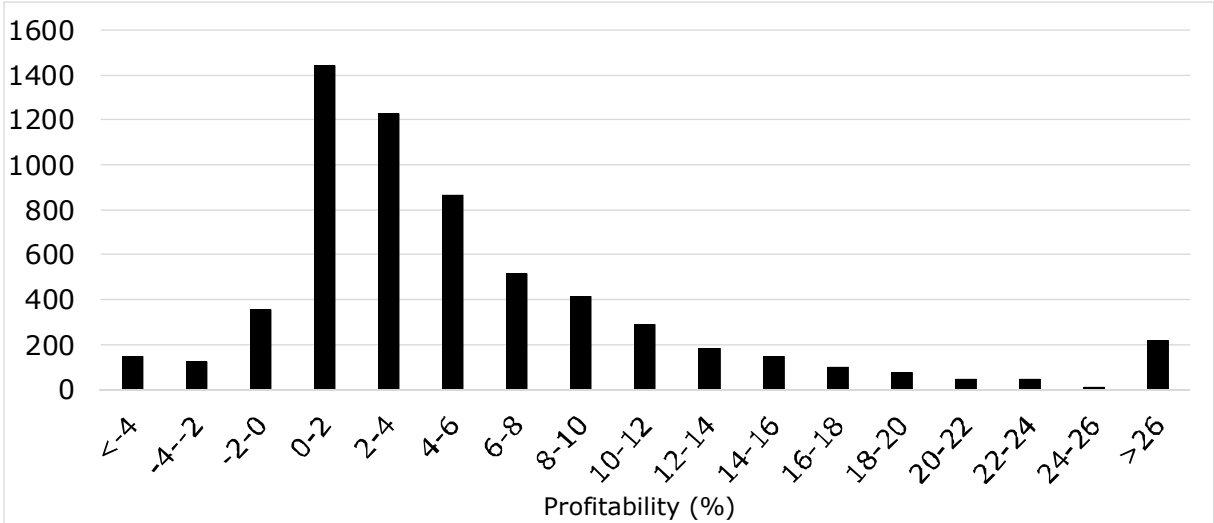
	Czech Republic	Hungary	Poland	Slovakia
Number of related companies	6,211	6,383	10,503	4,159
Number of companies – tax base not raised (A)	4,821	5,201	8,362	3,371
Number of companies – tax base raised (B)	1,390	1,182	2,141	788
B/A	22.4%	18.5%	20.4%	18.9%
Total annual tax potential (K CZK)	5,068,591	4,040,238	8,310,742	2,837,625
Tax potential per company (K CZK)	3,646	3,418	3,882	3,601

Source: Amadeus database, own calculation

If we look at the comparison between countries in terms of the ratio of the number of related companies that achieve at least the first quartile of the independent profitability, and companies whose profitability is under, we find that the Czech Republic has the highest proportion (to 22.4% of all assessed companies could be assessed additional tax). For example, Poland is at the level of 20.4%, Slovakia and Hungary even at 18%. This ratio indicates that fiscal discipline of related companies in the Czech Republic is lower than in comparable neighbouring countries. The question is, what is causing this situation. One possible explanation could be the fact that in all the remaining countries of the Visegrad Group there is an obligation to prepare transfer pricing documentation, which forces the related companies to a greater degree of caution.

To supplement the results, a histogram below provides a distribution of related companies into different intervals according to achieved profitability. The largest group (1444) are companies with profitability from 0% to 2%, which is an interval that can still be considered lower than the interval determining independent profitability.

Figure 1 Profitability Distribution



Source: Amadeus database, own depiction

Comparison of results with other researches

In the past there were prepared several studies on the topic of profit shifting to countries with more favourable tax regime. Most of them describes the situation in relation to the

US market. Hines and Rice (1994) evaluated the relationship between the profitability of foreign companies belonging to the group of companies controlled by the US company in relation to the tax burden of the particular country. Their finding is that *"American companies locate a sizable fraction of their foreign activity in tax havens."* Newlon (1997) also comes with the assumption that, in relation to the US market profit shifting is considerable with respect to its impact on the domestic economy. Bartelsman and Beetsma (2000) investigated the effect of the tax differential between countries on transfer of profits (costs). The basic thought approach was based on research results from Birnie (1996), that if there is an artificial transfer of profits from one economy to another, there is also artificially increased value added of work in a country with a lower rate of taxation. If this really happens, it will be a confirmation of deliberate transfer of profits. In this research they proceed from the secondary data on the cost of labour and the creation of added value provided by the OECD structural analysis database, therefore it was a sector inquiry. As a result, they confirmed the transfer of profits from selected countries. Their research, however, was not focused only on transfer pricing because the final results could be influenced also by other factors. In terms of recommendations they suggest that strict adherence to the rules of transfer pricing can lead to relatively high additional tax revenue while enabling effective international exchange of information between tax authorities. This effort should, however, be implemented with regard to negative side effects (dampening of investments, etc.). Unfortunately, all of the above studies are already older and so may not fully reflect the reality of the present.

Mandatory transfer pricing documentation impact

The classical concept of the safe harbour specifies the path how to set up transfer price under the arm's length principle and taxpayers may voluntarily decide whether they want to use it, or whether they will defend transfer price with the help of classical methods of determining transfer prices defined by the OECD Guidelines or by the local laws. The element of selectivity does not allow to observe any substantial change in the behaviour of related companies after introducing the safe harbour concept. In this case, it would come into consideration, for example, comparison of the tax levies of related companies in countries where this kind of safe harbour has been applied, with countries where it is not implemented. Accuracy of this investigation, however, would be significantly affected by other factors that influence the behaviour of related companies. It would therefore be a necessary to make the adjustments, which would eliminate any other influences.

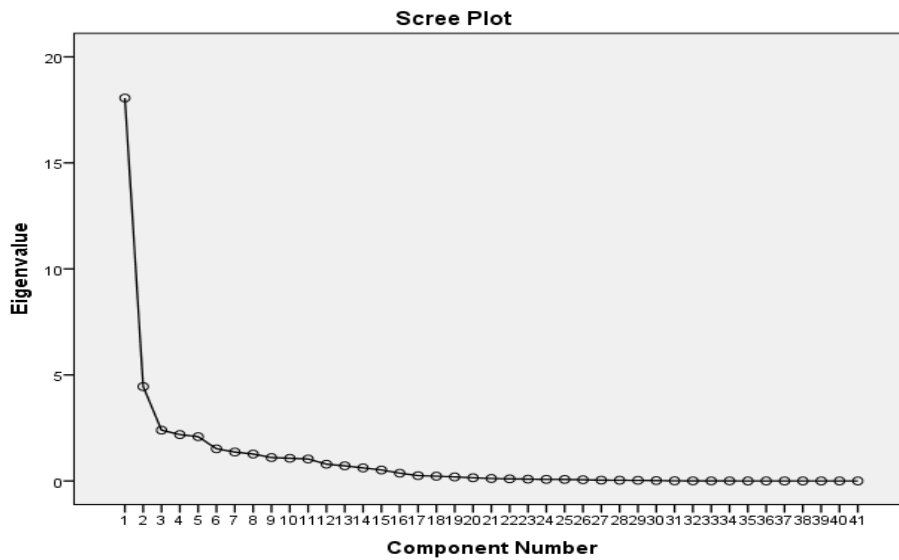
For this reason, it appears more appropriate to explore such a concept of the safe harbour, which must necessarily affect the behaviour of related companies, and this behaviour then may or may not occur at the macroeconomic level. According to the opinion of the author, such a concept is represented by a mandatory transfer pricing documentation. It was therefore selected one country (Spain), which introduced in the past requirements for mandatory transfer pricing documentation. It was tested on related companies whether mandatory documentation has affected their behaviour, and if so in what way. Before the implementation of cluster analysis, it was needed to determine which variables shall enter into the model. For this purpose, a factor analysis was processed first. The table and figure below show that five components of factor analysis can be considered as appropriate.

Table 3 Factor Analysis

Component	Initial Eigenvalues		
	Total	% of Variance	Cumulative %
1	18.059	44.046	44.046
2	4.450	10.854	54.900
3	2.396	5.843	60.743
4	2.187	5.334	66.076
5	2.087	5.090	71.166

Source: Amadeus database, SPSS

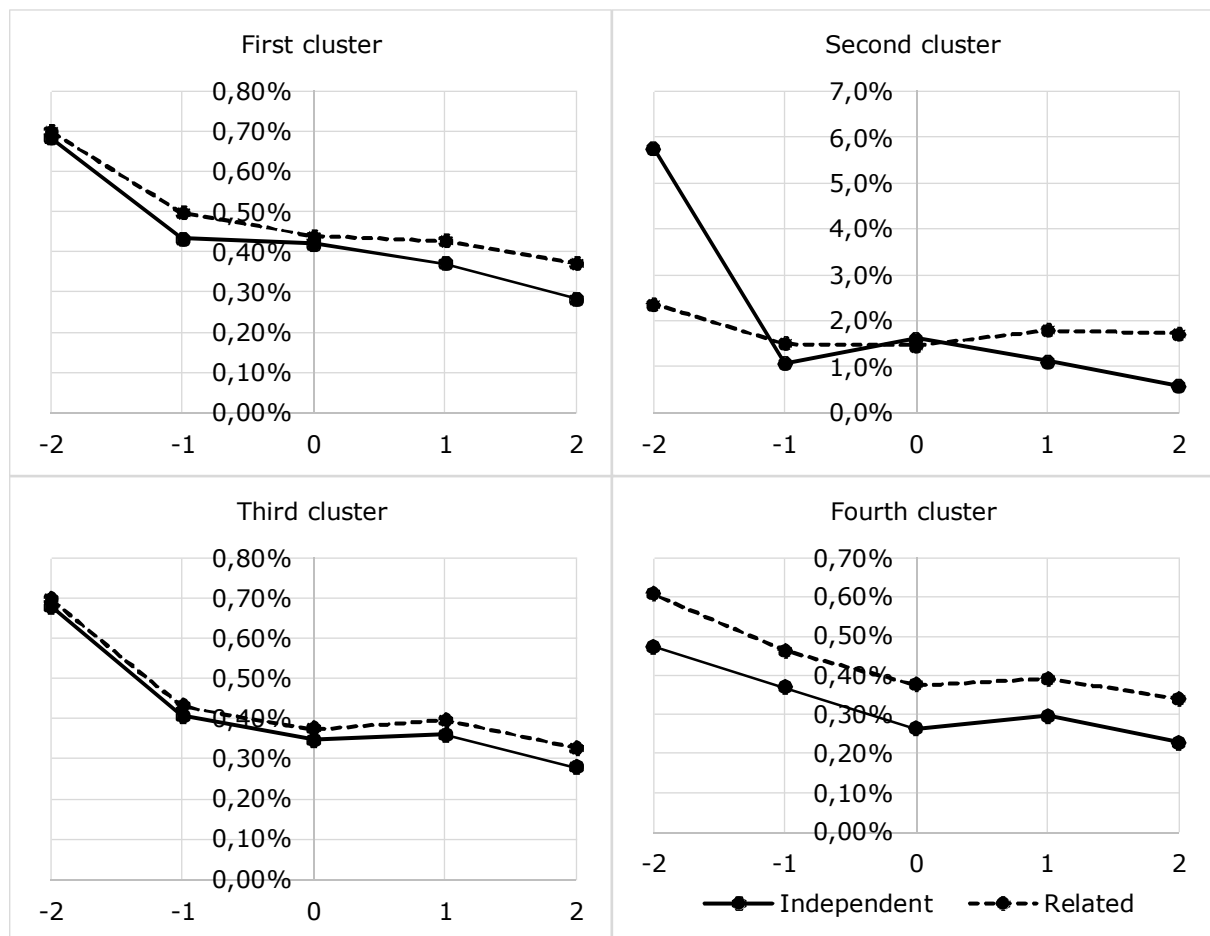
Figure 2 Scree Plot



Source: Amadeus database, SPSS

Two-step cluster analysis in SPSS was used to determine clusters with the help of factor analysis. Four clusters were determined and afterwards assessed.

Figure 3 Cluster Analysis



Source: Amadeus database, SPSS

The first cluster includes distribution companies. During the assessed period there is an obvious drop in tax revenue in both groups of companies, dependent and independent. A decline in both cases has the same trend, while tax revenue is higher in all periods at the related companies side.

Companies included in the second cluster reach compared to companies from other clusters much higher profitability. Until the year in which the mandatory documentation was introduced, the profitability of the two groups was different. Subsequently profitability of related companies increased slightly, and contrarily profitability of independent companies significantly decreased. Tax revenue (compared to sales) of related companies is in the last considered year by one percent higher than in the case of independents.

The development of both groups of companies is the same. During the period there is a gradual decline in tax revenue, the pace of reduction is similar, it increases with independent companies in the end. The profitability of related companies is higher in each year than profitability of independent companies. In last years the difference is greater and in the last year reached its maximum.

Development of revenue in the fourth cluster is similar to that in the previous cluster. However, the difference in profitability is more significant.

4 Conclusions

This paper assesses whether there is any influence of the introduction of mandatory transfer pricing documentation on related companies tax payments. This effect was tested on the information on the taxation of related and independent companies in Spain. Before performing the examination, all the companies were appropriately distributed according to the cluster analysis to clusters in which it is assumed that the individual companies (elements) have some common characteristics. Cluster analysis was based on previously performed factor analysis, which enabled the creation of system of variables that allow the individual companies to be compared between themselves.

From the above it can be concluded that in the country in which there was introduced mandatory transfer pricing documentation, i.e. in which there exists a legislative requirement on the attitude of related companies to administer their transfer pricing system, related companies show higher tax payments than independent companies.

The second conclusion is that the introduction of mandatory documentation may result to the increase of expected tax levy on the side of related companies. In Spain there can be seen gentler slope of reduction of taxes paid by the related companies in comparison with independent companies.

Acknowledgments

This paper was funded from the resources of the project F3/66/2015, a negotiated contract between the researchers and Internal Grant Agency at the University of Economics in Prague.

References

Bartelsman, E. J. and Beetsma, R. M. W. J. (2000). *Why pay more? Corporate tax avoidance through transfer pricing in OECD countries*. (Discussion paper). Available here: www.rrojasdatabank.info/wir2006/pricetransfer.pdf.

Birnie, J. E. (1996). Comparative Productivity in Ireland: The Impact of Transfer Pricing and Foreign Ownership. In K. Wagner, B. van Ark (Eds.), *International productivity differences: Measurement and explanations* (195-223). Contributions to Economic Analysis, vol. 233.

Bureau Van Dijk: Amadeus database.

Hines, J. J., & Rice, E. M. (1994). Fiscal Paradise: Foreign Tax Havens and American Business. *Quarterly Journal Of Economics*, 109(1), 149-182.

Newlon, T. S. (2000). Transfer Pricing and Income Shifting in Integrating Economies. In S. Cnossen (Ed.), *Taxing capital income in the European Union: Issues and options for reform* (214-242). Oxford and New York.

OECD. (2010a). *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations*. Paris: OECD.

OECD. (2013). *Addressing Base Erosion and Profit Shifting*. Paris: OECD.

The Electronic Record of Sales and Impact on the Reduction of Tax Evasion

Eva Kolářová¹, Eva Podolská¹

¹ Tomas Bata University in Zlín
Faculty of Management and Economics Department
Mostní 5139,760 01 Zlín, Czech Republic
E-mail: ekolarova@fame.utb.cz

Abstract: *Tax evasion is a problem not only in the Czech Republic but in other countries as well. Combating tax evasion and more efficient tax collection is one of the priorities of the government. Implementation of Electronic Records of Sales will cut down shadow economics and ensure straightening of market environment. This implementation will affect most of business subjects. The research is based on a survey. It deals with electronic revenue registry and the impact of its introduction on small businessman, natural persons and micro legal entity. The aim of this article is to identify the attitude of surveyed subject on the Electronic Records of Sale implementation. Results of the research confirms that the entrepreneurs' view of ERR differs from the view of non - entrepreneurial public.*

Keywords: revenues, electronic records of sales, tax, value added tax

JEL codes: H26

1 Introduction

The Tax evasion is a problem in all EU countries. Among the most important driving forces of the shadow economy is the tax morale (Schneider et al., 2015).

The Minimizing tax is rational economic conduct of a tax entity. The state, not only counts with this conduct it even tries to use it in order to redirected the activity of tax entity in the desired direction (Vančurová and Láchová, 2014).

There is a very thin line between the legal tax optimization and the tax evasion, which complicates the assessment of, what was the legislators intention and what already is a circumvention of the law (Široký, 2008).

The Czech Republic has had a very low level of personal income tax in the long term. This tax is paid by employees and entrepreneurs. The 2013 collection of personal income tax from employees was 126.13 billion CZK. The amount collected from people who declare on their own was only 2.68 billion CZK (Finardi and Vančurová, 2014).

Every year the EU faces tax frauds and tax evasion which causes estimated loss of €1 billion (approximately €2 000 per EU citizen). To resolve this deficit has therefore become a common goal of almost all member countries. European Parliament even appealed on member states to commit human resources, expert advice and budgetary resources in the national system of tax administration for fighting against tax fraud and evasion and urged them to establish effective anti-corruption tools (The VAP Gap, 2015).

Tax coordination is the first and broadest degree of the various tax systems convergence. It is mostly about creating bi- and multilateral agreements and schemes whose primary purpose is the amendment of the tax law of individual states, as well as the secure data exchange with between countries, prevention of money-laundering, reducing harmful tax competition and improving tax systems transparency (Nerudová, 2014).

Czech Republic also faces the tax evasion and therefore introduces the electronic revenue registry. It is supposed that this tool will help to correct the business environment in the Czech Republic by eliminating the competitive advantage of organizations that kills tax obligation by underreporting the full amount of revenues from selling the goods and services.

On March 30th, the Czech President signed a law on the registration of revenues. Electronic revenue registry relies on the fact that each payment is recorded and the customer receives a receipt from the merchant with a unique code. When realizing registered revenue, the trader sends a data message through the Internet connection to the Financial Management server, where information will be saved and the code generated. This code will be immediately sent back to the merchant's device and printed on the receipt. This means millions of data operations every day and is really a revolutionary step.

Electronic Records in Europe

The estimated tax revenue loss in the European Union is about €1 billion as a result of tax evasion and tax avoidance. Such leaks cause large losses of the state revenue and threaten fair competition. In order to combat tax fraud, EU Commission adopts new provisions constantly (Evropský parlament, 2016).

Furthermore, tax evasion related to financial activities is important both in terms of lost income and because of its role in supplying the means to evade taxes to implement tax noncompliance (Blackburn et al., 2012).

Not only the Czech Republic, is trying to create electronic revenue registry. Similar models work in 16 countries of the European Union. In Germany it works for the segment of taxi service. Before the Czech Republic will introduce the ERR, all European models are thoroughly compared (monitoring of online models, as well as off-line models of cash registers). For example, in Sweden, where the payment discipline of taxpayers is at a much higher level and volume of the shadow economy is lower than in the Czech Republic, the number of reported sales increases by an average of 5.2% after the introduction of evidence in the form of cash registers in 2010. Tax collection has increased in the conversion by 8.1 billion CZK (Ministerstvo financí České republiky, 2013).

As clearly the most effective, least exploitable and from a microeconomic perspective the cheapest became Croatian online model, which later inspired the Czech Republic as well.

Electronic Records in the Czech Republic

One of the innovations in 2016 in the Czech Republic is the introduction of ERR for evidence of cash payments for goods and services. ERR will prevent fraud and allow more efficient targeting of inspections where the irregularity is reported. Financial administration wants to use the ERR to avoid negative impact of the reduction in sales only to honest entrepreneurs, but also to all citizens of the Czech Republic who pay taxes to the state, as they have (Finanční správa, 2016).

ERR will be released in several phases:

- Phase 1 from December 1st, 2016 - accommodation and catering services
- Phase 2 from March 1st, 2017 - retail and wholesale
- Phase 3 from March 1st, 2018 - other activities except those in the 4th stage - the professions, transport, agriculture
- Phase 4 from June 1st, 2018 - Selected crafts and production activities

The cost of ERR will vary depending on the type of equipment and business. The cost of acquisition will start at 5000 CZK and operation costs (payment for connection, depreciation, service, paper for printing receipts), and of course personal costs, which will be worst quantifiable item because it will be necessary to estimate the time to create, print and send documents (Ministerstvo financí České republiky, 2016).

For the system to be effective, it must also apply sanctions for non-compliance. Entrepreneurs, both legal and natural persons who will not fulfil their obligations can get fines up to CZK 500,000. If the control reveals a serious breach of the obligation of sending data or issue with receipts, it may order the immediate closure of the establishment or suspension of the activity that requires to record sales. Against this decision, moreover, cannot be appealed. The Act also contains a provision that allows to

establishing the receipts lottery. If and when it will actually be implemented is unclear (Ministerstvo financí České republiky, 2015).

Supporter and opponents to ERR (Electronic Record of Sales)

Opponents point to the type of "languishing" tradesman who cannot earn so much and even the little he earns, he hands in to the state. Supporters expect that there are mostly rogue traders who enrich themselves at the expense of honest entrepreneurs. It is important to ask whether the ERR truly will be effective in the fight against tax evasion and how much it will press the entrepreneurs. ERR supporters believe that it will be effective in the fight against tax evasion. Opponents on the contrary think, that this project in the fight against tax evasion will not work, and business owners will be under a disproportionate burden. It is interesting that opponents also point to other impacts. Some fear that the ERR gives to the state a great power in monitoring of citizens' lives. Some opponents do not consider ERR to be unreasonable spying, but rather criticize the cost for the entrepreneurs (Podnikání, 2016).

Table 1 Costs and Further Negative Impact of ERR Introduction

Cost of system set up	370 mil CZK
Operating costs for system release	170 mil CZK/year
Other costs (receipt verification, control purchase)	70 mil CZK/year
Public costs (PR, call centre)	60 mil CZK/year
Other impacts	
VAT decrease from 21 % to 15 %	0.5 bill CZK
Tax credit	1 bill CZK

Source: The Final Report on Evaluation of Regulation Impact own processing, Ministry of Finance

Due to the expected increase in tax income (VAT and income tax) to EUR 12.5 billion CZK /year the ERR is an effective tool.

2 Methodology and Data

Research, whose results are presented in this paper, was conducted within the IGA project on FAME UTB in Zlín with the students of Student Accounting and Tax Office during February and March 2016. The aim of the project was to identify the attitudes of those surveyed towards the introduction of ERR. The objects of the research were attitudes of self-employed people (tradesmen), micro entities with up to 5 employees and non-business public.

The situation before the introduction of ERR was analyzed by the confirmation or refutation of hypotheses:

Hypothesis (H0) - entrepreneurs and non-entrepreneurs have the same opinion on the introduction of ERR

Hypothesis (H1) - entrepreneurs and non-entrepreneurs do not have the same opinion on the introduction of ERR

Methodology

The focus was on quantitative research using questionnaires to which the self-employed, micro entities and the public clearly answered with one answer. Outcomes of the research were oriented on the key research question - what is the attitude of entrepreneurs to introduce ERR. Respondents rated the way of introduction, whether the ERR is an appropriate tool to reduce tax evasion and whether a tax advantage on the introduction of ERR is sufficient.

Standardized interview included a total of 10 questions for entrepreneurs and 8 questions for non-business public. The paper compares answers of both subjects. The questions

were posed to both groups of respondents in the same wording. Most questions were closed questions, only two questions were open.

Quantitative research data were processed using basic statistical methods, absolute and relative frequencies, average and standard deviations. Standard deviation is the positive square root of the variance.

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^N (x_i - \bar{x})^2} = \sqrt{\left(\frac{1}{N} \sum_{i=1}^N x_i^2\right) - \bar{x}^2} \quad (1)$$

(1) Standard deviation

3 Results and Discussion

The topic of the research was electronic revenue registry. The survey sample was chosen from the Zlín region and consists of 102 respondents.

Questions posed to entrepreneurs:

1. Do you perceive the introduction of the electronic revenue registry as positive or negative?
2. Are you familiar enough with the implementation of the ERR?
3. Do you think that this is an appropriate tool?
4. Do you think that the introduction of the ERR will prevent tax evasion?
5. Do you suppose that the tax compliance of the merchants will increase?
6. Do you know the amount of tax relief when implementing the ERR?
7. Do you ask the each customer whether he/she wants the receipt?
8. There are rumours that after ERR implementation small businesses may go bankrupt. Are you worried about your business?
9. From what amounts should the revenue be registered?
10. Do you plan to somehow change the payment options?

Questions posed to the public (non - entrepreneurs):

1. Do you perceive the introduction of the electronic revenue registry as positive or negative?
2. Are you familiar enough with the implementation of the ERR?
3. Do you think that this is an appropriate tool?
4. Do you think that the introduction of the ERR will prevent tax evasion?
5. Do you suppose that the tax compliance of the merchants will increase?
6. Do you think that entrepreneurs should be granted tax relief for using the ERR?
7. Do you require receipt from the merchants?
8. There are rumours that after ERR implementation small businesses may go bankrupt. Do you think this will happen?
9. Are you situated in a place with sufficient internet coverage?

Outcome of entrepreneurs answers in Table 2

Table 2 Questions from the Questionnaire

Question no.	Answers - yes	Answers - no	Answers - doesn't
--------------	---------------	--------------	-------------------

			know
No. 1	1%	99%	0%
No. 2	1%	99%	0%
No. 3	2%	23%	75%
No. 4	0%	86%	14%
No. 5	26%	52%	22%
No. 6	22%	78%	0%
No. 7	100%	0%	0%
No. 8	0%	80%	20%

Source: Own processing

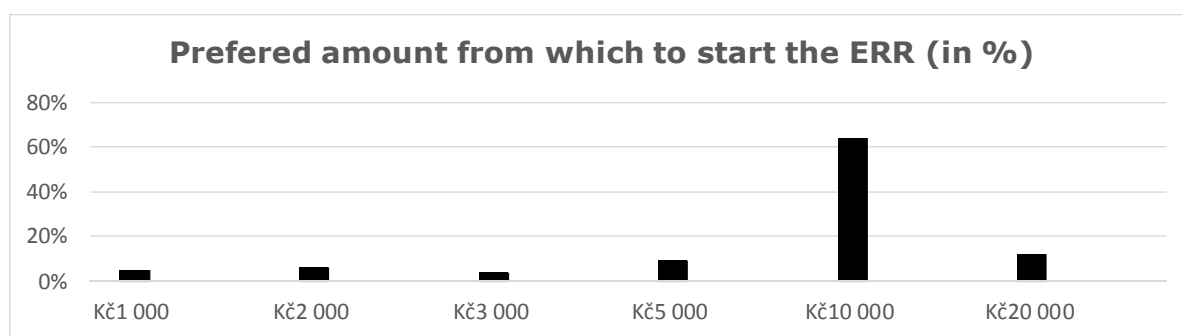
Most entrepreneurs have a negative attitude to the introduction of ERR, but tax breaks, unfortunately, does not.

Table 3 Question No. 9 from the Questionnaire

% of respondents	The limit amount
5%	Up to 1000 CZK
6%	Up to 2000 CZK
4%	Up to 3000 CZK
9%	Up to 5000 CZK
64%	Up to 10 000 CZK
12%	Up to 20 000 CZK

Source: Own processing

Figure 1 Question 9 from the Questionnaire



Source: Own processing

The question no. 9 to address the amount, of which should record sales. Most entrepreneurs are inclined to EUR 10 000, - CZK. This amount is the limit for the monitoring reports for which can no longer specify payment cumulatively.

Table 4 Question No. 10 from the Questionnaire

Do you plan to change the payment	% of respondents
Yes, partly	6%
Yes, where possible, I will change	19%
Yes, I will change all payments	2%
No, I will keep it as it is	18%
I will not care about it	3%
I will care once it is implemented	52%

Source: Own processing

The answers on question 10 show that it is not important for the entrepreneurs to deal with something that will happen at the end of this year or even in 2017.

Outcome of answers of non- entrepreneur public in Table 5

Table 5 Questions from the Questionnaire

Question no.	Answers - yes	Answers - no	Answers – doesn't know
No. 1	72%	22%	6%
No. 2	1%	99%	0%
No. 3	69%	13%	18%
No. 4	75%	20%	5%
No. 5	10%	42%	48%
No. 6	32%	38%	30%
No. 7	63%	37%	0%
No. 8	12%	82%	6%

Source: Own processing

Table 6 Comparison of Answers of Entrepreneurs and Non-entrepreneurs Public

Question no.	Answers	Yes	Answers no	No	Answers	Doesn't know
No. 1	1%	72%	99%	22%	0%	6%
No. 2	1%	1%	99%	99%	0%	0%
No. 3	2%	69%	23%	13%	75%	18%
No. 4	0%	75%	86%	20%	14%	5%
No. 5	26%	10%	52%	42%	22%	48%
No. 6	22%	32%	78%	38%	0%	30%
No. 7	100%	63%	0%	37%	0%	0%
No. 8	0%	12%	80%	82%	20%	6%

Source: Own processing

May 9. – 13. 2016 STEM realised a quick research for The General Financial Directorate. This research focused on citizens attitude towards the ERR. Representative collection of the Czech population aged over 18 has been studied by combination of techniques CATI and CAWI. In total 1.010 people were surveyed. The research did not show whether they are entrepreneurs or not.

Questions about the ERR:

1. „Taking into account all pros and cons of ERR, its implementation is from your perspective: “Answer – 63% positive, 37% negative

2. „Would you say about the ERR: “I know everything I need“

Answer – 41% yes, 36% would like to know more, 23% not even interested

3. „Do you think the introduction of ERR will contribute to improving the collection of taxes from merchants and service providers?“

Response - 67% yes and 33% no

4. „Considering all the pros and cons, you said, that tax morale of merchants, vendors of goods and services is now in the Czech Republic.“

The answer - good 60% Poor 40%

5. „Do you think that the State tries to find a way how to increase the amount collected on taxes from merchants and vendors on Czech market?“

Answer – yes 82%, no 18%

6. „Would it increase your motivation to require the receipt from the merchant if this receipt might win in a lottery (financial or factual)?“

Answer – yes 72%, no 28%

Research results

The research sample consisted of tradesmen, micro entities and non-entrepreneurs public. Respondents answered the questionnaire. The big difference of opinion on electronic records of sales arose between groups of entrepreneurs and non-entrepreneurs. In order to determine the hypothesis H1 the standard deviations were detected in question no. 1, no. 2, no. 4 and no. 5.

The standard deviation from the average for question no. 1 for a "yes" was 31.56%, meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 1 in the answer "no" was 33.32 meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 2 in the answer yes was 18.85%, meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 2 in the answer "no" was 18.85 meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 4 for yes answers was 33.62%, meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 4 in the answer "no" was 26.39%, meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 5 for yes answers was 20.84 meaning that the deviation is large and entrepreneurs! Answer does not match with the public.

The standard deviation from the average for question no. 5 in the answer "no" was 5.24%, in this case the deviation coincides with entrepreneurs and their response match with the public.

Based on the calculation of standard deviation and their comparison we can say that we condemn hypothesis H0 and correct is H1 the opinion of entrepreneurs does not match with a non-business public.

4 Conclusions

Electronic Records of Sales aims to progressively straighten the conditions in all of the risky business sectors. 500-600.000 entrepreneurs will be liable to ERR. This research did not cover the whole population. The sample was chosen from entrepreneurs and general public of Zlín region. The study found out that most of the answers of entrepreneurs differ from the answer of the public. For the question no. 5 the respondents believes that the morals of entrepreneurs will not improve. According to state, as a result of a law on the registration of revenues the motivation to report sales and tax income will raise. The majority of respondents is not able to judge the impact of ERR on tax collection.

It is to be expected that small portion of entrepreneurs will quit, in a similar way it was in Croatia. Those were the entrepreneurs that worried about higher taxation because of income increase due to ERR introduction.

Acknowledgments

"Authors are thankful to the Internal Grant Agency of FaME UTB No. IGA/FaME/2015/ The Electronic Record of Sales and Impact on the Reduction of Tax Evasion - for financial support to carry out this research."

References

- Nerudová, D. (2014). *Harmonizace daňových systémů zemí Evropské unie*. 4. aktualizované a doplněné vydání, Praha: Wolters Kluwer.
- Široký, J. (2013). *Daně v Evropské unii*. 6., aktualiz. a přeprac. vyd. včetně CD. Praha: Linde Praha.
- Vančurova, A., Láchová, L. (2014). *Daňový systém ČR 2014*. 12. aktualiz. vyd. Praha: Vox.
- Blackburn, K., Bose, N., Capasso, S. (2012). *Tax evasion the underground economy and financial development*, J. Econ. Behav. Organ., vol. 83 (2), pp. 243-253.
- Finardi, S., Vančurová, A. (2014). Estimation of a Tax Gap in the Personal Income Tax by Means of National Accounts. *European Financial and Accounting Journal*, roč. 9, č. 2, pp. 66-78.
- Schneides, F., Rackowski, K., Mroz, B. (2015). Shadow economy and tax evasion in the EU. *Journal of Money laundering control*.
- Evropský parlament (2016). *Fakta a čísla o Evropské unii*. Retrieved from: http://www.europarl.europa.eu/atyourservice/cs/displayFtu.html?ftuId=FTU_5.11.1.htm.
- Finanční správa (2016). *E-tržby (EET – elektronická evidence tržeb) 2016*. Retrieved from: <http://www.financnisprava.cz/cs/financni-sprava/eet>.
- Ministerstvo financí České republiky (2013). *Základní informace o projektu Elektronická evidence tržeb (EET)*. Retrieved from: https://mfcr.ezak.cz/documentaudit_15121/.docx.
- Ministerstvo financí České republiky (2015). *Studie - Specifikace projektu Elektronická evidence tržeb, 2013*. Retrieved from: <http://www.mfcr.cz/cs/o-ministerstvu/odborne-studie-a-vyzkumy/2016/studie-eet-23692>.
- Ministerstvo financí České republiky (2016). *Závěrečná zpráva hodnocení dopadů regulace: Návrh zákona o evidenci tržeb*. Retrieved from: <http://docplayer.cz/5495275-Zavererna-zprava-hodnoceni-dopadu-regulace-ria-navrh-zakona-o-evidenci-trzeb.html>.
- Podnikání, (2016). *Peníze*. Retrieved from: <http://www.penize.cz/podnikani>.
- The VAT Gap, (2015). *Questions and Answers*. Retrieved from: http://europa.eu/rapid/press-release_MEMO-15-5593_en.htm.

The Comparison of the Selected Aspects of Taxation in Visegrad Four Countries

Jaroslav Kovárník¹, Pavel Jedlička², Eva Hamplová³

¹ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 HradecKrálové, Czech Republic
E-mail: jaroslav.kovarnik@uhk.cz

² University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 HradecKrálové, Czech Republic
E-mail: pavel.jedlicka@uhk.cz

³ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 HradecKrálové, Czech Republic
E-mail: eva.hamplova@uhk.cz

Abstract: *Visegrad Four countries, namely the Czech Republic, Slovakia, Poland, and Hungary, share not only same geographical position in the Central Europe, but also similar history, and similar economic development. All countries were under the influence of Soviet Union, they went through the economic transformation in the nineties of the last century, they joined the European Union in the same year, and they also experienced the economic crisis. However, even if the economic development before crisis was similar in all analysed countries, the after-crisis development has been different, where some countries have been developing faster than the others in terms of GDP. The aim of this article is to analyse not only GDP development in Visegrad Four countries, but also analyse the development of selected aspects of taxation, namely tax collection and tax burden (more precisely tax quota). The authors analyse whether the development of mentioned tax problems corresponds with the GDP development or not. The analysis shows that even if the Slovakia has been developing in terms of GDP after crisis, there is the lowest tax collection and tax burden. Details of this analysis are described in this article.*

Keywords: GDP development, taxation, Visegrad Four countries

JEL codes: H20, O11, O57

1 Introduction

Macroeconomic theory shows that Gross Domestic Product (GDP) is one of the most important indicator showing and evaluating development in particular country. There exist more macroeconomic indicators, such as inflation or unemployment rate, but another important indicator for every economy is tax collection. The amount of tax collected by the government represents the tax revenue. It can be consequently used for government spending and can cover not only goods and services bought by the state, but also transfer payments, such as pensions (Mankiw, 2010).

With respect to the taxation, one basic indicator can be used both for the international comparison and for the analysis of the development over time. This indicator is called tax quota, it measures the share of tax revenues of the government on GDP, but two different types of this indicator can be found. In the first version, only tax revenues are included in the formula, while in the second version are tax revenues together with social contributions paid to the general government. In other words, in the first version are included only such revenues, where the word "tax" is directly in the title of such collected revenue. In the second version, also other revenues of the government are included, where these revenues are not called "taxes", but they have the character of taxes. These revenues are usually called social insurance contributions, where these contributions

have usually two parts, namely social security and health insurance (Samuelson & Nordhaus, 2010).

Countries of Visegrad Group or Visegrad Four, namely the Czech Republic, Slovakia, Hungary, and Poland, can be found in the Central Europe. These countries share similar history, where all of them were on the east side of the Iron Curtain, which means under the influence of the Soviet Union. All countries went through transformation in the nineties of last century, and all countries also joined the European Union together in 2004. Nowadays, these countries share some similar opinions, for example in the terms of migration crisis. Because of the common history, these countries established the Visegrad Group in 1991, and had been cooperating even before they joined the EU. After their entrance, they still have been cooperating, with greater or lesser success, not only in general ways, but also on the field of EU.

Authors of this article already published several papers about taxation, but mostly from a little bit different point of view (see for example Hájek, Hamplová, Jedlička & Kovárník, 2013, Jedlička & Kovárník, 2013, or Kovárník & Jedlička, 2014). Other authors are dealing with taxation as well (see Dubrovina & Peliova, 2015, or Valouch & Lemeshko, 2014), but again mostly with different issues. Visegrad Four countries are also evaluated by other authors (see for example Zdražil & Kraftová, 2012), but taxation in these countries is usually not evaluated. Therefore authors of this article decided to focus on this topic.

The aim of this article is to analyse the development of GDP in the countries of Visegrad Four, and then the development of tax quota in the analysed countries. It is relatively well known fact that the analysed countries have been growing in terms of GDP after crisis, but the growth rate is different, some countries are faster than the others. This article is verifying the hypothesis, whether the development of tax collection is similar with the GDP development or not, in other words, whether there exists some correlation between GDP development and tax collection development.

2 Methodology and Data

According to the theory, GDP can be calculated in three different ways. First approach is based on the definition of GDP, where it measures value of the goods and services in specific year in all industrial sectors in particular country. Second approach of GDP calculation is based on income earned by all production factors in particular economy, which present wages paid to labour, rent earned for land, and the return on capital in the form either of interest or entrepreneur's profit. In this approach, some adjustments have to be made, such as increasing for indirect taxes, increasing for depreciation, and finally correction for net foreign income. Last approach for GDP calculating is based on spending of different groups that participate in the economy, where GDP is a measure of consumer spending (C), business investment (I), government spending (G), and net exports, which can be calculated as exports minus imports (X-M), in other words

$$\text{GDP} = C + I + G + (X - M). \quad (1)$$

All indicators have autonomous part and some of them also induced part. Autonomous elements present expenditures taking place when disposable income levels are at zero. In other words, these payments are used to fund necessities, but causes subjects to borrow money or withdraw from savings accounts. Induced elements present payments which differ based on income. As disposable income rises, so does the rate of induced element. In other words, disposable income is at zero when induced element is at zero (see Mankiw, 2010, or Samuelson & Nordhaus, 2010).

Taxation has influence on two parts of GDP formula, specifically on consumer spending and on government spending. Despite the fact that taxes are essential resource for government, every state can have the deficit budget, in other words, the size of government spending is not dependent on the size of tax collected, government spending can be covered by other resources as well. However, the size of consumer spending is influenced by the taxes, higher taxes means lower disposable income. On the other hand,

growing income leads into growth of taxes, which means growth of government spending, and consequently another growth of income. Therefore it can be expected that there exists some correlation between taxation and GDP development (see Mankiw, 2010, or Samuelson & Nordhaus, 2010).

For the verification of this hypothesis will be used a selective correlation coefficient, which can analyse the size of interaction between GDP per capita and tax collection per capita (Kubanová, 2003).

$$r_{X,Y} = \frac{\sum_{i=1}^n X_i Y_i - n\bar{x}\bar{y}}{\sqrt{\sum_{i=1}^n X_i^2 - n\bar{x}^2} * \sqrt{\sum_{i=1}^n Y_i^2 - n\bar{y}^2}} \quad (2)$$

By using of this coefficient is possible to verify the null hypothesis that there is no correlation relationship, against the alternative hypothesis that there is correlation relationship in the GDP and tax collection development. For the testing of this null hypothesis will be used the following test criterion

$$T = \frac{r}{\sqrt{1-r^2}} * \sqrt{n-2} \quad (3)$$

Assuming validity of null hypothesis, the test criterion will have the Student probability distribution with $n - 2$ degrees of freedom. The critical value of this distribution on the level of significance $\alpha = 0.05$ with 17 degrees of freedom (analysed data since 1995 until 2013) is 2.1098. The null hypothesis about no correlation relationship will be valid, when the value of test criterion falls into the acceptable value area, in this case value lower than above mentioned 2.1098 (Linda & Kubanová, 2000).

The data, which have been used for the calculations, were obtained in general available database Eurostat (Eurostat a, 2016, Eurostat b, 2016), and in tax yearbook of the European Union (Denis, Hemmelgarn & Sloan, 2015). GDP per capita for whole analysed period and all analysed countries are in following Table 1:

Table 1 GDP per Capita in Visegrad Four Countries (Euro)

	1995	1996	1997	1998	1999	2000	2001
Czech Rep.	4 300	5 000	5 100	5 600	5 700	6 200	7 000
Hungary	3 400	3 500	4 000	4 200	4 400	4 900	5 800
Poland	2 800	3 200	3 600	4 000	4 100	4 900	5 600
Slovakia	2 800	3 100	3 500	3 700	3 600	4 100	4 400
	2002	2003	2004	2005	2006	2007	2008
Czech Rep.	8 200	8 300	9 000	10 200	11 500	12 800	14 800
Hungary	6 900	7 300	8 100	8 800	8 900	9 900	10 500
Poland	5 500	5 000	5 300	6 400	7 100	8 200	9 500
Slovakia	4 800	5 500	6 300	7 100	8 300	10 200	11 900
	2009	2010	2011	2012	2013		
Czech Rep.	13 600	14 300	14 800	14 600	14 200		
Hungary	9 100	9 600	9 900	9 800	9 900		
Poland	8 100	9 200	9 600	9 900	10 100		
Slovakia	11 600	12 100	12 800	13 200	13 300		

Source: Denis, Hemmelgarn & Sloan (2015), Eurostat a (2016), Eurostat b (2016)

Following Table 2 presents another set of source data, specifically tax collection per capita.

Table 2 Tax Collection per Capita in Visegrad Four Countries (Euro)

	1995	1996	1997	1998	1999	2000	2001
Czech Rep.	1 530	1 710	1 772	1 880	1 963	2 109	2 377
Hungary	1 395	1 399	1 535	1 609	1 717	1 954	2 248
Poland	1 070	1 222	1 345	1 457	1 486	1 660	1 895
Slovakia	1 131	1 224	1 314	1 367	1 279	1 407	1 464
	2002	2003	2004	2005	2006	2007	2008
Czech Rep.	2 850	2 952	3 250	3 649	4 074	4 608	5 110
Hungary	2 629	2 782	3 060	3 303	3 332	4 013	4 246
Poland	1 872	1 676	1 755	2 181	2 471	2 933	3 346
Slovakia	1 602	1 830	2 036	2 277	2 486	3 053	3 535
	2009	2010	2011	2012	2013		
Czech Rep.	4 562	4 856	5 246	5 250	5 194		
Hungary	3 660	3 677	3 719	3 861	3 907		
Poland	2 648	3 003	3 195	3 309	3 353		
Slovakia	3 410	3 488	3 758	3 819	4 130		

Source: Denis, Hemmelgarn & Sloan (2015), Eurostat a (2016), Eurostat b (2016)

Last topic analysed in this article is tax burden (tax quota) in Visegrad Four countries. Necessary data (in percent of GDP) can be found in the following Table 3. These data have been available also for the year 2014.

Table 3 Tax Burden in Visegrad Four Countries (% of GDP)

	1995	1996	1997	1998	1999	2000	2001
Czech Rep.	34.5	33.2	33.5	32.3	33.1	32.5	32.4
Hungary	40.5	39.5	37.9	37.8	38.4	39.2	38.1
Poland	37.4	37.4	36.9	36.1	35.8	33.8	33.8
Slovakia	39.6	38.7	36.7	36.3	35.0	33.9	32.8
	2002	2003	2004	2005	2006	2007	2008
Czech Rep.	33.4	34.1	34.6	34.2	33.9	34.4	33.1
Hungary	37.5	37.5	37.2	36.8	36.7	39.7	39.7
Poland	34.0	33.4	33.0	34.0	34.6	35.5	35.2
Slovakia	33.0	32.6	31.7	31.5	29.4	29.3	29.1
	2009	2010	2011	2012	2013	2014	
Czech Rep.	32.1	32.6	33.7	34.2	34.8	34.1	
Hungary	39.2	37.5	36.9	38.6	38.2	38.4	
Poland	32.3	32.0	32.5	32.8	32.8	33.0	
Slovakia	28.9	28.2	28.7	28.4	30.3	31.2	

Source: Denis, Hemmelgarn & Sloan (2015), Eurostat a (2016), Eurostat b (2016)

3 Results and Discussion

GDP Development Analysis

Based on the fact that the Czech Republic has currently around 10.5 billion of inhabitants, Hungary around 9.8 billion, Slovakia around 5.4 billion, and Poland more than 38.4 billion, it is quite obvious that the level of GDP in billions of euro is the highest in Poland, while the Czech Republic is on the second position, Hungary is on the third position, and Slovakia on the fourth. However, Table 1 presents level of GDP per capita, because this indicator can be used for international comparison. According to this Table, the highest level has the Czech Republic, Slovakia is on the second place, Poland is the third, and Hungary the last. Moreover, the position of the Czech Republic has been same during whole analysed period, but the positions of other countries have changed. Hungary had the second highest GDP per capita in 1995, but it was overtaken by Slovakia in 2007 and by Poland in 2012. One of the possible explanations can be seen in the development in the number of inhabitants, where in the Czech Republic, in Poland,

and in Slovakia this indicator grew (comparison between 1995 and 2013), while in Hungary it dropped.

Deep analysis of GDP development shows that in all analysed countries was significant decrease in this indicator in the year 2009 (both in absolute value and in per capita) as a result of global economic crisis. In pre-crisis year 2008, Hungary was still on the third position, where Poland was the last country in the terms of GDP per capita. However, even if all analysed countries have started to grow again in 2010, only Slovakia managed to recover really quickly and had the GDP per capita higher than in pre-crisis year 2008. Moreover, in the year 2012 had two analysed countries another drop in the level of GDP per capita, namely the Czech Republic and Hungary, while Poland and Slovakia have been growing since 2009. This second drop can be another result while Hungary is currently on the last position in the terms of GDP per capita. Additionally, only the Czech Republic dropped again in 2013 (both in absolute value and in per capita level), while Hungary started to grow again. Therefore, the first position of the Czech Republic in terms of GDP per capita is only because of the lead from previous years.

Tax Collection Development Analysis

Data presented in Table 2 shows relatively similar development between tax collection and GDP per capita, however, some differences can be found in all analysed countries. The Czech Republic has had the best results in all analysed years, and it has been growing in whole period with two exceptions. First one was in 2009, as well as in GDP per capita. However, despite the fact that GDP per capita dropped in 2012, tax collection grew in the Czech Republic in this year, but this growth was not significant. In 2013, both GDP per capita and tax collection per capita dropped.

Tax collection in Hungary has been growing in whole period with one exception in 2009. That means that tax collection grew in 2012, despite the fact that GDP per capita dropped. Additionally, even if the tax collection after crisis (since 2009) has been growing, it still does not exceed the value from pre-crisis year 2008. Another difference is that Hungary was on the second position in terms of tax collection per capita in almost all years, it was exceeded only by Slovakia in 2011 and 2013.

The development in Poland is similar; there were declines both in GDP per capita and in tax collection per capita in 2003 and 2009. The after-crisis recovery process was also longer, as well as in Hungary, and tax collection exceeded the value from the pre-crisis year 2008 in 2013. The position of Poland is slightly different, in the years 1995 and 1996 was Poland on the last position, it became third in 1997 (it exceeded Slovakia), but it was exceeded by Slovakia in 2003. Even if it managed to exceed Hungary in terms of GDP, it remains on the last position in terms of tax collection.

Slovakia has also similar development as in case of GDP per capita, which means growth in almost all analysed years with exceptions in 1999 and 2009. In Slovakia was a recovery process also a little bit longer, and tax collection per capita exceeded the pre-crisis level in 2011, not in 2010 (as GDP). In terms of tax collection, Slovakia was on the third position, it was exceeded by Poland in 1997, it managed to get back its third position in 2003, but in comparison with Hungary it has remained worse with only exceptions in 2011 and 2013.

The Relationship between GDP and Tax Collection Development

It is possible to verify the null hypothesis that there is no correlation relationship, against the alternative hypothesis that there is correlation relationship in the GDP and tax collection development by using of selective correlation coefficient.

Assuming validity of null hypothesis, the test criterion will have the Student probability distribution with $n - 2$ degrees of freedom. The critical value of this distribution on the level of significance $\alpha = 0.05$ with 17 degrees of freedom (analysed data since 1995 until 2013) is 2.1098. The null hypothesis about no correlation relationship will be valid, when the value of test criterion falls into the acceptable value area, in this case value lower

than above mentioned 2.1098. (Linda & Kubanová, 2000). The results of selective correlation coefficient are in following Table 4.

Table 4 Results of Selective Correlation Coefficient

	Result	Critical Value	Null Hypothesis
Czech Republic	56.27365	2.1098	Denied
Hungary	45.16995	2.1098	Denied
Poland	44.18294	2.1098	Denied
Slovakia	63.15282	2.1098	Denied

Source: Own calculation

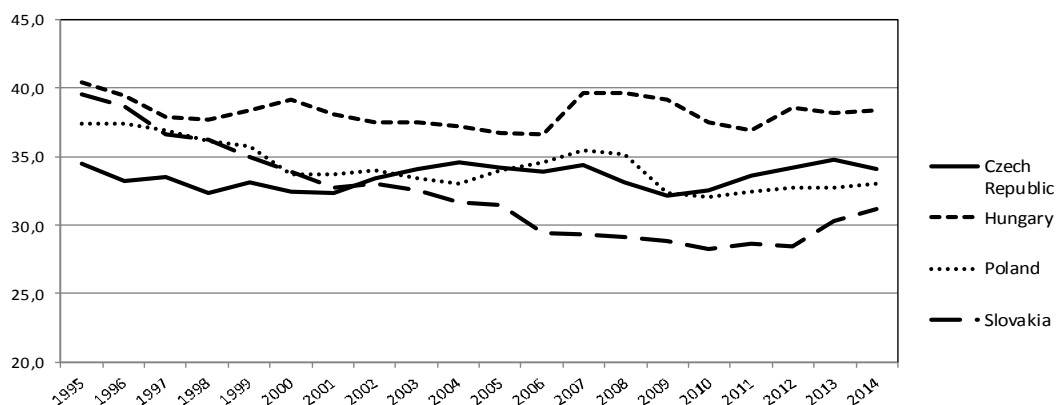
It is quite obvious that the null hypothesis about no correlation has been denied in all Visegrad Four countries, and alternative hypothesis is valid. Despite above mentioned differences (both in development and in position of each country) there exists relatively strong correlation between these indicators.

Even if this result was expected, the strength of this correlation is relatively surprising. It is possible to find differences, as was already described, where one analysed indicator increased, while the other one decreased, and vice versa. Also the position of some countries was different, which means that there are different growth rates in case of GDP and tax collection. Nevertheless, selective correlation coefficient proofs that despite these differences is the development of both indicators similar in all analysed countries.

Tax Quota Development

In the following Figure 1 is described the development of tax quota in Visegrad Four countries.

Figure 1 The Development of Tax Quota in Visegrad Four Countries (% of GDP)



Source: Own calculation

Because of strong correlation between GDP per capita development and tax collection development can be assumed that the tax quota will be relatively the same in whole analysed period. However, Figure 1 shows quite varied development. Interesting fact is that there are some differences in the development of tax quota among analysed countries, while the GDP per capita or tax collection have been developing in relatively similar way. For example, GDP per capita and tax collection decreased in the year 2009 in all analysed countries, but tax quota decreased strongly only in Poland, other countries remained almost the same. Moreover, sometimes the tax quota grew in some countries, while there was decrease in other countries.

The highest tax quota has been in Hungary in whole analysed period, where there has been only small decrease from 40.5% (in 1995) to 38.4% (in 2014). Interesting development occurs in Slovakia, where the tax quota was second highest in 1995 (39.6%), but it has been rapidly decreasing for almost whole analysed period, with the only exception of last two analysed years. Currently has Slovakia the lowest tax quota

(31.2%), and the minimum was in 2010 (28.2%). Poland has been dealing with decrease as well, but the decrease rate is not as rapid as in case of Slovakia. In 1995, Poland had the third highest tax quota (37.4%), currently is also on the third position, but the size of tax quota is only 33%. The size of tax quota in the Czech Republic is almost the same. Even if some declines and increases occurred, the size of tax quota was 34.5% in 1995 and is 34.1% in 2014. However, the position of the Czech Republic has been changed because of the decreases in Slovakia and in Poland. The Czech Republic had the lowest tax quota in 1995, but currently has the second highest tax quota (in 2014).

Discussion

As was already mentioned, on one hand there exists strong correlation between GDP development and tax collection development in Visegrad Four countries, but on the other hand, there exist also differences in the tax quota development, which measures the share of revenues of the government from taxes and social contribution on the GDP.

The Czech Republic has had the highest GDP per capita in all analysed years, there is strong correlation between GDP and tax collection development, but in case of tax quota was the Czech Republic on the last position in 1995 and currently has the second highest tax quota. It can be explained in such way that the increase of GDP in this country is accompanied with the higher tax collection, therefore the tax quota has been similar in all analysed years. This conclusion is supported by the GDP decreases, where tax collection also decreased.

Hungary had the second highest GDP per capita in 1995, but currently has the lowest level. The development of tax collection is similar; however, the tax quota has been the highest in all analysed years. The possible explanation can be that Hungary has been dealing with really low GDP growth rate, but it tries to support its economy through other than tax tools, because the tax quota is really high.

Poland had the lowest tax collection in 1995, and even if it increased a little bit during following years, it is currently the lowest again. Nevertheless, its GDP per capita has been increasing, and currently has Poland the third highest GDP per capita. This development can be explained in such way that Poland managed to increase its GDP growth rate, but not its tax collection. Question is whether the GDP has increased in non-tax elements, such as net export, or whether tax rates have decreased in Poland during analysed periods, which has consequently lead into the tax quota decrease.

Slovakia had the lowest GDP per capita in 1995, but its development, especially after the crisis, has been really rapid. The tax collection in Slovakia is also growing, but the growth rate is not as rapid as GDP growth rate. The tax quota in Slovakia has been decreasing rapidly in whole analysed period. The possible explanation can be similar as in case of Poland.

It is important to add one comment. The calculated tax quota included also social contribution, while tax collection included only revenues for the government which are called "taxes". Therefore the results of tax quota can be a little bit distorted by the changes not in taxes, but in social contribution.

4 Conclusions

This paper dealt with selected issues of taxation in Visegrad Four countries. More precisely, it analysed firstly GDP per capita development in these countries, secondly tax collection per capita development, and finally tax quota development. The correlation between GDP per capita development and tax collection per capita development has been verified thanks to selective correlation coefficient.

The analysis shows strong correlation between GDP and tax collection. That means that the developments of GDP and of tax collection are similar in all analysed countries, usually both either increase or decrease. It is possible to find some differences, where one indicator increases while the other one decreases, but these differences occur only in one year. However, the growth rates are different, and therefore the positions of

countries changed. The Czech Republic has been the best country in terms of GDP per capita, but Slovakia has been developing rapidly after crisis.

With respect to the tax quota, Hungary has had the highest level in all analysed years, where the level of tax quota has remained almost unchanged. Similar level of tax quota can be found also in the Czech Republic, but the position of this country changed from the last one (in 1995) to the second position (in 2014), because of relatively rapid decreases of tax quota both in Poland and in Slovakia. This development can have several possible explanations. Firstly, these countries can have their GDP development supported by non-tax elements, such as net export. Secondly, there can be some changes in tax rates. Last but not least, tax quota included also social contribution, where tax collection does not include these payments. This fact can distort the results a little bit.

Acknowledgments

This paper is written with financial support from Internal grant project from Faculty of Informatics and Management at the University of Hradec Králové.

References

- Denis, C., Hemmelgarn, T., Sloan, B. (2015). *Taxation Trends in the European Union*. 1st ed. Luxemburg: Publications Office of the European Union.
- Dubrovina, N., Peliova, J. (2015). Optimal Strategies for Tax Policy and Social Policy Tools Mix. In: Kajurová, V., Krajíček, J. eds.. *European Financial Systems 2015*. Brno: Masaryk University. pp. 106-113.
- EUROSTAT a (2016). *GDP and Main Components*. Retrieved from: http://ec.europa.eu/eurostat/en/web/products-datasets/-/NAMA_GDP_C.
- EUROSTAT b (2016). *Main National Accounts Tax Aggregates*. Retrieved from: http://ec.europa.eu/eurostat/web/products-datasets/-/gov_a_tax_ag.
- Hájek, L., Hamplová, E., Jedlička, P., Kovárník, J. (2013). Vybrané aspekty kauzality daňové incidence. *E+M Ekonomie a Management*. vol. 13(4). pp. 159-169.
- Jedlička, P., Kovárník, J. (2013). Analýza faktorů růstu inkasa daně z přidané hodnoty. In: Jedlička, P. ed.. *Hradec Economic Days 2013*. Hradec Králové: Gaudeamus. pp. 275-280.
- Kovárník, J., Jedlička, P. (2014). Personal Taxation: An Emotive Issue. *International Accountant*. vol. 75(2). pp. 8-9.
- Kubanová, J. (2003). *Statistické metody pro ekonomickou a technickou praxi*. 1st ed. Bratislava: Statist.
- Linda, B., Kubanová, J. (2000). *Statistické tabulky a vzorce*. 1st ed. Pardubice: Univerzita Pardubice.
- Mankiw, G. N. (2010). *Macroeconomics*. 7th ed. New York: Worth Publishers.
- Samuelson, P. A., Nordhaus, W. D. (2010). *Macroeconomics*. 19th ed. Boston: McGraw-Hill/Irvin.
- Valouch, P., Lemeshko, O. (2014). Tax Considerations and Merger Activity in National and International Context: Empirical Evidence from the Czech Republic. In: Deev, O., Kajurová, V., Krajíček, J. eds. *European Financial Systems 2014*. Brno: Masaryk University. pp. 669-676.
- Zdražil, P., Kraftová, I. (2012). Konvergují regiony zemí V4? In: Klímová, V., Žítek, V. eds.. *15th International Colloquium on Regional Sciences*. Brno: Masaryk University. pp. 48-58.

Alternative Investments in Voluntary Pension Security

Patrycja Kowalczyk-Rólczyńska¹, Tomasz Rólczyński²

¹ University of Economics in Wrocław
Faculty of Management, Information Systems and Finance, Department of Insurance
ul. Komandorska 118/120, 53-345 Wrocław, Poland
patrycja.rolczynska@gmail.com

² WSB University in Wrocław
Faculty of Finance and Management, Institute of Economics
Fabryczna street 29-31, 53-609 Wrocław, Poland
tomasz.rolczynski@wsb.wroclaw.pl

Abstract: *Voluntary pension security plans play an important role in every pension system. Demographic changes in European countries cause that the value of pension benefits from the mandatory part of the pension system will be getting lower in the following years. This will have a significant effect on quality of life and consumption of retired people. In order not to increase the group of people at risk of poverty, one needs to increase the number of economically active persons who voluntarily save for their retirement. As part of the voluntary forms of pension security different products, mainly financial ones, are offered (often by banks, insurance companies, investment funds and pension funds). The contributions paid are invested mostly on the capital market (both safe and risky financial assets). However, on the market there are also alternative assets which in the long term can generate higher rates of return than investments in traditional assets. People who save money should consider including in the portfolio alternative assets which would affect also the diversification of the portfolio constituting voluntary pension security plans. Among alternative assets a special attention should be paid to real estate, gold, silver, arts, wine and whisky as well. In those types of assets investors can invest both directly and indirectly. The aim of the article is to assess the role which alternative investments play in voluntary pension security on the Polish market. To achieve that purpose, statistical methods, such as for example correlation coefficient, are used to assess the relationship between characteristics of describing alternative and traditional assets.*

Keywords: alternative investments, traditional assets, rate of return, risk, pension security

JEL codes: J32, E44, G11, G12

1 Introduction

The demographic changes on the European market made it necessary to reform pension systems, which led to the creation of the so called pension pillars. Within their framework, there are mandatory (basic) and voluntary (supplementary) forms of pension security distinguished (see more in: Lanoo et al., 2014). The pensions which are paid under the mandatory part of the pension scheme should meet the basic needs of the retirees. The pensions paid under the supplementary part should, on the other hand, ensure a higher living standard of people who ceased their occupational activity.

The voluntary part of the pension scheme may take different forms. According to M. Szczepański (2010), the essence of the participation in the supplementary part consists in the fact that the additional retirement savings should be accumulated systematically, possibly over the entire period of the occupational activity, until retiring. Under some of the regular retirement savings programs, when their participant is young, the funds are invested in high risk assets. Moreover, at a previously specified date (e.g. 5-10 years prior to retirement), the accumulated capital (as well as other funds subsequently paid into) is transferred (invested) into lower risk assets such as bonds and cash (Blake et al., 2014).

There is a variety of regular retirement savings programmes available on the market (for more, see: Lannoo et al., 2014). These include the so called unit-linked insurance (offered by life insurance companies) under which net premiums are invested based on the choice of the policy holder. This means that throughout the entire saving period the policy holder bears the investment risk. At a time of economic slowdown/financial crisis it may happen that the investment risk materializes and the policy holder will experience financial losses (for more, see: Ciumas et al., 2012). High potential profitability characterizes this type of insurance, since the profit is based on equity investments (for more, see: Schragger and Pelsser, 2004). Such products like unit-linked insurance are among the group of products offered under the defined contribution pension plan, in which future pension benefits are not set out in advance, being dependent on numerous factors. These include, in particular, the amount of the premium paid, risk aversion of the insured, lifetime expectancy, portfolio composition (for more, see: Konicz and Mulvey, 2015). The net premium paid under the unit-linked insurance is divided into two parts: the one securing the covering of the insurance risk and the investment part. The premium amount of the first part depends mainly on the current probability of sudden death of the person concerned (Stroiński, 2003). Thus, the net premium - for a young person - will nearly entirely be invested. On the other hand, for slightly older people (whose probability of death is higher), the investment part of the premium will be smaller.

On the Polish market unit-linked insurance may be purchased directly from life insurance companies as an individual client product or under pension programmes - supported by the state in the form of the tax incentive system - i.e. Individual Retirement Account (IRA), Individual Retirement Security Account (IRSA) and Occupational Retirement Provision (ORP). Nevertheless, despite the demographic changes and the increase in the pension awareness of the Polish society, there are still very few people amongst the working-age population who save for retirement. At the end of 2015, less than 12% of the total of the employed population had savings under those three programmes (Polish Financial Supervision Authority, 2016a, 2016b). This low percentage of people who decided to join the pension programmes can be traced to a variety of factors, e.g. too low earnings, household budgets burdened with mortgages, lack of trust in the financial institutions (in 2015, 44% of Poles trusted commercial banks and 35% trusted life insurance companies (Czapliński and Panek, 2015)). Moreover, for middle-aged people, saving for retirement using unit-linked insurance may seem rather little effective considering those people's higher probability of death and a higher premium to cover the insurance risk. They often enough have a stable job and sufficient earnings and can therefore plan pension savings or investments to provide security in the old age (in 2010, the highest earnings on the Polish market were recorded for men, aged 40-49, and for women aged 30-39 (OECD 2015)).

Under pension security, individuals - apart from saving under pension programmes - can invest in a variety of assets (traditional and alternative) which will ensure an additional income in the old age. Traditional assets include, among others, bonds and stocks. The group containing alternative assets comprises, in particular: hedge funds, goods, currencies, private equity, venture capital, business angles, real estate, infrastructure, wine, violins, coins, whisky, art (Muley and Kim, 2008; Shawky et al., 2012; Campbell, 2008). Alternative assets - unlike the traditional ones - present a decidedly higher liquidity risk, which may discourage investors. However, they have a greater potential to achieve a higher rate of return and provide investors with the access to global markets. A long investment horizon (associated with the alternative investments) has the effect that alternative assets may represent an important element in pension security.

Investment decisions should be made in such a way as to allow the investment portfolio to generate the lowest risk possible and the highest possible rate of return. The requirement to make this scenario happen is the appropriate construction of the investment portfolio, comprising relevant traditional assets and those diversified by alternative assets characterized by behaving differently than stocks or bonds (for more, see: Jureviciene and Jakavonyte, 2015).

The aim of the article is to assess the role which the alternative investments play in voluntary pension security on the Polish market. To achieve that purpose, statistical methods, such as, for example, correlation coefficient, are used to assess the relationship between the characteristics describing alternative and traditional assets.

2 Methodology and Data

The study takes into account the value of the financial instruments, as at the end of each quarter in 2001-2015. This provided the basis for calculating logarithmic rates of return (Campbell et al., 1997):

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right) \quad (1)$$

P_t – the price of the financial instrument at time t ;

P_{t-1} – the price of the financial instrument at time $t-1$;

afterwards, we calculated the average rates of return and the standard deviations of the rates of return. From the point of view of the work's objective, of significance is both assessment of the relationship between the rates of return of different financial instruments and the risk performance expressed by the standard deviation of the rates of return, with respect to the average rates of return.

In order to assess the relationships, the Pearson's correlation coefficient was used, given by the following equation (Bernstein and Bernstein, 1999; Sharma, 2007):

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^n (x_i - \bar{x})^2 \sum_{i=1}^n (y_i - \bar{y})^2}}, \quad (2)$$

where: r_{xy} - the correlation coefficient value

y -dependent variable

x -explanatory variable

n -number of observations

Seeking to verify whether the interdependencies identified by employing the correlation coefficient are significant statistically, the correlation coefficient significance test was carried out. Based on the sample results, the hypothesis $H_0 : \rho_{xy} = 0$ was tested (variables X and Y are independent in the population) against the alternative hypothesis $H_1 : \rho_{xy} \neq 0$ (variables X and Y are dependent in the population), assuming that the distribution (X, Y) is normal or approaches the normal distribution. To do this, a numerical value of the empirical statistic t_{emp} was calculated (Groebner et al., 2005; Berenson and Levine, 1996):

$$t_{emp} = \frac{r_{xy} \sqrt{n-2}}{\sqrt{1-r_{xy}^2}}, \quad (3)$$

where r_{xy} is the empirical correlation coefficient between the variables X and Y calculated for a random sample. The statistic t_{emp} has t-Student distribution with $n-2$ degrees of freedom. If the numerical value of t_{emp} belongs to the critical region, for the specified significance level, then the hypothesis H_0 should be rejected and the alternative hypothesis H_1 accepted.

To illustrate how the parameters of the average rate of return and the standard deviations of the rates of return develop, a correlation scatter graph was created. The standard deviations values for the particular instruments were displayed on the horizontal axis, while on the vertical one, the average logarithmical rates of return.

In line with the paper's aim, the study took into account both traditional and alternative assets that could be used in the construction of an investment portfolio which would generate income in the old age. The stock exchange indices of the Polish market (WIG and WIG20, characteristic for the Polish capital market) were chosen to represent traditional assets, as well as long-term bonds issued by the State Treasury and bank deposits offered by the banks operating on the Polish market. With respect to the alternative assets, out of their fairly long list, the following assets were chosen for the purpose of this study: gold, silver, real estate, (herein represented by residential real estate) and wine. The prices of both residential real estate, gold and silver are expressed in PLN, since they are available on the Polish market. The wine investments are, on the other hand, represented by the Liv-ex Fine Wine Investables Index, which reflects a typical wine investment portfolio (this is one of the indices which belongs to the Liv-ex Exchange). The assets used in the analysis together with the variables describing them are demonstrated in Table 1.

Table 1 The Type of Analysed Assets

Asset symbol	Name of asset	Variables describing the assets
A1	Real estate	Price per square meter of usable floor area in a residential building, ready for use, PLN
A2	Gold	Gold price per 1 ounce, PLN
A3	Silver	Silver price per 1 ounce PLN
A4	Wine	The Liv-ex Fine Wine Investables Index
A5	stocks (broad market)	WIG (Warsaw Stock Exchange Index)
A6	stocks (the top 20 largest companies)	WIG20 (stock market index of the twenty largest companies on the Warsaw Stock Exchange)
A7	Bank deposits	Deposits rate, above two years for households
A8	10-year state treasury bonds	Bonds yield

Source: Authors' own study

3 Results and Discussion

Table 2 and Figure 1 illustrate the average quarterly rates of return on each of the assets and the risk measured by the standard deviations of the rate of return. It can be observed from them that the bank deposits and bonds issued by the State Treasury have the lowest risk. This is consistent with the portfolio theory as those assets are considered to be "risk-free" instruments (Markovitz, 1952). On the other hand, stocks and silver carry the highest risk. Among the alternative assets, residential real property investments have the lowest risk. The highest rate of return (above 1,5% on a quarterly basis) was recorded for the investments in gold, silver, wine and stocks (WIG index was analysed, as an index of the broad market)

Comparing the alternative investments with the traditional ones did not yield a clear result. Investing in large companies (quoted on the WIG 20 index) brought the lowest rate of return among all the assets under consideration and carried high risk (only the silver investments had a slightly higher risk). The stock investments (broad market) were

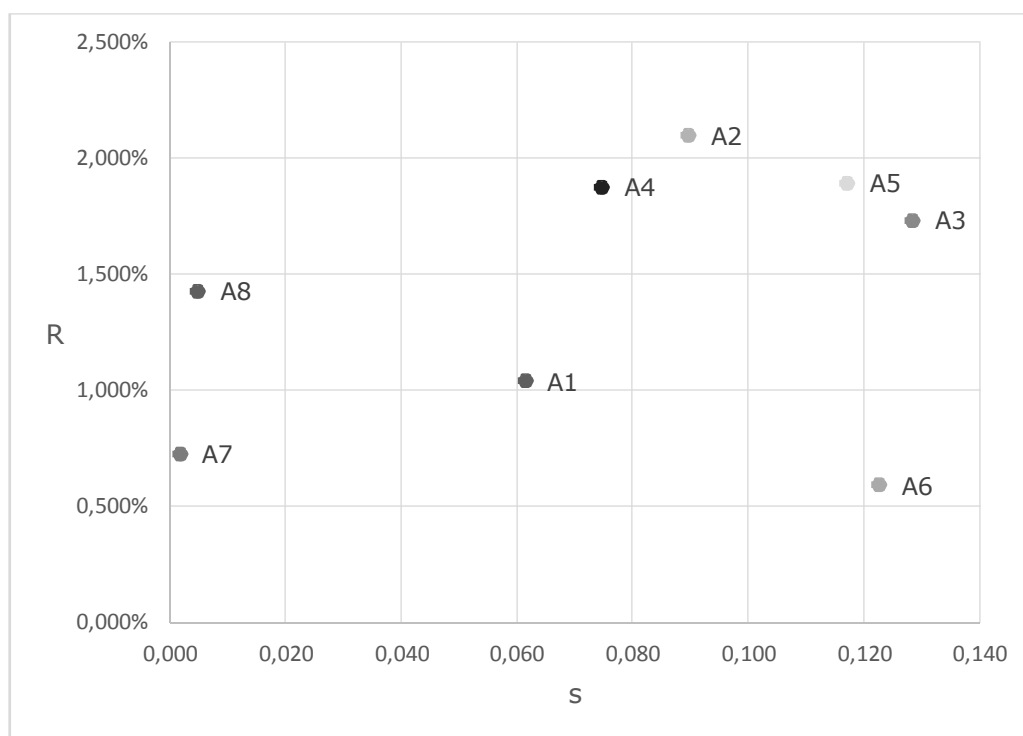
characterized by the rate of return which was comparable to that on the investments in gold, silver and wine, with the risk similar to that recorded for the investments in silver and the stocks of the 20 largest companies quoted on the Polish market. Among the assets used in the study, silver had the highest investment risk. Jureviciene and Jakavonyte (2015) obtained the same result.

Table 2 Characteristics of Rates of Return

	A1	A2	A3	A4	A5	A6	A7	A8
Average quarterly rate of return (R), %	1,04	2,10	1,73	1,88	1,90	0,59	0,73	1,43
Standard deviation of the rates of return (s)	0,061	0,090	0,128	0,075	0,117	0,123	0,002	0,005

Source: Authors' own study based on data from: www.nbp.pl; www.stat.gov.pl; www.bossa.pl; www.liv-ex.com; www.rynekzlota24.pl

Figure 1 Risk-return Map



Source: Authors' own study

From the point of view of the risk diversification, the correlation between the rates of return plays a significant role. In order to control the risk, a negative correlation is advantageous. Table 3 demonstrates the correlations between the rates of return on the investments in the assets under study. It can be observed that the investments in residential property, precious metals (gold, silver) are negatively (or insignificantly) correlated with all the other remaining investments, which implies that their including in the investment portfolio controls the investment risk of the entire portfolio. A statistically significant correlation (it means that hypothesis H_0 was rejected) occurs between the rates of return of gold and silver, which is to be expected. The wine investments are correlated significantly (positively) with the investments in stocks (WIG and WIG 20) and bank deposits, which indicates that including wine in the investment portfolio (comprising stocks and deposits) has little effect in terms of controlling investment risk.

Table 3 Correlation Coefficient Matrix

Asset symbol	Correlation coefficients							
	Underlined correlation coefficients are significant with $p < 0,05$							
	A1	A2	A3	A4	A5	A6	A7	A8
A1	1,000	-0,021	-0,188	-0,093	-0,157	-0,157	0,001	0,091
A2	-0,021	1,000	<u>0,710</u>	-0,168	<u>-0,338</u>	<u>-0,297</u>	0,115	0,047
A3	-0,188	<u>0,710</u>	1,000	0,188	0,015	-0,001	0,214	0,046
A4	-0,093	-0,168	0,188	1,000	<u>0,517</u>	<u>0,459</u>	<u>0,432</u>	0,135
A5	-0,157	<u>-0,338</u>	0,015	<u>0,517</u>	1,000	<u>0,969</u>	0,051	-0,155
A6	-0,157	<u>-0,297</u>	-0,001	<u>0,459</u>	<u>0,969</u>	1,000	0,128	-0,168
A7	0,001	0,115	0,214	<u>0,432</u>	0,051	0,128	1,000	<u>0,471</u>
A8	0,091	0,047	0,046	0,135	-0,155	-0,168	<u>0,471</u>	1,000

Source: Authors' own study based on data from: www.nbp.pl; www.stat.gov.pl; www.bossa.pl; www.liv-ex.com; www.rynekzlota24.pl

4 Conclusions

The study on the assessment of the role played by alternative investments for pension security on the Polish market revealed that holding residential real property, silver and gold in an investment portfolio which already comprises traditional assets has a significant impact on controlling investment risk, since there is no correlation, or if so, the negative one, with traditional assets investments. Moreover, the analysis of the risk carried by different types of assets may be very helpful in the construction of the investment portfolio, since – depending on the investors' aversion to or proclivity for risk – particular types of assets either will, or will not be included in the investment portfolio.

Thus, the conclusion made based on the study may also be of importance to financial institutions which support pension planning and construct portfolios for long-term investments. However, it needs to be emphasized that the Polish market is still a market in the process of development, not only in terms of the alternative assets availability, but also in terms of the society's financial education. The increase in the level of financial literacy and every change within the pension system can have the effect of raising interest in alternative assets.

References

- Berenson, M.L., Levine D.M.(1996). *Basic Business Statistics, Concepts and Applications*. Prentice Hall, New Jersey.
- Bernstein, S., Bernstein, R. (1999). Schaum`s outline of elements of statistics In: *Descriptive statistics and probability*. The McGraw-Hill Companies, Inc.
- Blake, D., Wright, D., Zhang Y. (2014). Age-dependent investing: Optimal funding and investment strategies in defined contribution pension plans when members are rational life cycle financial planners. In: *Journal of Economic Dynamics & Control*, vol. 38, pp. 105-124.
- Campbell, R.A.J. (2008). Fine violins as an alternative investment: strings attached?. In: *Pensions: An International Journal*, vol. 13(1/2), pp. 89-96.
- Campbell, J.Y., Lo, A.W., MacKinlay, A.C. (1997). *The Econometrics of Financial Markets*, Princeton University Press, New Jersey.
- Ciomas, C., Chris D.M., Mircea B.H.(2012). Global financial crisis and unit-linked insurance markets efficiency: empirical evidence from Central and Eastern European countries. In: *Annals of the University of Oradea, Economic Science Series*, Vol. 21 Issue 2, pp. 443-448.

- Czapliński, J., Panek, T. (2015). *Diagnoza społeczna 2015. Warunki i jakość życia Polaków*. Rada Monitoringu Społecznego. Warszawa.
- Groebner, D.F., Shannan P.W., Fry P.C., Smith K.D. (2005). *Business Statistic*, Pearson Prentice Hall, New Jersey.
- Jureviciene, D., Jakavonyte, A. (2015). Alternative investments: valuation of wine as a means for portfolio diversification. In: *Business: Theory and Practice*, 16 (1), pp. 84-93.
- Konicz, A.K., Mulvey, J.M. (2015). Optimal savings management for individuals with defined contribution pension plans. In: *European Journal of Operational Research*, 243, pp. 233-247.
- Lannoo, K., Barslund, M., Chmelar, A., Werder, M., (2014). Pension Schemes. In: *European Union*. Retrieved from: http://www.europarl.europa.eu/RegData/etudes/STUD/2014/536281/IPOL_STU%282014%29536281_EN.pdf.
- Markowitz, H. (1952). Portfolio Selection. In: *The Journal of Finance*, Vol. 7, No. 1, pp. 77-91.
- Muley, J.M., Kim W.C. (2008). The Role of Alternative Assets in Portfolio Construction. In: *Encyclopedia of Quantitative Risk Analysis and Assessment*. IV.
- OECD. (2015). *Ageing and Employment Policies: Poland 2015*, OECD Publishing, Paris. DOI: <http://dx.doi.org/10.1787/9789264227279-en>.
- Polish Financial Supervision Authority (2016a). Indywidualne Konta Emerytalne oraz Indywidualne Konta Zabezpieczenia Emerytalnego w roku 2015, Warsaw, Retrieved from: http://www.knf.gov.pl/Images/Oprac_IKE_IKZE_122015_tcm75-47033.pdf.
- Polish Financial Supervision Authority (2016b). *Informacja dotycząca pracowniczych programów emerytalnych w 2015 r.* Retrieved from: http://www.knf.gov.pl/Images/informacja_PPE_w_2015_tcm75-46129.pdf.
- Schrager, D.F., Pelsser, A.A.J. (2004). Pricing Rate of Return Guarantees in Regular Premium Unit Linked Insurance. In: *Insurance: Mathematics and Economics* 35, pp.369-398.
- Sharma, J.K. (2007). *Business Statistics*, Dorling Kindersley, Delhi.
- Shawky, H., Siegel, D. S.; Wright, M. (2012). Editorial – Financial and real effects of alternative investments. In: *Section: Financial and Real Effects of Alternative Investments*, *Journal of Corporate Finance* 18(1): 105–107.
- Stroiński, E. (2003). *Ubezpieczenia na życie, teoria i praktyka*, Poltext, Warszawa.
- Szczepański, M. (2010). Alokacja ryzyka w PPE w Polsce. In: *Polityka Społeczna*, nr 2/2010.

Impact of the Interest Rates in the Economy, the Banking and Financial System

Jan Krajíček¹, Bohuslava Doláková²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41 a, 602 00 Brno, Czech Republic
E-mail: krajicek@econ.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41 a, 602 00 Brno, Czech Republic
E-mail: 175975@mail.muni.cz

Abstract: *The continued decline of interest rates, pointing to negative interest rates is reflected in the economy, banking and financial sector. The decline in interest rates would itself be a problem for banks, such as resources grow in the banking sector. Growth in deposits not only in banking, but in the financial sector, and has its consequent reflection in both the declining risk aversion and the need to create new products and services. The main reason for their creation is the need to secure the necessary amount of profit. Similarly, the decline in risk aversion is also reflected in the design of new products, where risk is transferred to raise immediate profits.*

Keywords: liabilities, profit, rates, risk, management

JEL codes: C15, E 37, E43, G20, G21

1 Introduction

Asset and liability management form the crux of bank management and is an essential part of the financial management of the bank. It's a way of managing the balance sheet structure of the bank, which is an overview of the bank's assets and sources of its financing (Krajicek 2016).

Management of assets and liabilities refers to the bank as a whole. Bank to manage bank risk diversification, risk limitation specifying upper and lower volumes borders, while respecting the criteria of profitability and bank profitability. When management assets and liabilities of the bank always acts in the space defined by the central bank, and must respect its actions in terms of prudent banking and monetary policy. While it is necessary to understand the management of assets and liabilities as a whole, management liability has its rules and peculiarities, by analogy Asset Management which is followed by risk management.

Management of bank liabilities

Its goal is to acquire resources while respecting the principle that the cost of obtaining funds should be minimized and the principle of least partial alignment requirements of party assets, the liabilities side as to their maturity periods overs, amount and interest rate sensitivity. Fundraising in the bank actively supported the process of marketing measures.

Each bank has its own specific sources. The Bank shall have an overall resource for your business in a structure with respect to the asset side, the current market situation, resources, assessment in terms of risk and the costs, or other aspect. Management liabilities of banks is important not only from a position of profit motive sourcing the lowest possible cost and with them the longest possible use, but also with regard to the problem of bank liquidity.

Management of bank assets

Its aim is to use the gained financial resources so that revenues were at a reasonable risk reduction as high as possible, while it is necessary to take into account the liabilities in terms of maturity periods overs, etc.

When creating the structure of bank assets must respect two fundamental goals - the bank's profitability based on the resources used profitably and the stability of banks based on risk management. Compared with other businesses, the share of equity in total liabilities is relatively low, the banks in their activities is widely used by foreign capital. Balance sheet of banks has considerable explanatory power, based on its analysis, we estimate the orientation of the bank, its strength and "health".

The balance sheet of the mouth of the business plan and strategy of the bank. Recently seen growth in bank vulnerability. Banks due to increasing competition trying to carefully distribute these resources - between different clients, products, markets. Growing competition forces the creation of new products and capabilities, while significantly increasing the number of market participants. The result is better decision-making and management of banks, to which the latest theoretical knowledge and experience.

Asset and liability management

In banks is significantly developing mainly from the 80 - ies of 20 - th century. In the 50s of last century, banks had a passive approach to sourcing, acquired the deposits and lending in the form of a loan or invest on a conservative basis. The main emphasis was on the asset side, the management of the business banking portfolio. In recent years, however, to asset and liability management enters a sharp increase in both total assets of banks, as primarily customer deposits. Client deposits are growing very strongly.

Yield management

Changes in interest rates significantly reflected in the financial results of banks. Due to the orientation of the bank can be expected to produce different impacts on banks depending on their size. The paper is devoted to analyzing the impact of the decline in interest rates in recent years, the results of banks. The decline in interest rates on the interbank market (3M Pribor - as an important reference rate) reflects not only the economy but also to the Bank of risks taken. It is also possible objection that this rate is not important. Theoretically it is possible to consider as well as on the rates announced by the central bank (the discount rate repo rate), which have a decisive impact mainly on bond prices. Rate announced by the central bank are reflected in the rates of the interbank market. Therefore, in these calculations considered an interest rate of 3M PRIBOR.

2 Methodology and Data

In this research we draw mainly of the following methods.

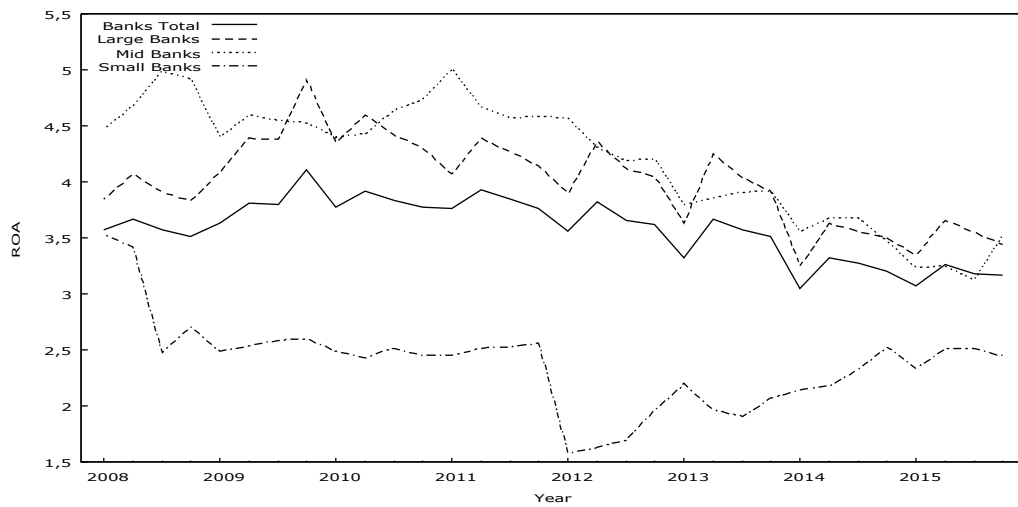
The basic method for examining the analysis of the data, followed by the Positivist research methodology, Followed by the methodology of Pragmatism. Basis is on date analysis methodology. Following methods are the methodology of critical rationalism, Followed by economic and statistical methods to evaluate lessons learned using data CNB.

The paper is mainly used data analysis, which are available in the system ARAD CNB. The analysis is focused exclusively on the Czech Republic for which data are available over a sufficiently long time series, which allows the adoption of conclusions. Use of a literature search is limited primarily to the basic literature, which is dedicated to banks and their evaluation.

The decisive is considered primarily an analysis of profits in relation to the development of particularly interest rates, balance sheet and risks in the banking sector. For purposes of evaluating risk development are used data obtained from the CNB.

Our analysis shows particularly significant impact on the size of banks developing their economic results. The development of ROE (Return of Equity) is pronounced as increases in small banks, while for medium and large banks showed a systematic decline.

Table 1 Development of ROE in %

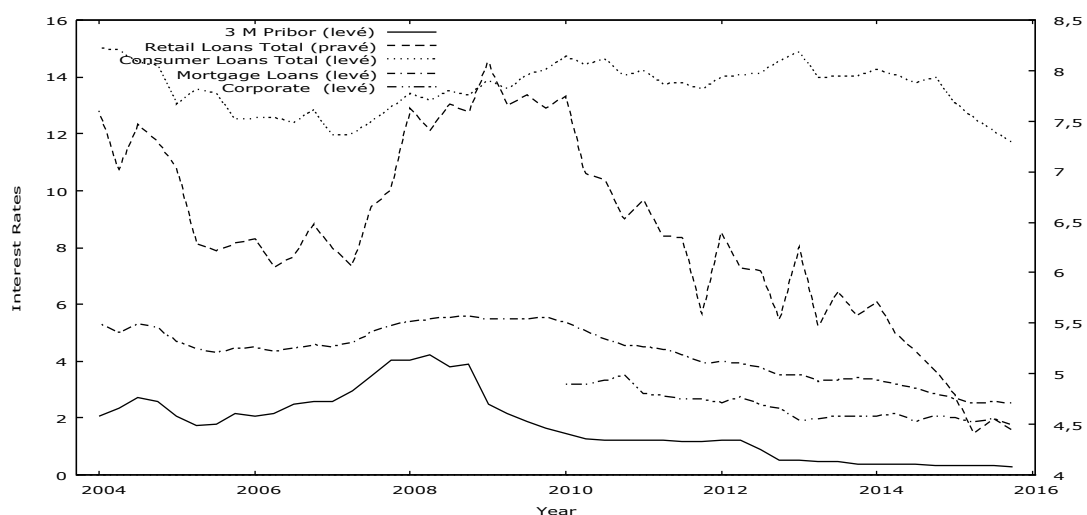


Source: Own processing on (data CNB 2016)

One of the decisive factors that influence the development of ROE can be considered orientation banks. While large banks are primarily focused on corporate clients, although the proportion of retail and mortgage loans for them is insignificant, but small banks with their focus primarily on retail clients and show better results.

This development is documented in the following graph, which is focused on the development of average interest rates provided in the individual categories of loans. From the following graph it is clear that the highest average interest rate is achieved for consumer loans, for which provision is aimed primarily smaller banks that do not reach to corporate clients and is focused on providing consumer loans at an average interest rate exceeding 12%, while the average interest rates on corporate enterprises is around 2%. 3M Pripor is 31. 12. 2015 amounting to 0.29%.

Table 2 Development Interest Rates in %

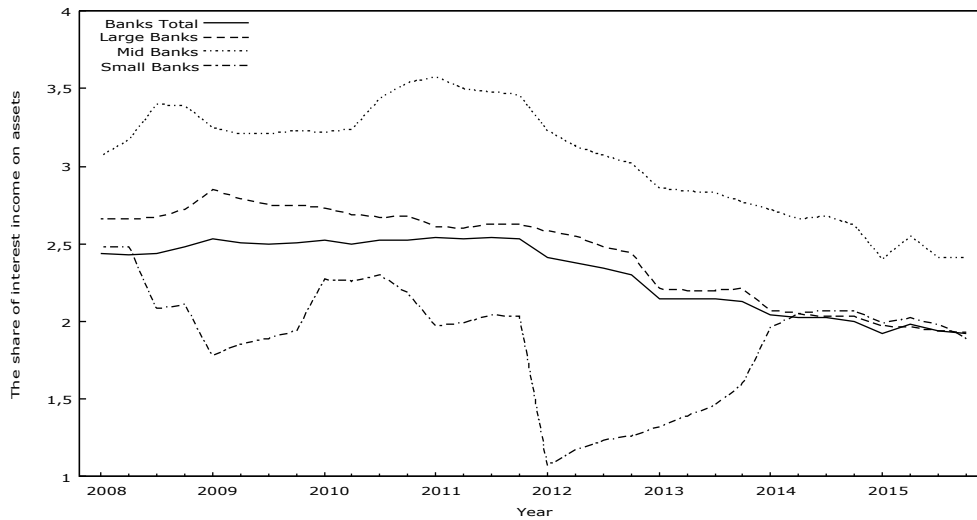


Source: Own processing (data CNB 2016)

With the development of interest rates depending on the size of banks is associated with the development of the share of interest expenses in assets. The share of interest costs on assets showed a decline in recent years, but the best results are achieved by medium-

sized banks. In accordance with the direction of small banks is among them to better results, which are in line with the development for the entire banking sector.

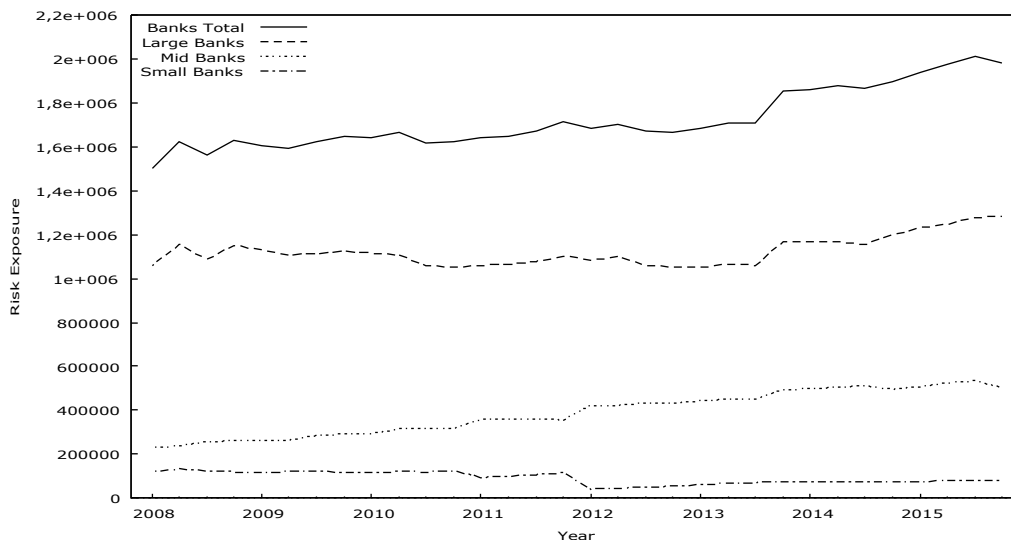
Table 3 Development of the Share of Interest Income on Assets in %



Source: Own processing from (data CNB 2016)

For the negative impact of the decrease in interest income on the assets must be considered significant growths risk exposures in the banking sector, which is particularly significant for large and medium-sized banks, while small banks retain risk exposure to stable.

Table 4 Development of Risk Exposure in Mil. CZK



Source: Own processing from (data CNB 2016)

3 Results and Discussion

With the development of interest rates depending on the size of banks is associated with the development of the share of interest expenses in assets. The share of interest costs on assets showed a decline in recent years, but the best results are achieved by medium-sized banks. In accordance with the direction of small banks is among them to better results, which are in line with the development for the entire banking sector.

4 Conclusions

Development of economic indicators in the banking sector at the current low interest rates depends mainly on the orientation of the bank, the result of the woods reach small banks.

References

Heffernan, S. (2005), *Modern banking*. 1.rst. ed. Chichester: John Wiley & Sons.

Krajicek, J. (2016). *Economics and Management of Banks*. 3rd upgraded and revised edition. Brno.. Masaryk University. Faculty of Science. Department of Finance - Study texts.

Slovik, P., Cournede, B. (2011) Macroeconomic Impact of Basel III, *OECD Economics Department Working Papers*, vol. 844.

CNB (2016). *The time series Database*. Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS.

Accrual Accounting in the Army of Great Britain - Clarity, Transparency, and Accounting Data Analysis Options

Miroslav Krč¹, Vladimír Golik², Jana Vodáková³

¹ University of Defence
Faculty of Military Leadership, Department of Economics
Kounicova 65, 662 10 Brno, Czech Republic
E-mail: miroslav.krc@unob.cz

² University of Defence
Faculty of Military Leadership, Department of Economics
Kounicova 65, 662 10 Brno, Czech Republic
E-mail: vladimir.golik@unob.cz

³ University of Defence
Faculty of Military Leadership, Department of Economics
Kounicova 65, 662 10 Brno, Czech Republic
E-mail: jana.vodakova@unob.cz

Abstract: *The article "Accrual accounting in the Great Britain army - clarity, transparency, and easy accounting data analyze" analyzes the application of the accrual accounting and resulting consequences of the introduction of resource accounting and budgeting in the Great Britain Armed Forces. The analysis was based on the selected financial statements: Summary of Resource Outturn; Operating Cost Statement, Balance sheet. The horizontal analysis was used to analyze trends of the changes on the annually managed expenditure limits during the period of RAB implementation. The Great Britain army was monitored as a business. Analyzed reports show data for the current and last year. Using data from individual years there was calculated the increase in absolute terms and as well as in percentage terms (growth rate). The original absolute data from financial statements are monitored in certain contexts. Analysis of the trends examined the changes of absolute indicators over time. Change is expressed in percentage or index. How many units of the item has changed over time? (Absolute change) and how many percent of the item has changed over time? (Percentage change). In the horizontal analysis we measured the development of selected items of expenditure limits and capital resources (Resource / Capital DEL) and Annually managed expenditure (AME).*

Keywords: resource accounting and budgeting, effective allocation, resource / capital, annually managed expenditure

JEL codes: M41, M480, M490

1 Introduction

The disintegration of bipolarity set a long term goal in Great Britain - continuous improvement and effective allocation of scarce resources, while the transformation of defence forces in accordance with the changing security environment. Defence is a specific public good. There is a tendency to an inefficient use of resources when managing them. The public is increasingly interested in what is the efficiency of use. Logically, it is therefore necessary for defence to treat the resources adequately and to avoid inefficient consumption using economic view applied to the command and control.

Unlike the previous accounting system aimed at incomes and expenses counting the RAB enables to classify and register expenditures purpose for which they were created. So it provides a better overview of the current situation in the accounting. Thus it creates ample scope for the application of economic and transparent management of the organization and creates potential conditions for management decisions. Here the period of implementation of RAB 2001 – 2011 is examined according to data compatibility, including comparing the period 2009-10 to 2010-11.

It is essential to analyse the relationship between accrual and cash accounting. Using simple analysis the above-mentioned relationship is examined. To explore the relationships these methods were chosen: description and explanation. The starting point of the analysis of selected financial statements will be the horizontal analysis helping to analyse trends. Here changes in absolute indicators in time (absolute change) and the change in percentage (percentage change) are explored using the horizontal analysis. The hypothesis is following: "Accrual accounting contributes to cost savings." The RAB allows accurate analysis and traceability of particular indicators. It can be said on the basis of analysis that the RAB represents a useful tool for the management of financial and internal accounting also for defence area, hence the public sector.

2 Methodology and data

Cash accounting has several shortcomings in comparison with the accrual accounting. For example, loss of funds is recorded in the reporting period, but no longer recorded the part of consumption that has no direct connection with the loss of funds within the reporting period; however it was spent on the operations of the accounting unit. For example, it could be material consumption that was purchased in previous accounting period. If a center have ordered discharge that exceeded budget, but its maturity was agreed out of the financial year, so this budget was not exceeded in accounting. However, there was an increase in center debt and in growth of pressure when deciding on the size of the budget for the next period (the debt exists, and if it were not included in subsequent budget, there would be sanctions for non-discharging. (Likierman, 2003)

Accrual accounting as an accounting methodology used mainly by businessmen has been implemented in different ways, so it may not always means it is its full form (Vodáková, 2012). There are four variants in the public sector, first, accounts compiled on a cash basis, second, modified accounting on a cash basis, third, modified accrual accounting, and forth, full accrual accounting.

In the public sector, including the Great Britain defense sector, it was necessary to ensure the willingness of accepting change when introducing the RAB; active participation of professionals in the field of accounting; comprehensive training for management; support from the external audit; the creation and development of accounting standards; qualification and control; joint integration of accounting and budgeting; output superiority over entrances; persistence; the need to make sacrifices; institutionalizing changes; information technology; combating corruption; rational estimate of the time frame required for implementation. (Heald, 2005)

The RAB provides generally greater visibility, better assets utilization, performance measurement and improvement of financial fiscal control that allows more efficient comparisons of economic indicators. Military tasks should retrieve signs of economic tasks and that allows commanders to act as managers. (Krč, 2003) In the period 2009 - 2015 operating expenditure limits (DEL) raised from £34.9 to £35.1 billion and annual managed expenditure (AME) fell from £37.2 to £36.9 billion. *Defence Statistics (Tri Service)*. (2014).

Table 1 Defence Expenditures in Great Britain during 2008 - 2015 (000 £)

Total departmental spending	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Resource DEL	Outturn	Outturn	Outturn	Outturn	Outturn	Outturn	Plans
Provision of Defence Capability Service Personnel Costs	8534221	9016445	9822628	9400516	904 6632	7878 834	8788394
Provision of Defence Capability Civilian Personnel Costs	776422	1353 353	214 603	200829	192110	1937614	984885
Provision of Defence Capability Infrastructure Costs	4575357	4130436	4365665	4428 812	4545389	4576992	4478611
Provision of Defence Capability Equipment Support Costs	6066863	5721074	5625988	5161399	6065557	6463365	6463363
Operations Service Personnel Staff Cost	187477	204 898	278 285	197449	10909	85480	13000
Operations and Peacekeeping Civilian Personnel Staff Costs	60870	2304	25570	22421	13777	6036	4000
Operation Infrastructure Costs	366 443	312 144	21 4071	164921	162069	86516	30000
Operations Equipment Support Costs	806205	629133	630 108	427032	345016	184400	70000
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.
Total Resource DEL	34917369	39034896	37979945	3874176	36448452	35105038	36641252
Resource AME							
Operations War Pensions Benefits Programme Costs	7168	39575	6799	10884	6152	61995	-
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.
Total Resource AME	37212935	46922993	38946782	37740973	37411571	36969344	38151422

Source: Annual Report and Accounts 2014-15. Ministry of Defence. 2015. p.52.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/482894/19_MOD_ARAc_combined_at_02_Dec_2015_for_web.pdf The author's processing.

Horizontal Analysis

The starting point of the analysis of selected financial statements will be the horizontal analysis helping to analyse trends. Here changes in absolute indicators in time (absolute change) and the change in percentage (percentage change) are examined using the horizontal analysis.

Summary of Resource Outturn

The summary of resource outturn gives an overview of the total resource requirements while the result is being reduced by incomes arising by legitimate DoD business in Great Britain (Appropriations-in-Aid) - one example is the compensation for divested unwanted goods, material, or for disposal of techniques. Net Cash Requirement means the

difference between the net sources and aggregated requirements (adjusted for the effect of accrual). Basic analysis of financial statements serves us for the initial orientation in economic affairs and we can see the original absolute data in certain periods. The Summary of Resource outturn increased by 19% in the period, it is £7,770 million. (DASA, 2011)

Operating Cost Statement

Statement of comprehensive net expenditure or operating cost statement provides information on the costs of military and civilian employees expenses, on wage income for the reporting period, salaries and pensions of senior staff and other operating expenses. Fuel expenses, fees, services, stores, hotels, research, and depreciation and amortization are included in the group of miscellaneous operating expenses. The total cost of administration in 2010/2011 were approximately £2,026 billion, so there is an decrease of £111,8 million compared to the period 2009/2010, when these expenses were approximately £2,138 billion. Absolute change was £111,807 million, that was - 5.2% as a percentage change. (DASA, 2011)

Operating cost statement also provides information on net operating expenses before interest. Non-cash transactions, such as amortization expenditure, reducing the value of fixed assets, expenses reducing the value of inventory, audit rewards deficit on disposal of fixed assets and an increase in reserves and other liabilities are deducted from this amount. Net operating expenses 2010-2011 exceeded the previous net operating expenses by £28 billion. That was about £232 million more than in the previous year. The percentage change was 0.8%. (DASA, 2011)

Table 2 Net Operating Costs 2010-2011 (£ 000)

	Note	2010-11	2009-10
Cash flows from operating activities			
Net operating cost		47144880	38042745
Adjustments for non-cash transactions	SoCNE	(18410126)	(10497312)
Increase / (Decrease) in trade and other receivables		(191760)	281789
Less movements in receivables relating to items not passing through operating costs		112244	(239885)
Increase / (Decrease) in assets held for sale		137602	9696
(Increase) / Decrease in trade payables		(1045636)	(253953)
Less movements in payables relating to items not passing through operating costs		(192,182)	(357,567)
Movements in derivatives not passing through operating costs		(192182)	(357567)
Use of provisions including movement due to change in discount rate		236224	749544
Net cash outflow from operating activities		28161518	27929206
Absolute change		+232312	
Percentage change		+0,8%	

Source: DASA - Deputy Assistant Secretary of the Army, 2011, pp. 14-26. The author's processing

Cash Flow Statement

Cash Flow Statement shows the financial resources and the way they are used. Statement of cash flow consists of:

- Cash flows from Investing Activities;
- Net financing.

For example, deductions for dividends received from business funds or interest (deduction received, plus interest paid) are recorded in Cash flows from investing activities). Absolute change was £203 million and it was 2.3%.

Net financing analyses capital expenditures and financial investment. It is the volume of acquisition of fixed assets, the deduction of the cost of disposal of fixed assets and deduction of loan repayments into retail funds. Further payments are recorded in the consolidated fund and there is a deduction of funds received from the consolidated fund. Payments of loans from the National Loans Fund have positive value. The result occurred in Net financing is a reduction or increase in funds in banks and in cash. The result here is 1.5%.

Balance Sheet

RAB Balance Sheet provides an overview of fixed assets and sources of its financing (liabilities). Fixed assets here are controlled by the accounting unit and they represent the result of past business operations. Such funds mean future economic benefits.

Table 3 Horizontal Analysis of the Balance Sheet in 2001/02 and 2010/11 (mil. £)

	Variable	2001/02	2010/11	Change	
				Change	%
Resource DEL	Expenditure on Personell – Armed forces	7014	9888	2874	40,98%
	Expenditure on Personell – Civilians	2442	2878	436	17,85%
	Property management	1222	1629	407	33,31%
	Movements	718	856	138	19,22%
	(Accommodation and Utilities	572	692	120	20,98%
	Fuel	160	628	468	292,50%
	...	etc.	etc.	etc.	
	RESOURCE DEL Total	18521	39084	20563	111,03%
Capital DEL	Intangible assets	1031	1365	334	32,40%
	Plants, machines and vehicles	99	51	-48	-48,48%
	IT and communication equipment	84	320	236	280,95%
	War pensions	4479	6596	2117	42,27%
	...	etc.	etc.	etc.	
	CAPITAL DEL Total	5918	9379	3461	58,48%
AME	AME Total	14962	7881	-7081	-47,33%

Source: DASA - Deputy Assistant Secretary of the Army, 2011 pp. 14-26. The author's processing.

The horizontal analysis measures the change in selected items of expenditure limits and source of capital (Resource/Capital DEL) and Annually Managed Expenditure (AME). Operating expenditure limits grew by 111%, to £39,084 million, from 2001 to 2001. This increase was especially caused by movement of some items (depreciation, cost of capital) from AME group to DEL one. This is clearly seen in the decrease in Annually Managed Expenditure of 47% over the analysed period, while there was an increase in Capital DEL. (DASA, 2011)

The transformation of the defence budget in time includes a two-stage transition period when implementing RAB, as can be seen in table 4. First, Resource/ Capital DEL and AME groups were introduced. In the first phase, an increase in volume in the AME group could be registered. In this group non-monetary costs (depreciation) are held, but they are not a part of the Resource DEL. In the second phase, there was a rapid decrease in the volume of funds in the AME group and it was due to the transfer of non-cash expenses in the Resource DEL. The role of savings in the defence budget in Great Britain has been described by many authors (e.g. Krč, M., Golik, V. 2015).

Table 4 The Development of Costs and Incomes (mil. £)

Phase	RAB Phase 1					RAB Phase 2				
	2001/ 02	2002/ 03	2003/ 04	2004/ 05	2005/ 06	2006/ 07	2007/ 08	2008/ 09	2009/ 10	2010/ 11
Resource DEL	18521	19958	31266	31798	32911	33457	35689	36715	38572	39084
Capital DEL	5918	6185	5908	6525	6840	7197	7945	8758	9075	9375
Annually Managed Expenditures(A ME)	14962	19293	1011	908	890	582	510	214	2417	7881
Costs	–	–	–	–	–	–	–	–	–	–
Net Cash Requirement	26100	26991	29338	29524	30603	31454	33486	36431	37425	37645

Source: DASA - Deputy Assistant Secretary of the Army, 2004, p. 14, DASA - Deputy Assistant Secretary of the Army, 2011 p. 26.

4 Conclusions

This analysis allowed us to describe the changes in the values of particular items and compare them with the previous period. Financial year 2001/02 was chosen for the analysis purpose, when the implementation phase of RAB was carried out, and the middle period, i.e. 2010/11.

Our research has confirmed that RAB allows accurate analysis and traceability of particular indicators. It can be said on the basis of analysis that RAB represents a useful tool for the management of financial and internal accounting also for defence area, hence the public sector. It allows analysing the actual state of funds. There is a fact confirming its importance for resource management that this system allows consideration of past indicators development and thus helps to define the target, i.e. desired state in the future. Using the horizontal analysis, selected items of expenditure limits and source of capital (Resource/Capital DEL) and AME - Annually Managed Expenditure were measured. Operating expenditure limits increased in that period by 111%, to £39,084 million (2010/11). This increase was especially caused by moving some items (depreciation, cost of capital) from Annually Managed Expenditure (AME) group to Expenditure Limits (DEL) one.

According to the analysed data, there was a decline in Annually Managed Expenditure of 49% over the analysed period, while account of Source of expenditure limits increased. Economic management in the Ministry of Defence using the RAB should lead to fulfilling the mission of the armed forces: ensuring the sovereignty, territorial integrity, principles of democracy and the rule of law, protection of life of residents their property against outside attack, and under conditions effective, economical and efficient use of material, financial and human resources. Analysis of RAB in the army of the Great Britain showed the possibility for its application of economic and transparent management for the organization and creates potential conditions for managerial decision-making in the public sector, such as defence. Performance measurement in the public sector is concerned with Vodáková (Vodáková, 2014).

Under the Government Resources and Accounts Act 2000 (the GRAA), HM Treasury has directed the Ministry of Defence to prepare, for each financial year, consolidated resource accounts detailing the resources acquired, held or disposed of and the use of resources, during the year by the Department (inclusive of its executive agencies) and its sponsored Non-Departmental and other arms-length bodies designated by order made under the GRAA by Statutory Instrument 2014 No. 3314 (together known as the 'Departmental

Group', consisting of the Department and sponsored bodies listed at Note 27 to the accounts). The accounts are prepared on an accruals basis and must give a true and fair view of the state of affairs of the Department and the Departmental Group and of the net resource outturn, application of resources, changes in taxpayers' equity and cash flows of the Departmental Group for the financial year. (Annual Report and Accounts 2014-15. 2015. p.88.)

References

Annual Report and Accounts 2014-15. (2015). London: Ministry of Defence.

DASA - Defence Analytical Services and Advice (2004). Deputy Assistant Secretary of the Army, p.14 Retrieved from: <http://www.dasa.mod.uk/publications/UK-defence-statistics-compendium/2013/chapter-1-finance/2013-chapter-1-finance.pdf>.

DASA- Defence Analytical Services and Advice (2011). Deputy Assistant Secretary of the Army, p. 21, 26.

DASA - Defence Analytical Services and Advice (2004) Retrieved from: <http://www.dasa.mod.uk/gov.uk/government/organisations/ministry-of-defence/about/statistics>.

Defence Statistics (Tri Service). (2014). Ministry of Defence. London.

Heald, D. (2005). *The Implementation of Resource Accounting in UK Central Government*. London. Financial Accountability & Management. Retrieved from: International federation of accountants. 2008. IF AC Handbook of International Public Sector Accounting Standards. IPSAS 1. p.32 Retrieved from: <http://www.ifac.org/Members/Downloads/2006.pdf>.

Krč, M. a kol. (2003). *Moderní ekonomické nástroje v obraně*. Brno: Vojenská akademie v Brně. P. 65.

Krč, M., Golik, V. (2015) Resource accounting and budgeting for manning personnel cost and the amount of capital expenditures in the UK armed forces. *European Financial Systems 2015. Proceedings of the 12th International Scientific Conference*. Brno: Masarykova univerzita, 2015, p. 320-325.

Likierman, A. (2003). Planning and Controlling UK Public Expenditure on a Resource Basis. *Public Money and Management*, Vol. 23, pp. 45-50, Retrieved from: <http://ssrn.com/abstract=381678>.

Ministry of Defence Annual Report and Accounts 2010-2011.(2011) Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/27067/mod_ara1011.pdf.

MoD - *Ministry of Defence Annual Report and Accounts 2014-15*. (2015). Retrieved from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/482894/19_MOD_ARAc_combined_at_02_Dec_2015_for_web.pdf.

Vodáková, J. (2012). *Akruální účetnictví ve veřejném sektoru*. 1st ed. Praha: Wolters Kluwer ČR, a.s. pp. 192.

Vodáková, J. (2014) Performance Measurement in the Czech Public Sector. *The 8th International Days of Statistics and Economics Conference Proceedings*. Prague: VSE, pp. 1606-1614.

The Impacts of the Directive No. 2013/34 / EU Transposition into National Accounting Modifications in the Czech and Slovak Republic

Michaela Krejčová, Milena Otavová, Jana Gläserová¹

¹ Mendel University in Brno
Faculty of Business and Economics, Department of Accounting and Taxes
Zemědělská 1, 613 00 Brno, Czech Republic
E-mail: xkrejco5@node.mendelu.cz

Abstract: *The obligation of all EU Member States was to implement Directive No. 2013/34 / EU on the annual financial statements, the consolidated financial statements and related reports of certain types of business corporations. The implementation of Directive No. 2013/34/EU was the duty for all EU state members no later than 1. 1. 2016. Member states have acceded to this obligation differently, since the Directive has in some areas only recommendatory character. The goal of this article is therefore to identify the differences; and then evaluate the impacts of the directive transposition into national accounting adjustments in the Czech and Slovak Republic. The main focus is primarily the classification of accounting units by their size and the subsequent determination of their accounting obligations. Based on the identified differences the conclusions for the users of financial statements with respect to their economic and financial decisions will be also determined. The starting point of the paper is processing a comparative analysis of the Accounting Act, including implementing regulations in the monitored countries. The identified differences will provide a basis for an appraisal of level of implementation of the directive into national accounting adjustments for these countries. The impact on reporting framework for micro, small, medium and large enterprises will also be defined including links to basic accounting principles - in particular a true and fair picture of the accounting and principle of prudence.*

Keywords: *European Directives, accounting entity, accounting principles, financial statements, Czech and Slovak accounting system*

JEL codes: M41

1 Introduction

The following directives of Council of the European Community generated Code of Accounting Practice and Financial Reporting of European Union and constituted the fundamental harmonization measure for European Council. The point of reference is following:

- Fourth directive of Council of the European Community (focused on the content of the financial statements). This directive was thought as the most important rules in the accounting system in Europe.
- Seventh directive of Council of the European Community (based on coordinating the legislation governing procedure of consolidated financial statements).
- Eighth directive of Council of the European Community conditioning qualifying requirements for profession of auditors.

The above directives have been amended for several times but never essentially changed. When they were changed, they brought only small obscure and hardly viable changes. Also, they contained more possibilities in using principles so it caused hard comparison of accounting information. In primary row it was necessary reduce to administrative demand factor of several enterprises. (Žárová, 2013)

For this reason, first two directives of Council of the European Community (the fourth and seventh) have been replaced by the only Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements,

consolidated financial statements and related reports of certain types of undertakings (further Directive). (Ready Ratios, 2013) The EU Member States have to incorporate the rules of the Directive with their national law by 20 July 2015 at the latest during the year 2016. (The Chamber of Auditors, 2013)

According to the European Union, the reason and the sense of this Directive is to raise the competitive advantage and productivity of small and medium-sized enterprises. Considering small and medium-sized enterprises constitute the inherent part of sociality of the EU, the Directive could influence the economy and the economic growth of the European Union as a whole. Glogar (2015) says that the objective of European Union is to suggest the high-quality and legal regulations which can keep the principles of subsidiarity and proportionality. At the same time it is important to administrative burden of accounting entities is adequate to benefits. There is a fundamental problem of small and medium-sized enterprises whereby is necessary to reduce to administrative burden.

Starting point of simplification or immunity from certain accounting duties is classification of accounting entities according to the size. The Directive distinguishes small, medium-sized and big sized enterprises, newly micro enterprises. These micro entities would be excluded from several obligations in each EU Member State not to be administratively and too loaded. (Müllerová, 2014)

Dubský (2014) adverts to the fact that the Directive changed the criteria for micro and small enterprises but the criteria for medium-sized and big enterprises haven't been changed in comparison with the previous legal regulation.

The starting point of concrete regulations of the Directive is universal accounting principles. The significant concept of the Directive is the principle "substance over form", where reporting items in the financial statements should include the economic situation, the business essence or an agreement. But the EU Member States can set free its enterprises from this principle. The EU Member States have also the possibility to reduce to the obligatory application of principle of materiality and they can only report and to publish Directive 2013/34/EU (European parliament and the council of the EU, 2013). According to Březinová (2014), the Directive demands the Directive to fill the request of true and fair picture of the accounting of assets, liabilities, financial situation and trading income. At the same time to keep the principle of going concern.

(Müllerová, 2014) adds that the Directive place emphasis on the principle of prudence which express oneself in the accounting interception only of realized gains on the date of making of financial statement. In the case of losses it is necessary to consider the assumed losses in the accounting. The Directive supports an accrual principle, the principle of balance and permanency in the using of accounting methods and the way of assessing. In case of principle of compensation of individual items of assets, liabilities, costs and returns, the Directive makes it possible to permit compensation. (FEE, 2013) states that the companies in terms of assessing should keep the principle of purchase price or production cost but the EU Member States can permit or even require the assessing by real value.

It is necessary to point out change in the fundamental notions of the Directive in comparison with the previous legal regulation. The notion "company" has been replaced by notion "undertaking", the notion "accounts" by notion "financial statements" and notion "annual report" by notion "management report". It is possible that a new terminology come better up to the present evolution of economy.

2 Methodology and Data

The main intention of this paper is to determine and to evaluate the impacts of transposition of the Directive 2013/34/EU into the Czech and Slovak Accounting Laws. This paper is focused on core areas which are: classification of the accounting entities according their sizes, classification of consolidated groups, obligation of accounting

entities liable to audit and obligation of accounting entities in the field of drawing up and publishing of particular parts of financial statements in both countries.

Starting point of this paper is an analysis of the Directive then there is an identification of new matters of fact which can influence the accounting laws in the Czech Republic and Slovakia. The emphasis of this paper is a classification of accounting entities and consolidated groups by size. In this paper the differences of Czech Accounting Act No. 563/1999 (Collection of Laws, 1991) and of Slovak Accounting Act No. 431/2002 (Collection of Laws, 2002) after the transposition of the Directive will be determined.

In paper will be determined the extent of implementation of the Directive into national accounting adjustments researched countries. Based on the observed differences will be evaluated the impacts of implementation of the Directive on the financial obligations of entities of both countries. There will also be evaluated the impact on accounting principles, especially the principle of true and fair picture of reality and the principle of caution and assessing the significance of the statutory audit of financial statements of entities in relation to their size.

The way of solving the paper is based on the set objectives. A prerequisite for the processing the paper is the collection of information sources about the issue. Theoretical findings were based on studies of Czech and Slovak foreign scientific literature related to the topic, but especially the analysis of amendments to laws on accounting, which formed from the mandatory implementation of the Directive.

Information was also gathered from Internet sources. The share of individual categories of entities and their total number was calculated on the basis of data from the Amadeus database version 13.01, updated to 16 December 2015. In addition to scientific methods, which are description methods, comparison and analysis in this paper are used methods based on the principles of logical thinking, particularly the method of deduction. The results are then arranged in tables and also graphically presented. For conclusions is applied synthesis method.

3 Results and Discussion

Classification of accounting entities and consolidated groups

The Directive was implemented into national laws on accounting of researched countries in accordance with its requirements. Both states, however, acceded to the implementation differently and in different deadlines. The Czech Republic performed one extensive amendment to the Accounting Act with effect from 1st January 2016, while Slovakia performed five sub-amendments to the Accounting Act in the period from 1st January 2014 to 17th June 2016. Only one modification of accounting software can be considered as an advantage in connection with a single implementation of the Directive by the Czech republic. However, a large amount of new information and changes to a single point of time can be considered as a disadvantage.

The most significant change in laws based on the implementation of Directive is by classification of entities according to three criteria listed in the following tables. Here is necessary to state that in Slovakia were micro entities introduced in 2014, other categories of entities were created in 2015. In the Czech Republic the classification of entities is effective, as was already mentioned, since the beginning of 2016.

Due to different dates of implementation of the Directive into national legislations of the both countries there were logically determined values for the first categorization on the basis of the financial statements on 31st December 2014 in Slovakia and the 31st December 2015 in the Czech Republic. Moving to a different category in both countries is only possible after 2 years when are met the criteria of another category. (KPMG, 2015)

Table 1 Classification of Accounting Entities: Balance Sheet Total

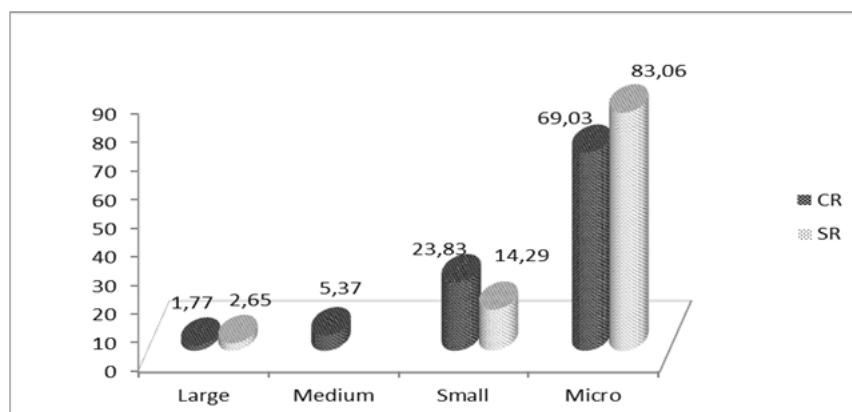
	Micro	Small	Medium	Large
Czech Republic, mil. CZK	≤ 9	≤ 100	≤ 500	> 500
Slovak Republic, mil. EUR	≤ 0,35	≤ 4	Not implemented	> 4
Directive, mil. EUR	≤ 0,35	≤ 4	≤ 20	> 20
Net sales				
	Micro	Small	Medium	Large
Czech Republic, mil. CZK	≤ 18	≤ 200	≤ 1 000	> 1 000
Slovak Republic, mil. EUR	≤ 0,70	≤ 8	Not implemented	> 8
Directive, mil. EUR	≤ 0,70	≤ 8	≤ 40	> 40
Average number of employees				
	Micro	Small	Medium	Large
Czech Republic, CZK	<11	10 – 51	50 – 251	>250
Slovak Republic, EUR	<11	10 – 51	Not implemented	> 50
Directive, EUR	<11	10 – 51	50 – 251	>250

Source: Own processing on the basis of legal standards

Data for the Czech Republic have been translated using the Czech National Bank (The explanatory report of the Ministry of Finance of the Czech Republic, 2015). The exchange rate with EUR was calculated according to the Czech National Bank (The explanatory report of the Ministry of Finance of the Czech Republic, 2015) which is equal to recommended value of Directive.

The tables shows that both researched countries held strictly to recommended values of the Directive, with the exception of the number of employees where Slovakia set stricter regulation. Czech Republic defined all types of entities according to the Directive, unlike Slovakia, which even did not introduce middle category. This is in line with the Directive in the case when large enterprises do not enter into obligations beyond the obligations applicable to medium-sized entities.

With view of this fact it is evident that the values of the criteria for large entities in the Czech Republic and Slovakia vary significantly. It is already possible to state that in Slovakia will be greater percentage of enterprises in large category. It should also be noted that in the Czech Republic based on the high values of criteria for large enterprises these enterprises will be very little. According to the Explanatory Memorandum of Ministry of Finance it is only 0.4% of all businesses. It is therefore questionable, given that they do not have any other obligations in comparison to medium-sized enterprises, whether the regulation in the Slovakia is not preferable.

Figure 1 Percentage Distribution Entities in the Czech Republic and Slovak Republic

Source: Own elaboration based on Amadeus database

The percentage distribution of entities in the Czech Republic and the Slovak Republic was calculated using the Amadeus database. The graph confirms that both countries have a higher proportion of micro-entities, while large entities have the lowest percentage.

In contrast to Slovakia the Czech Republic acceded also classification of consolidation groups in accordance to Directive. The Czech Republic introduced a classification of consolidation groups to small, medium and large. Criteria for consolidation groups are the same as for classification of entities, as shown in Table 1. Slovakia did not introduced categorization of consolidation groups. The obligation of consolidation, however, stems solely from setting limit values, which are the total sum of assets in net values, net sales and average adjusted number of employees. Exempted are those groups of enterprises that do not exceed two of the limit values specified in the following table 2.

Table 2 Conditions for Exemption from the Obligation to Prepare Consolidated Financial Statements

		Balance sheet total	Net sales	Average number of employees
Czech Republic, mil. CZK	Consolidated base	≤ 100	≤ 200	≤ 50
Slovak Republic, mil. EUR	Individual statements	≤ 24	≤ 48	≤ 250
	After consolidation	≤ 20	≤ 40	≤ 250

Source: Own processing on the basis of legal standards

The table shows that in the case of Slovakia, it is necessary to assess the obligation of consolidation based on the values of each individual financial statement and also for the consolidation of capital, relationships between entities, net income, expenses and revenues. The Directive from the requirement to prepare consolidated financial statements exempts small groups of companies, with the exception of cases where some of the companies in the group are an entity of public interest. This procedure is fully implemented by the Czech Republic. In Slovakia are exempted not only small groups of entities, but also medium, as shown in the table, although there aren't defined the category of consolidated groups. Therefore, in Slovakia will be less parent entities, which are obliged to prepare consolidated financial statements.

Czech Republic defined small, medium and large consolidation groups. Given that to the large groups do not arise compared to medium groups any additional obligations, it is possible to say that the definition of medium consolidation groups was unnecessary, as with the definition of medium-sized entities.

Financial statements and disclosure

Direktive defines three components of the financial statements: balance sheet, P&L statement and Annex. The minimum content of the financial statements meet both states. Direktive defines three components of the financial statements: balance sheet, P&L statement and Annex. The minimum content of the financial statements meet both states. Another types of statements required in Czech Republic are: cash flow statement and statement of changes in equity. The Slovak Republic has also defined these statements, but they are part of the Annex. Companies with an obligation to compile these financial statements in the CZ are medium and large entities and companies with the duty of audit.

Table 3 Financial Statements and Short or Full Form Version

	Micro	Micro A	Small	Small A	Medium	Large
Czech Republic	Short	Full	Short	Full	Full	Full
Slovak Republic	Short	Short	Full	Full	Not implemented	Full

Source: Own processing on the basis of legal standards

Criteria for the preparation of financial statements in the Slovak Republic may seem more strict. It is necessary to say that in the Czech Republic for micro and small entities

without the duty of audit, it is possible to prepare financial statements in short form version. However, this is only for entities to which this obligation is aimed by special legislation. These are mainly non-profit organizations. Commercial companies must therefore prepare financial statements in full form version in the Czech Republic. Varmusová (2016) states that in Slovak republic the micro-entities prepare statements in full form version based on the measure no. MF / 15464 / 2013-74. Simplification is associated with presentation of certain items in the balance sheet in accumulated form. Sometimes it is reported only in the net value.

With regard to the publication of accounts Directive allows some simplification for micro, small and medium entities. Czech Republic allowed the micro and small entities that are not under the duty of audit to not publish profit and loss statement. In the Slovak Republic there was no simplification allowed. However in the Czech Republic the P&L statement must be compiled (for micro companies) despite of the exception from publishing. The advantage of on-publishing is the possibility of keeping sensitive data only for internal purposes.

In the Czech Republic micro and small entity therefore published only balance sheet and Annex. This step reduces the power of the financial statements and the possibility of financial analysis. Micro and small entity have a significant reduction in administrative duties. This reduction has a negative impact on the basic accounting principles, especially the precautionary principle and the principle of true and fair view of accounts. It can be assumed that small and medium entities will report only those facts, which will be tax deductible from income tax perspective. This means that small and medium-sized entities won't be sufficiently cautious in predicting risk situations. This may cause the future reporting of financial results in lower values. Accountancy will not give a true and fair view, which is a basic requirement for accounting. Slovak Republic does not allow this exemption for micro and small entities. Therefore, the above mentioned negative impacts affect the explanatory power of their accounts.

Audit of Financial Statements

Directive gives the duty of audit of financial statements for medium and large enterprises as well as public-interest entities. The directive allows Member States to introduce an audit for small and micro enterprises, if there are grounds for it. Czech Republic and Slovakia solved the issue of audit obligation differently. Czech Republic is governed by the Directive. Slovak Republic holds the values as shown in the following table 4.

Table 4 Criteria for Duty of Audit

		Total Assets	Net Sales	Average number of employees
Duty of audit	Czech republic mil. CZK (net v.)	40	80	50
	Slovak republic mil. EUR (gross v.)	1	2	30
Small entity	Czech republic mil. CZK (net v.)	100	200	50
	Slovak republic mil. EUR (net v.)	4	8	50

Source: Own processing on the basis of legal standards

It is interesting that in the Slovak Republic are assets, for the purposes of audit, expressed in gross value. This differs from the definition of assets within the categorization. Czech Republic defines assets in net value. Although Slovakia has enabled the gross value, this value is significantly lower than in the Czech Republic. (After adjusting for the crown) The same applies to the value of the net turnover and average number of employees. In the Slovak Republic will be a larger percentage of small companies subject to a mandatory audit.

4 Conclusions

It is necessary to point out that the Amendments of accountancy legislation in the Czech and Slovak Republics were essential. This was based on the necessity of mandatory

transposition of the directive. The Czech Republic made the one and only extensive amendment to the Accounting Act. The Slovak Republic made five partial amendments to the Accounting Act.

Accounting act amendment in the Czech Republic takes almost to the extent possible the possibilities of simplification or exemption. In the Czech Republic is manifested the exemption manifested in the ability of the simplified and the subsequent disclosure of financial statements of micro and small entities without an obligatory audit. Slovakia has not assumed the exemption for micro and small entities into their national accounting law adjustments.

In accordance with the Directive Czech Republic overtook the criteria for categorizing entities in full (including the size criteria.) Unlike the Czech adjustments Slovak Republic has set stringent legislation in relation to the criterion of the average adjusted number of employees. Slovak republic has not introduced the category of medium entities, which is in line with the directive. It is possible in case of when large corporations are not subject to further obligations in comparison to medium enterprises. In the Slovak republic has also not been introduced the categorization of groups of entities.

The introduction of categorization of the entities has an impact on all entities in both countries. Entities will be required to annually monitor the fulfillment of the criteria for inclusion in the category. For the accuracy of the financial statements is necessary to correctly determine the size of the entity. Size of the entity logically follows the desired content.

On the basis of this research was for micro and small entities found that basic accounting principles will be affected by the amendment to the Accounting Act in the Czech Republic. Time will show whether the main objective of the Directive will be fulfilled. The main aim is true and fair view of the accounts. Impact on accounting principles has not been demonstrated in Slovak republic.

Acknowledgments

This article was prepared as a result of an internal grant project IGA PEF_TP_2016004 Mendel University.

References

BIS (2011). Basel III: A global regulatory framework for more resilient banks and banking systems. Retrieved from: <http://www.bis.org/publ/bcbs189.pdf>.

Březinová, H. (2014). *Rozumíme účetní závěrce podnikatelů*, 1. vyd. Praha: Wolters Kluwer.

Collection of Laws (1991). *Czech Accounting Act No. 563/1991*. Retrieved from: <https://apps.odok.cz/kpl-detail?pid=KORN9N6EU93J>.

Collection of Laws (2002). *Slovak Accounting Act No. 431/2002*. Retrieved from: <http://www.szsk.sk/legislativa/zakon-o-uctovnictve/>.

Dubský (2014). *Malé a střední podniky a auditorské praxe*. Retrieved from: http://www.roedl.com/fileadmin/user_upload/Roedl_Czech_Republic/clanky/2014/Auditor_special_12_2014_JDU.pdf.

Glogar, M. (2015). *Právní prostor: Novela zákona o účetnictví*. Retrieved from: <http://www.pravniprostor.cz/zmeny-v-legislative/vyslo-ve-sbirce-zakonu/novela-zakona-o-ucetnictvi>.

European parliament and the council of the EU (2013). *SMĚRNICE EVROPSKÉHO PARLAMENTU A RADY 2013/34/eu ze dne 26. června 2013 o ročních účetních závěrkách, konsolidovaných účetních závěrkách a souvisejících zprávách některých forem podniků, o změně směrnice Evropského parlamentu a Rady 2006/43/ES a o zrušení směrnic Rady*

- 78/660/EHS a 83/349/EHS. Retrieved from: http://www.kacr.cz/file/1598/http___new.eur-lex.europa_česky.pdf.
- FEE (2013). *Member State Option Comparison Table*. Retrieved from: http://www.fee.be/images/Comparison_table_-_47_with_2013_Directive.pdf.
- KPMG (2015). *Novela zákona o účtovníctve z mája 2015*. Retrieved from: <https://www.kpmg.com/SK/sk/IssuesAndInsights/ArticlesPublications/Publicationseries/Documents/AAS-aktuality-novela-zakona-o-uctovnictve-z-maja-2015.pdf>.
- MÜLLEROVÁ, L. (2013). *Změní nová evropská směrnice české účetnictví?* Retrieved from: <http://www.vse.cz/polek/download.php?jnl=cfuc&pdf=400.pdf>.
- Ready Ratios (2013). *New Accounting Directive Approved and Published by European Parliament*. Retrieved from: <http://www.readyratios.com/news/other/2418.html>.
- The Chamber of Auditors (2013). *Nová evropská směrnice o účetních závěrkách nahrazuje 4. a 7. směrnici EP a Rady EK*. Retrieved from: <http://www.ucetni-portal.cz/nova-evropska-smernice-o-ucetnich-zaverkach-nahrazuje-4-a-7-smernici-ep-a-rady-ek-383-c.html>.
- The Chamber of Auditors (2015). *The explanatory report of the Ministry of Finance of the Czech Republic*. Retrieved from: <http://www.kacr.cz/pripominky-k-zakonum-a-navrh-zakonupredpisu>.
- Varmusová, Z. (2016). *Účtovná závierka mikro účtovnej jednotky v roku 2016 (za rok 2015)*. Retrieved from: <https://www.podnikajte.sk/dane-auctovnictvo/c/2422/category/uctovnictvo/artide/uzavierka-mikro-uctovnej-jednotky-2016.xhtml>.
- Žárová, M. (2013). *Changes in EC Directives and Impact on Presentation of Financial Statements in the Czech Republic*. Retrieved from: <http://www.vse.cz/efaj/99>.

Current Issues of Accounting for Intangibles in Various Reporting Systems

Zuzana Křížová

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
krizovaz@econ.muni.cz

Abstract: *In today's economy value is often created by intangible assets that represent intellectual capital. The accounting standard setters try to meet the challenge of recognition and reporting the results of knowledge-based entities. The problems relating to the accounting for intangibles are international in scope. This paper briefly reviews existing IFRS, US, UK and Czech accounting standards relating to Intangibles. Inconsistencies are highlighted, and evidence is provided that suggests that recognition of Intangible Assets is in accordance with existing accounting principles. This article is based on analysis and comparisons of relevant literature resources, mainly articles and conference papers, but also legislative acts and monographs.*

Key words: accounting, intangibles, measurement, reporting standards

JEL codes: M41, O34

1 Introduction

Surveys of intangible assets and intellectual capital are classified in many different ways. Available publications on the **terminology** for used intangible assets may be divided into **four basic groups**: most authors use the basic term intangible assets, or intangibles, such as B. Lev, F. Gu, L. Canibano, P. Sanches, K. E. Sweiby. Some groups of authors use the term intellectual capital; they are J. H. Daum and others. The third group of authors slightly modifies the above two basic approaches and uses for example intangible resources, intellectual property, immaterial values – see for example O. Granstrand, T. Gunter, C. Kriegbaum and currently especially P. Sullivan. The last group does not introduce any special term and only uses the general word “knowledge” (Kaufmann and Schneider, 2004). As follows from the above classification, the basic terms and definitions in this area are not yet generally accepted. To further illustrate this variability I would like to add the following two examples: Sullivan (2000, p. 228) submits a working definition of intellectual capital in the following wording: “...knowledge that can be converted into profit”. In his opinion intellectual capital consists of two components - human capital and intellectual assets. Baruch Lev in his famous work “Intangibles – Management, Measurement and Reporting” of 2000 states on page 5: “An intangible asset is a claim to future benefits that does not have a physical or financial embodiment. A patent, a brand, and a unique organizational structure (for example, an Internet-based supply chain) that generate cost savings are intangible assets”. According to Sweiby (1997, p. 18) “the difference between the marked value of a publicly held company and its official net book value is the value of its intangible assets. In most companies, the value of intangible assets exceeds the value of tangible assets.” Like in the case of the basic terms and definitions the authors of publications about IA/IC have **not yet reached too much agreement about their sorting, classification** or categorisation. All classifications in effect remain very abstract, thus not offering a real instrument for management and use of the intangible assets by corporate managers. A classification which – guessing from the number of quotations – has more significantly influenced other researchers was published in 1997 by L. Edvinsson. This classification is the simplest, and only consists of two basic categories: Human capital and Organisational, or Structural capital. Some publications do not provide any classification at all, or state that a classification would be very difficult. Other authors, with Sweiby, 1997, being one of the most often mentioned and quoted, divide intangible assets to three basic groups or levels: employee competence, internal structure and external structure. Studies

analysing publications on intangible assets mostly deal with works by American and Western European authors. There are also two more detailed and more specified classifications, which are quite exceptional in this area: The first is the **basic categorisation** developed by the American Financial Accounting Standard Board for the purpose of accounting reporting and already mentioned in the first part of the article, in the section on the accounting statement systems. This categorisation distinguishes seven basic categories of intangible assets based on: technologies, customers, market, employees, contracts, organization and company status. The second classification by the German working group investigating intangible assets in accounting for Schmalenbach Society includes human, customer, supplier, investment, process, allocation and innovation capital (Kaufmann, Schneider, 2004).

2 Methodology and Data

This article is based on analysis and comparisons of relevant literature resources, mainly articles and conference papers, but also legislative acts and monographs.

Intangible assets represent one part of the assets showing significant differences in reporting depending on what accounting system is applied for the accounting statement preparation.

Intangible Assets in IFRS

Intangible assets are dealt with by **IAS 38** – Intangible Assets, including criteria for recognition, appreciation and reporting of intangible assets. This standard became effective in 1999 and was amended in 2004. As stated in this standard intangible assets are defined as identifiable non-cash assets without physical essence. The company may report an intangible asset in its balance sheet if it is intangible asset by definition, if there are probable economic benefits following from it for the company and if the asset can be reliably priced. If an item does not meet these criteria it is recognised as cost.

Features of intangible asset defined by IAS 38 Intangible Assets are as follows: identifiable – the **asset is separable from the company, may be sold, leased etc. or comes from contractual or other legal rights, controllable** – the company is entitled for economic benefits following from the asset and can restrict third party access to these benefits and bringing future economic benefits.

If an item is recognised as intangible asset it is first priced by its acquisition costs. Further expenditures after this recognition usually do not meet the asset definition and therefore are recognized as expenses. Acquisition costs, costs of employee training, costs of advertising and sale support, costs of moving or reorganisation of enterprise are thus directly recognised as costs. Expenditures once recognised as costs cannot be activated anymore in future. Reporting standard distinguish among **four types of acquisition** of intangible assets and **two types of in-house generated** assets. The types of acquisition of intangible assets are as follows. The most frequent type of acquisition is purchase from a supplier. The acquisition price may be represented by the price stipulated by the purchase contract or in the invoice. Acquisition price may include: import duty, non-refundable taxes, employee wages directly related to launch of operation of the asset, costs of experts (expert assessors, legal experts etc.) and costs related to testing of correct function of the asset. IAS 38 standard further lists examples of costs which are not part of the asset acquisition price, such as: costs of advertising, costs related to business extension by the new area, administrative and overhead costs, costs incurred after launch of operation of the asset etc. Another type of intangible asset acquisition may be acquisition in the context of business combination. The asset is then measured by the fair value as to the date of acquisition (as follows from IFRS 3 standard – Business Combinations). State subsidy is the third form of intangible asset acquisition. As this acquisition is often for free or for a symbolic price, the asset is measured either on the basis of its fair value or on the basis of its nominal value increased by all costs directly attributable to the asset launch of operation. And the final basic type of

intangible asset acquisition is the asset exchange – exchange for another non-cash asset or a combination of a cash asset and a non-cash asset.

The two basic types of in-house generated intangible assets include the in-house generated **goodwill** and intangible assets generated by in-house activities. In-house generated goodwill represents items not meeting the definition of intangible assets but generating future economic benefits. Goodwill is often exemplified with employee knowledge, quality of product or service, environmental aspects of company activity etc. In-house generated goodwill cannot be recognised as asset and cannot be included in the balance sheet. Goodwill is not separable from the enterprise, does not follow from contractual or legislative rights and cannot be priced reliably. As for intangible assets created by in-house activities of the company they are represented by the **research and the development generated assets**:

The research stage is represented by activities related to acquisition of new knowledge, examination of use of this new knowledge, search from and selection of alternatives for new materials, devices etc. The research stage is not recognised in the company intangible assets pursuant to IAS 38. The reason is the fact that in this stage the company is unable to determine the future economic benefits of the asset. The research expenditures are recognised as costs of the period in which they were incurred.

In the following development stage the future economic benefits of the activity are easier to estimate thanks to the commercial use related to the development results. Development means use of the knowledge obtained in the previous research stage for manufacture of new materials, products, improvement of manufacturing processes, such as design, construction and testing of prototypes, design of instruments and templates for new technologies, etc. But even in the development stage the company may only recognise an intangible asset under certain conditions, including: completion of the asset is feasible, the company plans and is able to complete the asset, use it or sell it, there is market for the asset, and the company possesses available resources for the intangible asset completion. The necessary preconditions also include the fact that the company is able to separate and calculate the costs of development of the intangible asset. The development measurement then includes for example the acquisition prices of the consumed materials and services, employee wages, registration and legal fees, depreciations of patents and licences and potential interest paid.

Intangible Assets in US GAAP

The rules of US GAAP are applied by the companies voluntarily, but in some cases the application is strictly required by an authority. The Securities Commission (SEC) has always required from all players at the US capital market to publish their financial statements pursuant to US GAAP, only recently also accepting statements based on the IFRS methodology. Like IFRS the US GAAP are not formulated by legislators but by independent experts. In the case of US GAAP these are represented by the Financial Accounting Standards Board (FASB), the non-profit non-governmental organisation with independent in-house source of financing. The basic characteristics and examples included in the following paragraph can be found on the web site of FASB, in the document entitled "**Statement of Financial Accounting Standards No. 142, Glossary**", on page 105 "Intangible assets are assets (except for financial instruments) without any physical substance. Types of intangible assets include but are not limited to the following from: the law – patents, copyright, trademarks, trade names, broadcasting licences etc., following from contracts – agreements with employees, manufacturing agreements, consultancy agreements, publicity agreements, distribution agreements, leasing agreements etc., following from other agreements – licences for use of software, licences for use of technologies, patents, rights to mining, rights to copy books etc. Intangible assets following from technology – in-house developed computer software, manufacturing processes, technical documentations, drawings, databases, following from business relations – list of customers, suppliers, distributors, records on credit trustworthiness of debtors compiled by creditors etc. Goodwill – Decree no 142 defines goodwill also as excess acquisition value of a purchase unit over the value often sum of

the acquired asset and the assumed liabilities. There is no negative goodwill pursuant to US GAAP. The aspects relevant for asset pricing pursuant to US GAAP include the asset value following from the transaction. This value reflects the future economic benefits following from the asset for the company. The paid out amount is thus recognised in assets. If the asset is not purchase but developed in-house, its recognised value may only include the legal fees, the court fees, patent licensing, and similar costs necessary for the asset registration and legal treatment.

Intangible Assets in UK FRS

United Kingdom Financial Reporting Standards deals with intangible assets in **Section 18 Intangible Assets other than Goodwill**. This section applies to accounting for all intangible assets other than goodwill and intangible assets held by an entity for sale in the ordinary course of business. According Section 18 an intangible asset is an identifiable non-monetary asset without physical substance. Such an asset is identifiable when it is separable, ie capable of being separated or divided from the entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, asset or liability. Or it arises from contractual or other legal rights, regardless of whether those rights are transferable or separable from the entity or from other rights and obligations.

General principle for **recognizing** intangible assets: the entity shall recognize an intangible asset as an asset if, and only if it is probable that the expected future economic benefits that are attributable to the asset will flow to the entity; and the cost or value of the asset can be measured reliably. An entity shall recognize expenditure on the following items as an expense and shall not recognize such expenditure as intangible assets internally generated brands, logos, publishing titles, customer lists and items similar in substance, start-up activities (i.e. start-up costs), which include establishment costs such as legal and secretarial costs incurred in establishing a legal entity, expenditure to open a new facility or business (i.e. pre-opening costs) and expenditure for starting new operations or launching new products or processes, training activities, advertising and promotional activities, relocating or reorganizing part or all of an entity, internally generated goodwill. No intangible asset arising from **research shall be recognized**. Expenditure on research shall be recognized as an expense when it is incurred. Examples of research activities are activities aimed at obtaining new knowledge. An entity may recognize an intangible asset arising from **development** if, and only if, an entity can demonstrate all of the following: the technical feasibility of completing IA so that it will be available for use or sale, its intention to complete IA use or sell it, its ability to use or sell IA, how the intangible asset will generate probable future economic benefits. Necessary is the availability of adequate technical, financial and other resources to complete the development and to use or sell the IA and its ability to measure reliably the expenditure attributable to the intangible asset during its development. Examples of development activities are the design, construction and testing of pre-production or pre-use prototypes and models, the design of tools, jigs, moulds and dies involving new technology, the design, construction and operation of a pilot plant that is not of a scale economically feasible for commercial production. An entity shall measure an intangible asset initially at cost in the manner intended by management. Examples of directly attributable costs are costs of materials and services used or consumed in generating the intangible asset, costs of employee benefits arising from the generation of the intangible asset; fees to register a legal right; and amortization of patents and licences that are used to generate the intangible asset.

For the purpose of this FRS, all intangible assets shall be considered to have a **finite useful life**. The useful life of an intangible asset that arises from contractual or other legal rights shall not exceed the period of the contractual or other legal rights, but may be shorter depending on the period over which the entity expects to use the asset. If the contractual or other legal rights are conveyed for a limited term that can be renewed, the useful life of the intangible asset shall include the renewal period only if there is evidence to support renewal by the entity without significant cost. If, in exceptional cases, an

entity is unable to make a reliable estimate of the useful life of an intangible asset, the life shall not exceed 10 years. An entity shall allocate the depreciable amount of an intangible asset on a systematic basis over its useful life. The amortization charge for each period shall be recognized in profit or loss, unless another section of this FRS requires the cost to be as part of the cost of an asset. Amortization begins when the intangible asset is available for use, i.e. when it is in the location and condition necessary for it to be usable in the manner intended by management. The entity shall choose an amortization method that reflects the pattern in which it expects to consume the asset's future economic benefits. If the entity cannot determine that pattern reliably, it shall use the straight-line method. An entity shall disclose the following for each class of intangible assets: the useful lives or the amortization rates used and the reasons for choosing those periods, the amortization methods used, the gross carrying amount and any accumulated amortization at the beginning and end of the reporting period etc. An entity shall disclose the aggregate amount of research and development expenditure recognized as an expense during the period, the amount of expenditure incurred internally on research and development that has not been capitalized as an intangible asset or as part of the cost of another asset that meets the recognition criteria.

Intangible Asset Recognition Pursuant to Czech Accounting Standards

The intangible asset area is settled in the Czech accounting legislation in **Standard no 013 Long-Term Intangible and Tangible Assets**. This standard contains definition and pricing of long-term intangible and tangible assets, depreciation principles, procedure of account recognition on acquisition, technical valuation and asset write off. Like the other standards the Czech Accounting Standard no 013 is governed by Act no 563/1991 Coll., on Accounting, and Decree no 500/2002 Coll., executing some provisions of the Accounting Act. The standard contains the **list of assets defined as long-term intangible assets**. The condition for classification as long-term intangible asset is usable life of more than one year and the asset value higher than the valuation limit determined by the accounting unit. This class also includes other long-term intangible assets, long-term intangible work in progress, and advances provided for this type of assets. Initial (establishment costs) were defined as all expenditures incurred for establishment of the accounting unit until the moment of its incorporation (abolished since 2016). These costs included in particular the court and administrative fees, costs of business trips, remuneration for mediation and advisory services and rent. Costs of acquisition of long-term tangible assets and inventories, representation costs or costs related to the company transformation were not included in the establishment costs. Intangible results of research and development (R&D) – for results of research and development to be eligible for inclusion in long-term intangible assets they need to be developed by in-house activity and intended for trading, or acquired from other parties. Rights of determinable value – these are in particular subjects of industrial and similar ownership, results of creative activity and rights pursuant to special legislation, if created by in-house activity for the purpose of trading or acquired from other parties. Rights of determinable value include for example industrial patterns, usable patterns, registered trademarks and patents. Software must be developed in-house for the purpose of trading or acquired from other parties – suppliers. Goodwill is a positive or negative difference between the valuation of the entity, or its part in the sense of the Commercial Code, acquired by purchase, deposit or asset and liability appreciation in the context of company transformation, except for change of legal status of the company, and the sum of the individually revaluated asset items reduced by taken over liabilities. Other long-term intangible assets include emission permits and preferential limits and long-term intangible assets not recognised elsewhere. The emission permits include greenhouse gas emission permits, and emission reduction units and verified emission reductions by project activities regardless the appreciation amount. Long-term intangible work in progress includes acquired long-term intangible assets in the period of their acquisition until establishment of the asset condition suitable for launch of operation. Provided deposits for long-term intangible assets include short-term and long-term advance deposits provided for the purpose of acquisition of long-term intangible assets.

3 Results and Discussion

The basic difference between Czech and international accounting standards is represented by their respective legal frameworks. Both IFRS and US GAAP focus on principles, and thus do not defined exact accounting procedures. The Czech accounting standards, on the other hand, are part of the legislation binding for all companies registered in the Czech Republic. The appearance of Czech accounting is considerably affected by the tax legislation, which may be a source of certain inflexibility of the system and may lead to acceptance of standpoints based on tax considerations rather than on the concept of faithful and fair reflection of a transaction in its essence. The Czech accounting system is formulated by legislators, which both IFRS and US GAAP are formulated by non-governmental non-profit organisation. The Czech accounting regulations are focused on accounting from the tax viewpoint and partly from the investor viewpoint. On the other hand both international accounting systems are primarily focused on reflection of the reality for use by investors.

Table 1 Selected Differences in Reporting of Intangible Assets

Area	IFRS	US GAAP	UK FRS	Czech AS
Definition	Economic source managed by a company that is used to profit	no physical value, company will retain an economic advantage in the future	Identifiable non-monetary asset without physical substance	No definition, list a number of items
Evaluation	All costs directly linked to creation of capital and its usage	All costs necessary to register and establish legal contracts	Costs directly linked to IA and its usage	All direct and indirect costs linked to exploitation
Capitalization of R&D	Allowed only costs in development	Forbidden	Allowed only some costs in development	Allowed for costs both R&D
Depreciation	Not always compulsory	Necessary to write off capital that has a certain expiration date	Amount of IA on a systematic basis over its useful life	Following regulations expressed in the law

Source: Authors results

The differences between the Czech and other regulations begin with the **missing definition** of intangible assets. While the Czech accounting legislation defines this term by a list of items meeting the definition, both IFRS and US GAAP define intangible assets by their properties. Both international systems emphasize the absence of physical essence of intangible assets, and IFRS in addition mention three signs of intangible assets – they are identifiable, controllable and bring future economic benefits. The Czech standards on the other hand emphasize usable life longer than one year and the fact that the asset value is higher than a limit specified by the company. The list of intangible asset items of the Czech intangible asset definition included establishment costs (abolished since 2016), recognised directly in costs by both international accounting systems, for pursuant to their interpretation they do not bring and future benefits to the company.

If the assets are not purchased but developed in-house, the Czech accounting standards appreciate them on the basis of in-house costs of development. This is conditioned by the purpose of the asset, which is its trading. **IFRS distinguish between the research and the development stage** in this asset type. Only the development stage related costs may be activated and only after fulfilment of certain conditions - completion is feasible, the company possesses sufficient resources for the completion etc.

US GAAP are the strictest in this area and only include in the asset value the costs necessary for the asset registration and legal treatment, for the other costs are not considered specifically identifiable. US GAAP do not consider research and development intangible asset at all.

The international accounting standards in one of their interpretations (SIC 3) specifically deal with costs of web sites. The costs of activities related to an internet application development must be activated. The costs incurred in the course of the planning stage and the costs related to operation are recognised as costs only. The Czech accounting standards do not specifically deal with this. The new developments of the Czech accounting standards include the so called greenhouse gas emission permits. This issue is also settled by IFRIC 3 interpretation.

4 Conclusions

According to OECD (2013) investment and growth in *OECD* economies is increasingly driven by investment in *intangible assets*, also known as knowledge-based capital (KBC). Earlier (Krizova 2008) we demonstrated, via comparison of model examples, that a given company will report the highest profit when using Czech reporting standards. In contrast, the lowest profit will be reported when using US GAAP standards. The reported differences may then affect the manner in which the level of company efficiency is reported, particularly when using traditional methods of share indexes of profitability. Companies striving to succeed within the European or the world markets need to report their results using methods that are concomitantly used by others. The differences in intangible asset reporting pursuant to the for abovementioned reporting systems also reflect in the indicators based on the financial statements, such as the asset return indicators and the equity return indicators. Regarding the volume of costs of research and development incurred by many companies the method of their reporting performs a significant role. In harmony with the trend of the growing share of intangible assets in the overall assets of the company it is also very desirable to achieve international comparability of the companies' economic results.

The issue of harmonisation of standards is currently resolved both on the level of harmonisation of the national standards of the individual countries and IFRS, and on the level of harmonisation of IFRS and US GAAP. The International Accounting Standards Board, the issuer of IFRS, and the Financial Accounting Standards Boards, the committee responsible for the issue of US GAAP, signed a Memorandum of Understanding in February 2006. This document includes a sequence of steps to be taken to formulate quality and compatible accounting standards. The intangible asset area has not been included in the themes for short-term convergence but research and discussion in this area have been carried out nevertheless.

At present the variability of recommendations for reporting elements that are not part of financial statements continues to grow. For that purpose various instruments in the form of guides, monitors etc. are produced. As my experience shows it might be beneficial to focus on extension of the "accounting technology", software, such as the eXtended Business Reporting Language (XBRL). If this reporting method was used the traditional financial statements might be complemented with tables with graphical symbols, different colour codes etc.

References

Act no 563/1991 Coll., on Accounting (Czech accounting legislation).

De Silva T.A, Stratford M., Murray C. (2014). Intellectual capital reporting: a longitudinal study of New Zealand companies. *Journal of Intellectual Capital*, Vol. 15 (1), 157 – 172.

Czech Accounting Standard no 013.

Edvinsson, L. (1997). *Developing intellectual capital at Skandia, Long Range Planning*. Vol. 30, No. 3, pp. 366–373.

Guthrie, J., Petty, R. and Ricceri, F. (2006). The voluntary reporting of intellectual capital: comparing evidence from Hong Kong and Australia, *Journal of Intellectual Capital*, 7(2), 254-271.

Financial Reporting Standard 102. Retrieved from: <http://www.icaew.com/en/technical/financial-reporting/new-uk-gaap/frs-102-the-financial-reporting-standard>.

Financial Accounting Standards Board, Statement of Financial Accounting Standards No. 142, Glossary, p. 105. Retrieved from: <http://www.fasb.org/st/>.

Goebel V. (2015). Intellectual capital reporting in a mandatory management report: the case of Germany. *Journal of Intellectual Capital*, 16 (4), 702 – 720.

IAS 38 Intangible Assets as issued at 1 January 2016. Retrieved from: <http://www.iasb.org/>.

Kaufmann, L, Schneider, Y. (2004). Intangibles: a synthesis of current research. *Journal of Intellectual Capital*, Volume 5, Number 3, pp. 366-388.

Křížová, Z. (2008). Many Changes in Recognition and Depreciation of Intangibles. In *4th Workshop on Visualising, Measuring and Managing Intangibles and intellectual Capital*. Hasselt, Belgium: EIASM, pp. 101-111.

Lev, B. (2001). *Intangibles - Management, Measurement and Reporting*, The Brooking Institution, Washington, DC.

OECD (2013) New Sources of Growth Knowledge-Based Capital Driving Investment and Productivity in the 21st Century. Retrieved from: <https://www.oecd.org/sti/50498841.pdf>.

Sullivan, P. H. (2000). *Value-Driven Intellectual Capital – How to convert Corporate Assets into Market Value*, Wiley, New York.

Schaffhauser - Linzatti, M. (2004). *Intellectual capital reporting for Austrian universities – a thrilling work in progress*. EIASM Workshop on the Process of Reform the University Across Europe, Sienna.

Overview of differences between International Financial Reporting Standards and Czech accounting legislation; Ernst & Young. 2013. Retrieved from: [http://www.ey.com/Publication/vwLUAssets/FAAS_brochure_ENG/\\$FILE/EY%20-%20FAAS%20Brochure%2010_2013%20EN%202.pdf](http://www.ey.com/Publication/vwLUAssets/FAAS_brochure_ENG/$FILE/EY%20-%20FAAS%20Brochure%2010_2013%20EN%202.pdf).

Sweiby, K. E. (2007). *Methods for Measuring Intangible Assets*ge. B-K Publishers, San Francisco. Retrieved from <http://www.sveiby.com/articles/Intangible-Methods.htm>.

Analysis of Financial Statements Focusing on Detection of Ponzi Schemes Using XBRL

Zuzana Kubaščíková¹, Zuzana Juhászová²

¹ University of Economics in Bratislava
Faculty of Business Informatics, Department of Accounting and Auditing
Dolnozemska 2, 851 04 Bratislava, Slovak Republic
E-mail: zuzana.kubascikova@euba.sk

² University of Economics in Bratislava
Faculty of Business Informatics, Department of Accounting and Auditing
Dolnozemska 2, 851 04 Bratislava, Slovak Republic
E-mail: zuzana.juhaszova@euba.sk

Abstract: *A number of companies are asked to provide the relevant financial information in electronic form for the needs of national and international regulators of trading with securities and for the purposes of supervisors of financial institutions. To fulfill these requirements there is also a need to ensure effective electronic communication that allows grouping, organizing, and analyzing data according to the requirements of the user. This paper deals with the possibilities of using XBRL (eXtensible Business Reporting Language) for this purpose with a focus on tracking features of a Ponzi scheme. Typical characteristics of a Ponzi scheme are often found in a high-risk type of investment companies called HYIP (High-yield Investment Programs) many of which belong to bankrupt non-bank entities investigated since 2000.*

Keywords: financial statements, Ponzi scheme, XBRL, financial analysis, fraud

JEL codes: M41

1 Introduction

The financial crisis that has been observed for a decade along with recent financial scandals have together reinforced the need for improvement of the quality of financial statements. In this context, several studies focus on the quality of financial statements and specifically of the accounting profits considered as priority information. Most of these studies use accounting accruals as a measure of the quality of the accounting profits. (Smii, 2016)

Regarding this observation, the aim of this paper is to check if it is possible to detect fraud on the basis of published accounting information. The objective is to investigate to what extent using XBRL (eXtensible Business Reporting Language) can help in tracking the features of a Ponzi scheme in Slovak conditions.

XBRL is defined, from a practical business perspective, as an open, platform-independent, international standard for the timely, accurate, efficient, and cost-effective electronic storage, manipulation, repurposing, and communication of financial and business reporting data (Bergeron, 2003).

XBRL (eXtensible Business Reporting Language) is the name for a computer markup language that uses standard definitions, or taxonomies, to allow computers to recognize data for sophisticated viewing and analysis. (Tumpach, Juhászová, 2006)

XBRL does not improve the level of disclosures, but it improves the quality of available information. XBRL will immediately point out inconsistencies. Not every inconsistency is a fraud but it can be a red flag. For example if a company has a totalling mistake in their balance sheet, XBRL would reject it at the time of submission, thus the quality of data goes up. (Tumpach, 2005).

XBRL is increasingly being attached to financial data around the world to enable easier comparisons between businesses. XBRL tags are used in various financial analysis tools. One of the boldest uses so far of the computer-readable XBRL tags is AQM (Accounting

Quality Model). AQM is a computerised tool designed to automatically trigger alerts concerning suspicious accounting information in financial statements of companies. This data-mining software is partly based on a model the SEC developed to trawl through hedge fund returns for signs of Ponzi schemes.

AQM was designed by SEC (Securities and Exchange Commission) to provide a set of quantitative analytics that could be used to assess the degree to which financial statements appear anomalous. (Meluchová, Máziková, Mateášová, 2015). AQM analyzes whether a company reports anomalies in areas such as accruals, which are non-cash entries that can be manipulated by management. Other factors that might raise red flags include:

- Loss of market share,
- Transient performance problems (at least in the short term),
- High ratio of book to taxable income,
- Off-balance sheet transactions,
- Changes in auditor,
- Delayed financial statements,
- Ratios out of line with industry (the AQM model may flag a company whose margins are much greater than the industry norm).

AQM culls XBRL data from financial reports to identify earnings management. Using the XBRL data allows for comparisons of filings against industry competitors to identify anomalies. The AQM generates an automated risk score which the SEC uses to identify companies for priority examinations. The SEC has also acknowledged that it is sharing these risk scores with enforcement – which could open an investigation based on a risk score alone. Additionally, the exam program that applies to broker dealers, investment advisors and investment companies can also use the AQM risk scores.

2 Methodology and Data

Annual financial statements of 10 bankrupt companies or companies accused of fraud in the Slovak Republic between 2000-2015 were examined for financial frauds in order to determine any incidence of Ponzi schemes (Sun, Pallas Athene, Unifa Invest, Elia, Moda Raj, Drukos-výnos, BMG Invest, AGW, Horizont Slovakia, Allegros). Financial statements are from the period 2000-2015. Financial statements from different years were compared. The aim was to process data, even if it is presented in a different form or if financial statements were prepared according to different regulations (many changes in accounting regulations took place in the Slovak Republic during the period 2000-2015) or prepared in a different currency (SKK – till December 31st, 2008, EUR – since January 1st, 2009).

Every disclosed accounting change by the companies under observation was treated as an independent case, and data on all changes was collected, regardless of impact. After analysis the changes were classified into five groups similar to those used in AQM:

- Earnings management,
- Ratios out of line with industry,
- Discretionary accruals,
- Financial reporting errors,
- Frequent changes in outside auditors.

Financial statements of the entities registered in the Trade Register of the Slovak Ministry of Justice are public and can be obtained from the internet web page <http://www.registeruz.sk/cruz-public/domain/accountingentity/simplesearch>. This information is published in the same form as it was delivered in to the Financial Administration Office – in xls or pdf form. The register of financial statements began its functions on January 1st, 2014 (Pakšiová, 2014). Older financial statements are available only in paper form upon request addressed to the Trade Register. Data was processed manually in Excel spreadsheets.

We transferred financial statements to XLS format and used XBRL for analysis of financial statements. Using XBRL in financial reporting allows us to reduce the information asymmetry resulting from incompatible reporting formats making possible the easy recognition, selection, processing and analysis of information, even if it is in different languages, currency and results from the application of different regulations (Kurt, Cornelis, 2013, Mejlík, Ištvánfyová, 2008, Doni, Inghirami, 2011).

In the following example we mapped the information in an Excel document (including balances of various items at the end of the financial period) to the content set for the XBRL instance through the taxonomy, to which were automatically added some items and attributes for which presentation is made directly in the instance. In fact, this is one of the simplest ways of implementing the language in the organizations. The following scheme shows the mapping that was done for extracting the data from financial statements in order to transpose it into an XBRL format.

Example of communication protocol application:

```
<?xml version="1.0" encoding="UTF-8"? >
```

```
<Profit/LossFromOrdinaryActivities contextRef="NetProfit/LossForTheAccountingPeriod" unitRef="U-Euros" decimals="0">4433</ Profit/LossFromOrdinaryActivities>
```

Using an XML communication interface, XBRL has set taxonomy and indicates further context and the currency used for reporting and the unit in which the content is referred to. In the example mentioned above, the company reported Profit / Loss from ordinary activities and also Net Profit / Loss for the accounting period that consists only of Profit / Loss from ordinary activities in the amount of 4433,- eur. Any software capable of processing a document in XBRL communication protocol can display the content as follows:

Net Profit/Loss for the Accounting Period: 4433,- eur

Profit/Loss from Ordinary Activities: 4433,- eur

XBRL information is in the form of XBRL instance documents. These documents are electronic files consisting of financial data together with their corresponding XBRL tags. (Debreceny, Felden, Ochocki, Piechocki, Piechocki, 2010) For example, an instance document prepared under older accounting legislation may be automatically transferred according to new accounting legislation taking into account changes in indication of financial statements items, changes in the aggregation of items in financial statements etc.

3 Results and Discussion

We decided to test the early warning system on selected financial statements processed by using XBRL that will detect anomalies in financial data that are continuously supplied by companies through official filings such as annual reports.

Earnings management criteria were oriented towards finding companies which attempt to smooth earnings in periods where performance is either much greater or much less than prior periods relative to the company performance and industry performance. Any detected abnormality is classified as a red flag.

Ratios out of line with industry helped us to flag a company whose margins are much greater than the industry norm. Also in this case any detected abnormality is classified as a red flag.

Discretionary accruals should find the difference between free cash flow and reported net income is made up of accruals; non-discretionary accruals such as depreciation are removed. We were looking at total accruals, which comprise accounting income minus cash flows. Examples of discretionary accruals would be bad debt expense, allowances for loans and lease losses, and fair value accounting. If a company is an outlier in the

area of discretionary accruals, it is an accurate indicator of earnings management and indicator of a red flag.

Financial reporting errors can identify manipulation with data. The idea is that companies not paying attention to the details of financial statements may not be paying attention to other factors either and therefore carry more risk. This is why we also consider these errors to be red flags.

Frequent changes in outside auditors can signal conflict between accounting decisions made by management and an auditor and can signal the risk of fraud.

The information related to the issues is stratified in a number of ways. The following table shows the issues compared to the total number of filings submitted.

Table 1 Red Flags Found in Analysed Companies

	Confirmed	N/A	Rejected
	(no. of companies)		
Earnings management	6	0	4
Ratios out of line with industry	10	0	0
Discretionary accruals	8	1	1
Financial reporting errors	1	0	9
Frequent changes in outside auditors	2	6	2

Source: Financial statements of selected companies.

The table shows that the rate of confirmed red flags is higher than 50% in 3 criteria. We cannot really take one criterion into account because data was not available – 6 companies had no issues. Financial reporting errors have a small number of filings.

Based on these results, we can conclude that the analysis of selected indicators (oriented towards detection of Ponzi schemes) provides users of financial statements with basic indicators or red flags of fraud, but these indicators need to be analyzed further to prove financial fraud. However, the treatment process through Excel spreadsheets was not effective and the solution would be to unify the publication of financial statements. Such a monitoring tool has become possible to apply only if a mandatory XBRL tagging requirement is introduced for companies that disclose financial statements so that analysis of big data can be carried out.

Benefits of using the XBRL as an eligible communication interface for the detection of red flags are:

XBRL can efficiently reduce costs associated with analysis of financial statements; it facilitates the possibilities of automated data processing and concurrent increase in speed in processing; data processing in the XBRL format enhances the usability in that various data can be aggregated to compare, process and use advanced search criteria.

XBRL reporting would be especially helpful for analysis of earnings in companies in comparison with industry performance and with ratios which help us to flag a company whose margins are much greater than the industry norm.

XBRL does not improve the level of disclosures, but it improves the quality of available information. XBRL will immediately point out inconsistencies (Debreceeny, Felden, Piechocki, 2007). Not every inconsistency is a fraud but it can be a red flag. For example if a company has a totaling mistake in their balance sheet, XBRL would reject it at the time of submission, thus the quality of data goes up.

4 Conclusions

Financial reports are the only public documents designed to provide financial information for users outside companies. Therefore, for users not only the quantity and quality of information provided through financial statements are important but so too are the form

of these statements (their standardized or not standardized structure) and the manner by which the information is transmitted to users (the use of traditional or modern means in transferring information). In the wake of the 2008 financial crisis, accounting investigations, financial fraud and issuer disclosures are areas of renewed focus. The Slovak government has made financial statements public in recent years but it is still not sufficiently capable of using big data effectively and should evolve ways of doing so. The ability to use the data sources that it has to shape investigations and ultimately cases and policy is based on analytics, and for public companies these analytics start with XBRL. When companies use XBRL for their filings, they submit tagged data that can be used for analytics. Financial statements in this modern format enables accelerating and improving decision-making processes through the transparency ensured to financial reporting by using XBRL and reducing time for processing the data. We have focused only on items of financial statements and not considered the other components of financial statements such as graphics, tables, etc. Those will be the subject of future research.

Acknowledgments

This article is an output of the project of the Scientific Grant Agency of the Ministry of Culture of the Slovak Republic and Slovak Academy of Sciences (VEGA) no. 1/0935/16 "XBRL based implementation of electronic financial reporting."

References

- Bergeon, B. (2003). *Essentials of XBRL: Financial Reporting in the 21st Century (Essentials Series)*. 1th ed. New Jersey: John Wiley&Sons.
- Doni, F., Inghirami, E. I. (2011). *XBRL and strategic information*. Exploiting XBRL in BSC modeling. Heidelberg, New York, Dordrecht, London: Springer.
- Debreceny, R., Felden, K., Ochocki, B., Piechocki, M. – Piechocki, M. (2010). *XBRL for Interactive Data*. Berlin, Heidelberg: Springer.
- Debreceny, R., Felden, C., Piechocki, M. (2007). *New Dimensions of Business Reporting and XBRL*. Wiesbaden: Deutscher Universitat-Verlag.
- Kurt, R., Cornelis, R. (2013). *IFRS and XBRL: How to improve Business Reporting through Technology and Object Tracking*. New Jersey: John Wiley&Sons.
- Mejzlík, L., Ištvánfyová, J. (2008). Zverejňovanie účtovných závierok v elektronickej podobe. In: *AUDITOR*. pp. 10-15.
- Meluchová, J., Máziková, K., Mateášová, M. (2015). New capital requirements for financial institutions in the European Union. In: *Anali Ekonomskog fakulteta u Subotici*. pp. 345-359.
- Pakšiová, R. (2014). *Majetková podstata podniku*. 1th ed. Bratislava: Vydavateľstvo Ekonóm.
- Smii, T. (2016). The Impact of the Audit Quality on that of the Accounting Profits: the Case of Companies listed on the TSE. In: *International Journal of Managing Value and Supply Chains*, vol. 7, pp. 39-54.
- Tumpach, M., Juhászová, Z. (2006). International financial reporting and information technologies - is XBRL the panacea? In: *International Scientific Journal of Management Information Systems*, vol. 1, pp. 80-83.
- Tumpach, M. (2005). Prezentovanie účtovnej závierky na báze jazyka XBRL - nový impulz alebo slepá cesta? In: *Vývoj ekonomickej teórie a vzdelávania, uplatnenie a perspektívy v SR. Medzinárodná vedecká konferencia*. Bratislava: Vydavateľstvo Ekonóm, pp. 365-369.

The Success of Business Failure Prediction Using Financial Creditworthy Models

Michal Kuběnka

¹ University of Pardubice

Faculty of Economics and Administration, Institute of Business Economics and Management
Studentská 84, 532 10, Czech Republic
E-mail: michal.kubenska@upce.cz

Abstract: *Financial creditworthy models are popular for their simplicity and fast applications. Above all, quantitative evaluation of financial health guarantees an unbiased assessment of company. On the other hand, these models do not take into account the soft factors. Probably, the most famous Czech financial models known as creditworthy are Credibility Index, Rudolf Doucha's Balance analysis, and Kralicek's Q-test. They were created for the purpose of assessing the creditworthiness usually without using statistical methods. Can they be used for prediction of business failure despite this drawback? What is their success rate? Which of these classic financial models achieves the highest accuracy? To find answers a dataset of financial statements of 92 companies in manufacturing industry was analysed. These companies went bankrupt between 2010-2014.*

Keywords: credibility index, Rudolf Doucha's Balance analysis, Kralicek's Q-test, failure, predictive power

JEL codes: G32, M10, C38

1 Introduction

There is a plethora of financial models for financial diagnostic and financial health prediction in the world. They are generally classified into two categories as bankruptcy models and creditworthy models. Kuběnka and Slavíček (2014) claim that although these two categories were created differently, their construction is usually similar, which means a combination of ratios and assigned weights of importance. They point out that prediction models vary predominantly in their targeting.

The purpose of bankruptcy models is to predict a default of company based on an analysis of financial statements. Probably the most famous models are made by Altman. His Z-Score (Altman (1968)) started an expansion of business failure modeling. Later, he created many more e.g. Altman (1993) or Altman, Hartzell, Peck (1995). Other well-known are Beermann test (Beerman (1976)), Springate model (Sands, Springate, (1983)), Fulmer model (Fulmer (1984)), and Taffler model (Taffler, Tisshaw (1997)). In the Czech Republic, IN95 and IN05 models are the best known bankruptcy models. IN95 accuracy is more than 70% in conformity with findings of authors Neumaierová, Neumaier (2002). Bankrupt prediction accuracy of IN05 model is 83% according to Neumaierová, Neumaier (2005).

Slavíček (2015) emphasizes that the most famous bankruptcy models are usually generic, which do not reflect the specifics of individual industries. That is why he suggested his own prediction model for small companies operating in the construction sector in the Czech Republic (a bankruptcy prediction with accuracy of 82%)

However, the finite accuracy can be affected by many factors. For instance, a success of failure prediction can be decreased also by using non-identical accounting systems. It means e.g. usage of US GAAP when creating the model and subsequently usage of IFRS or CAS system when applying the model. Accounting and differences in accounting systems are dealt with e.g. by Honková (2015) and Fosbre, Kraft, Fosbre (2009).

Many authors emphasize that taking non-financial factors into consideration can significantly increase the effectiveness of risk-management systems and decision-making processes (Korableva and Kalimullina, 2015). Some authors even focused unconventional

non-financial factors eg. (Hájek, Olej and Myšková, R., 2014) indicated eleven categories of annual reports' sentiment which can be utilized as the inputs of the prediction models. However, the frequency of use in practice decreases with the increasing complexity of the method (Stříteská, 2012). Financial prediction models use only quantitative and easily available financial data. That is the reason why the financial prediction models are so popular.

While the bankruptcy models were created using samples of real enterprises, the creditworthy models are made on the basis of logical assumptions without empirical research. That is why these models usually do not have a quantified accuracy. The best known creditworthy models are Tamari risk index ((Tamari (1966)), Czech IN99 model for economic value added prediction (Neumaierová (2002)), Grünwald's index ((Grünwald, Holečková (2007)), Doucha's Balance analysis I., II., III. ((Doucha (1996)), Credibility Index (see more Zalai, 2010), and Q-test made by Kralicek (1993) made in 1991.

The first goal of this article is to determine the success rate of creditworthy models - namely Credibility Index, Rudolf Doucha's Balance analysis, and Kralicek's Q-test. And the second goal is to answer the question which of these classic financial models achieves the highest accuracy.

2 Methodology and Data

Kralicek's Q-test

Q-test uses four financial ratios that are applied to a specific company. The values achieved are then subsequently compared with the scale shown in Table 1. The equity quota can be calculated as:

$$(K_1) \text{ Equity quota} = \frac{\text{Equity}}{\text{Total assets}} * 100 \quad (1)$$

The indicator refers to the capital strength of the company. According to Sedlacek (1998), it also describes the long-term financial stability of the company and capital independence and it informs how the company covers its needs with its own resources. In contrast, Debt payment from cash flow expresses a length of period of time needed to pay off company debts from cash flow. It can be calculated as:

$$(K_2) \text{ Debt payment from CF} = \frac{\text{Foreign capital} - \text{financial assets (short-term)}}{\text{Annual cash flow}} * 100 \quad (2)$$

Kralicek used the item „annual cash flow“ in this ratio. Kislingerová (2005) calculates it as the sum of economic result, depreciations and the change of reserves level.

Cash flow in revenues is the ratio which should be maximized. It can be calculated as:

$$(K_3) \text{ Cash flow in revenues} = \frac{\text{Cash flow}}{\text{Revenues}} * 100 \quad (3)$$

The return on assets means the profitability of total assets. It should be higher than the interest rate of debts. Only in this case financial leverage can have a positive influence. This ratio is calculated in this way:

$$(K_4) \text{ Return on assets} = \frac{\text{Earnings after taxes}}{\text{Total assets}} * 100 \quad (4)$$

The resulting grade is the arithmetic average of ratings achieved in particular evaluated areas $((K_1+K_2+K_3+K_4)/4)$. The company classified with the grade 1 and 2 is considered to be prosperous, and the ones with the grade 4 and 5 are pointed to the bankruptcy. See more in Table 1.

Table 1 Evaluation Scale & Grades According to Kralicek

	Scale for evaluation (grades)					
	1. Excellent	2. Very Good	3. Good	4. Bad	5. Very bad	
Equity quota	> 30%	> 20%	> 10%	< 10%	neg.	Financial stability
Return on assets	< 3 yrs.	< 5 yrs.	< 12 yrs.	> 12 yrs.	> 30 yrs.	
Debt payment from CF	> 10%	> 8%	> 5%	< 5%	neg.	Revenues situation
Cash flow in revenues	> 15%	> 12%	> 8%	< 8%	neg.	

Source: Own according to Kralicek (1993)

Q-test uses grades from 1 to 5 but for the determination of the informative value capability it is necessary to work with intervals. According to Kuběnka (2016), it is suitable to divide the scale <1;5> in five intervals. Then every interval encompasses the width of 0.8 of a grade. Under this recommendation the evaluation scale has this grades and zones:

- Grade 1 with interval <1;1.8) => classified as failure zone
- Grade 2 with interval <1.8;2.6) => classified as failure zone
- Grade 3 with interval <2.6;3.4) => classified as grey zone
- Grade 4 with interval <3.4;4.2) => classified as prosperity zone
- Grade 5 with interval <4.2;5> => classified as prosperity zone

Credibility Index (I_c)

Compared to Q-test, I_c was created in a more sophisticated way. The author used the methodology of multivariate discriminant analysis. That is why the formula (5) includes ratios with different importance (1.5 vs. 0.08 vs. 10 vs. 5 vs. 0.3 vs 0.1). According to (Zalai, 2010) I_c formula includes six ratios in the following form:

$$I_c = 1.5X_1 + 0.08X_2 + 10X_3 + 5X_4 + 0.3X_5 + 0.1X_6 \quad (5)$$

Where X₁ ratio means Cash Flow / Total liabilities and Equity; X₂ component is proportion of Total Capital / Total liabilities and Equity; X₃ ratio is EBIT / Total Capital; X₄ ratio means EBT / Revenues; X₅ ratio is Inventory / Total Assets; X₆ ratio involves Equity / Total Capital. Then the comparison with the following rating scale must be done. In compliance with Table 2 the threshold between prosperity and bankruptcy is zero.

Table 2 I_c Rating Scale

	Type of financial position	Fin. health category
I_c ∈ < 3 ; ∞)	extremely good financial position	prosperous companies
I_c ∈ < 2 ; 3)	very good financial position	
I_c ∈ < 1 ; 2)	good financial position	
I_c ∈ < 0 ; 1)	problematic financial position	
I_c ∈ < - 1 ; 0)	bad financial position	bankruptcy companies
I_c ∈ < - 2 ; - 1)	very bad financial position	
I_c ∈ < - ∞ ; - 2)	extremely bad financial position	

Source: Kuběnka (2015)

Rudolf Doucha 's Balance analysis I. (BaI.)

The last chosen model, which is very well known in the Czech Republic, is Rudolf Doucha 's Balance analysis made by Doucha (1996). It was created in conditions of the Czech Republic contrary to Q-test and I_c. This model exists in three versions differing in elaborateness and accuracy. BaI. works with these four indexes (ratios):

$$\text{Index of stability } (S) = \frac{\text{Equity}}{\text{Total assets}} \quad (6)$$

$$\text{Index of liquidity } (L) = \frac{(\text{Short term financial property} + \text{receivables})}{2,17 \times \text{Current liabilities}} \quad (7)$$

$$\text{Index of activity } (A) = \frac{\text{Gross revenue}}{\text{Total liabilities}} \quad (8)$$

$$\text{Index of rentability } (R) = \frac{8 \times \text{EAT}}{\text{Equity}} \quad (9)$$

$$\text{Total } (T) = \frac{(2 * S + 4 * L + 1 * A + 5 * R)}{12} \quad (10)$$

Total score (T) is done as a weighted average of the achieved values as stated (10). The interpretation of ratings is the same. The total T value means a good financial situation of the company if it exceeds value 1. T value under 1 indicates a bad financial situation of the company.

Data set

To test the predictive power of the models a dataset of companies operating in the manufacturing industry was chosen. It comprised of 321 companies that got into distress (bankruptcy) between 2010 and 2014. This information was drawn from a database of businesses MagnusWeb of Bisnode company. Accounting data contains information from the balance sheet, profit and loss statement one year before bankruptcy, i.e. from 2009 to 2013. Companies that had zero or very small turnover were subsequently excluded out of the sample, therefore, the data set was reduced to 285.

The author assumes that such indicia would have been clear signals about distress to a analyst. Usage of prediction model is then unnecessary. Further reduction of the sample was due to the negative equity of some companies. The author considers this fact is also a clear signal of distress. As a result of this, sample decreased to 92 companies. The accuracy of the models was evaluated on the basis of generally known methodology. It is based on analysis of historical data. The resulting value of the model at time t is compared with the fact at time t + 1.

Methodology of success expression

A lot of prediction models were tested in history. Formerly (e.g. forefather of failure prediction E. Altman (1968)) and even now (e.g. Berzkalne and Zelgalve (2013), Huijuan (2015)) this methodology for accuracy enumeration of model in the area of bankruptcy prediction has been used.

Table 3 I_C Accuracy Enumeration

	Prediction	
	Bankrupt	Non-Bankrupt
Fact: Bankrupt	H ₁	α

Source: Author according to Altman (1968)

where:

H₁ – number of correct predictions of future bankrupt

α – Type I. error is number of bankruptcy companies mistakenly classified as non-bankrupt

Success of bankrupt prediction (SBP) in percentage terms for bankrupt companies (so called "sensitivity") can be quantified in this way:

$$\text{Sensitivity } (SBP) = \frac{H_1}{H_1 + \alpha} \times 100 \quad (11)$$

3 Results and discussion

Each of tested model has a different zones for evaluation of tested companies. These zones are able to sort analysed companies into two groups (see Table 4). One group consists of companies diagnosed with a poor financial situation ("bankrupt area") and in the other group there are financially stable and prosperous companies ("creditworthiness area").

Table 4 Bankrupt and Credibility Zones

	No. of rating degrees	Threshold	Bankrupt Area	Creditworthiness Area
Q-test	5	3	> 3	< 3
Credibility Index	7	0	< 0	> 0
Balance Analysis I.	2	1	< 1	> 1

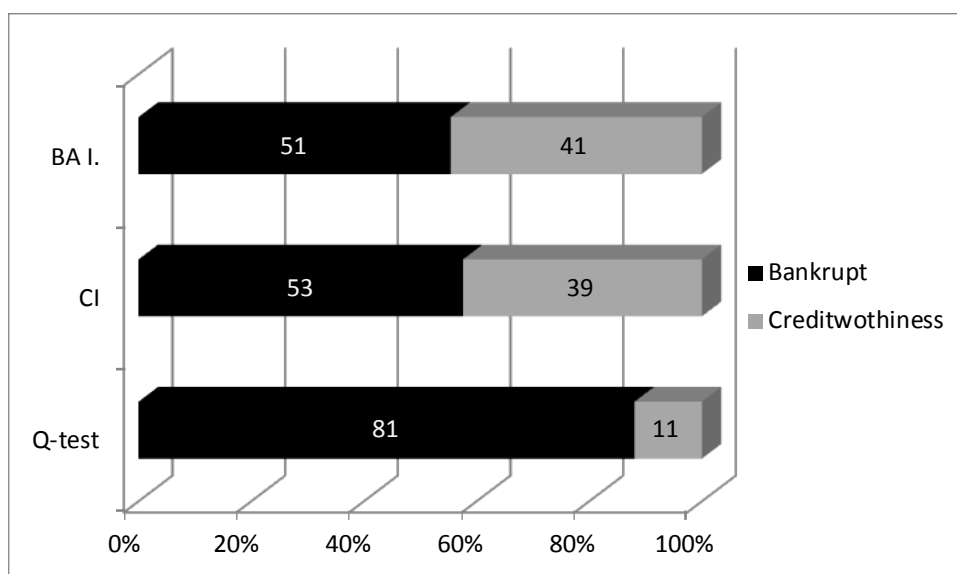
Source: Own

The dataset of 92 manufacturing companies was tested using three selected creditworthy models. Each of 92 companies showed no signs of decline in the form of negative equity or zero or very low turnover. Also, 30 companies in the sample (32.61%) had a positive ROE value and 62 companies, i.e. 67.39% negative ROE value. Average of ROE value is -1.24%, median -16.78%. Maximal ROE is 6520.65% and minimal ROE value is -4453.67%. These outliers are usually caused by low values of equity.

Not only following this, the Balance Analysis I. model (BA I. in Figure 1) identified 41 companies, i.e. 44.57% as companies in good financial situation and only a little more than half, namely 55.43% (51 companies) in bankruptcy. Credibility Index (CI in Figure 1) evaluated the companies more negatively as it ranked 57.61% companies in the bankrupt area and the remaining 42.39% in creditworthiness area.

The most negative evaluation of companies and also most successful model is Q-test. It marked 88.04% (81 companies) of companies as financially troubled and only 11.96% (11 comp.) as financially healthy.

Figure 1 Success of Business Failure Prediction



Source: Own

Table 5 area 1 indicates probability that both the models will predict bankruptcy when applied to a specific company. The most consistent are Q-test and Credibility Index (Q-t vs. CI) that identically predict bankruptcy in 61.53% of cases. The best consistency in

bankruptcy prediction at the conditioned probability (Table 5 area 2 & 3) was 100% found in Quick test and Balance analysis I. (Q-t vs. CI) where conditioned conformity of Q-t vs. CI/CI was 100% and in case Q-t vs. BA/BA also 100%.

Table 5 Agreement in Bankruptcy Prediction

Probability*			Conditioned probability* direction A			Conditioned probability* direction B		
Area 1.			Area 2.			Area 3.		
Models	Abs.	Rel.*	Models	Abs.	Rel.*	Models	Abs.	Rel.*
Q-t vs. CI	53/92	57.61%	Q-t vs. CI /CI	53/53	100%	CI vs. Q-t /Q-t	53/81	65.43%
Q-t vs. BA	51/92	55.43%	Q-t vs. BA /BA	51/51	100%	BA vs. Q-t /Q-t	51/81	62.96%
CI vs. BA	46/92	50.00%	CI vs. BA /BA	46/51	90.20%	BA vs. CI /CI	46/53	86.79%

* probability of agreement in prediction of bankruptcy

Source: Own

Some links between models appear to be very strong, however, it should be understood that this is a conditioned probability. For example, the strongest links Q-t vs. CI means that if CI identifies a company as bankrupt, there is 100% probability of being identified as bankrupt company by Q-test as well.

4 Conclusion

In order to meet the goal of this article, the classification of companies in 2009-2013 was confronted with the fact that these companies went bankrupt one year later. Balance Analysis I. showed the worst prediction power. It correctly predicted a business failure in 55.43% of cases based on the data available a year earlier. Credibility Index model was better in bankruptcy predicting, namely in 57.61% of cases, and the best one was Q-test, predicting correctly even in 88.04% of cases (i.e. 81 of 92 companies).

Generally, these financial models can be considered as an easy tool for assessment of company on the quantitative basis. However, it should be noted that the forecast of future financial condition can never be absolute.

In conclusion, we can say that the predictive power of one of the three tested creditworthy models is very high. That is why the Q-test can be recommended as a suitable model for practical use in the area of bankruptcy prediction. It even has a higher accuracy than the other mentioned bankruptcy models (IN95 70%, IN05 83%, Slavíček 82%).

References

- Altman, E. I. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. *Journal of Finance*, vol. 23(4), pp. 589-609.
- Altman, E. I., Hartzell, J., Peck, M. (1995). Emerging Markets Corporate Bonds: A Scoring System, *Salomon Brothers Working Paper*.
- Beerman, K. (1976). Possible Ways to Predict Capital Losses with Annual Financial Statements, *University of Düsseldorf Working Paper*.
- Berzkalne, I., Zelgalve, E. (2013). Bankruptcy Prediction Models: A Comparative Study of the Baltic Listed Companies. *Journal of Business Management*. Issue 7, pp. 72-82.
- Doucha, R. (1996). Financial Analysis. Practical Applications. (orig. "Finanční analýza podniku. Praktické aplikace.") Praha: VOX.
- Fulmer, J. G. (1984). A Bankruptcy Classification Model for Small Firms, *The Journal of commercial bank lending*, vol. 66(11), pp. 25-37.

- Grünwald, R., Holečková, J. (2007). *Financial Analysis and Planning in Company* (orig. „*Finanční analýza a plánování podniku.*“) 1st ed. Praha: Ekopress.
- Hájek, P., Olej, V., Myšková, R. (2014). Forecasting Corporate Financial Performance Using Sentiment in Annual Reports for Stakeholders' Decision-making, *Technological and Economic Development of Economy*, vol. 20(4), pp. 721-738.
- Honková, I. (2015). International Financial Reporting Standards Applied in the Czech Republic. *E&M Economics and Management*, Vol. 18(3), pp. 84-90.
- Huijuan, L. (2015). Default Prediction Model for SME's: Evidence from UK Market Using Financial Ratios, *International Journal of Business and Management*, vol. 10, pp. 81-106.
- Kislíngrová, E., Hnilica, J. (2005). *Financial Analysis Step by Step* (orig. „*Finanční analýza krok za krokem.*“) 1st ed. Praha: C. H. Beck.
- Korableva, O., Kalimullina, O. (2015). Improving of the Decision-making Methodology on the Basis of an Advanced Approach "BSC+SWOT+ANP" in Banking. In: *Proceedings of International Conference on Economics, Political and Law Science*, pp. 28-37.
- Kralicek, P. (1993). *Fundamentals of Financial Management* (orig. „*Základy finančního hospodaření.*“) 1st. ed. Praha: Linde.
- Kuběnka, M. (2015). Predictive Ability of the Index of Creditworthiness. Finance and the Performance of Firms in Science, Education and Practice. In: *Proceedings of the 7th International Scientific Conference*, Zlín: Tomas Bata University, pp. 795-804.
- Kuběnka, M. (2016). Informative Value of Q-test in Conditions of Czech Republic. In: *Hradec Economic Days 2016*. Hradec Králové: Gaudeamus, pp. 440-447.
- Kuběnka, M., Slavíček, O. (2014). Detection of Cognation between Creditworthy Models and Bankruptcy Models. In: *Proceedings of Managing and Modelling of Financial Risks*, Ostrava: Technical University of Ostrava, pp. 426-433.
- Neumaier, I., Neumaierová, I. (2005). Index IN05. In: *Evropské finanční systémy*. Brno: Masaryk University, pp. 143-148.
- Neumaierová, I., Neumaier, I. (2002). *Performance and Market Value of the Company* (orig. „*Výkonnost a tržní hodnota firmy*“), GRADA Publishing, a.s.
- Sands, E. G., Springate, G. L., Peck, M. (1983). Predicting Business Failures, *CGA Magazine*, vol. 17, pp. 24-27.
- Sedláček, J. (1998). *Accounting Data in the Hands of a Manager: Financial Analysis in Management* (orig. „*Účetní data v rukou manažera: finanční analýza v řízení.*“) 1st ed. Praha: Computer Press.
- Slavíček, O. (2015). The predictive model of financial health for companies in the construction sector. In: *Financial Management of Firms and Financial Institutions, 10th International Scientific Conference Proceedings*, Ostrava: VŠB-TU of Ostrava, pp. 1166-1173.
- Stříteská, M. (2012). Key Features of Strategic Performance Management Systems in Manufacturing Companies. *Procedia - Social and Behavioral Sciences*, vol. 58, pp. 1103-1110.
- Taffler, R. J., Tisshaw, H. (1997). Going, Going, Gone - Four Factors which Predict, *Accountancy*, vol. 88, pp. 50-54.
- Tamari, M. (1966). Financial ratios as a means of forecasting bankruptcy. *Management International Review*, vol. 6(4), pp. 15-21.
- Zalai, K. (2010). *Financial - Economic Analysis of the Company* (orig. „*Finančno - ekonomická analýza podniku*“) 7th ed. Bratislava: Sprint dva.

Stock Market Volatility in the European Emerging and Frontier Markets

Lumír Kulhánek

VŠB-Technical University of Ostrava
Faculty of Economics, Department of Finance
Sokolská třída 33, 701 21 Ostrava 1, Czech Republic
E-mail: lumir.kulhanek@vsb.cz

Abstract: *The main objective of this paper is to investigate and evaluate development both of stock market returns and volatility in the European emerging and frontier markets. Both main quantitative characteristics of the stock markets development will be analysed (daily returns, risk), as well as the relationships between daily stock market indices returns changes and volatility. The comparison with developed stock markets and MSCI European Union index is also performed. In analysis are used daily values of stock market indices for the sample period from May 2002 to May 2016, which is also divided into two non-equal length sub periods with the beginning of the Euro area sovereign debt crisis. We found that only three frontier markets of the European Union have positive returns both in pre-crisis and crisis period. The emerging stock markets in comparison with frontier markets are reasonably highly correlated with each other and with MSCI European Union index. Very weak correlations of frontier markets of the European Union furthermore decreased in Euro area sovereign debt crisis period.*

Keywords: emerging markets, frontier markets, volatility, stock market return, risk

JEL codes: F36, G15

1 Introduction

In this paper, first, we examine the development of the emerging and frontier stock markets in ten member countries of the European Union. The sample selection of emerging and frontier markets is driven by the Morgan Stanley Capital International (MSCI) classification. Six of these stock markets are classified by MSCI as frontier markets (Bulgaria, Croatia, Estonia, Lithuania, Romania, and Slovenia). Four of these stock markets are recognised by MSCI as emerging markets (Czech Republic, Hungary, Poland, and Greece). Greek stock market was from developed market status downgraded to emerging market status European stock market that is a member of the Euro area. European frontier markets have lower market capitalisation and liquidity (Kulhánek and Šoltés, 2010) in comparison with more developed traditional emerging markets in the European Union member countries.

Subsequently, we compare stock market returns volatility and stock returns of European emerging and frontier markets with developed stock markets of the European Union. For the comparison are selected stock markets in Austria, France, Germany, and in the United Kingdom, where only Austria, France and Germany are part of the Euro area. Both main quantitative characteristics of the development of stock market indices will be analysed (daily returns and risk), as well as the correlation of returns and changes in the correlation of returns among particular countries. The analysis of relationships between the ten emerging and frontier markets of the European Union is supplemented by monitoring of the development of pairwise correlation coefficients with The MSCI European Union (EU) Index. This index captures large and mid-cap representation across the 17 countries in the European Union. With 435 constituents (MSCI, 2016) the index covers approximately 85 % of the free float-adjusted market capitalisation in the European equity universe.

A number of empirical studies have empirically examined the relationship between stock price returns and stock price volatilities (thus market risk) among different stock markets. Five central European stock markets examined e.g. Wang and Moore (2009). Stock markets in the Czech Republic, Croatia and selected EU member countries are

analysed e.g. in Kulhánek (2008). Volatility and correlations for stock markets in the emerging economies of Central and Eastern Europe before and after EU accession have examined Allen, Golab and Powell (2010), the relationship between time-varying correlations and volatility among worldwide emerging and frontier stock markets have examined e.g. Baumöhl and Lyócsa (2014). The co-movement dynamics of European frontier markets examined Piljak (2013). Horvath and Petrovski (2013) have compared correlations of Central European stock markets with markets in South-eastern European countries. On differences among volatility patterns of stock markets in Visegrad countries focused e.g. Heryán and Kulhánek (2015). In this paper we also prove what affects stock market volatility more, whether the increase or decrease of stock market indices returns. We maintain not only a position that the relationship between returns and volatility is negative, but also that volatility increases more following negative returns than it does following positive returns. For monitoring of this relationship we use development of average returns and risks measured by standard deviation of returns calculated in moving windows with length of 200 trading days.

Our analysis is based on a sample of daily closing stock market indices for the period from May 2002 to May 2016. In this period not only intensification of the financial crisis in September 2008 after the collapse of Lehman Brothers affected both returns and volatility on stock markets. The Euro area sovereign debt crisis (DeSantis, 2012) also has impacted on analysed stock markets. In May 2010, the European Financial Stability Facility (EFSF) was created to provide loans to cash-strapped countries. Established at the same time, the European Financial Stabilisation Mechanism (EFSM) would also lend to struggling countries. Likewise, on May 10, 2010 the European Central Bank announced the beginning of the Securities Markets Programme (SMP). The Governing Council of the ECB decides on several measures to address severe tensions in financial markets. In particular, it decides to conduct interventions in the euro area public and private debt securities markets (SMP) and to adopt a fixed rate tender procedure with full allotment in the regular three-month longer-term refinancing operations in May and June 2010 (ECB, 2011). Based on this development and in order to isolate the impact of the Euro area sovereign debt crisis our sample period is divided into two sub-periods by the beginning of the fore mentioned Securities Markets Programme (SMP) at May 10, 2010.

2 Methodology and Data

For the analysis of the emerging and frontier stock markets development are used daily statistical data. End of day indices data are obtained from the world renowned and highly respected provider of investment decision tools Morgan Stanley Capital International (Retrieved from: <https://www.msci.com/end-of-day-data-country>). MSCI national stock market indices are in local currencies, since the primary objective is to depict the development of the national stock markets and not the aspects of the international portfolio diversification.

In view of the fact that MSCI indices for three countries included in analysis (Bulgaria, Romania, and Lithuania) have been not available since May 2002, we used also official indices of national stock exchanges. Daily data for the Bulgarian stock market before May 2005 are recalculated from the official BSE-Sofia main index SOFIX, which calculation started on October 20, 2000 (Retrieved from: <http://www.bse-sofia.bg/?page=Indices>). Daily data for the Romanian stock market before December 2005 are recalculated from The Bucharest Stock Exchange main index BET, which is reference index for the Romanian capital market (Retrieved from: <http://www.bvb.ro/FinancialInstruments/Indices/IndicesProfiles>). Daily data for the Lithuanian stock market before June 2008 are recalculated from the NASDAQ OMX-Vilnius Index (Retrieved from: http://www.nasdaqomxnordic.com/index/index_info?Instrument=LT0000999963).

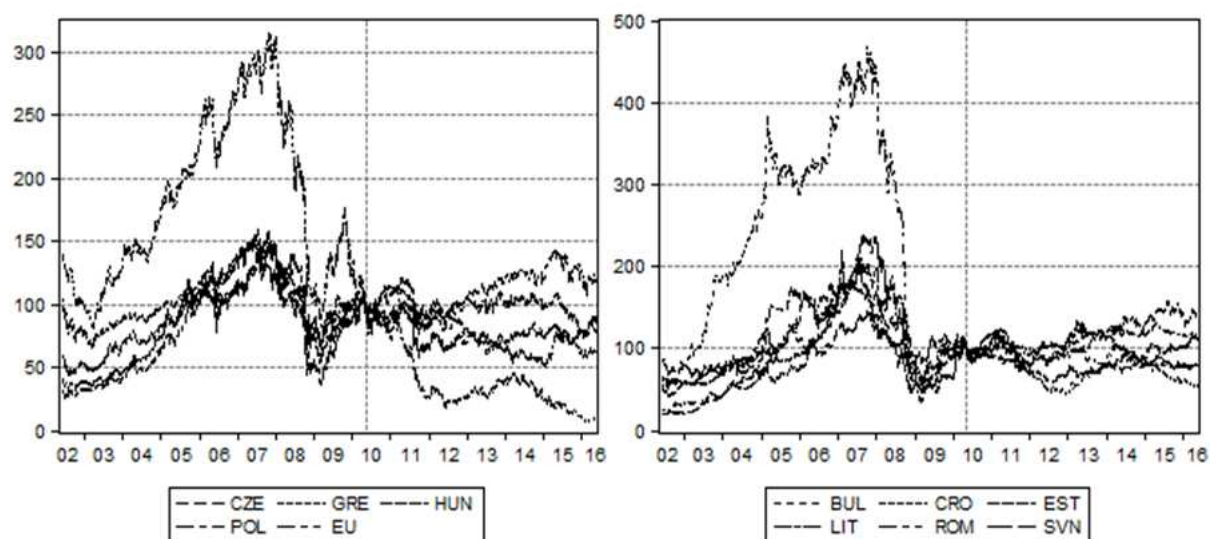
The period from May 30, 2002 to May 20, 2016 (3647 Observations) is examined. For the detailed analysis and in order to isolate the impact of the Euro area sovereign debt crisis the sample period is divided into two non-equal length sub-periods. First sub-period, the pre-Securities Markets Programme period (pre-SMP period), ended at May

09, 2010 (2071 observations). Second sub-period, the SMP period, started at May 10, 2010 (1575 observations).

Reference period in which the index is given a value of 100 is for all analysed indices specified by May 10, 2010. Daily logarithmic returns in local currency are calculated as $\ln(P_t / P_{t-1}) \times 100$, where P is the stock market index in local currency. Volatility is measured by the standard deviation of daily returns. Correlation coefficients of returns are calculated and compared both for the while period and two sub-periods (pre-SMP period and SMP period). The correlation coefficients of returns between analysed markets and MSCI EU Index were identified also for 200 trading days moving windows.

The development of stock market indices in analysed European emerging and frontier markets from May 30, 2002 to May 20, 2016 is represented in Figure 1. Every graph has been divided by a vertical line into two parts showing pre-SMP and SMP phases of the analysed period.

Figure 1 Development of Stock Market Indices of European Emerging and Frontier Markets in the Whole Period (May 10, 2010 = 100)



Source: Own calculation based on MSCI indexes in local currency.

As it is apparent from the Figure 1, the increasing trend of emerging and frontier markets was stopped by force of the financial crisis. Slump of stock prices was continued to February 2009. Starting in March 2009 the emerging and frontier markets began to grow up. Development of stock market indices in SMP period (from May 2010) is very different. At the end of examined period (May 20, 2016) stock market indices was higher in comparison with May 2010 only in three frontier markets: in Romania (139,5 %), in Estonia (118,2 %), and in Lithuania (111,3 %). MSCI index European Union was also higher (119,1 %). In four European emerging markets stock market indices was declined. At the end of examined period the stock market indices reached in comparison with May 2010 in Hungary 88,1 %, in Poland 76,9 %, in the Czech Republic 62,1 %, and in Greece only 10,9 %. For comparison of emerging and frontier markets with developed stock markets (not displayed in Figure 1) we can notice that stock market indices at the end of examined period was higher in the USA (177,1 %), Germany (141,8 %), France (122,7 %), and in the United Kingdom (112,2 %).

3 Results and Discussion

Table 1 and Table 2 present descriptive statistics for the daily returns for the pre-SMP and SMP periods.

In every case the return series has a mean value close to zero and a distribution characterized by non-normality (Jarque-Bera statistics). The mean of returns in the pre-

SMP period was in all analysed stock markets, except Greece, positive. The highest mean of returns can be observed in pre-SMP period at frontier markets in Lithuania (0,074) and Romania (0,063). Only those two countries and Estonia have positive return also in the SMP period (0,027 for Romania, 0,013 for Estonia, and 0,009 for Lithuania).

Table 1 Descriptive Statistics for Daily Logarithmic Returns of Emerging and Frontier Markets (the Pre-SMP Period, 2071 Observations)

	Mean	Med.	Max.	Min.	St.	Skew.	Kurt.	J-Bera
Czech R.	0,054	0,061	14,64	-15,30	1,660	-0,561	15,83	14316
Greece	-0,020	0,000	10,71	-9,95	1,718	-0,190	7,95	2125
Hungary	0,038	0,000	15,11	-14,04	1,901	-0,143	9,87	4076
Poland	0,023	0,000	7,86	-8,42	1,647	-0,141	5,21	429
Bulgaria	0,030	0,000	11,05	-16,18	1,711	-1,388	18,10	20352
Croatia	0,006	0,000	10,64	-11,00	1,556	-0,048	10,32	4628
Estonia	0,032	0,000	12,40	-9,23	1,567	0,270	10,41	4767
Lithuania	0,074	0,032	23,29	-11,31	1,306	2,404	62,53	307749
Romania	0,063	0,009	9,07	-32,30	1,955	-2,418	41,98	133154
Slovenia	0,022	0,007	13,83	-8,83	1,436	0,284	14,15	10754

Source: Own calculation based on MSCI indexes in local currency.

The lowest and negative mean of returns is assigned in both periods to Greece (-0,020 in pre-SMP and -0,134 in SMP period). The highest mean of returns in pre-SMP period in analysed developed countries (not reported in Table 1) was in Austria (0,004) and in the USA (0,003). Negative mean of returns is assigned for France (-0,010) and Germany (-0,003). In the SMP period all developed markets, except Austria, generate positive mean of returns (not reported in Table 2). The highest returns can be observed in the USA (0,039) and in Germany (0,026). The data contains positive skewness for two stock markets both in pre-SMS period (Estonia and Slovenia) and SMP period (Estonia and Hungary). All other values of skewness are negative which implies that the distribution has a long left tail. All stock markets generate kurtosis more than 3 which indicates the series is characterised by leptokurtosis.

Table 2 Descriptive Statistics for Daily Logarithmic Returns of Emerging and Frontier Markets (the SMP Period, 1575 Observations)

	Mean	Med.	Max.	Min.	St.	Skew.	Kurt.	J-Bera
Czech R.	-0,027	0,000	4,65	-6,58	1,106	-0,258	5,12	312
Greece	-0,134	0,000	16,20	-23,64	3,012	-0,264	9,19	2533
Hungary	0,000	0,000	11,96	-8,50	1,486	0,080	8,08	1697
Poland	-0,013	0,000	5,47	-7,49	1,157	-0,420	6,87	1031
Bulgaria	-0,039	0,000	6,17	-6,85	1,329	-0,038	5,45	395
Croatia	-0,015	-0,003	7,10	-6,72	0,706	-0,656	21,85	23435
Estonia	0,013	0,000	8,81	-6,73	1,223	0,026	8,42	1929
Lithuania	0,008	0,000	5,71	-9,15	0,801	-1,163	22,91	26370
Romania	0,027	0,000	10,07	-12,67	1,292	-0,474	16,62	12237
Slovenia	-0,015	0,000	4,56	-6,71	0,985	-0,369	6,57	873

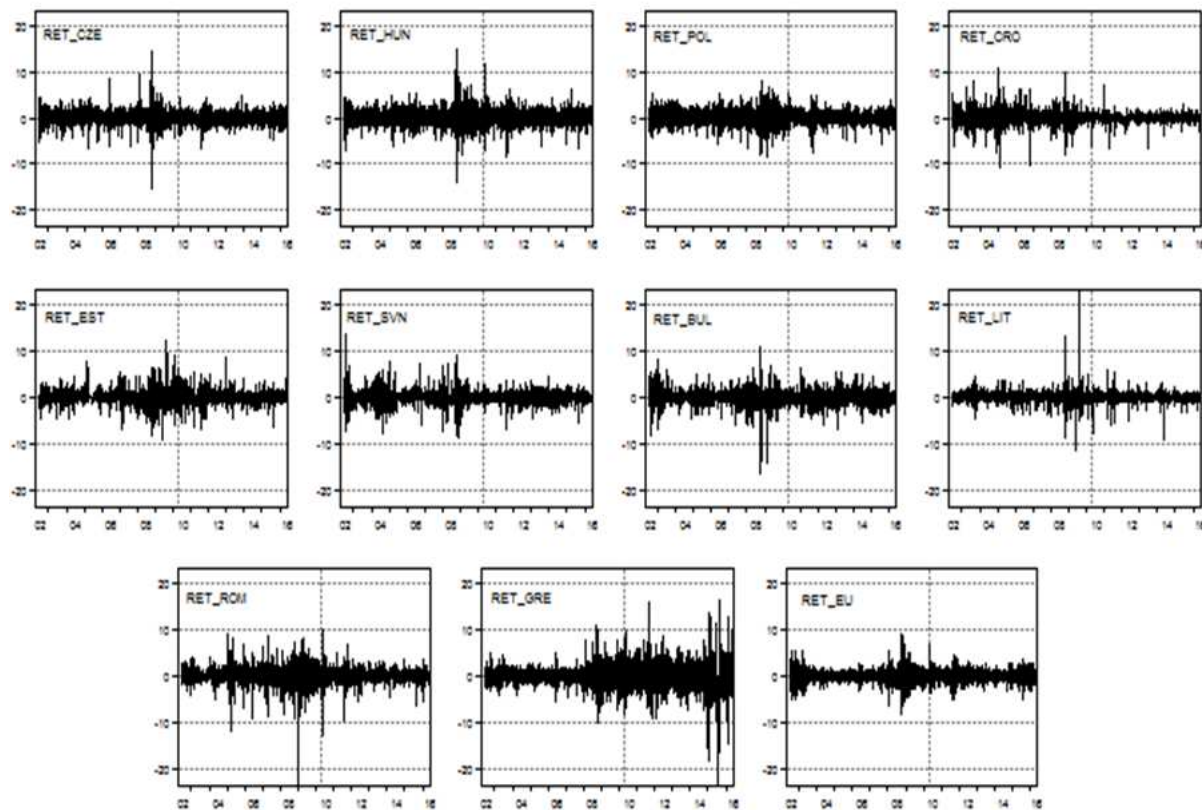
Source: Own calculation based on MSCI indexes in local currency.

Volatility measured by the standard deviation of returns shows that a group of four countries (Bulgaria, Romania, Hungary, and Greece) has the most volatile stock markets in both analysed periods. The highest volatility in SMP period can be observed in Greece. On the other hand, a group of three countries (Croatia, Lithuania, and Slovenia) has the lowest volatility in both examined sub-periods. Data in Tables 1 and 2 represent also the decrease in stock returns volatility from the pre-SMP period to the SMP period for all countries, except Greece.

The volatility of ten European emerging and frontier markets can be observed on Figure 2 that provides plots of daily returns. Similar to Figure 1 every graph has been divided by a

vertical line into two parts showing pre-SMP period and SMP period. From Figure 2 is apparent both the volatility clustering and some massive stock returns fluctuations during analysed period.

Figure 2 Returns Series of European Emerging and Frontier Markets (May 31, 2002 - May 20, 2016)



Source: Own calculation based on MSCI indexes in local currency.

Table 3 Correlation Coefficients Matrix (the Pre-SMP Period and the SMP Period)

	CZE	GRE	HUN	POL	BUL	CRO	EST	LIT	ROM	SVN	EU
CZE	1	0,46	0,53	0,56	0,24	0,32	0,27	0,29	0,31	0,23	0,54
GRE	0,28	1	0,45	0,49	0,19	0,25	0,21	0,18	0,28	0,20	0,58
HUN	0,39	0,26	1	0,59	0,17	0,28	0,23	0,24	0,29	0,19	0,56
POL	0,45	0,27	0,53	1	0,17	0,26	0,21	0,20	0,30	0,15	0,55
BUL	0,07	0,06	0,08	0,05	1	0,21	0,24	0,29	0,21	0,23	0,19
CRO	0,11	0,04	0,09	0,10	0,10	1	0,17	0,18	0,22	0,20	0,32
EST	0,22	0,16	0,21	0,23	0,15	0,18	1	0,42	0,21	0,23	0,24
LIT	0,15	0,10	0,09	0,12	0,16	0,14	0,30	1,00	0,24	0,24	0,21
ROM	0,30	0,23	0,33	0,33	0,13	0,24	0,35	0,24	1	0,19	0,28
SVN	0,11	0,08	0,14	0,14	0,11	0,17	0,19	0,15	0,24	1	0,20
EU	0,43	0,35	0,56	0,64	0,08	0,12	0,30	0,15	0,40	0,12	1

Note: Upper triangular matrix for the returns in pre-SMP period from May 31, 2002 to May 09, 2010, lower triangular matrix for the returns in SMP period from May 10, 2010 to May 20, 2016.

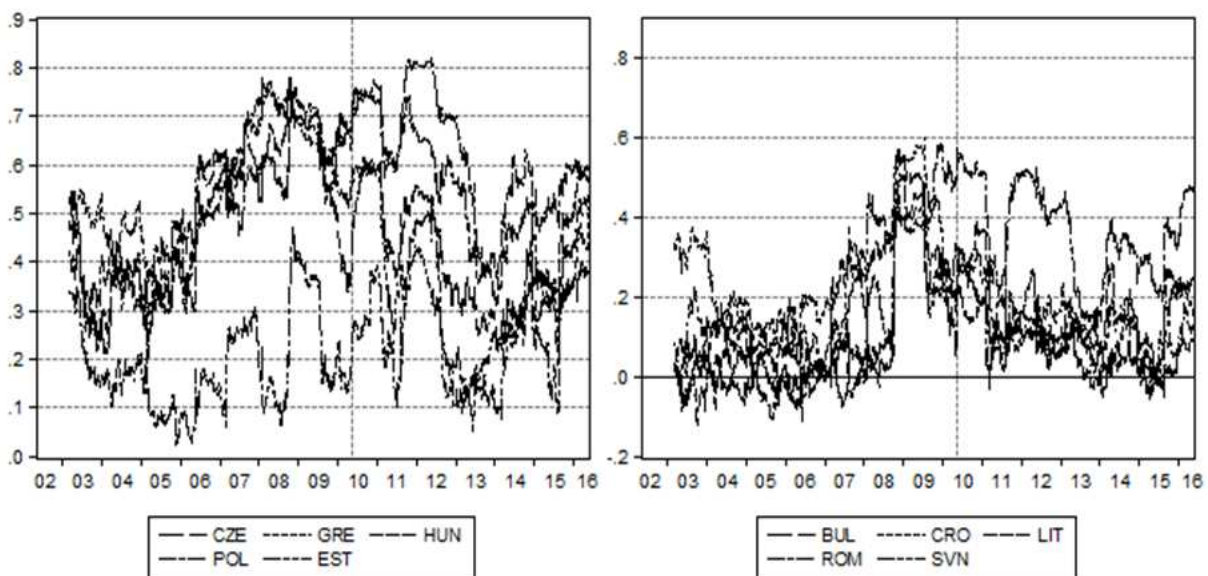
Source: Own calculation based on MSCI indexes in local currency.

Table 3 presents correlation coefficient matrix of daily returns both for the pre-SMP period and the SMP period. Coefficients in upper triangular matrix show correlations in the pre-SMP period contrariwise coefficients in lower triangular matrix shows correlations in the SMP period. Four of the ten analysed markets that are by the MSCI recognised as emerging markets have in comparison with frontier markets greater correlation coefficients. The stock markets in the Czech Republic, Greece, Hungary and Poland are

reasonably highly correlated with each other and with MSCI European Union Index. But the SMP period shows some changes with a decrease of returns co-movements against MSCI EU Index for the Czech Republic (from 0,54 to 0,43) and Greece (from 0,58 to 0,35). On the other hand, correlation coefficients against MSCI EU Index are stronger for Poland (from 0,55 to 0,64) and unchanged for Hungary (0,56). Very weak correlations of European frontier markets have increased in the SMP period in comparison with the pre-SMP period for stock markets in Estonia (from 0,24 to 0,30) and Romania (from 0,28 to 0,40), but decreased for all other frontier markets.

Due to the changeable character of the stock markets development, the correlation coefficients between analysed markets and MSCI EU Index were identified also for 200 trading days moving windows. As it is apparent from the Figure 3, changes of correlation coefficients based on 200-trading days moving averages are obvious in the course of time.

Figure 3 Development of Correlation Coefficients of Analysed Markets against the MSCI EU Index (200-trading Days Moving Windows)



Source: Own calculation based on MSCI indexes in local currency.

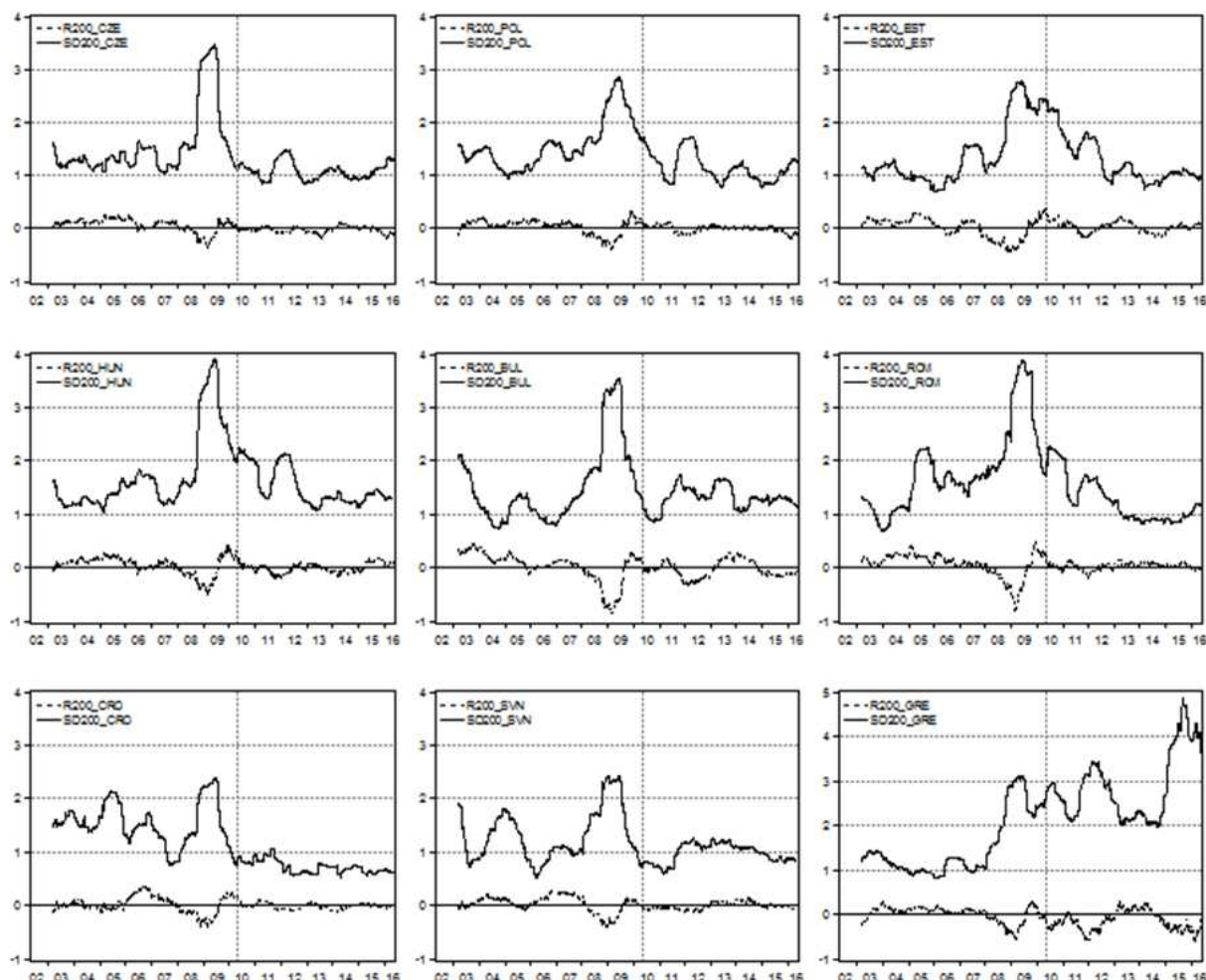
The most correlated returns of stock markets against MSCI EU Index at the end of the sample period are in Poland, Hungary, and the Czech Republic. The increased trend in the correlations of emerging markets from 2013 means that the scope for portfolio diversification with these markets has been diminished. But much higher correlations than is the case with stock market indices we can observe amongst bond indices (Capiello et al., 2006). On the other hand, the lowest correlated returns can be observed at European frontier markets in Bulgaria, Croatia, and Lithuania.

The comparison of the development of risk and returns of analysed European emerging and frontier markets brings remarkable results too. For this purposes of comparison, the 200-trading days moving averages of daily returns and risk were obtained, which are showed in Figure 4.

The monitoring of daily returns and risk development (measured by 200-days moving averages of daily returns and standard deviation) and their international comparison prove in principle the fundamental relation between returns and risk. As it is apparent from Figure 4, the increase of returns was connected with the decrease of standard deviation. In the case decrease of returns volatility increases more than it does following positive returns. Correlation coefficients between 200-days moving averages of daily returns and standard deviations are negative. The highest negative correlation coefficients can be observed in Greece (-0,749) and in Bulgaria (-0,615). In Central

European emerging markets correlation coefficients are for the Czech Republic (-0,440), Hungary (-0,437), and for Poland (-0,348). Similar level of correlation coefficients can be observed also in two frontier markets, in Romania (-0,476) and in Slovenia (-0,446). The lowest negative correlation coefficients between 200-days moving averages of daily returns and standard deviations shows frontier stock markets in Croatia (-0,170), in Lithuania (-0,186), and in Estonia (-0,206).

Figure 4 Development of Risk and Returns for European Emerging and Frontier Markets (200-days Moving Averages)



Source: Own calculation based on MSCI indexes in local currency.

4 Conclusions

In this paper we examine the relationships between the ten emerging and frontier markets in the European Union. We provide their fundamental statistical and diagnostics test of stock market returns, pairwise correlation and volatility. Our period of analysis extends from May 30, 2002 to May 20, 2016. In order to isolate the impact of the Euro area sovereign debt crisis the sample period is divided into two non-equal length sub-periods representing the pre-SMP and the SMP periods. The SMP period started with the beginning of the Securities Markets Programme of the ECB at May 10, 2010.

First we provided descriptive statistics of daily stock market returns which suggest that the data behaves like typical financial price and return series. Stock market returns in the SMP period are lower in comparison with pre-SMP period. We examined pairwise correlations showing the co-movements between daily return series of emerging and frontier markets in the European Union. Four of the ten stock markets are recognized by the MSCI as emerging markets. These markets demonstrate stronger co-movements

with developed markets of the European Union in comparison with European frontier markets. Analysed frontier markets reveal a very low level of mutual interdependence among group members both in pre-SMP and in SMP periods. This perception has been confirmed also by analysis of changes in correlation coefficients based on 200-trading days moving averages in the course of time. By way of monitoring of daily returns and volatility development (measured by 200-days moving averages of daily returns and standard deviation) was confirmed negative relationship between returns and volatility. In all European emerging and frontier markets volatility increases more following negative returns than it does following positive returns.

Acknowledgments

This paper was supported within SGS Project VSB – TU Ostrava 2016/54 Modelling of Behavioural Factors in Financial Markets.

References

- Allen, D., Golab, A., Powell, R. (2010). Volatility and correlations for stock markets in the emerging economies of Central and Eastern Europe: Implications for European investors. *SAFE Working Paper Series*, Vol. 1001.
- Baumöhl, E., Lyócsa, Š. (2014). Volatility and dynamic conditional correlations of worldwide emerging and frontier markets. *Economic Modelling*, Vol. 38, pp. 175-183.
- Capiello, L., Engle, R., Sheppard, K. (2006). Asymmetric Dynamics in the Correlations of Global Equity and Bond Returns. *Journal of Financial Econometrics*, Vol. 4, Iss. 4, pp. 537-572.
- DeSantis, R.A. (2012). The Euro area sovereign debt crisis. *ECB Working Paper*, Vol. 1419.
- ECB (2011). Chronology of monetary policy measures of the Eurosystem. *ECB Monthly Bulletin*, September 2011. Retrieved from: <https://www.ecb.europa.eu/pub/pdf/mobu/mb201109en.pdf>.
- Heryán, T., Kulhánek, L. (2015). Differences among volatility patterns of Visegrad countries' stock markets. In: *Proceedings of the 15th Int. Conference on Finance and Banking*. Silesian University Opava, School of Bus. Admin. in Karviná, 2015, pp. 109-115.
- Horvath, R., Petrovski, D. (2013). International stock market integration: Central and South Eastern Europe compared. *Economic Systems*, Vol. 37, pp. 81-91.
- Kulhánek, L. (2008). Stock market volatility in the Czech Republic, Croatia and selected EU Member States. In: Stavárek, D., Polouček, S., eds., *Consequences of the European Monetary Integration on Financial Systems*. Newcastle: Cambridge Scholar Publishing.
- Kulhánek, L., Šoltés, V. (2010). Finančné trhy. In: Polouček, S. et al., *Peniaze, banky, finančné trhy*. Bratislava: Iura Edition.
- MSCI (2016). *MSCI European Union Index*. Retrieved from: https://www.msci.com/resources/factsheets/index_fact_sheet/msci-european-union-index.pdf.
- Piljak, V. (2013). Essays on the Co-movement Dynamics of Frontier/Emerging and Developed Financial Markets. *Acta Wasaensia*, Vol. 281.
- Wang, P., Moore, T. (2009). Sudden changes in volatility: The case of five central European stock markets. *Journal of International Financial Markets, Institutions and Money*, Vol. 19, Iss. 1, pp. 33-46.

Perspective of Sustainability of Fiscal Policy in Czech Republic

Dušan Litva

University of Economics in Prague
Faculty of Business and Administration, Department of Microeconomics
Nám. W. Churchilla 1938/4, 130 67 Praha 3, Czech Republic
E-mail: xlit00@vse.cz

Abstract: Each country entering monetary union automatically gives up one of key macroeconomic tool- monetary policy. Hence second tool which is fiscal policy has increasing influence and significance. In this papers are discussed in theoretical part basic principles of fiscal policy, its tools and possible consequences of use. Emphasis is put on derivation of theoretical relationships using Wickens approach which is based on general dynamic equilibrium in economy and its application on evaluation of sustainability of fiscal stance. Needed data for model construction are inflation, GDP, and debt to GDP ratio. In this article was used data prediction of IMF for Czech Republic for period 2015- 2020 for formulation of hypothesis for sustainability of fiscal policy. For expression of degree of sustainability was established SFP index while comparing Czech Republic with other chosen countries. Based on predicted data fiscal policy of Czech Republic seems to be sustainable for explored period. Key drivers for this result are high and stable predicted growth of GDP, stable and low predicted inflation, but mainly decrease of overall predicted debt (resulting in decrease of debt and GDP ratio as a result of cumulative surpluses of government budget).

Key words: fiscal policy, sustainability, prediction, SFP

JEL code: E620

1 Introduction

Monetary policy is targeting inflation and fiscal policy stable and predictable environment with effective market without unequally growth of government debt. One of applicable approaches for justification of sustainability of fiscal policy are equations derived by M. Wickes based on general dynamic equilibrium approach. Needed data for dynamic model construction are inflation, growth of real GDP, debt to GDP ratio and deficit. Using prediction of these data for period 2016- 2020 by International Monetary Fund, it is possible to predict and compare tendencies of fiscal policies and compare trends between countries of European Union or even globally which is objective of these papers.

2 Methodology and Data

Sustainability of fiscal policy

In literature are existing a lot of definitions of fiscal sustainability. According to Krejdl (2006) are public finance sustainable if present value of current and future fiscal assets and liabilities is equal to zero. If this condition is fulfilled, government is avoiding debt accumulation and is capable to pay debt back in parallel and if does not exist risk of insolvency. However, this criterion meets only a few countries nowadays. According to less strict definition fiscal policy is sustainable if it is based on expectations of the future where in long term current situation is sustainable only without risks tending to get worse. In practice it is commonly used approach of stating value of overall gross domestic debt, which country should not exceed. For developed countries it is considered government debt to be sustainable if it is up to 60 % of current value of gross domestic product. For developing countries this borderline is defined to be 40 %. There are existing also indicators or indexes containing more of above mentioned fiscal parameters. As a result it is typically one number which is used as early warning signal. For example Baldaci proposed Fiscal Indicators Index (FII), which is based on 12 indicators such as grow of risk premium from emitted bonds, cyclically modified primarily balance, total gross debt, gross financial need, short term debt, debt denominated on foreign

currencies, debt hold by nonresidents, average debt maturity, short term external debt, natality, ratio of economically active and inactive people and long term public costs for rents and health care.

Fiscal policy in dynamic models

According to M. Wickens (*A Dynamic General Equilibrium Approach, 2008*) using government budget constrain, trend of ratio of debt and GDP can be described according to following differential equation with classified two cases:

$$\frac{b_t}{y_t} = \left(\frac{(1+\pi)(1+\gamma)}{1+R} \right) \frac{b_{t+1}}{y_{t+1}} - \frac{1}{1+R} \frac{d_t}{y_t} \quad (1)$$

b.....debt

y.....yield (GDP)

d.....deficit

R.....nominal interest rate

n.....inflation

γ.....growth of yield (GDP)

- growth of nominal GDP is higher than interest rate
- growth of nominal GDP is lower than interest rate

It results in specific implications and modifications of relations between debt and GDP. I will show this in theoretical and later also practical part of these papers.

Case 1: $[(1 + \pi)(1 + \gamma)] / (1 + R) > 1$: Stability

In this case grow of nominal GDP is higher than interest rate. Budget constraints of government can be thus rewritten as following differential equation:

$$\frac{b_{t+1}}{y_{t+1}} = \frac{1+R}{(1+\pi)(1+\gamma)} \frac{b_t}{y_t} + \frac{1}{(1+\pi)(1+\gamma)} \frac{d_t}{y_t} \quad (2)$$

Because $0 < (1+R) / [(1+\pi)(1+\gamma)] < 1$ this is stable case and equation can be solved backwards, for $n > 0$ we obtain

$$\frac{b_{t+n}}{y_{t+n}} = \left(\frac{(1+R)}{(1+\pi)(1+\gamma)} \frac{b_t}{y_t} \right)^n + \frac{1}{(1+\pi)(1+\gamma)} \sum_{s=0}^{n-1} \left(\frac{(1+R)}{(1+\pi)(1+\gamma)} \frac{b_t}{y_t} \right)^{n-s-1} \frac{d_{t+s}}{y_{t+s}} \quad (3)$$

considering $n \rightarrow \infty$ we obtain

$$\lim_{n \rightarrow \infty} \frac{b_{t+n}}{y_{t+n}} = \frac{1}{(1+\pi)(1+\gamma)} \sum_{s=0}^{\infty} \left(\frac{(1+R)}{(1+\pi)(1+\gamma)} \frac{b_t}{y_t} \right)^{n-s-1} \frac{d_{t+s}}{y_{t+s}} \quad (4)$$

Implication

a) In special case, when it is expected, that ratio of primarily deficit and GDP stays constant in the future

$$\frac{d_{t+s}}{y_{t+s}} = \frac{d_t}{y_t} \quad (5)$$

we obtain equation

$$\lim_{n \rightarrow \infty} \frac{b_{t+n}}{y_{t+n}} = \frac{1}{(1+\pi)(1+\gamma) - (1+R)} \frac{d_t}{y_t} \cong \frac{1}{\pi + \gamma - R} \frac{d_t}{y_t} \geq 0 \quad (6)$$

Because if $\pi + \gamma > R$, ratio of debt and GDP stays constant, regardless of initial value of ratio d_t/y_t . This is reason why fiscal policy is sustainable for whatever value of d_t/y_t . It can even exist permanent primarily deficit and ratio of debt and GDP stays constant.

b) In principle sustainability of fiscal policy requires debt to GDP ratio to stay constant and also market needs to be willing to keep government debt. Thus in general ratio of d_{t+s}/y_{t+s} can change during the time. Increasing debt and GDP ratio increase also probabilities of possible failure. It is thus logic that exists upper limit of this ratio, when market does not want to hold government debt and considerate it to be too risky (Arbatli, 2015). In case fiscal policy is not sustainable for defined limit there is a temptation of government to increase this limit which can result in lower credibility of central bank.

c) With effort to increase trust in government and its fiscal policy there can be existing specific limits for period $t+n$ which can be valid for period t as well. Government can even require constant debt to GDP ratio and also deficit to GDP ratio. It would imply following equation:

$$\frac{b_t}{y_t} \geq \frac{1}{\pi + \gamma - R} \frac{d_t}{y_t} \quad (7)$$

Equality sign was replaced by inequality sign and fiscal policy is thus sustainable if debt growth caused by increase of government deficit will not reach above defined ratio of debt to GDP. In general we can thus define debt to GDP ratio and GDP for whatever constant ratio of deficit to GDP and constant value, which needs to be positive. On other words fiscal policy can be sustainable also for different debt to GDP ratio in comparison with originally defined ratio.

d) We can obtain this result also directly from government budget constrain rewritten in following equation:

$$(1 + \pi)(1 + \gamma) \Delta \frac{b_{t+1}}{y_{t+1}} = -(\pi + \gamma - R) \frac{b_t}{y_t} + \frac{d_t}{y_t} = 0 \quad (8)$$

If debt to GDP ratio is constant, then $\Delta(b_{t+1}/y_{t+1}) = 0$

e) Fiscal policy can be sustainable if exists permanent primarily deficit but also in case of permanent total deficit. If

$$\frac{D_t}{y_t} = \frac{d_t}{y_t} + R \frac{b_t}{y_t} \quad (9)$$

then

$$\frac{b_t}{y_t} \geq \frac{1}{\pi + \gamma - R} \left(\frac{D_t}{y_t} - R \frac{b_t}{y_t} \right) \quad (10)$$

$D_t \geq 0$ imply, that fiscal sustainability is also consistent with permanent total deficit. However for sustainability of fiscal stance is needed balanced budget.

Case 2: $0 < [(1 + \pi)(1 + \gamma)] / (1 + R) < 1$: Unstability

In this case $R \geq \pi + \gamma$: nominal interest rate is higher than growth of nominal GDP. Government budget constrains is thus unstable differential equation and must be solved as forward looking (Alfonso, 2014):

$$\frac{b_t}{y_t} = \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right) \frac{b_{t+1}}{y_{t+1}} - \frac{1}{1+R} \frac{d_t}{y_t} = \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right)^n \frac{b_{t+n}}{y_{t+n}} - \frac{1}{1+R} \sum_{s=0}^{n-1} \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right)^s \frac{d_{t+s}}{y_{t+s}} \quad (11)$$

Assuming limit $n \rightarrow \infty$, if

$$\lim_{n \rightarrow \infty} \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right)^n \frac{b_{t+n}}{y_{t+n}} = 0 \quad (12)$$

$$\text{then } \frac{b_t}{y_t} \leq \frac{1}{1+R} \sum_{s=0}^{\infty} \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right)^s \left(-\frac{d_{t+s}}{y_{t+s}}\right) \quad (13)$$

where $-d_t < 0$ is primarily surplus. Inequality sign shows that present value of current and future surpluses is higher than normal debt to GDP ratio and is also consistent with fiscal policy. Final condition is known as Ponzi condition. It shows relation of financing government debt by another debt.

Implication

a) Right side is present value of current and future surpluses as proportion of GDP. Thus for fiscal sustainability must be sufficient to meet current debt obligation. It enables changes of d_t/y_t in time. One of the first reasons causing changes in d_t/y_t is business cycle. d_t/y_t tends to be positive in recession and negative in a boom (Wilcox, 1989). Practical interpretation of this relation for sustainability of fiscal policy is condition enabling present value of primarily surpluses during business cycle to stay 0.

b) In special case where

$$\frac{d_{t+s}}{y_{t+s}} = \frac{d_t}{y_t} \quad (14)$$

we obtain

$$\frac{b_t}{y_t} \leq \frac{1}{(1+R)} \sum_{s=0}^{\infty} \left(\frac{(1+\pi)(1+\gamma)}{1+R}\right)^s \left(-\frac{d_t}{y_t}\right) \cong \frac{1}{R-\pi+\gamma} \left(-\frac{d_t}{y_t}\right) \quad (15)$$

If equality sign is true then it is the same situation as in case of stability. As $R - (\pi + \gamma)$ sign is now opposite sign for d is also opposite (we need surpluses to pay back interests). Inequality sign is reflecting the fact that positive present value enables present debt to be paid back (Dinca, 2015). Inequality sign is in unstable case opposite than in stable case. Reason for this difference is that in stable case future primarily deficits do not need to cause that future values for debt to GDP ratio will exceed upper limit. In unstable case future primarily surpluses must be high enough to recover present debt (Polito, 2007).

c) Although it is necessary to have primarily surpluses it is still possible to have total deficit.

$$\frac{D_t}{y_t} = \frac{d_t}{y_t} + R \frac{b_t}{y_t} \quad (16)$$

We thus gain

$$\frac{b_t}{y_t} \leq \frac{1}{R-\pi-\gamma} \left(R \frac{b_t}{y_t} - \frac{D_t}{y_t}\right) \quad (17)$$

We consider 3 possible cases for this equation:

$$i) \frac{b}{y} \geq \frac{1}{\pi + \gamma} \frac{D}{y} \text{ decreasing debt to GDP ratio} \quad (18)$$

$$ii) \frac{b}{y} = \frac{1}{\pi + \gamma} \frac{D}{y} \text{ constant debt to GDP ratio} \quad (19)$$

$$iii) \frac{b}{y} \leq \frac{1}{\pi + \gamma} \frac{D}{y} \text{ increasing debt to GDP ratio} \quad (20)$$

From fiscal policy sustainability point of view are equations 18 and 19 sustainable but 20 is not.

d) Let's consider situation if government keeps current debt but with 0 primary deficit ($d_t/t_t=0$). If governments wants to interests from current debt then must increase current debt (Greiner, 2015). Debt would hence accumulate without limits and budget constrains could be written as

$$\frac{b_t}{y_t} = \frac{(1+\pi)(1+\gamma)}{1+R} \frac{b_{t+1}}{y_{t+1}} \quad (21)$$

And hence

$$\frac{b_t}{y_t} = \lim_{n \rightarrow \infty} \left(\frac{(1+\pi)(1+\gamma)}{1+R} \right)^n \frac{b_{t+n}}{y_{t+n}} \quad (22)$$

This non- Ponzi condition is implying that only 0 initial debt would be consistent with limit convergence to 0. If initial debt is non- zero, then it is required primarily surplus otherwise debt would grow fast.

3 Results and Discussion

For justification of sustainability of fiscal policy were in this chapter used equations derived by M. Wickens based on general dynamic equilibrium in economy (Wickens, 2008). Parametres needed for model construction are inflation (π), grow of real GDP (γ), ratio of debt and GDP (b/y) and total deficit (D/y) for each year from 2016 to 2020. Data are obtained from IMF database (IMF, 2016). For evaluation of fiscal policy I was comparing b/y (ratio of total debt and GDP) and $(1/(\pi+\gamma))*(D/y)$. To keep fiscal policy sustainable following condition needs to be kept: $b/y > (1/(\pi+\gamma))*(D/y)$. For purpose of emhasizing of this relation are yelow highlighted all relevant rows. Taking into consideration this condition it can be shown that the bigger is difference between b/y and $(1/(\pi+\gamma))*(D/y)$ the better je perspective of sustainability of fiscal policy chosen country. Hence I am establishing index SFP (Sustainability of Fiscal Policy), which can be considered as quantified parameter of sustainability of fiscal policy reflecting inflation, growth of GDP, debt and deficit, while the higher the value of this index is the higher is probability, that fiscal policy is long term sustainable. This condition can be interpreted in the way that ratio of deficit and incremental growth of nominal GDP must be in case of sustainable fiscal policy lower than debt to GDP ratio. If this conditions are succeeding than overall debt to GDP ratio will become lower. Advantage of this principle when justifying sustainability of fiscal policy is mainly in taking into consideration also growth of GDP. Justification based only on overall debt or deficit justification is only one side metrics which can be misleading. Except with justification of fiscal policy using SFP index it can be quantified and evaluated degree of sustainability which can be used for overall justification of government policy or as a guideline when choosing right government policy. The higher the difference between debt to GDP ratio and ratio of deficit to incremental annual nominal GDP growth the faster is debt to GDP ratio decreasing and the bigger is this positive dynamics. In calculation is necessary needed to reflect via using +/- if we assume deficit or yield.

Table 1 SFP Index Calculation for Czech Republic

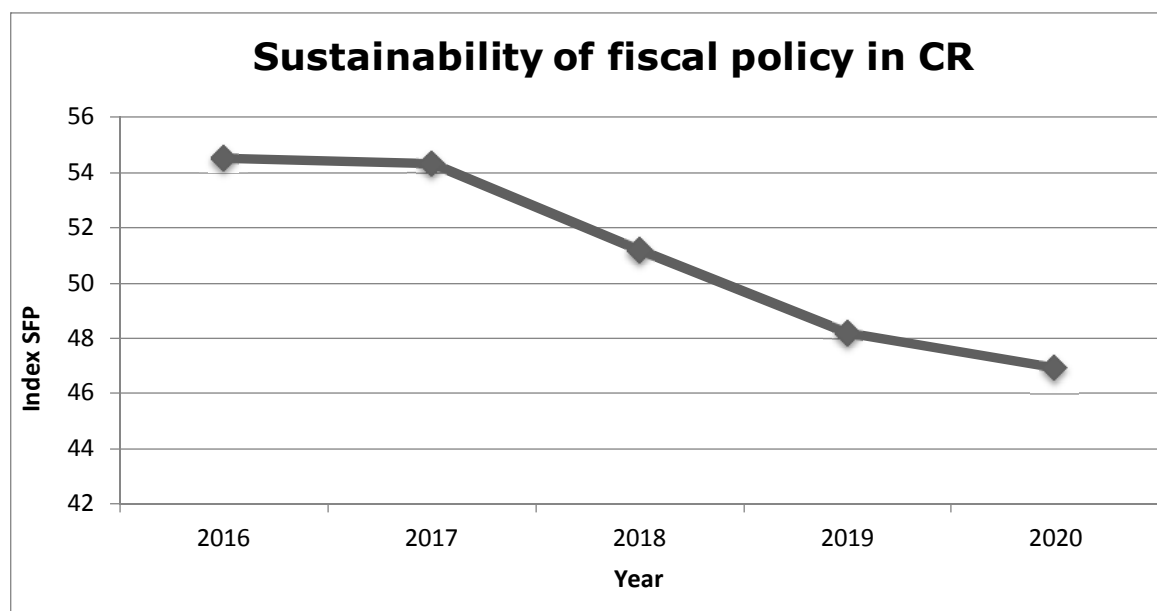
	2015	2016	2017	2018	2019	2020
Growth GDP (γ), %	3,91	2,55	2,61	2,18	2,17	2,18
Inflation (π), %	0,37	1,48	2	2	2	2
b/y, %	40,63	40,05	39,36	38,84	38,43	38,06
D/y, %		-0,58	-0,69	-0,51	-0,41	-0,37
$(1/(\pi+\gamma))*(D/y)$, %		-14,46	-14,97	-12,33	-9,75	-8,86
SFP index		54,51	54,33	51,17	48,18	46,92

Source: IMF prediction, own calculations

From data shown in table 1 is obvious:

- Positive and relatively stable 2-4% growth of GDP in explored period
- Slightly growing inflation since 2015 to 2020 in range 0-2 %
- Slightly decreasing debt to GDP ratio in range 38-40 %
- Annual yield in range 0,3-0,7 %
- Value $(1/(\pi+\gamma))*(D/y)$ is negative as a consequence of government yields
- Positive and medium level of SFP index, which is indicating sustainability of fiscal policy

Figure 1 Predicted Trend of SFP Index in CR in Period 2016-2020



Source: IMF prediction, own elaboration

From figure at picture 1 is obvious minor increase of SFP index as a consequence of mutual relations between GDP growth, inflation, debt and deficit. Positive values are indicating that fiscal policy is sustainable, but degree of sustainability is since 2016 decreasing as a consequence of decrease of GDP growth and decreasing positive yields of government budget.

Analogically it calculated and expressed grade of sustainability of fiscal policy also for some other countries shown in table 2. From this table it is obvious that sustainability of fiscal policy is the best policy of Germany, which is influencing significantly also EU economy (Berritella, 2015). On the other side the worst is fiscal policy of Russia which would due to relatively low debt to GDP ratio either increase growth of GDP or decrease annual deficit to keep fiscal policy sustainable.

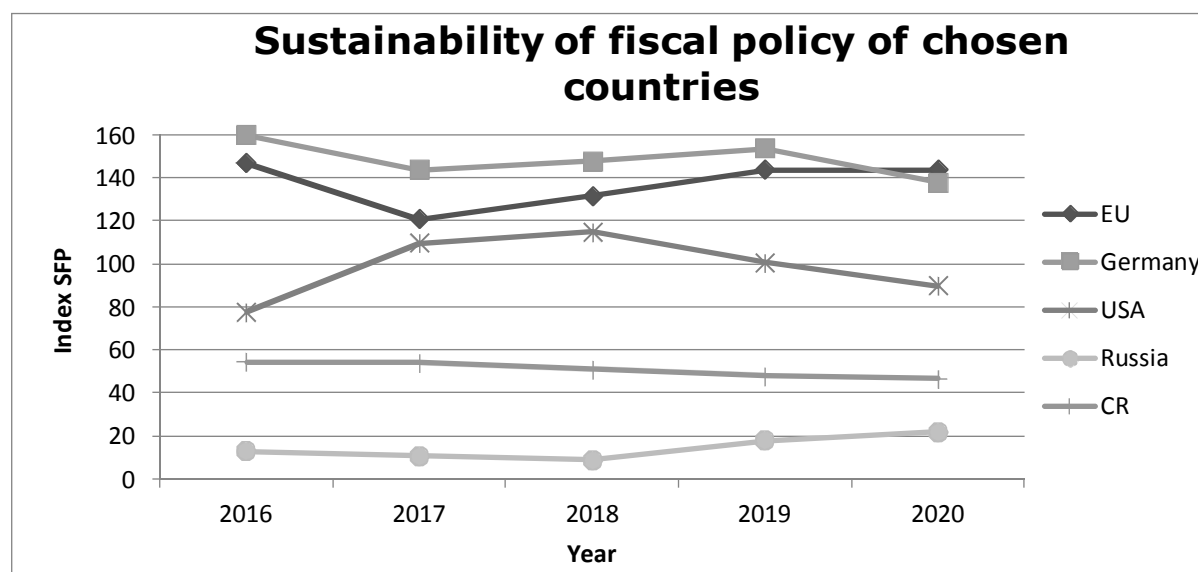
Table 2 Absolute Value of Difference of b/y and $(1/(n+\gamma))*(D/y)$ of Chosen Countries

Country	2016	2017	2018	2019	2020	Average
EU	147	121	132	144	144	138
Germany	160	144	148	154	138	149
USA	78	110	115	101	90	99
Russia	13	11	9	18	22	15

Source: IMF prediction, own calculations

In chart at picture 2 is visualized comparison of SFP index for chosen countries. From this comparison is obvious that Czech Republic with SFP index in range 46 to 54 is for period 2016- 2020 bellow EU average or USA but better than for example Russia. Government should thus try to increase growth of GDP or increase annual yields.

Figure 2 Predicted Trend of SFP Index of Chosen Countries in Period 2016-2020



Source: IMF prediction, own elaboration

4 Conclusions

In these papers were in theoretical part discussed basic principles of fiscal policy and its tools and possible consequences. Emphasis was put on derivation of theoretical equations according to M. Wickens based on principle of general dynamic equilibrium in economy and their application for justification of sustainability of fiscal policy. For analysis were used data from IMF prediction for years 2016- 2020 needed for model construction (inflation, real GDP, debt to GDP ratio and total deficit). Justification of sustainability of fiscal policy was based on comparison of relations b/y (ratio of debt and GDP) and $(1/(n+\gamma))*(D/y)$. In principle I can state sustainability of fiscal policy of Czech Republic. Main drivers for this result are high and stable predicted grow of GDP, stable and low predicted inflation, positive predicted deficit (and thus surplus), decrease of overall predicted debt for most of the countries (decrease of debt and GDP ratio as a result of cumulative surplus of government budget). Key is trend of decreasing debt. I was considering for deficit description positive values and thus negative numbers are showing practically annual surpluses. According IMF prediction most of countries will be decreasing their debt and thus according to M. Wickens dynamic model fiscal policies are sustainable. Mathematically interpreted, negative value of $(1/(n+\gamma))*(D/y)$ given by negative surpluses is always smaller than positive number of value of b/y . Based on difference of b/y and $(1/(n+\gamma))*(D/y)$ it was calculated quasi degree of sustainability of fiscal policy which is also absolute measure for expression of sustainability. Hence I established index SFP discussed in practical part. Trend of SFP index for Czech Republic has been compared with other countries. In years 2016- 2020 is obvious slight decrease

of trend for this index with overall lower average than in EU which means lower probability of sustainability of fiscal policy. It is important to note that application of Wickens model and conclusions obtained are based on IMF prediction. Prediction can be intentionally positive as in economy is well known theorem of expectations of the economical subjects. Which means positive prediction support positive expectations and turns them to reality which could help global welfare growth.

References

- Alfonso, A., Jalles, JT. (2014). *A longer run perspective on fiscal sustainability. Empirica* 41, pp. 821-847.
- Arbatli, E., Escolano, J. (2015). Fiscal transparency, fiscal performance and credit ratings. *Fiscal studies* 36, pp. 237-270.
- Berritella, M., Zhang, J. (2015). Fiscal sustainability in the EU: From the short-term risk to the long-term challenge. *Journal of policy modeling* 37, pp. 261-280.
- Dinca, G., Dinca, MS. (2015). Public debt and economic growth in the EU post-communist countries. *Romanian journal of economic forecasting* 18, pp. 119-132.
- Greiner, A. (2015). Public Debt, Productive Public Spending and Endogenous Growth. *Japanese economic review* 66, pp. 520-535.
- IMF (2016). *World Economic Outlook Update*, Washington, DC.
- Krejdl, A. (2006). Fiscal Sustainability – Definition, Indicators and Assessment of Czech Public Finance Sustainability, Working Paper Series 3, *Česká národní banka*.
- Polito, V., Wickens, M. R. (2007). Measuring the fiscal stance. *University of York Discussion Paper* 07/14.
- Wilcox, D. W. (1989). The sustainability of government deficits: implications of the present-value borrowing constraint. *Journal of Money, Credit, and Banking* 21, pp. 291–306.
- Wickens. M. (2008). *Macroeconomic Theory: A Dynamic General Equilibrium Approach. Princeton University Press.*

Interrelation between Concentration in Banking Sector and its Main Performance Indicators: Case of Russia

Marina Malkina

Lobachevsky State University of Nizhni Novgorod
Institute of Economics and Entrepreneurship
Macroeconomics and Microeconomics Center
37 Bolshaya Pokrovskaya street, room 201
Nizhny Novgorod, Russia, 603000
E-mail: mmuri@yandex.ru

Abstract: *The research is aimed at determining the interrelation of Russian banking sector concentration for most assets and liabilities in 2008-2015 with its main performance indicators, such as Return on Assets, Return on Equity and Capital Adequacy. We used a set of indices from the industrial organization theory to evaluate the level of concentration and unevenness in Russian banking sector and proposed the method of Herfindahl-Hirshman index decomposition to separate concentration caused by reduction in number of banks and by growing heterogeneity in banking sector. Having tested 4 statements concerning correlation between banking sector concentration and its main performance indicators, we have not found any functional connection between a particular bank share in total capital or assets and its performance, but revealed positive influence of concentration in banking system as a whole on its performance both at a snapshot and in time series. Additionally, we recognized a relatively negative contribution of small and medium-sized banks to Russian banking system's efficiency in the period of recession, whilst during recovery they, though being less effective than larger banks, form a zone of stability. Taking into account the support given to large banks by the state, we still bear in mind not only natural but also artificial origin of such a result. Finally, we state the need of effective control over the structure of the banking system.*

Keywords: bank, market structure, concentration, assets, liabilities

JEL codes: G21, L10

1 Introduction

This research is a part of testing the «structure - conduct - performance» (SCP) hypothesis for Russian banking sector. The hypothesis was implemented in the industrial organization theory by A. Mayson in 1950-th and since then it has been tested several times in banking sectors of various countries. According to this hypothesis, the more the concentration of capital and assets in banking sector the less the competition which affects some banks' behaviour, primarily behaviour of the banks whose monopolistic power increases. It has an impact on banking sector indicators such as Return on Equity, Return on Assets and Capital Adequacy.

There is a number of reasons for banks capitalization. It is assumed that more concentrated banking system is more sustainable, it is easier handled by the state, and the costs of its maintenance are lower. The concentration of banks property may occur in several ways, some of which are: 1) tightening regulation (adoption of stricter rules concerning capital requirements and other standards including counteraction to money-laundering), 2) deteriorating macroeconomic conditions that freeze the weak banks out of the banking industry, and 3) maintaining unequal banks competition by granting privileges to certain banks, providing state support and preferential access to public funds. Deterioration of competition is also possible through lessening degree of conscientiousness, when some less fair banks declare overestimated capital figures and hide risks in breach of banking regulations. Capitalization may lead to reduction in the number of banks with decreasing or increasing their differences in size. It may be accompanied by increase or decrease in the capitalization of the entire system. It also may or may not encourage economic growth.

There are two opposing tendencies in large banks performance. On the one hand, large banks have technical advantages. They may gain from increasing returns to scale and increasing returns to diversity and they may benefit from greater flexibility and greater diversification of their assets. Large banks can usually afford more qualitative assets that help them survive and thrive in rainy days. Moreover, large banks may be more economically effective for themselves (not for the society) because they are able to manage prices of their products and services, keeping sales prices higher and purchase prices lower. All these technological and economic advantages improve big banks efficiency and enhance their sustainability. Some empirical studies confirm advantages of concentration of property and capital in banking sphere. For instance, Chalermchatvichien, Jumreornvong, Jiraporn and Singh (2014) provide evidence that the concentration of ownership in the banking system has a positive effect on the stability of capital adequacy and liquidity. Study of Mamonov (2012) based on econometric analysis demonstrates that the increase in bank market power results in the improvement of loan portfolio quality, which reduces the credit risk. According to Hanafi, Santi and Muazaroh (2013), concentration contributes to greater profitability and better risk management. In the meanwhile, Behr, Schmidt and Xie (2010) argue that banks in the banking system with a lower concentration operate with lower franchise values and therefore more tend to select risk strategies.

However, there is a contra tendency of banks concentration. On the other hand, large banks operate in a less competitive environment and that reduces their incentives to make effective decisions. They begin to demonstrate so-called X-inefficiency. They may increase the overhead costs, use routine technologies and become reluctant to develop new products attractive to their customers, and the quality of their services may deteriorate. It is obvious that they suffer from such inefficiency to a lesser extent than the society. In the study of Busta, Sinani and Thomsen (2014) it is assumed that banking concentration leads to a decrease in Tobin's Q and relative market capitalization of banking system, although the result depends on the institutional environment of a particular economy. Theoretical study of Guzman (2000) based on mathematical modeling calculations proved that countries with monopolistic banking system have a lower rate of economic growth than countries with competitive banking system and *ceteris paribus* conditions. In the former case the growth suppression occurs by means of credit rationing or excessive monitoring of credit financed investment.

As we can see from the previous research, performance of banking system itself depends on institutional environments, formal and informal rules of the game. Formal rules are referred to regulations: the Russian state has recently adopted a list of "system-relevant banks" which could get aid from the state in case of a forthcoming crisis. Thus the state sends signals to the public as to which banks are more stable or more favorable, whose stability would be maintained artificially by external measures. This is the how public behaviour is influenced. Informal rules include habits and stereotypes of public behavior. For instance, in Russia it is common that public confidence in larger banks is historically confirmed to great extent due to the state support they enjoy.

2 Methodology and Data

While testing the «structure - conduct - performance» (SCP) hypothesis, we omitted the intermediate link in this chain, merely studying correlation between the input (market structure) and the output (banks performance indicators). For this analysis we used the data on all functioning Russian banks for 2007-2015 at the end of each year. The input data included: the value of capital, total assets, profits, some types of assets: consumer loans, loans to business, securities in assets, some types of liabilities: personal deposits, current business accounts, deposit business accounts and securities issued. All the data used were taken from the official sources published by the Central Bank of Russia (<http://www.cbr.ru>), and collected and processed by official banking portal Bankir.ru (<http://bankir.ru/rating/>). For these variables we determined the indices of interbank concentration и unevenness.

The output data was presented by three Main Performance Indicators (MPI) of banks: Return on Assets (ROA), Return on Equity (ROE), which were calculated on the basis of data mentioned above, and Capital Adequacy which was taken from the Portal of banking analyst (<http://www.analizbankov.ru/index.php>).

Current analysis comprises several stages.

Estimation of the concentration and unevenness level in dynamics for input variables using the range of methods from industrial organization theory, i.e.:

Herfindahl-Hirshman index, which measures concentration:

$$HHI = \sum_{i=1}^N x_i^2, \quad (1)$$

where x_i – share of the bank with number “i” in the total value of banking sector variable, $\sum_{i=1}^N x_i = 1$.

Coefficient of variation:

$$V = \frac{\sigma_x}{\mu_x}, \quad (2)$$

where $\sigma_x = \sqrt{\sum_{i=1}^N (X_i - \mu_x)^2}$ – the standard deviation of the variable, μ_x – the mean value of this variable.

Gini coefficient, which can be calculated as:

$$G = 1 - \frac{1}{N} \cdot \sum_{i=1}^N \left(\sum_{j=1}^i (2x_{j-1}) + x_i \right). \quad (3)$$

Gini calculation is based on Lorenz curve which demonstrates the distribution of some variable in economy. Variation and Gini coefficients both measure the level of unevenness.

Determination of the nature of the shift in concentration by means of *the decomposition of the Herfindahl-Hirschman index* into changes caused by two factors: reduction in the number of banks and altering heterogeneity in the banking sector:

$$HHI = (1 + V^2) \cdot \frac{1}{N}, \quad (4)$$

where v – is coefficient of variation that measures the degree of heterogeneity, and $\frac{1}{N}$ – the value of Herfindahl-Hirschman Index in the banking system, consisting of N banks absolutely identical. For this multiplicative model we used the logarithmic method of factor analysis to separate the influence of each factor.

Proposing and testing several statements within the SCP hypothesis aiming to verify the interaction between banking sector concentration and its performance.

Statement 1 “Larger banks perform better” was tested by means of determining Pearson correlation between share of the banks in capital and assets and their main performance indicators based on panel data of all banks for each year considered.

Statement 2 “Viewed over time, the concentration in banking sector correlates with main performance indicators of this sector” was tested by estimation of their interdependency in time series for 2007-2015.

Statement 3 "Viewed at a snapshot, the concentration in banking sector correlates with main performance indicators of this sector" was verified on the basis of panel data including all banks. For this purpose we developed distributive curves which describe the change in cumulative MPI of banking sector when it picks up banks starting from the largest.

Statement 4 "The market conditions affect larger and smaller banks to varying degrees; the response of sustainability of the banks is different" was tested by determining contributions of banks varying in size to change in main indicators of the banking sector in times of crisis.

3 Results and discussion

Speaking about Russian banking sector, it seems necessary to say that as of May 1, 2016 it comprised 696 operating banks, and their number decreased by almost 48% over the past twelve years. In 2015 average banking assets accounted for 94.8% of GDP, whilst ten years ago they were just 39%. Therefore, capitalization of Russian banking system was increasing while the number of banks was reducing.

By the market structure Russian banking system can be characterized as an oligopoly with competitive fringe. Table 1 describes the fractions in main banking variables of the largest Russian banks that argues for the huge level of concentration in Russian banking sector in spite of enormous competitive surroundings, whose share is minor. But in the oligopolistic family there is also an outstanding bank holding dominant position. It is the state-controlled bank Sberbank which possesses around 30% of assets and capital in Russian banking sector, and it has at its disposal 45% of all personal savings and deposit accounts and 23% of corporate accounts and deposits. In 2013 Sberbank earned 48.4% of the total banking profits, in 2014 – 90.8%, and in 2015 its profits exceeded total profits of Russian banking sector by 36%, taking into account the losses incurred by some banks.

Table 1 Some Indicators of the Concentration in Russian Banking Sector, 01.01.2016, %

Banks (listed by assets, highest to lowest)	Share in assets	Share in capital	Share in personal accounts	Share in profits
Sberbank of Russia*	29.50	31.80	45.11	136.45
VTB Bank*	11.67	17.39	0.18	26.52
Gazprombank*	6.40	5.73	2.79	-22.23
Financial Corporation "Otkritie"	3.7	1.70	1.10	2.31
VTB 24*	3.67	2.54	8.95	-0.52
Rosselkhozbank*	3.27	3.26	2.13	-34.97
Alfa-Bank	2.81	3.14	2.73	27.13
Bank of Moscow*	32.31	1.36	1.81	-33.69
National Clearing Centre*	1.99	0.84	0.00	13.12
UniCredit Bank	1.73	1.87	0.78	4.17
10 largest banks by assets	67.04	69.62	65.58	118.029
20 largest banks...	76.69	77.66	74.65	146.80
1/3 largest banks...	97.97	95.98	97.27	93.61
1/2 largest banks...	99.11	97.79	98.94	95.74
Total number of registered banks	720			

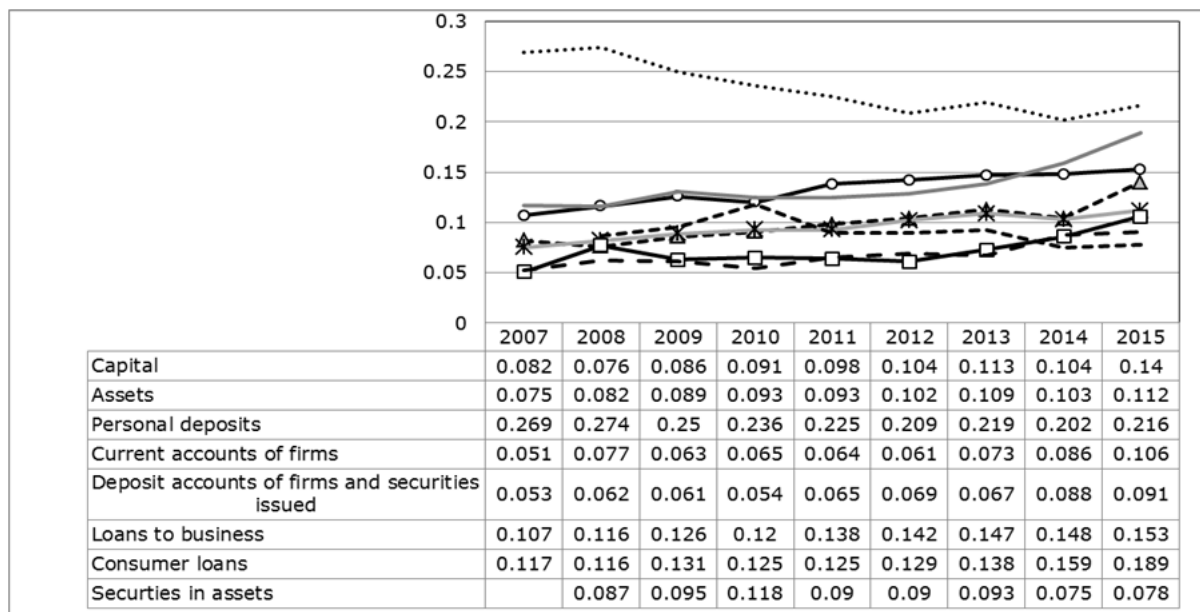
* Banks with state share in capital

Source: Author calculations based on Bankir.ru (<http://bankir.ru/rating/>)

All the generalized indices calculated by formulas (1-3) demonstrate a considerable and growing level of concentration and unevenness in Russian banking sector. Thus, Gini coefficient for 2015 varies from 0.929 for current accounts to 5.87 for profits because of

incurred losses of many banks for that year. The results of HHI calculations are shown on Figure 1.

Figure 1 HHI for the Banks' Assets and Liabilities at the End of Period

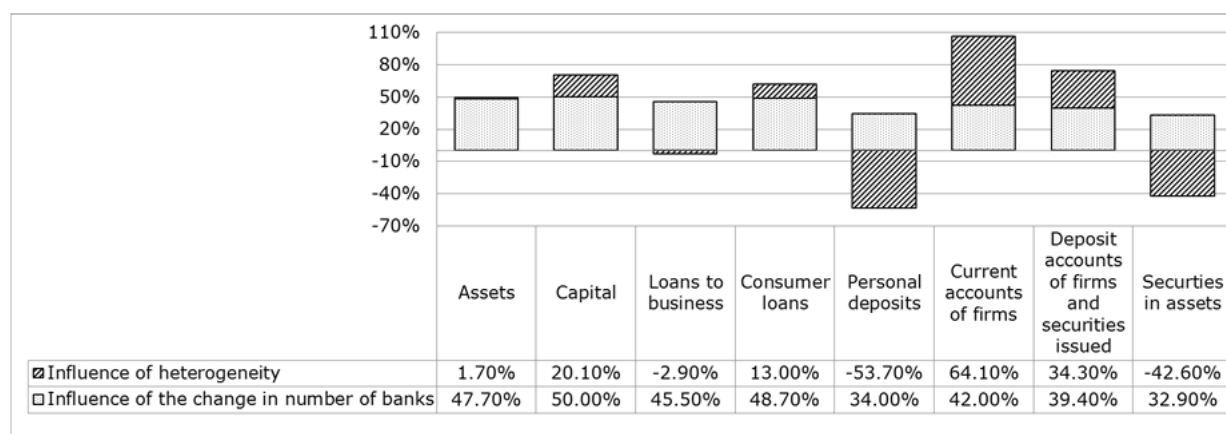


Source: Author's calculations based on Bankir.ru data (<http://bankir.ru/rating/>)

The only exception from general tendency of growing concentration is deposits of population, which demonstrate the descending tendency of concentration. This may be explained by strengthening public confidence in commercial banks which was maintained by successful activity of Deposit Insurance System in that period. However, spreading crisis in banking sphere caused two bursts of personal deposits concentration marked on 01.01.2014 and 01.01.2016. Moreover, the HHI for personal deposits remains the highest of all. The lowest and the most changeable concentration is observed for securities in bank assets, and one of the largest growth of HHI for 9 years considered are obtained for banks capital (+70.1%) and for consumer loans (+61.7%).

Decomposition of the level of concentration made by means of logarithmic factor analysis (which results are presented on Figure 2) allows us to affirm that an increase in concentration of assets and liabilities mainly caused by reduction in the number of banks was accompanied by growing heterogeneity in banking sector, especially increase in banks' capital variance and prevailing change in structure of liabilities rather than assets.

Figure 2 Results of HHI Decomposition for Changes in Concentration of Capital, Assets and Liabilities



Source: Author calculations based on Bankir.ru (<http://bankir.ru/rating/>)

But the greatest impact of growing unevenness is observed for profits. Concentration of profits (as per HHI) increased almost 24.3 times for the period, and it is explained by 11% with the reduction in the number of banks and by 89% with growing heterogeneity in profits distribution among banks which, however, is attributable to the unfolding crisis in economy.

When testing *Statement 1*, we did not obtain any noticeable correlation between Russian banks fraction in total capital or assets of the banking system and their effectiveness (ROA and ROE) in different periods. Thus the hypothesis suggesting that a larger bank has better performance whilst the performance of a smaller bank is comparably worse, has been rejected.

Testing *Statement 2* led us to conclusion that concentration and unevenness of all the variables in time series are negatively related to ROA and ROE in banking sphere. More significant correlation was obtained for unevenness measured by Gini coefficient, and the results are shown in table 2.

Table 2 Correlation Matrix, 2007-2015

Gini coefficient for...	ROA	ROE	E/A
– Assets	-0.83	-0.713	-0.943
– Capital	-0.725	-0.721	-0.758
– Profits	-0.789	-0.807	-0.684
– Loans to business	-0.855	-0.773	-0.883
– Consumer loans	-0.705	-0.605	-0.839
– Personal deposits	-0.61	-0.653	-0.089
– Current accounts of firms	-0.806	-0.722	-0.878
– Deposit accounts of firms and securities issued	-0.781	-0.672	-0.873
– Securities in assets	-0.953	-0.939	-0.564

Source: Author calculations based on previous data obtained

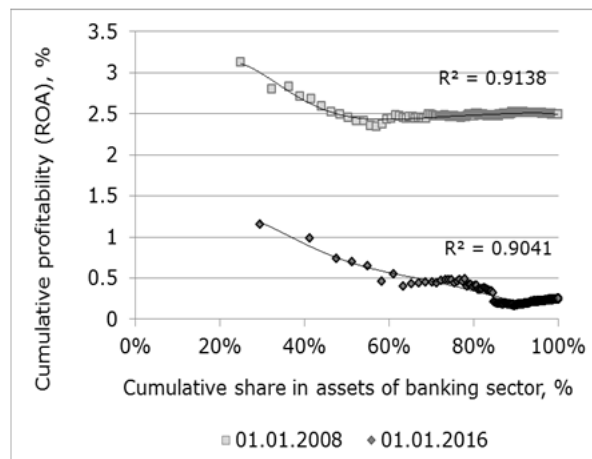
Strong negative statistical interdependency between indices of concentration and main banking sector performance indicators in time series, however, do not point out the reason and the consequence. Taking into account the worsening market condition in that period, we can suppose that a fall in profitability has caused capitalization in banking sector, but still not the opposite. We also have to remember that right at the time of crisis the Central Bank of Russia provided support to larger banks, so natural capitalization had been enhanced by artificial one. Thus the statement about interrelation between concentration in the system and its performance is confirmed to a great extent but with reliance on institutional conditions.

To test *Statement 3* we employed the method of the “snapshot” of the system and gradual “picking up” banking sector by adding banks in order of their decreased fraction in total banking assets and capital. Hence we calculated series of cumulative fraction, changing concentration in system (measured by HHI) and average performance indicators of extending system. Figure 3 shows dependency of profitability of banking sector on its scale for two periods. The upper curve characterizes the period of stability, and the lower curve represents the period of crisis. The Pearson correlation between HHI and ROA of the system collected in such a way is 0.62 for 2008 and 0.86 for 2016. It means that the period of recession makes the dependency between “gradually gathered” concentration and profitability of system more evident.

We used the same methodology to assess the interrelation between inner concentration of system and its average capital adequacy. According to the results presented on Figure 4, small and medium sized banks are characterized by larger capital adequacy on average, but its extremely excessive value can rather be explained by higher difficulties in raising funds from public than better risk management. On Figure 4 the upper curve corresponds to better market conditions compared to the lower curve. Pearson correlation between HHI and capital adequacy of collected system is -0.7 for 2012 and -

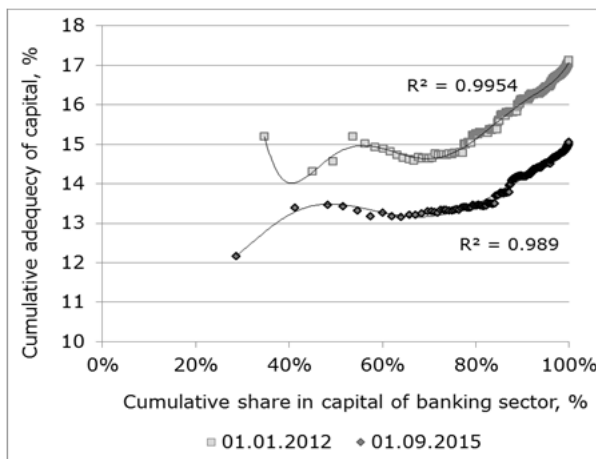
0.66 for 2015. It is apparent that concentration in banking system leads to better resource management.

Figure 3 Change in the Overall Profitability by Adding Smaller Banks in the Periods of Stability and Crisis



Source: Author calculations based on Bankir.ru (<http://bankir.ru/rating/>)

Figure 4 Change in the Overall Capital Adequacy by Adding Smaller Banks in the Periods of Stability and Crisis



Source: Author calculations based on Portal of banking analyst (<http://www.analizbankov.ru/index.php>)

Thus the statement about better performance of more concentrated banking system for “snapshot” data is confirmed, especially in worsened market conditions.

The two figures above also allow to verify *Statement 4*. According to Figure 3, in the period of economic rise medium and small sized banks form a stability zone. But in crisis this part of graph falls sharply, while the first one shifts down in parallel. Medium and small sized banks make more negative contribution to the fall of system profitability in comparison with larger banks. However, this is applicable to the entire system rather than to particular banks, referring to unconfirmed *Statement 1*.

As to capital adequacy, at the time of crisis it decreases, whilst difference between large banks and small and medium banks is a little bit smoothed out, that is due to greater fall in capital adequacy in group of small banks as a result of deterioration of assets quality. Additionally, in times of crisis there are more banks with inadequate capital, i.e. with fall of capital adequacy beyond the lower normative boundary. Finally, according to calculations, during the recession banks demonstrate less difference in terms of capital adequacy, whilst their profitability variance, contrarily, increases.

4 Conclusions

The above analysis revealed the growing concentration in Russian banking sector for capital, most assets and liabilities as well as turning out in the tendency of diminishing concentration for personal accounts in period of crisis. Primarily caused by a reduction in the number of banks, capitalization was strengthened by the growing heterogeneity of the banking sector, especially with regard to capital and some types of liabilities. Such type of capitalization has deteriorated banking structure and eventually resulted in critical redistribution of profits in the banking sector.

Testing of four proposed statements within the framework of the «structure - conduct - performance» has led us to ambiguous results concerning interrelation of capitalization with bank performance. On the one hand, no correlation had been found between the size and profitability and capital adequacy of Russian banks when we consider them as units. On the other hand, the system as a whole clearly shows some dependency between the level of concentration and its performance. In time series this dependency becomes apparent because larger banks demonstrate better fitness to survive in

deteriorating market conditions. The unfolding crisis has led to a decrease in profitability and capital adequacy in the banking sector, but small and medium sized banks proved to be utmost vulnerable. In a "snapshot" approach the system gradual extension resulted in declining concentration worsens its performance indicators, which would, in turn, stimulate concentration.

Thus we have pro et contra banking sector concentration that cannot ultimately confirm or reject SCP hypothesis, merely receive some evidence in favor and against it. When we speak about each particular bank, "contra" prevails, when we speak about the whole system, "pro" dominates.

Moreover, we need to take into account the institutional conditions. The growing presence of larger banks on the banking market is only partially derived from their natural competitiveness which leads to smaller banks pushed out of the industry mainly during the crisis. Having been supported by the state for political reasons, some large state-owned Russian banks master artificial preferences. Such a situation reduces opportunities for a number of more effective but less-sized commercial banks to expand their market, and distorts the market structure, taking into account that small and medium-sized banks form a zone of stability during the years of economic growth.

In the meanwhile, we suggest that during the crisis the monetary authority should develop measures of effective banking sector capitalization which would not cause its excessive heterogeneity. One of the possible courses of action to be taken by the state is regulatory promotion of voluntary and fair mergers and acquisitions of small and medium-sized banks, as well as conversion of some less effective small banks into non-banking credit organizations with limited functions.

The role of intermediate chain, namely banks conduct, which was excluded here, provides an area for further research and investigation. Such a study may clarify how better natural and artificial positions may provoke monopolistic behavior of larger banks, which in turn may improve or worsen their result.

Acknowledgments

This research was supported by the Ministry of education and science of Russia as a part of the state assignment, Project Number 2648.

References

- Behr, P., Schmidt, R. H., Xie, R. (2010). Market Structure, Capital Regulation and Bank Risk Taking. *Journal of Financial Services Research*, vol. 37(2-3), pp. 131-158.
- Busta, I., Sinani, E., Thomsen, S. (2014). Ownership concentration and market value of European banks. *Journal of Management & Governance*, vol. 18(1), pp. 159-183.
- Chalermchatvichien, P., Jumreornvong, S., Jiraporn, P., Singh, M. (2014). The Effect of Bank Ownership Concentration on Capital Adequacy, Liquidity, and Capital Stability. *Journal of Financial Services Research*, vol. 45(2), pp. 219-240.
- Guzman, M. G. (2000). Bank structure, capital accumulation and growth: a simple macroeconomic model. *Economic Theory*, vol. 16(2), pp. 421-455.
- Hanafi, M. M., Santi, F., Muazaroh (2013). The Impact of Ownership Concentration, Commissioners on Bank Risk and Profitability: Evidence from Indonesia. *Eurasian Economic Review*, vol. 3(2), pp. 183-202.
- Mamonov, M. The impact of market power of Russian banks on their credit risk tolerance: A panel study. *Applied Econometrics*, vol. 4(28), pp. 85-112.

Risks and Efficiency of Tax System at Different Budget System Levels: Revenue Formation and Sharing in the Russian Federation Regions

Marina Malkina¹, Rodion Balakin²

^{1,2} Lobachevsky State university of Nizhni Novgorod
Institute of Economics and Entrepreneurship
Macroeconomics and Microeconomics Center
37 Bolshaya Pokrovskaya street, room 201
Nizhny Novgorod, Russia, 603000
E-mails: mmuri@yandex.ru, rodion-balakin@yandex.ru

Abstract: *The research is aimed at analyzing tax systems at the stages of tax revenue formation and its distribution among different budget levels to compare risks and efficiency of tax systems. H. Markowitz portfolio theory is applied to the tax system risk assessment. The deflation of tax revenue and regional gross product (GRP) was employed to adjust the price scale of the analysed time series. The ratio between the tax yield to GRP applied to 8 basic taxes and tax groups was viewed as the profitability of the 'tax portfolio'. For evaluation of the tax risks we used the intertemporal standard deviation of tax yield ratio to GRP. In order to identify the influence of tax variance and tax covariations on general risk of the tax system at the stages of tax revenue formation and its distribution, decomposition method of tax portfolio risk index is used. W. Sharpe ratio is employed to assess the efficiency of a tax system, on the assumption that risk-free return equals zero. According to the results obtained, Russian tax system shows the highest risks and profitability rates at the stage of federal budget formation, whereas the risks and yield rates of the regional consolidated budgets are lower. It works the same way when it comes to regional tax return's distribution among regional and local budgets. However the tax system efficiency, according to the calculated Sharpe ratio, at a regional level generally compares favorably with that at the federal or local levels. The policy of interregional inequalities levelling forms the basis of tax return distribution among different budget levels. Hence the federal level shows the highest rate of interregional inequality of tax system efficiency, while regional level is characterized by a lower rate, the lowest one found at the local budget level.*

Keywords: tax system, budget, region, Markowitz portfolio theory, risk, profitability, Sharpe ratio

JEL codes: G11, H71

1 Introduction

The economic literature dealing with tax system risks and efficiency primarily addresses the question of optimal tax level and tax structure (Mankiw et al., 2009), as well as factors related to them (Mahdavi, 2008). A number of papers analyzed the interrelation between parameters of real economy, such as economic growth, and tax revenue volatility (Fricke and Süßmuth, 2014 and Cornia and Nelson, 2010). Other scholars estimated the influence of different factors on tax revenue volatility and assessed tax revenue sensitivity to external shocks (European Commission, 2013) or developed approaches of smoothing tax revenues over the business cycle (Kodrzycki, 2014). Several papers consider the buoyancy, elasticity and stability of tax revenues to be the main parameters of tax system which have been tested to different cases (Haughton, 1998 and Moldogaziev, 2012).

The use of portfolio theory in tax system risk and efficiency evaluation began from introduction of the so-called "tax revenue minimum - variance frontiers", which laid the basis for optimal tax portfolio formation. By extension of this approach Harmon and Mallick (1994) incorporated the third function in this model which evaluated the fairness of taxation. The approach developed by N. Seegert directly employed portfolio theory for tax systems risk assessment (Seegert, 2015). Our research is also based on portfolio

theory, but we have chosen another method, namely adaptation of investment portfolio theory to tax system risk evaluation.

The method of tax system risks evaluation using Markowitz portfolio theory and Sharpe ratio was introduced in one of our earlier papers (Malkina and Balakin, 2015). Later it was tested to compare risks and efficiency of taxation in Russia with that of Italy (Malkina and Balakin, 2016). Another research dealing with Russian budget (Malkina, 2014) has demonstrated the decrease in interregional fiscal capacity inequality in Russian regions per capita at the stage of tax return distribution among the budget levels and at the stage of receiving intergovernmental transfers.

In this research the proposed method which has been used to assess tax system efficiency and risks is also applied to evaluate distribution of consolidated regional tax revenue between different budget levels: federal, regional and local budgets. Besides, this method was developed further: tax system risks were decomposed to analyse what taxes and tax interrelations add most to the overall tax system risk rate at different budget levels. Finally, the research evaluates the efficiency of regional tax systems at the stage of consolidated tax revenue formation and its distribution among different budget levels.

Research hypothesis: the existing taxation system of the Russian Federation aims at such a way of revenue and risk distribution when the most high-revenue and, at the same time, high-risk taxes are handled at the federal level, while taxes with lower revenue and risk indices are dealt with at both regional and local levels. However, high level of diversity of regional economies does not allow to fully level out the interregional risk and efficiency rates of tax systems when distributing tax revenue among the budget levels.

2 Methodology and Data

The official data of Federal State Statistics Service and Russian Federal Tax Service lays the basis for this research.

The method consists of the following steps:

1. Elimination of "change of the game rules" factor, i.e. official tax rates and tax credits variations, revision of tax basis calculation procedures.
2. Tax revenue and Gross Regional Product deflation, i.e. inflationary growth component elimination, which allows to level out the prevailing influence of the most recent data over preceding:

$$T^*_{ijk} = \frac{T_{ijk}}{PI_{ij}}, \quad (1)$$

$$B^*_{ij} = \frac{B_{ij}}{PI_{ij}}, \quad (2)$$

where T_{ijk} – nominal tax k return in region i in the year j ,

B_{ij} – nominal GRP of region i in the year j ,

PI_{ij} – cumulative deflator index for each region i in the year j .

3. Risk assessment of each particular tax based on standard deviation base-weighted index of tax yield rate:

$$\sigma_{ik} = \sqrt{\sum_{j=1}^n (t_{ijk} - t_{ik})^2 \cdot d_{ij}}, \quad (3)$$

where: $t_{ijk} = \frac{T^*_{ijk}}{B^*_{ij}}$ – tax k yield rate in region i in the year j ;

$$d_{ij} = \frac{B^*_{ij}}{\sum_{j=1}^n B^*_{ij}} - \text{ratio of GRP in the year } j \text{ to the total GRP for the whole analysed period}$$

of time in region i ;

$$t_{ik} = \sum_{j=1}^n t_{ijk} \cdot d_{ij} - \text{year-weighted average annual yield of tax } k \text{ in region } i.$$

4. Assessment of GRP-weighted region average risk:

$$\sigma_k = \sqrt{\sum_{i=1}^m \sigma^2_{ik} \cdot d_i}, \quad (4)$$

$$\text{where } d_i = \frac{\sum_{j=1}^n B^*_{ij}}{\sum_{i=1}^m \sum_{j=1}^n B^*_{ij}} - \text{ratio of GRP of region } i \text{ to the total GRP of all analysed regions}$$

for the whole analysed period of time, $\sum_{i=1}^m d_i = 1$,

In this case we understand only interregional fluctuation in tax yield as risk.

5. Employment of Markowitz portfolio theory to assess risks of regional tax systems:

$$\theta_i = \sqrt{\sum_{k=1}^l \sum_{f=1}^l \text{cov}_{ikf} \times \mu_{ik} \times \mu_{if}}, \quad (5)$$

where $k = \overline{1, l}$ and $f = \overline{1, l}$ – taxes (groups of taxes);

cov_{ikf} – covariation of taxes k and f in region i ;

$$\mu_{ik} = \frac{\sum_{j=1}^n T^*_{ijk}}{\sum_{j=1}^n \sum_{k=1}^l T^*_{ijk}} - \text{proportion of tax } k \text{ in the portfolio of region } i.$$

The following formula allows to calculate region-weighted average tax system risks:

$$\bar{\theta}_i = \sqrt{\sum_{i=1}^m \theta_i^2 \cdot d_i}. \quad (6)$$

6. Using Sharpe ratio to estimate regional tax system efficiency, assuming that risk-free yield equals zero:

$$Sh_i = \frac{t_i}{\theta_i}, \quad (7)$$

where t_i – total adjusted tax yield in region i .

3 Results and discussion

Table 1 shows the results of calculations by formulas (1-6).

Table 1 Yield and Risk Rates of Particular Taxes (Tax Groups) in Russia, 2006-2014

	Consolidated budget	Federal budget	Regional budgets	Local budgets
1	2	3	4	5
Adjusted tax yield, %				
Corporate Income Tax	5.374	1.187	4.118	0.070
Personal Income Tax	4.579	0.002	3.243	1.334
Value Added Tax	3.812	3.812	0.000	0.000
Excise duties	1.313	0.523	0.790	0.001
Property taxes	1.575	0.000	1.260	0.315
Natural resources taxes	5.250	5.075	0.172	0.003
Duties	0.042	0.022	0.003	0.017
Special tax regimes	0.481	0.000	0.264	0.217
Total	22.425	10.620	9.848	1.957
Regional average tax risk, %				
Corporate Income Tax	1.998	0.878	1.151	0.174
Personal Income Tax	0.390	0.006	0.319	0.212
Value Added Tax	1.212	1.212	0.000	0.000
Excise duties	0.670	0.458	0.409	0.013
Property taxes	0.198	0.000	0.180	0.119
Natural resources taxes	1.576	1.629	0.260	0.009
Duties	0.009	0.005	0.001	0.005
Special tax regimes	0.056	0.000	0.078	0.063
Total	2.913	2.385	1.111	0.332
Regional average portfolio (based on Markowitz portfolio theory) risk	1.223	1.654	0.508	0.162

Data presented as calculated by the authors.

Tax system risk evaluated by means of Markowitz portfolio theory depends on three factors: tax revenue structure at different budget levels; risks of the taxes that form the portfolio of a particular budget level; and the tax revenue rates covariation.

Let us take a closer look at the tax portfolio of Russia at different budget levels. In Russia 85% of consolidated budget tax revenue come from 4 core taxes: Corporate Income Tax, natural resource taxes (mainly, Mineral Extraction Tax), Personal Income Tax and Value Added Tax. Corporate Income Tax, VAT and natural resource taxes show the highest risks rates, while Personal Income Tax appears to have the lowest one. Moreover, natural resources taxes and VAT have the highest rate of interregional tax yield inequality. Tax distribution among different budget levels aims, first of all, at levelling out fiscal capacity of the regions. Taxes showing the highest inequality distribution rates are allocated to the federal budget and then are distributed among regions through inter-budget transfers.

The situation changes after distribution of taxes among different budget levels. Around 35.9% of the federal budget is formed by Value Added Tax, MET is forming 47.8% of it. As these taxes have highest risk rates, they increase federal budget risk rates, too. Corporate Income Tax and Personal Income Tax appear to be basic for regional budgets, the former making 41.8% of its tax revenue, the latter adding 32.9% to the same level. As the risk rate of Personal Income Tax is quite low, it smoothes general volatility of regional tax revenue. At local levels property taxes, special regime taxes and personal income tax play an important role, one third of the latter's yield coming from regional budgets. As these taxes show greater stability, the risk rate is lower at local levels.

In the framework of portfolio theory, internal covariation of the yield of particular taxes is also seen as a factor influencing tax yield risks. Positive covariation of Corporate Income Tax and VAT yields adds 12.75% to tax system risk rate of consolidated budget. At the same time, negative covariation of Corporate Income Tax and Personal Income Tax drop the risk rate by 6.82%, Personal Income Tax and natural resources tax – another 4.62%.

At the stage of tax distribution among the budget levels yield rates covariation add to the risks of the “portfolio” the tax return is allocated to. Thus negative covariation of VAT and natural resource tax yields lower the federal budget risk rates by 27.9% countrywide. Regional budget risk is partially neutralized because Corporate Income Tax yield rates is inversely related to Personal Income Tax (-30.41%), property taxes (-8.81%) and excise taxes (-6.52%) yield rates. However, positive interrelation between Personal Income Tax and property taxes yields appears to decrease portfolio risk at regional budget level.

Thus calculations show that average regional risk rate for consolidated budget is estimated to equal 1.223%. After distributing tax revenue among the budget levels, the portfolio of federal budget appears to have the highest risk rate, exceeding the risk rate of consolidated budget by more than 35%. At the same time, the regional budgets portfolio risk rate is lower, equaling to 41.5%, local budget portfolio risk rate makes 13.2% of consolidated budget risk level.

Estimation of tax system risks becomes of special interest when comparing Russian regions. Table 2 shows the dispersion of regional tax systems risk as a whole and after tax return distribution among different budget levels. It also demonstrates efficiency rates of regional tax systems, evaluated using Sharpe ratio, both in average and as variance among regions.

Table 2 Interregional Differences in Russian Tax System Risks and Efficiency Rates, by Level of Formation, 2006 – 2014

	Consolidated budget	Federal budget	Regional budgets	Local budgets
Tax system risk rate				
Maximum	3.0302	17.8781	1.6750	1.3298
Minimum	0.0678	0.1005	0.0851	0.0047
Weighted average	0.9573	1.2196	0.4311	0.1289
GRP-weighted				
Standard Deviation	0.7604	1.1169	0.2679	0.0974
Coefficient of Variation	0.7943	0.9158	0.6215	0.7555
Tax system efficiency rate				
Maximum	224.6817	38.0071	98.9409	31.5237
Minimum	6.2025	-0.4843	4.9326	3.4105
Weighted average	42.8465	9.9858	32.9152	14.0399
GRP-weighted				
Standard Deviation	44.2552	6.8904	21.7068	6.2056
Coefficient of Variation	1.0329	0.6900	0.6595	0.4420

Data presented as calculated by the authors.

Above all, regional risk rates at each formation level strongly correlate with one another. Pearson's correlation coefficient of consolidated and federal budgets risk rates equals to 0.61, consolidates and regional – 0.68, consolidated and local – 0.43.

It is clear that the higher the rank at the same budget level, the higher the rank at another stages of tax yield formation. For instance, Chukotka autonomous district, Far Eastern Federal District, shows the maximum risk rate, which is the highest at consolidated, federal and local budgets, ranking second among regions showing high-risk formation of consolidated budget. At the same time Zabaykalsky Krai, Siberian Federal District, shows the highest risk rate at the stage of regional budget formation. Among 80 analysed regions it ranks 13 based on federal budget risk rate and is only ranked 47 based on local budget risk rate. With that it comes third in the top of high-risk

consolidated budgets and tax system altogether. Tyumen Oblast, Ural Federal District, is facing similar situation. Oil and gas revenue lays the basis for the region economy. This region shows high risk rates for consolidated and federal budgets (ranking second and third respectively) ranking 19 based on regional budget risk rates and 60 based on local budget risk rates.

Next come regions that show the lowest risk rates. In contrast with previously described top-three regions of Ural, Siberia and Far East federal districts, here we see the regions of Western Russia. Rostov region, Southern Federal District, reveal minimal overall tax system risk rate, as well as near-minimum rates at federal and regional levels. Kirov region, part of Volga Federal District, show minimal risk rates at the stage of regional budget formation; its low consolidated and federal budget formation risk rate puts it in the rear of ranking list. Kostroma region, Central Federal District, had minimal federal budget tax yield risk rates. Moscow shows minimal risks for local budgets, although it ranks as one of top 20 regions that are high-risk at other stages of budget formation.

The greatest interregional difference in tax system risk rates, measured by standard deviation, is seen at the stage of federal budget formation, while local budgets show the least difference in these rates. However, coefficient of variation, which is sensitive to average risk values, demonstrates that regional level tax systems vary less in risk rates than local level tax systems.

Similar to assessing risks, results of tax systems efficiency evaluation at different stages of budget formation correlate with one another. Regions in that area show maximum efficiency rates at the local level as well as for consolidated level at large. Ranking the analysed 80 regions according to tax system efficiency rate at the level of consolidated budget formation we see, that 4 out of 6 regions of Southern federal district can be found among top 25 most efficient regions. Volga Federal District regions also show high efficiency rates. Nine regions in this area are among top 30 most efficient regions, the other five are among top-50 efficient regions. E.g., Kirov region shows maximum tax system efficiency at the stage of regional budget formation. Kostroma region, Central Federal District, has maximum efficiency rates at the stage of federal budget formation. It should be pointed out that 11 out of 18 regions of the Central District appear in the first half of the ranking list based on tax system efficiency at the stage of consolidated budget formation. Upon the whole tax systems showing minimal risk rates appear to be most effective.

Correspondingly, the least effective systems are those showing the highest risk rates. Regions of Far East show minimal efficiency level at the stage of regional and local budget formation, Siberian regions do not appear efficient enough at federal and consolidated budgets formation levels. In fact, 6 out of 10 Siberian regions take positions from 50 to 80 in the ranking list based on tax system efficiency rate at the stage of consolidated budget formation. Lower efficiency rates are also seen with North-Western regions of Russian. 8 out of 10 regions in that area are listed in the second half of the ranking list.

4 Conclusions

Thus, we evaluated the tax system risks at different budget levels by means of Markowitz portfolio theory, where overall risk of the tax system depends on the risks of certain taxes included in "tax portfolio", the tax system revenue structure and the relationship between different taxes return rates. The ratio of yield to risk rate, Sharpe ratio, was used to assess the tax system efficiency in Russian regions.

As we can see, the proposed hypothesis about risk and yield distribution among budget levels has been proven to be true. Federal level manages most efficient and, at the same time, high-risk taxes, which are dependent on the tone of the world market (e.g. MET). We believe that such an approach is reasonable as it is easier to control the tax rules, e.g. tax rates and taxes base formation, at federal level, by damping tax yield risks. Under existing Russian tax system, budget replenishment risk rates are lower at the

regional level, local level is showing even lower risk rates, however the level of yield here is low, too. At the same time, the regional budgets are showing the highest average efficiency rates compared to local and federal budgets having lower efficiency rates.

Besides, our research shows greater equality of tax system efficiency rates at local budget level rather than regional and, moreover, federal budget. Such a statutory regional inequalities smoothing is estimated as favourable. Meanwhile differences in regional tax system, even though managed, are still great; that requires further development of tax legislation in such a way that principles of equity and efficiency are reasonably applied and stimulating function of taxes is put to work.

Advancing Markowitz and Sharpe portfolio approach to tax system risk and efficiency assessment will allow to set an optimal scheme of tax yield distribution among budget levels, taking into account yield limits of each level, aiming at maximizing general rate of tax system efficiency which is yet to be determined in our further research.

Acknowledgments

The research was funded by Russian Foundation for Humanities, as part of project № 15-02-00638, "The relationship between income inequality and economic development in the regions of the Russian Federation".

References

- Cornia, G. C., Nelson, R. D. (2010). State Tax Revenue Growth and Volatility. *Regional Economic Development*, Vol. 6, No. 1, pp. 23-58.
- Fricke, H., Süsmuth, B. (2014). Growth and Volatility of Tax Revenues in Latin America. *World Development*, Vol. 54, pp. 114-138.
- Harmon, O., Mallick, R. (1994). The Optimal State Tax Portfolio Model: An Extension. *National tax journal*, Vol. 47(2), pp. 395-402.
- Haughton, J. (1998). Estimating tax buoyance, elasticity and stability. *African Economic Policy Paper*. Discussion Paper No. 11.
- Kodrzycki, Y. K. (2014). Smoothing State Tax Revenues over Business Cycle: Gauging Fiscal Needs and Opportunities. *Federal Reserve Bank of Boston Working Paper*, No 14.
- Mahdavi, S. (2008). The level and composition of tax revenue in developing countries: Evidence from unbalanced panel data. *International Review of Economics & Finance*, Vol. 17, Iss. 4, pp. 607-617.
- Malkina, M. Yu. (2014). Effectiveness of interbudgetary equalization system in Russia. *Society and Economics*, No. 2-3, pp. 118-134.
- Malkina, M. Yu., Balakin R. V. (2015). Correlation Assessment of Tax System Risk and Profitability in the Russian Regions. *Ekonomika regiona*, No. 3, pp. 241-255.
- Malkina, M. Yu., Balakin R. V. (2016). Comparing risk components of taxation systems of Italy and Russian Federation. *Mediterranean Journal of Social Sciences*, Vol. 7, pp. 45-53.
- Mankiw, G. N., Weinzierl, M., and Yagan, D. (2009). Optimal taxation in Theory and Practice. *Journal of Economic Perspectives*, Vol. 23, No. 4, pp. 147-174.
- Moldogaziev, T. (2012). Fiscal Decentralization and Revenue Stability in the Kyrgyz Republic, 1993-2010. *Eurasian Journal of Business and Economics*, No. 5 (9), pp. 1-20.
- Seegert, N. *Optimal tax portfolios: An estimation of Government Tax Revenue Minimum-Variance Frontiers*. Retrieved from: http://www-personal.umich.edu/OptimalTaxPortfolios_Seegert.pdf.
- Study on the vulnerability and resilience factors of tax revenues in developing countries. *European Commission*. Retrieved from: http://www.die-gdi.de/Vulnerability_of_tax_revenue.pdf.

Analysis of the Relationship between Adopting and Using XBRL as a Reporting Language for Small and Medium Sized Entities and the Development Status of the Country and the Existence of XBRL Jurisdiction

Anton Marci¹, Zuzana Juhászová²

¹ University of Economics in Bratislava
Faculty of Economic Informatics, Department of Accounting and Auditing
Dolnozemska cesta 1/b, 852 35 Bratislava, Slovakia
E-mail: anton.marci77gmail.com

² University of Economics in Bratislava
Faculty of Economic Informatics, Department of Accounting and Auditing
Dolnozemska cesta 1/b, 852 35 Bratislava, Slovakia
E-mail: juhasz@euba.sk

Abstract: *The aim of the paper is to explore possible relationship between adopting and using XBRL as a reporting language for small and medium sized companies and development status of the economy and to explore possible relationship between adopting and using XBRL as a reporting language for small and medium sized companies and the existence of XBRL Jurisdiction. Methodology used in the research project is focused on the current experiences of using XBRL by insurance and banking sector companies and by companies in other sectors with accordance to regulations for insurance and banking sector companies and for small and medium sized enterprises in European Union member states. Research is then focused also on the existing relationship between XBRL usage and the development status of the economy and other social factors. Preliminary results in the field of problems in the process of creating and implementing XBRL by small and medium sized enterprises in the future are dependence of automation on taxonomy preparation level. The second side of problems to overcome is linked to costs of adopting XBRL, which are highly changeable and not easily predictable. The other problem is linked to taxonomies already in use, which are subject to changes and transformations what can cause problems for software systems designed for older taxonomies. In some European Union countries XML reporting format is required by state legislation for small and medium sized enterprises with no other option. XBRL also requires more skills from accounting experts than simpler XML based reporting.*

Key words: XBRL, XBRL taxonomy, extensible business reporting language, SMEs, small and medium-sized enterprises

JEL codes: M40, M41, M48, M49

1 Introduction

EXtensible Business Reporting Language (from now on referred to as XBRL) as a part of a family of mostly eXtensible Markup Language-based (from now on referred to as XML) meta-languages referred to as a semi-structured data (Hussain K., Prieto E., 2016) is currently being adopted as a reporting language by a wide variety of jurisdictions around the world (Tumpach, M. 2005, Singerová, J., 2015). Financial products Markup Language, Financial Information eXchange, Interactive Financial eXchange, Market Data Definition Language, Financial Electronic Data Interchange, Open Financial eXchange, SWIFTStandards and others are also XML-based semi-structured data languages similar in some ways to XBRL, but often used for different purposes as financial reporting (Hussain K., Prieto E., 2016). Extensibility of XBRL is one of the traits which is different from some of the XML-based languages mentioned above. XBRL International Inc. is a non-for-profit consortium with the goal of improving reporting everywhere with more than 600 organisational members from more than 35 different countries and with 23 formal jurisdictions (xbrl.org). In Europe exist XBRL Europe as a non-for-profit organisation affiliated to XBRL International Inc. XBRL Europe is the organisation which interacts with wide variety of European Institutions and Authorities such as European

Banking Authority (from now on referred to as EBA), European Insurance and Occupational Pensions Authority (from now on referred to as EIOPA), European Securities Market Authority (from now on referred to as ESMA), European Parliament, European Central Bank, European Commission and then also with wide variety of other types of organisations with the goal of enhancing XBRL as a reporting standard (xbrleurope.org). EIOPA made in November 2015 decision of the Board of Supervisors on Collection of Information by EIOPA under Solvency II with accordance with other regulations applicable in European Union (from now on referred to as EU) and stated that prudential quantitative information reports and financial stability quantitative information reports shall be submitted using the EIOPA XBRL taxonomy format (eiopa.europa.eu). ESMA is still seeking public comment on aspects of the European Single Electronic Format, which will be required for the preparation of annual reports of all issuers in regulated markets as of January 1st 2020 and with high probability XBRL will become European Single Electronic Format used by fillers for ESMA requirements (Gostimir, D., 2015). EBA gathers data from national supervisory bodies in XBRL format and it has produced XBRL Taxonomies for banking sector with the last update at May 11th 2016 (eba.europa.eu). As we can see from information above, XBRL Europe is so far successful with expanding and enhancing XBRL as a business reporting language in EU at least in the field of regulated businesses and with high probability also in the field of businesses operating at regulated markets. On supra-national level is XBRL used in EU for chosen sectors of economy – especially banking and insurance companies or their national authorities have to provide information needed by EIOPA and EBA in XBRL format.

On national level is XBRL usage common in some EU-member states, but it is not mandatory for all the EU-member states to collect information from businesses in XBRL format. Financial reporting on national level inside the territory of the EU-member states and member states of European Economic Area (from now on referred to as EEA) is regulated by DIRECTIVE 2013/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC (from now on referred to as accounting directive) and Regulation (EC) No 1606/2002 of the European Parliament and of the Council of 19 July 2002 on the application of international accounting standards (from now on referred to as IFRS Regulation). Accounting directive and IFRS Regulation in EU-member and EEA-member states regulate financial reporting for chosen types of business entities with no clear definition of mandatory filling format, which is in the competence of member states (eurlex.europa.eu). At least some of the financial reports provided from businesses are filled in XBRL format in some EU-member and EEA-member states and it usually copies the existence of a so-called national jurisdiction for XBRL. In Europe jurisdictions for XBRL are formed in Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Russia (non-EU-member and non-EEA-member state), Spain, Sweden, Switzerland, Turkey (non-EU-member and non-EEA-member state) and United Kingdom (Singerová, J., 2015, xbrl.org). International Accounting Standards Board (from now on referred to as IASB) set up XBRL Taxonomy for business entities reporting their financial statements and financial reports in accordance with International Financial Reporting Standards (from now on referred to as IFRS), but even though XBRL taxonomy for IFRS exists, it is up to member states of EU and EEA, which reporting format they choose as acceptable for business reporting for their institutions (ifrs.org/XBRL/Pages/IFRS-filing-profile-project.aspx). IASB has developed also XBRL Taxonomy with use for small and medium-sized enterprises (from now on referred to as SMEs) using IFRS for SMEs as a standard for preparation and presentation of their financial statements and financial reports (ifrs.org/XBRL/IFRS-Taxonomy/Pages/IFRS-for-SMEs-Taxonomy.aspx). The IFRS for SMEs was accessed as incompatible with Accounting Directive and for that reason it is not endorsed for usage in EU (ifrs.org/Use-around-the-world/Documents/Jurisdiction-profiles/European-Union-IFRS-Profile.pdf). The way of adopting and using XBRL as a reporting format is for now in the competence of national states and they can choose mandatory or voluntary XBRL filling options for business

entities. XBRL can be also required from third parties such as financial institutions or business partners independently from the regulation of the member state, but that requires approval of all the participating partners (Kaya, D., & Pronobis, P., 2015).

Theoretical backgrounds

A growing body of research papers and literature documents shows different benefits of adopting and using XBRL for reporting of financial and non-financial information by wide variety of entities with different size-criteria and different motivation for doing so (Kaya, D., Pronobis, P., 2015, Singerová, J., 2015, Gostimir, D., 2015, Turcu, R., 2015). Researchers were able mostly to identify advantages of adopting and using XBRL in the fields of ensuring the quality of financial and non-financial reports, analysis of data, decision-making of different parties, facilitating the process of auditing, information exchange, cost efficiency, reducing the cost of capital, searching efficiency, higher quality of reporting (Wang, Z., 2015, Ilias, A., Razaka, M. Z. A., & Rahmanb, R. A., 2015). The process of adopting XBRL can be made by voluntary adopting XBRL reporting format and mandatory adopting XBRL reporting format set up by legislation or regulator (Kaya, D., & Pronobis, P., 2015). XBRL Inc. identified five possible approaches of getting ready for XBRL reporting for businesses and they are basically the use of forms offered by regulator or third party, embedded production with existing software, outsourcing, in house "bolt on" tools and embedded "disclosure management" and "regulatory filling" tools. All of them can have different pros and cons in accordance with the experience of adopting and using XBRL by businesses around the world, which withstands also by comparing research papers and literature from different parts of the world (Ilias, A., Razaka, M. Z. A., & Rahmanb, R. A. 2015, Singerová, J. 2015, Vasal, V. K., & Srivastava, R. P., 2002). When the regulators are willing to collect mandatory financial reports and financial information or non-financial information in XBRL format, it is important to be clear about the aim of the project and collecting data, regulators should determine how the data will be used, determine the level of comparability, think about possible reusing of XBRL data definitions and relation of adopting XBRL to respondent or administrative burden (Kaya, D., & Pronobis, P., 2015, xbrl.org/the-standard/how/getting-started-for-regulators/). Software developers are also important part of the process of adopting and using XBRL and to make the process easier for their customers, which could be both regulators and businesses, they should use existing libraries of XBRL Taxonomies and use test-driven approach (Sfetsos, P., Angelis, L., & Stamelos, I. 2015, xbrl.org/the-standard/how/getting-started-for-developers/). Small and medium sized companies would be likely to use XBRL in the case of low costs of adopting XBRL as a reporting language and some benefits which could arise from usage of XBRL and those are mentioned above and it could be done with relatively low-costs with the use of forms offered by regulator or third party or with the use of embedded production with existing software (Kaya, D., & Pronobis, P., 2015). According to the research done in the past the adoption of XBRL is strongly influenced or correlates strongly with previous existence of XBRL jurisdiction, cooperation of businesses and regulators, the development status of the economy of the state and benefits or motivation of businesses to adopt and use XBRL as a reporting or filling format (Kubaščíková, Z., Pakšiová, R., 2014, Hussain, K., & Prieto, E. 2016, Gostimir, D., 2015, Beerbaum, D., 2015, Wang, Z., 2015, Chumak, V. G., Ramzaev, V. M., & Khaimovich, I. N., 2015, Enachi, M., & Andone, I. I., 2015, Kravi, A., 2015, Bavdaž, M., Giesen, D., Černe, S. K., Löfgren, T., & Raymond-Blaess, V., 2015, Vafopoulos, M. N., Vafeiadis, G., Razis, G., Anagnostopoulos, I., Negkas, D., & Galanos, L., 2016, Tumpach, M., Baštinová, A., 2014).

2 Methodology and Data

Statistical data were used to research possible relationship of adopting and using XBRL as a reporting language for financial and non-financial reporting of wide variety of businesses and development criteria of the economy and existence of XBRL Jurisdiction. The main source of data for the research is the portal of Eurostat of the European Commission and then the portal of the United Nations Development Programme, the

portal of The Social Progress Imperative, the portal of XBRL International Inc. and the portals of national offices and software developers in different countries. Collected data were used for correlation analysis to show if existence of XBRL reporting for SMEs and the existence of national XBRL jurisdiction in the country is correlating with the development status of the economy and other social factors in the national states and for comparing with results from previous research papers on the similar topic. Tests of Pearson's Correlation were used to test the correlation between level of development of the economy of the national state and existence of national XBRL jurisdiction and to test the correlation between level of development of the economy of the national state and existence of XBRL reporting for SMEs in national states. The hypotheses were constructed as follows:

H0: the correlation coefficient is statistically insignificant,

H1: the correlation coefficient is statistically significant,

for which the testing statistic formula is:

$$r = \frac{\sum xy - \frac{\sum x \sum y}{N}}{\sqrt{(\sum x^2 - \frac{(\sum x)^2}{N})(\sum y^2 - \frac{(\sum y)^2}{N})}} \quad (1)$$

Symbol r stands for Pearson's correlation which is calculated on variables x for chosen development index and variables y for existence of XBRL jurisdiction in the national state for N number of samples in the search for correlation between development index and existence of XBRL jurisdiction. Symbol r stands for Pearson's correlation which is calculated on variables x for chosen development index and variables y for existence of XBRL reporting for SMEs in the national state for N number of samples in the search for correlation between development index and existence of XBRL reporting for SMEs. Dataset from the Table 1 below was used to search for correlation firstly between existence of XBRL national jurisdiction and gross domestic product per capita (from now on referred to as GDP) in EU-member states and EEA-member states. Correlation search continues between the existence of XBRL national jurisdiction and Human Development Index (from now on referred to as HDI) and finally between the existence of XBRL national jurisdiction and Social Progress Index (from now on referred to as SPI). The same approach was used when searching for correlation between XBRL reporting possibilities for SMEs and chosen development index. Firstly, correlation of GDP and XBRL reporting possibilities for SMEs were conducted and then separately correlation between XBRL reporting possibilities for SMEs and HDI and finally the correlation between XBRL reporting possibilities for SMEs and SPI.

3 Results and Discussion

Statistical data and research of the research papers and literature about the adoption and use of XBRL provided us with valuable information for creation of the main dataset to work with, which you can see just below. The data were collected for the year of 2014 as it was the last year where almost all the needed data were publicly available for each of chosen development indexes and those were relative GDP in comparison to the EU-member states combined average GDP, HDI which includes wider variety of sub-indexes for establishing its value on the scale from zero to one and finally SPI which includes wider variety of sub-indexes for establishing its value on the scale from zero to one hundred. From the indexes mentioned just the SPI for Luxembourg and Malta were missing due to size criteria of these EU-member states and due to lack of some data which are normally able to work with for the rest of EU-member and EEA-member states according to explanation from the portal of The Social Progress Imperative.

Table 1 EU and EEA Economic Development Indicators, XBRL Jurisdictions and SMEs

Index (EU28 = 100)	GDP per Capita in PPS	Human Development Index	Social Progress Index	National XBRL Jurisdiction	XBRL reporting for SMEs
Year	2014	2014	2014	2014	2014
EU 28 members	100	0,866	79,820	XBRL Europe	NO
Belgium	119	0,890	82,830	XBRL Belgium	YES
Bulgaria	47	0,782	70,190		NO
Czech Republic	85	0,870	80,590		NO
Denmark	125	0,923	86,630	XBRL Denmark	YES
Germany	124	0,916	84,040	XBRL Germany	YES
Estonia	76	0,861	80,490		YES
Ireland	134	0,916	84,660	XBRL Ireland	YES
Greece	73	0,865	74,030		NO
Spain	91	0,876	81,170	XBRL Spain	YES
France	107	0,888	80,820	XBRL France	NO
Croatia	59	0,818	73,300		NO
Italy	96	0,873	77,380	XBRL Italy	YES
Cyprus	82	0,850	77,450		NO
Latvia	64	0,819	74,120		NO
Lithuania	75	0,839	74,000		NO
Luxembourg	266	0,892	N/A	XBRL Luxembourg	NO
Hungary	68	0,828	74,800		NO
Malta	84	0,839	N/A		NO
Netherlands	131	0,922	86,500	XBRL Netherlands	YES
Austria	130	0,885	84,450		NO
Poland	68	0,843	77,980		NO
Portugal	78	0,830	81,910		NO
Romania	55	0,793	68,370		NO
Slovenia	83	0,880	81,620		NO
Slovakia	77	0,844	78,450		NO
Finland	110	0,883	86,750	XBRL Finland	NO
Sweden	123	0,907	88,060	XBRL Sweden	NO
UK	109	0,907	84,680	XBRL UK	YES
Iceland	119	0,899	87,620		NO
Norway	178	0,944	88,360		NO
Switzerland	162	0,930	87,970	XBRL Switzerland	NO

Source: Own elaboration according to used databases

It is possible to see from the Table 1 that in EU-member states and EEA-member states are many states with national XBRL jurisdiction and they usually have GDP, HDI and SPI higher from the EU and EEA average scores of chosen indexes.

Table 2 Correlations between XBRL Jurisdictions and Development Indicator

Index	XBRL Jurisdiction		Correlation
	Pearson Correlation	2-tailed p-value	
GDP	0,4360	0,0140	Significant
HDI	0,4960	0,0045	Significant
SPI	0,3040	0,1090	Significant

Source: Own elaboration according to used databases

Table 2 provides us with information that correlation between the existence of XBRL jurisdiction is significant for all chosen development indexes and the strongest correlation is made with HDI, which incorporates not only economic indexes, but counts in the account development of the society of the state. Confidence level for correlation analysis was established at 95%.

Table 3 Correlations between XBRL Use for SMEs and Development Indicator

Index	XBRL possibilities for SMEs		
	Pearson Correlation	2-tailed p-value	Correlation
GDP	0,1270	0,4960	Insignificant
HDI	0,4268	0,0167	Significant
SPI	0,2996	0,1143	Significant

Source: Own elaboration according to used databases

Table 3 provides us with information that correlation between the possibilities of SMEs to do reports in XBRL format is significant for two out of three development indexes and the strongest correlation is made with HDI, which incorporates not only economic indexes, but counts in the account development of the society of the state. In this case it is important to notice, that GDP does not seem to be significant enough in correlation relationship with possibilities of usage of XBRL for SMEs. Confidence level for correlation analysis was established at 95%. Despite there is significant, but mostly just moderately strong, correlation, there are examples of Italy and Estonia, which behave differently. Italy has lower GDP level than average GDP level and other countries with XBRL jurisdiction are above average when comparing GDP levels. Both Estonia and Italy have possibilities for businesses to use XBRL for reporting purposes, but theirs GDP levels are lower than average and Estonia is the only country from the EU-member states and EEA-member states without national XBRL jurisdiction, but Estonian SMEs are able to report financial and non-financial data in XBRL format. The strongest correlation was measured when analysing XBRL jurisdictions and XBRL possibilities for SMEs with HDI and that implies that HDI is best in predicting if the country is suited to use XBRL for SMEs or to have XBRL jurisdiction on national level.

4 Conclusions

Insurance and banking sector of economy and to some extend businesses which operate at regulated markets are strongly regulated at transnational level in EU and EIOPA, EBA and ESMA have a mandate to choose even format of reporting themselves, but according to Accounting directive in EU, the mandate to choose reporting format for SMEs which are not operating at regulated markets is in the competence of national states. Therefore, adoption of XBRL is possible mostly when regulators and businesses recognize XBRL as a reporting format which could benefit them and businesses themselves in multitude of ways also on national level and the development level of the state is above average.

Probably the best example EU-member state for the conclusion above is Belgium, where adoption of XBRL started partly thanks to recognition of its potential by banking sector for evaluating loan interest rates and with active approach for setting up national XBRL jurisdiction and involving regulators to the process. Now more than 95% of businesses reports are made with the use of XBRL (Kaya, D., Pronobis, P., 2015). Belgium is an EU-member state, where the development level of GDP, HDI and SPI is above average for EU and EEA and that implies that the conditions for implementing XBRL at national level were just right when we consider, that GDP, HDI and SPI were above European average before the year of 2014 as well. The need to first establish the right development status and then national jurisdiction for adopting XBRL as a reporting format is not always needed as we can see for Estonia, where other factors were probably at play when adopting XBRL at national level.

Acknowledgments

XBRL filling projects were started also in Sweden and Finland starting since 2015 and 2016 respectively and in both countries exist correlations with development level. XBRL Finland plans to help government and regulators to establish environment in which all businesses will start to report in XBRL from the year 2020. This paper was supported by grant VEGA 1/0935/16 XBRL based implementation of the electronic financial reporting.

References

- Bai, L., Koveos, P., Liu, M. (2016). Applying an ontology-augmenting XBRL model to accounting information system for business integration. *Asia-Pacific Journal of Accounting & Economics*, pp. 1-23.
- Bavdaž, M., Giesen, D., Černe, S. K., Löfgren, T., Raymond-Blaess, V. (2015). Response Burden in Official Business Surveys: Measurement and Reduction Practices of National Statistical Institutes. *Journal of Official Statistics*, vol. 31(4), pp. 559-588.
- Beerbaum, D. (2015). Towards an XBRL-enabled corporate governance reporting taxonomy. An empirical study of NYSE-listed Financial Institutions (Doctoral dissertation, University of Surrey).
- Chumak, V. G., Ramzaev, V. M., Khaimovich, I. N. (2015). Challenges of data access in economic research based on Big Data technology. In Proceedings of Information Technology and Nanotechnology (ITNT-2015), *CEUR Workshop Proceedings*, vol. 1490, pp. 327-337.
- Debreceny, R., Farewell, S. (2010). XBRL in the accounting curriculum. *Issues in Accounting Education*, vol. 25(3), pp. 379-403.
- Enachi, M., Andone, I. I. (2015). The Progress of XBRL in Europe—Projects, Users and Prospects. *Procedia Economics and Finance*, vol. 20, pp. 185-192.
- Gostimir, D. (2015). XBRL Standard for Financial Reporting in Croatia: Current State and Perspectives. *Business Systems Research*, vol. 6(2), pp. 31-40.
- Hussain, K., Prieto, E. (2016). Big Data in the Finance and Insurance Sectors. In: *New Horizons for a Data-Driven Economy*. Springer International Publishing, pp. 209-223.
- Ilias, A., Razaka, M. Z. A., Rahmanb, R. A. (2015). *How potential adopters in Malaysia perceive the relative advantage of eXtensible business reporting language (XBRL)?*
- Kaya, D., Pronobis, P. (2015). *The Benefits of Structured Data across the Information Supply Chain: Initial Evidence on XBRL Adoption and Loan Contracting of Private Firms*. Available at SSRN 2450858.
- Kravi, A. (2015). *The business value of XBRL reporting for Finnish public organizations*.
- KUBAŠČÍKOVÁ, Z., PAKŠIOVÁ, R. (2014). Applying Benford's Law. In *European Financial Systems 2014*. Brno: Masaryk University, 2014., pp. 359-363.
- Santos, I., Castro, E., Velasco, M. (2016). XBRL formula specification in the multidimensional data model. *Information Systems*, vol. 57, pp. 20-37.
- Sfetsos, P., Angelis, L., Stamelos, I. (2015, July). Prioritized test-driven reverse engineering process: A case study. *Information, Intelligence, Systems and Applications (IISA), 2015 6th International Conference*, pp. 1-6.
- Singerová, J. (2015). *XBRL: Different Approach of Utilization*. *Procedia Economics and Finance*, pp. 134-140.
- TUMPACH, M. (2005). Prezentovanie účtovnej závierky na báze jazyka XBRL - nový impulz alebo slepá cesta? Vývoj ekonomickej teórie a vzdelávania, uplatnenie a perspektívy v SR. *Medzinárodná vedecká konferencia. Vývoj ekonomickej teórie a vzdelávania, uplatnenie a perspektívy v SR: medzinárodná vedecká konferencia*, Bratislava: Vydavateľstvo EKONÓM, pp. 365-369.

TUMPACH, M., BAŠTINCOVÁ, A. (2014). Cost and Benefit of Accounting Information in Slovakia: Do We Need to Redefine Relevance? In *European Financial Systems 2014*, Czech Republic - Brno: Masaryk University, 2014.

Vafopoulos, M. N., Vafeiadis, G., Razis, G., Anagnostopoulos, I., Negkas, D., Galanos, L. (2016). Linked Open Economy: Take Full Advantage of Economic Data. Available at SSRN 2732218.

Vasal, V. K., Srivastava, R. P. (2002). Extensible business reporting language (XBRL)–the digital language of business: an Indian perspective. *Indian Accounting Review*, vol. 6(1), pp. 41-59.

Wang, Z. (2015). Financial reporting with XBRL and its impact on the accounting profession (Doctoral dissertation, Edinburgh Napier University).

DIRECTIVE 2001/34/EC of the European Parliament and of the Council of 28 May 2001 on the admission of securities to official stock exchange listing and on information to be published on those securities.

DIRECTIVE 2010/78/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 amending chosen directives in respect of the powers of the European Supervisory Authority, the European Insurance and Occupational Pensions Authority and the European Supervisory Authority (European Securities and Markets Authority).

DIRECTIVE 2013/34/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 June 2013 on the annual financial statements, consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repealing Council Directives 78/660/EEC and 83/349/EEC.

REGULATION (EC) No 1606/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 July 2002 on the application of international accounting standards.

REGULATION (EU) No 1094/2010 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 24 November 2010 establishing a European Supervisory Authority.

Corporate Tax Revenues of Selected European Countries Using Dynamic Conditional Correlation Approach

Slavomíra Martinková¹, Jakub Danko²

¹ Technical University
Faculty of Economics, Department of Finance
Němcovej 32, 040 01 Košice, Slovak Republic
E-mail: slavomira.martinkova@tuke.sk

² Technical University
Faculty of Economics, Department of Finance
Němcovej 32, 040 01 Košice, Slovak Republic
E-mail: jakub.danko@tuke.sk

Abstract: *The present paper focuses on the comparison of the development of corporate tax revenue of the largest European countries for the period of 1965 - 2014, followed by identification of selected differences between the countries and characterization of causes of this different development. Different amount of the corporate tax revenue is often affected by different types of fiscal policy and existing deficit tendencies of fiscal economy of countries. The main aim of this paper is to analyze and compare the differences in the development of tax revenues between the countries themselves in space and time by using the method of dynamic conditional correlations, while interpretation of the results is based on traditional macroeconomic indicators. The method allows us to compare the development of corporate tax revenue and structure of tax components between each pair of analyzed countries separately, what is in comparison with the commonly used (e. g. panel) models considered to be its main positive aspect. A new look on the measurement and evaluation of the selected revenues allows us to explain the structure of revenue components (especially the tax ones) for the implementation and testing of fiscal consolidation.*

Keywords: corporate tax revenues, dynamic conditional correlations

JEL codes: H20, H61, H25

1 Introduction

Corporate taxes, on one hand affect the total amount of government revenue and the resulting measures taken to consolidate public finances while on the other hand it is the attractiveness of the country for foreign investors in terms of tax expenditures. In 2014, fiscal burden of corporate tax countries of the Europe from 1.52% of GDP in Germany to 7.12% of GDP in Norway. Different development stems from several factors shaping the tax system and fiscal policy preferences. Tanzi and Chu (1997) highlight relevant reasons which led to the emergence of different tax systems. Their importance in the recent period ceases to apply also due to the globalization, which leads to the transfer of capital between countries. If the growing shifts of the tax revenue accruing into the state budget are affected by tax issues, the more the cooperation of countries in bringing together their individual taxation systems is needed as well as in the implementation of the revenue for fiscal consolidation.

The present paper focuses on the development of corporate tax revenues of selected European countries. The aim of the paper is to analyze and compare the differences in the development of selected indicators between a pair of selected countries and subsequently compare the results with selected traditional macroeconomic indicators using Dynamic Conditional Correlations method (DCC). Data on corporate tax revenues are taken from the Revenue Statistics published by the OECD each year from 1965 to 2014. The rest of the paper is organized as follows: The literature review is given in the second chapter, the methodology is discussed in the third chapter and the fourth chapter provides the results. The fifth chapter is devoted to a conclusion.

Literature Review

Since in this paper we examine a new context in the development of corporate tax revenues in the period 1965 - 2014, we confront the results with traditional indicators in international comparison of taxes and their effects. The literature characterizes fiscal indicators in the context of corporate taxes.

The OECD Tax Database (2016) distinguishes between various types of international indicators expressing the tax burden, their trends and the effects on macroeconomic level:

Separately present central, sub-central government rates and combined rates, further implicit tax rates on consumption, labour, capital and corporate incomes;

Effective and marginal tax rates;

Tax wedge expressed in percentage of total labour costs of the employer;

Tax ratios of the total tax revenues, alternatively GDP;

Tax quota representing the share of tax revenues determined with or without social and health insurance contributions to GDP.

The simplest indicator is the tax rate, but it has a low predictive value due to differently regulated tax bases in various countries. Goolsbee and Maydew (2000) point to the linking of corporate tax on payroll tax and property tax. The upshot is that the International Fiscal competition might be as much driven by high labor taxes and by high corporate taxes (Keuschnigg, Loretz and Winner, 2014). Greater importance than statutory tax rate has a tax base. Interdependence between corporate income tax and the tax base was for the first time examined by Gordon and Wilson (1986). They analyzed corporate taxation of companies using incentives between countries and companies. Multinational companies' decision on taxation affects supply-based and supply-demand based view. Classical tax bases models were constructed on two tax instruments: immobile labour and perfectly mobile capital (Bucovetsky and Wilson, 1991). Later research of Bettendorf, Van der Horst, de Mooij and Vrijburg (2010) suggests the tax base of corporate tax to be determined by three factors of equal weight, namely: employment, assets and output.

An important role when monitoring tax competition in terms of direct taxes is played by the aggregated macroeconomic tax burden appropriate for international comparisons of countries (Banociova, Jakubikova and Mihokova, 2012; Šoltés and Gavurová, 2015). Indicator of the tax burden is the tax quota. Low ratio does not necessarily indicate a low tax burden, but it may be due to higher levels of tax evasion or tax-levy system rigidity in relation to macroeconomic development (Odor and Marčanová, 2008). The tax quota problem lies in the definition of taxes, which include taxes paid by the state into their own treasurer. Another deficiency is the denominator, the output of GDP containing indirect taxes and the added value of public administration.

Correlation between corporate tax rates and the tax burden was firstly addressed by Mintz and Tulkens (1986), whose model monitors the tax competition between the two regions through cross-border shopping. Their results show that when countries with high tax burden increase the property tax, cross-border shoppers move to neighbouring countries with lower tax rates. Kanbur and Keen (1993) extended the research by including state revenue maximisation. The results suggest that smaller countries set lower tax rates than neighbouring countries, thus producing an increase in income from foreign consumers, hence increasing the loss of revenue from domestic individuals. The opposite is true for big economies. Consequences of changes in tax coordination are thereby not symmetrical and so it is important for the countries to be heterogeneous. Another study by Delgado (2009) is based on cluster analysis determining the group of countries according to the tax burden and tax structure. The author creates five clusters of countries with similar characteristics: the first one to be Belgium, Finland and Sweden,

second Greece and Portugal, third Ireland and the UK, fourth Denmark and fifth Germany, Austria, Spain, France, Italy and Luxembourg.

2 Methodology and Data

The analysis uses a Dynamic Conditional Correlations method introduced with the authors Engle and Sheppard (2001), the results of which are confronted with development of conventional indicators. Data on corporate tax revenues are taken from the Revenue Statistics published by the OECD each year from 1965 to 2014. In order to create partially stationary time series, corporate tax revenues in total tax revenues ratio was calculated for each of the 12 countries. Basic descriptive characteristics of countries' unit indicator are listed below (Table 1).

Table 1 Descriptive Statistics of the Corporate Tax Revenues Share on Total Tax Revenues in Selected European Economies

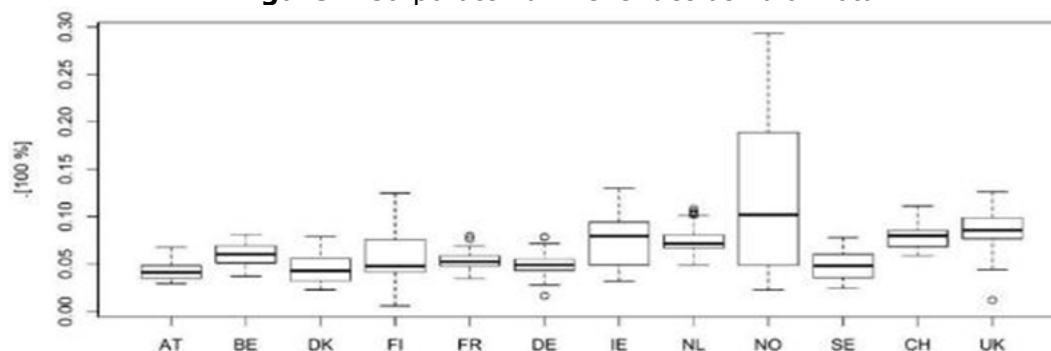
Country	Austria	Belgium	Denmark	Finland	France	Germany
ISO	AT	BE	DK	FI	FR	DE
NOBS	50	50	50	50	50	50
Mean	0,04210	0,06057	0,04509	0,05552	0,05465	0,04968
Median	0,04114	0,06057	0,04310	0,04797	0,05271	0,04909
StDev	0,00852	0,01091	0,01394	0,02331	0,00895	0,01222
Minimum	0,02939	0,03714	0,02275	0,00600	0,03460	0,01660
Maximum	0,06773	0,08118	0,07925	0,12480	0,07970	0,07877
1. Quartile	0,03483	0,05143	0,03244	0,04175	0,04834	0,04343
3. Quartile	0,04825	0,06912	0,05592	0,07564	0,05870	0,05503
Skewness	0,59673	-0,0399	0,36197	0,59728	0,60104	0,04505
Kurtosis	-0,1062	-1,0293	-0,8549	0,17843	0,27025	0,51096

Country	Ireland	Netherlands	Norway	Sweden	Switzerland	United Kingdom
ISO	IE	NL	NO	SE	CH	UK
NOBS	50	50	50	50	50	50
Mean	0,07477	0,07385	0,12526	0,04901	0,08082	0,08569
Median	0,07959	0,07149	0,10182	0,04814	0,07987	0,08591
StDev	0,02872	0,01457	0,08326	0,0147	0,01441	0,02087
Minimum	0,03214	0,04884	0,02272	0,02451	0,05874	0,01180
Maximum	0,12973	0,10829	0,29342	0,07819	0,11123	0,12605
1. Quartile	0,04933	0,06688	0,04935	0,03593	0,06850	0,07685
3. Quartile	0,09364	0,08063	0,18878	0,05992	0,08559	0,09884
Skewness	0,16927	0,61221	0,44430	0,30640	0,58721	-0,7846
Kurtosis	-1,1489	-0,13138	-1,1712	-0,9469	-0,82192	1,66073

Source: Own processing in R

As it is evident from the table above, there are some dissimilarities among analyzed shares. Graphical representation of Table 1 is illustrated in the Box-plot (Figure 1).

Figure 1 Corporate Tax Revenues as % of Total



Source: Own processing in R

If we assume that the volatility of corporate tax revenues share on total tax revenues will change over time, we should also consider a dynamic correlations structure. These so-called dynamic conditional correlations are estimated using the Generalized Autoregression Conditional Heteroskedasticity Model (GARCH (1, 1)).

We subsequently follow the development of the share in question by the indicator, which we call "the index ratio of corporate tax receipts in total tax revenue":

$$I_t = \ln \frac{R_t}{R_{t-1}} = \ln R_t - \ln R_{t-1}, \quad (1)$$

where I_t is the change in ratio of corporate tax revenues in total tax revenues in time t , R_t is the share of corporate tax revenues in total tax revenues in time t , R_{t-1} is the share of corporate tax revenues in total tax revenues in time $t - 1$.

Change ratio is representing the logarithmic return equivalent which is used in stock market analysis. By its implementation analyzed time series became stationary, what can be verified with Augmented Dickey-Fuller Test.

Then we calculate a correlation matrix for countries according to the change ratio for the whole analyzed period in order to identify such countries that have similar or different movement respectively for share of corporate tax revenues in total tax revenues. The correlation matrix was calculated using the Pearson correlation coefficient, which was calculated for each pair of countries. The value of row i and column j in the correlation matrix represents the Pearson correlation coefficient between countries i and j that is given by:

$$\rho_{i,j} = \frac{cov_{i,j}}{\sigma_i \cdot \sigma_j} \quad (2)$$

where the numerator represents the covariance between the countries i and j and the denominator is the product of standard deviations of these countries. The calculated correlation matrix is presented in Figure 2.

Figure 2 Pearson Correlation Matrix of Selected European countries

	AT	BE	DK	FI	FR	DE	IE	NL	NO	SE	CH	UK
AT	1	0,262	0,169	0,261	0,407	-0,033	0,051	0,473	0,125	-0,186	0,228	0,106
BE	0,262	1	0,324	0,135	0,464	0,213	0,063	0,422	-0,082	0,374	0,151	0,160
DK	0,169	0,324	1	0,092	0,174	0,296	-0,046	0,192	0,242	0,299	-0,133	0,076
FI	0,261	0,135	0,092	1	0,199	0,171	-0,012	0,154	0,168	-0,082	0,187	0,113
FR	0,407	0,464	0,174	0,199	1	0,146	0,239	0,338	0,230	0,007	0,320	0,152
DE	-0,033	0,213	0,296	0,171	0,146	1	-0,006	0,113	0,124	0,236	-0,177	0,126
IE	0,051	0,063	-0,046	-0,012	0,239	-0,006	1	0,048	0,150	0,037	0,070	-0,009
NL	0,473	0,422	0,192	0,154	0,338	0,113	0,048	1	0,183	0,167	0,114	0,140
NO	0,125	-0,082	0,242	0,168	0,230	0,124	0,150	0,183	1	-0,031	-0,042	0,115
SE	-0,186	0,374	0,299	-0,082	0,007	0,236	0,037	0,167	-0,031	1	0,034	0,056
CH	0,228	0,151	-0,133	0,187	0,320	-0,177	0,070	0,114	-0,042	0,034	1	-0,131
UK	0,106	0,160	0,076	0,113	0,152	0,126	-0,009	0,140	0,115	0,056	-0,131	1

Source: Own processing in R

Correlations greater than 0.4 are illustrated in dark gray accents, correlations between 0.1 and 0.4 in light gray accents and negative correlation of less than -0.1 is depicted in light gray accents in bold type.

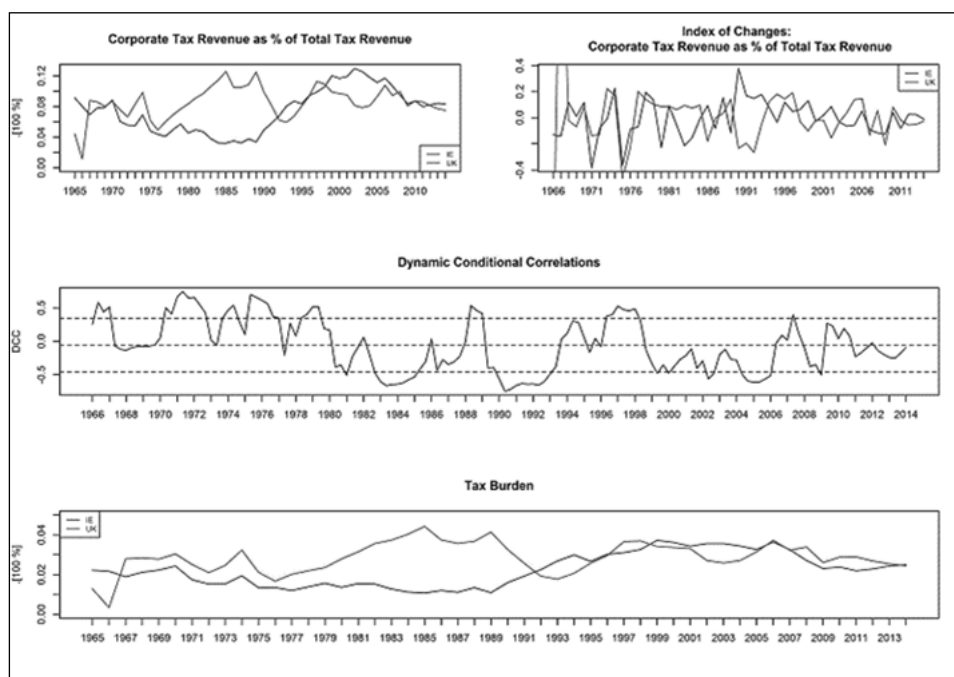
3 Results and Discussion

Classical correlation approach, based on literature research has identified three pairs of countries that form the basis for the implementation of DCC model GARCH (1, 1) to monitor the correlation relationship between countries in time.

United Kingdom and Ireland

The first pair is a geographic cluster United Kingdom and Ireland (Delgado, 2009). The figure illustrates the corporate tax revenue as % of total tax revenues, change ratio of share indicator, DCC between countries and the tax burden indicator - Tax Burden expressed as corporate tax revenues as % of GDP (Figure 3). The DCC charts listed in sections 4.1, 4.2 and 4.3 show DCC average using dashed line in the middle. It usually converges to a Pearson correlation coefficients indicated in Table 2. Dashed lines upper and below show increased and decreased average values by the standard deviation.

Figure 3 Development of Selected Indicators between United Kingdom and Ireland



Source: Own processing in R

Both countries have below-average tax burden in the period from 1965 to 2014 among European countries. This development is influenced by a low level of social security leading to a different tax mix from the other countries. It is therefore appropriate to compare these selected countries.

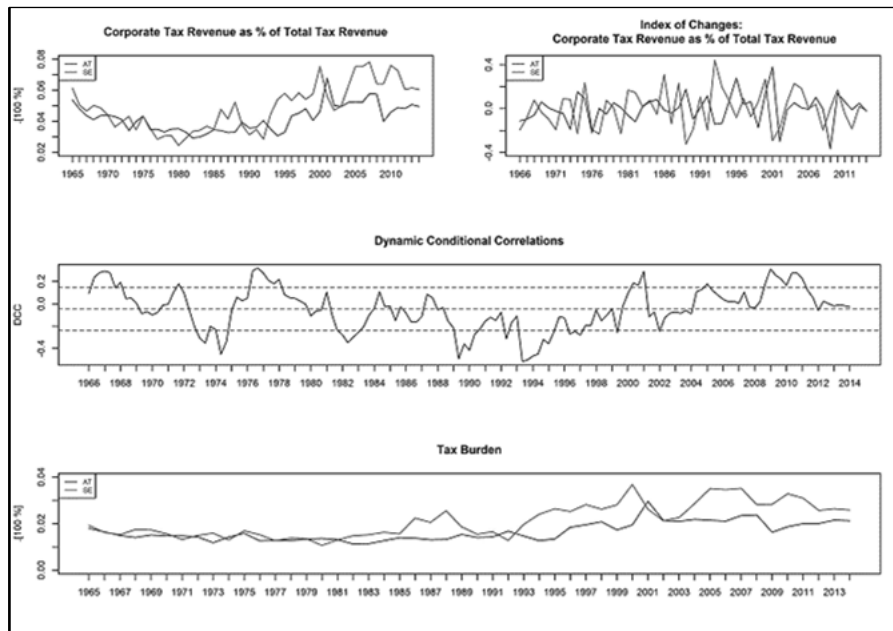
The Irish tax system is based on the pension tax, Pay-Related Social Insurance (PRSI), VAT and excise duties. Taxable profit is determined on the basis of worldwide income, after deduction of business-related expenses. Since 1981 the statutory tax rate has had a declining character from 50% to 12.5% (stable since 2003), in selected types of business 25%. Withholding tax is at 20%. Average Ratio indicator is 7.4%, with above-average values achieved in 1992, when opening the Single Market. The increasing Selected Ratio indicator reflects the positive trend.

UK tax system consists of income taxes, social insurance contributions, property tax, VAT and excise duties. The tax base is determined on the basis of business accounts held on an accruals basis. Tax incentive for small and medium-sized businesses is the possibility to deduct expenditure on research and development in its 175% value. The statutory tax rate has had a declining character since 1981 from 52% to 21%. The decline rates have not expressed significant change. There are three tax rates currently established: 21% for revenues lower than 300 000 GBP, 29.75% on revenues between 300,001 to 1.5 million GBP, 28% for revenues in exceeding 1.5 million GBP. Average Ratio indicator is 8.5%.

Sweden and Austria

Another pair showing DCC are Sweden and Austria, whose correlation for the period 1965-2014 has negative value (see Table 2). The figure illustrates the corporate tax revenue as % of total tax revenues, change ratio of share indicator, DCC between countries and the tax burden indicator - Tax Burden expressed as corporate tax revenues as % of GDP (Figure 4).

Figure 4 Development of Selected Indicators between Sweden and Austria



Source: Own processing in R

Swedish tax system consists of pension taxes, the tax on net assets, property tax and VAT and excise duties. Their system is relatively complicated and was criticized by the OECD in terms of its structure. The statutory tax rate has been declining since 1981 from 53% to 26.3%, and by 2012 to 22%. Tax on capital is at 30%. Average Ratio indicator reached 4.9%, with above-average values achieving since 2004.

Austrian tax system is based on pension tax with a progressive rate, VAT, excise tax and social insurance. The statutory tax rate has been declining since 1981 from 55% to 25%. Since 2009, the tax rate to the profits of corporations was progressive in absolute high. Annual minimum tax amounts to 3 500 EUR for joint-stock companies and 1 750 EUR for limited companies. Withholding tax is at 25%. Average Ratio indicator reached 4.2%, with above-average values achieved since 1996.

As determined by Pearson correlation coefficient, Long-term development trends in selected countries are reaching negative value for the period in question. If tax revenues in one country have declined, the value of income in the other country mostly grew, thus the DCC is during most of the period negative. A similar tax burden development in 1981 is reflected both in index ratios and change ratios. From 1981, in Austria we see systematically lower tax burden than in Sweden. Sweden had among the countries of the Europe an average total tax burden of 10 to 20%. In the '70s, however, Sweden doubled and increased its taxation rate to one of the highest in the world.

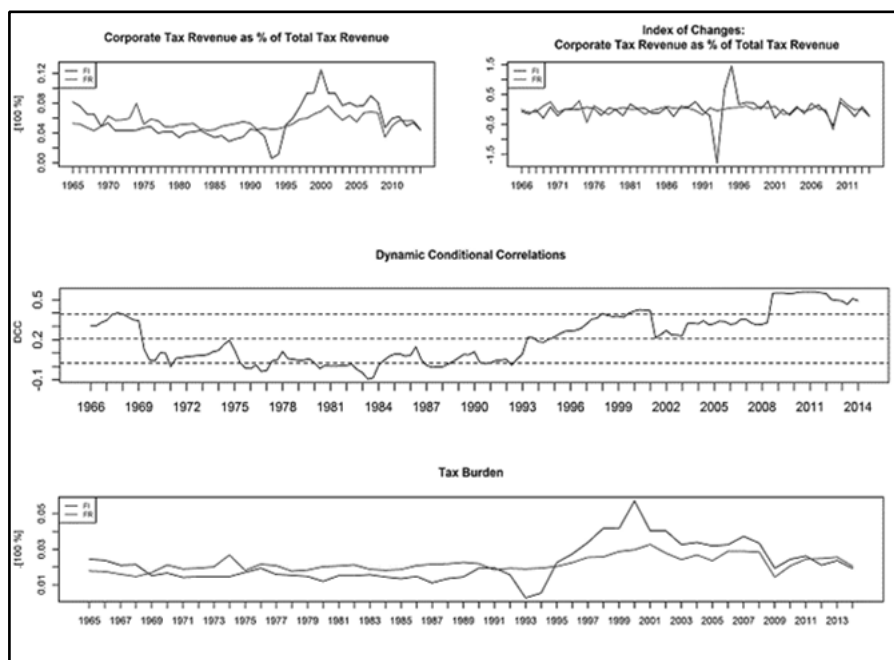
Finland and France

Third pair of countries is Finland and France. The relatively low Pearson correlation coefficient is not indicative of development influenced by transition period of both countries to classical tax system in 2005. The figure illustrates the corporate tax revenue as % of total tax revenues, change ratio of share indicator, DCC between countries and

the tax burden indicator - Tax Burden expressed as corporate tax revenues as % of GDP (Figure 5).

This pair of countries was chosen for interpretation because of the illustrations' suitability for use of DCC method. Although the Pearson correlation coefficient between countries is relatively low (0.199), DCC of chosen countries gain positive values in the second half of the period, significantly higher than the long term average. This means that especially in the current period, the change ratio of corporate tax revenues in total tax revenues for the two countries is developing similarly, what can also be observed in the graph at the top right corner of Figure 5. This joint development in recent period is confirmed by the Tax Burden indicator.

Figure 5 Development of Selected Indicators between Finland and France



Source: Own processing in R

Finnish tax system is formed by income tax, levy tax, social insurance contributions, property tax, VAT and a number of local taxes, which it largely makes complicated and confusing. The statutory tax rate has been declining since 1981 from 43% to 26% in 2011. Currently, the tax rate is at 20%. Ratio indicator and the tax burden are significantly declining since 2001. The corporate tax was adopted in 2005 by adopting a classical system of double taxation. There are no significant changes in the development of indicators. Average Ratio indicator was 5.5%, while recently declining.

French tax system was modified in 2005 by adopting a new finance law and classical tax system. The tax system is thus based on direct taxes, complicated social insurance, VAT and shares. Unlike most European countries, the corporate tax is based on the principle of territoriality. Tax liability on worldwide incomes only applies to passive incomes. The statutory tax rate is decreasing since 1981 from 50% to 33.4%, effective from 2005. Withholding tax is at 25%. There is an obligation to pay minimum tax for companies with a turnover of over 1.5 million EUR in graduated absolute high. Average Ratio indicator was 5.4%, while recently declining.

4 Conclusions

This paper focuses on analysis of corporate taxes between selected pairs of countries in the longer term period by DCC. Findings of the analysis suggest that in the process of fiscal consolidation, which is implemented in the European countries, it is necessary to take into account the specifics of tax systems, relationships and links between tax

revenues and selected variables, and the specificities considering corporation revenues. Impact of tax reforms and determination of variables in the context of the mutual convergences deserves attention through the DCC. An open question remains the relationship between the future development of tax revenues of small open economies and the direction of globalization.

Acknowledgements

This contribution was supported by the Scientific Grant Agency of Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences under the grant No. VEGA 1/0967/15.

References

- Bánociová, A., Jakubíková, E., Mihóková, L. (2012). Quantification of evolution dependencies of the Slovak Economy on the changes in tax structure. *17th International Conference on New Role of Public Finance 2012, Prague*, pp. 10-17.
- Bettendorf, L., Van der Horst, A., de Mooij, R., Vrijburg, H. (2010). Corporate Tax Consolidation and Enhanced Cooperation in the European Union? *Oxford University, Centre for Business Taxation. Working Paper*, No. 1.
- Bucovetsky, S., Wilson, J. (1991). Tax Competition with Two Tax Instruments. *Regional Science and Urban Economics*, No. 21, pp. 333–50.
- Delgado, F.J. (2009). Presión fiscal en la Unión Europea: un análisis de beta, sigma y gamma convergencia. *Revista de Economía Mundial*, No. 22, pp.141-166.
- Devereux, M. P., Li L., Loretz, S. (2014). The Elasticity of Corporate Taxable Income: New Evidence from UK Tax Records. *American Economic Journal: Economic Policy*, No. 6(2).
- Engle, R. Sheppard, K. (2001). Theoretical and Empirical properties of Dynamic Conditional Correlation Multivariate GARCH in NBER Working Paper, No. 8554.
- Goolsbee, A., Maydew, E. L. (2000). Coveting thy neighbor's manufacturing: the dilemma of state income apportionment. *Journal of Public Economics*, Vol. 75, pp. 125-143.
- Gordon, R., Wilson, J. D. (1986). An examination of multijurisdictional corporate income taxation under formula apportionment, *Econometrica*, Vol. 54, No. 6, pp. 1357-1373.
- Kanbur, R., Keen, M. (1993). Jeux sans frontières: Tax Competition and Tax Coordination when Countries Differ in Size. *American Economic Review*. No. 83, pp. 877-892.
- Keuschnigg, C., Loretz, S., Winner, H. (2014). Tax competition and tax coordination in the European Union: A survey. *Working Papers in Economics and Finance*, No.04.
- Mintz, J., Tulkens, H. (1986). Commodity Tax Competition between Members of a Federation: Equilibrium and Efficiency. *Journal of Public Economics*, No. 29, pp. 133-172.
- Musgrave, P. B. (1984). Principles for Dividing the State Corporate Tax Base.
- McLure, Ch. (1984). The State Corporation Income Tax – Issues in Worldwide Unitary Combination. Stanford: Hoover Institution Press Publication.
- Ódor, Ľ, Marčanová, M (2008). Efektívne agregátne daňové zaťaženie v SR. *Výskumná štúdia*. No.4/2008., pp. 33.
- Šoltés, V., Gavurová, B. (2015). Modification of Performance Measurement System in the intentions of Globalization Trends (Modyfikacja systemu pomiaru wyników w intencji trendów globalizacji). *Polish Journal of Management Studies*, Vol. 11, No. 2, p. 160-170.
- Široký, J. (2014). Daně v Evropské unii. Praha: LINDE PRAHA.
- Tanzi, V., Chu, Ke-Young (1997). Income Distribution and High-Quality Growth. New York: MIT Press.

The Characteristics of the Investment through the Airbag Certificates

Peter Mokrička¹

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: mokricka@econ.muni.cz

Abstract: *The aim of this paper is to examine the change in the fundamental investment characteristics, especially a change in the expected return and the risk of investment, provided that the investor will use the selected certificate with a partial guarantee on invested capital instead of a direct investment in the underlying asset. First will be selected an underlying asset. It will be then modeled the development of its value by Monte Carlo simulation. This development also affects the development of the value of alternative investments through a certificate. The certificate will be divided into components from which it is comprised, and these will be priced. Then it will be statistically evaluated and assessed the change in investment characteristics compared with investment characteristics of direct investment in the underlying asset. Finally, discussions will be carried out and formulated recommendations for the retail investor.*

Keywords: return, risk, airbag certificate, investment

JEL codes: G11, G12, G17

1 Introduction

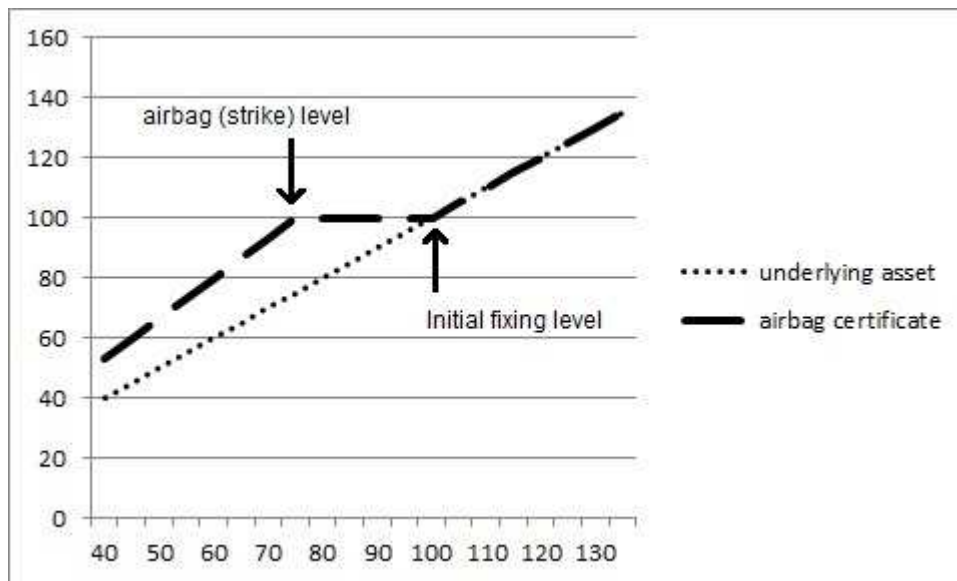
Modern structured products are presented as products that can optimize an investment of retail investor. If the investor is able to define his propensity for risk, his investment horizon and his expectations regarding the development of the value of the underlying asset, then you may find the structured product that is for these characteristics "tailored". This is possible thanks to the construction of these products and the use of derivative components in their structure. Two large groups of structured products consist of investment and leveraged products. This paper will focus on investment products. It is possible find many types of structured products among investment products. For example, Svoboda divides this segment into investment certificates and reverse convertibles and investment certificates further divides according guarantee of invested capital to certificate with full guarantee, certificates with partial guarantee and certificates without any guarantee of invested capital (Svoboda, 2005).

This paper deals with certificates with partial guarantee of investment capital, namely with airbag certificates. Alternatively, such products may be referred to as R-bag certificates, protector certificates, parachute certificates, cushion certificates. Each issuer may use its own marketing label of this product, but the term airbag certificate can be regarded as common standard term, which uses for example Frankfurt Stock Exchange (Boerse Frankfurt, 2016).

The aim of this paper is to examine how to change the basic characteristics of the investment, if investor utilizes airbag certificate instead of direct investments in the underlying assets.

Airbag certificate offers protection against downside losses to a pre- defined minimum level but allows an unlimited participation in upside movements of the underlying (in basic structure, but it is possible to create a product with limited participation or partial participation too). The yield-risk profile of airbag certificate is shown in the figure no. 1.

Figure 1 Yield-risk Profile of Airbag Certificate



Source: Author's construction

This product offers the investor on the redemption date the possibility to participate in a positive performance of the underlying asset. In addition, the investor will always receive an amount equal to the denomination as long as the underlying closes above the strike level on the final fixing date. If, however, the underlying closes below the strike level, the redemption of the product will depend on the value of the underlying. The investor will receive a cash settlement in the settlement currency according to the following formula:

$$CS = D * FFL / S \quad (1)$$

where:

CS – Cash settlement

D – Denomination

FFL – Final fixing level

S – Strike price.

Due to the buffer feature (strike level below initial fixing level) the possible loss of this product will always be smaller than with a direct investment (Leonteq Securities, 2015).

2 Methodology and Data

This paper loosely follows a study by Professor Ulrich Hommel and Professor Dirk Schiereck from European Business School (Hommel, Schiereck, 2004). The aim of this study was to examine the benefits of derivatives financial instruments compared to conventional investments such as stocks and bonds. Airbag certificate can also be considered as a derivative financial instrument, since its basic structure consists of three options. Bluemke present the following components of airbag certificate (Blümke, 2009):

- 1/airbag (strike) level * long zero-strike call
- 1/airbag (strike) level * short in the money call (strike at airbag level)
- 1 * long at the money call

First, will be designed the structure of hypothetically airbag certificate issued on 29 April 2016. Under the given market conditions will be determined the specific characteristics of this product. Based on the historical development of the value of the underlying asset over the past 5 years (data were obtained from the Frankfurt Stock Exchange) will be counted necessary characteristics of direct investment in the underlying asset (the average annual rate of return, volatility, etc.). As an underlying asset was share of Bayer

selected. Next, by using Monte Carlo will be simulated changes in the value of the underlying assets in the following year. This period corresponds approximately to the duration of the airbag certificates issued in practice. Since the development of the underlying shares will be derived also the development of the value of the airbag certificate.

By using Monte Carlo will be simulated changes in the value of the underlying assets according this formula:

$$dP/P = \mu dt + \sigma dz \quad (2)$$

where:

dP – change in the value of an asset

P – value of an asset

μ – average return (11.73%)

dt – the shortest period of time for which the change occurs (1/252)

σ – volatility (26.9%)

dz – random component ($N(0, \sqrt{1/252})$)

Optional components will be priced according to the basic Black Scholes formula, which also uses Hull (Hull, 2009). The results will be compared with each other and will evaluate their investment characteristics. By creating a certificate and evaluation of the investments will be ignored dividend yields.

3 Results and Discussion

According to the structure of the airbag certificate, was created a new airbag certificate. The value of the underlying asset at the date of issuance amounted to 101.40 euros. After the pricing of relevant option components of airbag certificate under the given market conditions was founded that the certificate would be more expensive than a direct investment in the underlying asset. This situation can be solved by issuer in several ways. First, there is the assumption that the underlying asset pays a dividend yield. Investor waives dividend yield in favor of the issuer and the issuer uses it to finance the structure of the certificate. The second way is the possibility that the issue price of the certificate remains higher compared to direct investment in the underlying assets and the cost of certificate structure financing are thus transferred to the investor. A third way is to use the fourth option feature, namely the sold call option. The option premium from this sale is the difference between the price of the underlying asset and the current price of the certificate. The strike price of such options then, however, limits the yield potential of the product, which was previously unbounded. Another option deal with the situation is to limit participation rate of certificate by growth in the value of the underlying asset.

Under the given market conditions (volatility of the underlying asset, low interest rates), the variant of limiting the participation rate would probably not be attractive from a marketing point of view, because for the investigated airbag certificates (with an airbag in the amount of 75% and 60%), the rate of participation in growth were very low (27.58% and 12.02%).

Since one of the preconditions of the research is to neglect dividend yield, was selected a variant with limited yield potential by sale of additional call options.

Thus were formed the airbag certificates, which parameters are summarized in table no. 1.

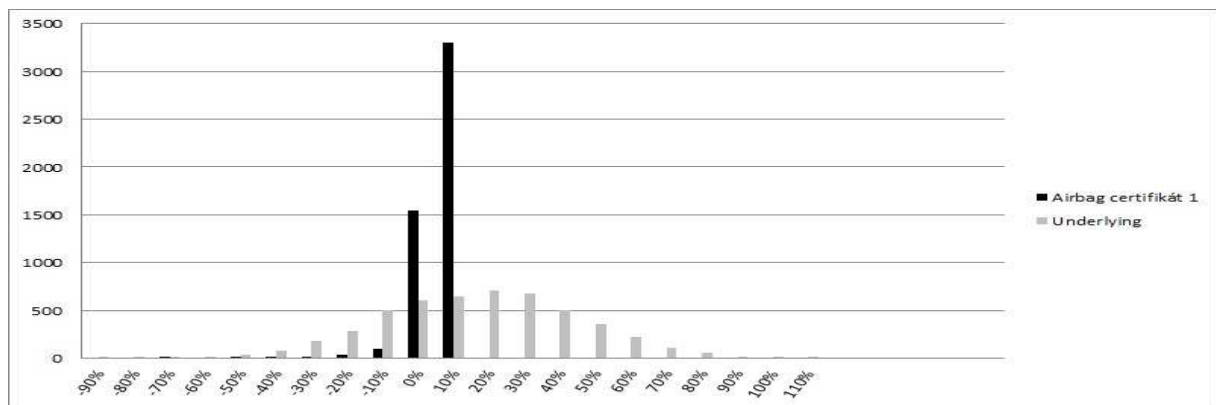
Table 1 Parameters of Created Airbag Certificates

	Airbag certificate 1	Airbag certificate 2
Underlying	Bayer	Bayer
Date of issue	29.4.2016	29.4.2016
Maturity	28.4.2017	28.4.2017
Spot price of the underlying asset	101.40 EUR	101.40 EUR
Issue price	101.40 EUR	101.40 EUR
Strike (airbag) level	75% of spot price	60% of spot price
Participation rate	100%	100%
Cap	109.20132 EUR	104.58978 EUR
Max. return	7.69%	3.15%

Source: Author's construction

It was created histogram of differences of frequencies of yields of both certificates and the underlying asset based on the simulation of 5000 time rows. The frequency of returns of direct investment in underlying asset and frequency of returns of both certificates and their differences are shown in the figures below.

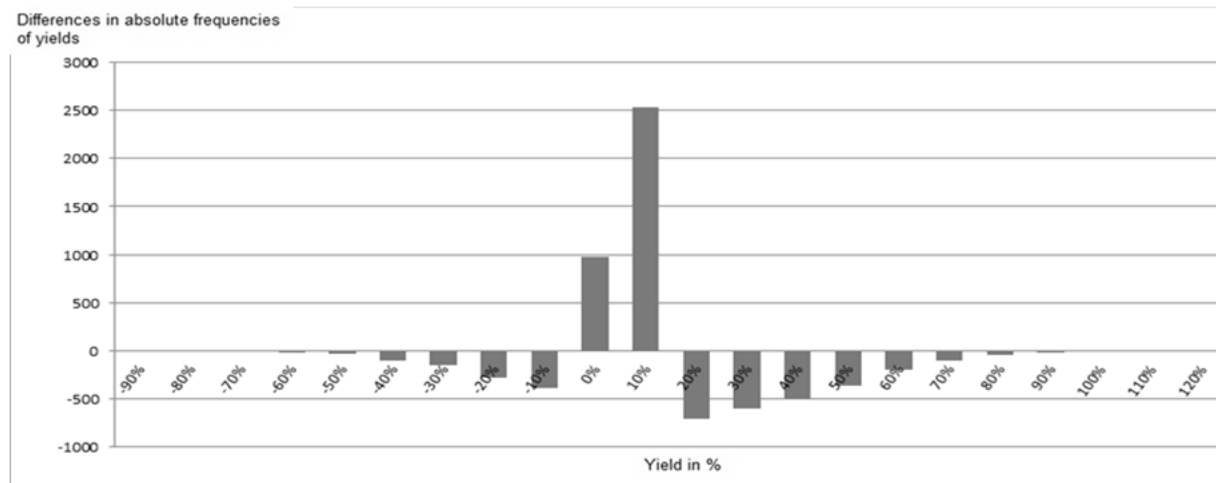
Figure 2 Frequencies of Returns of Airbag Certificate 1 and Returns of Underlying Asset



Source: Author's construction

By including three options to structure of airbag certificate is significantly changed the probability distribution of returns compared to the distribution of returns of underlying asset. Differences in absolute frequencies of yields are shown in figure 3.

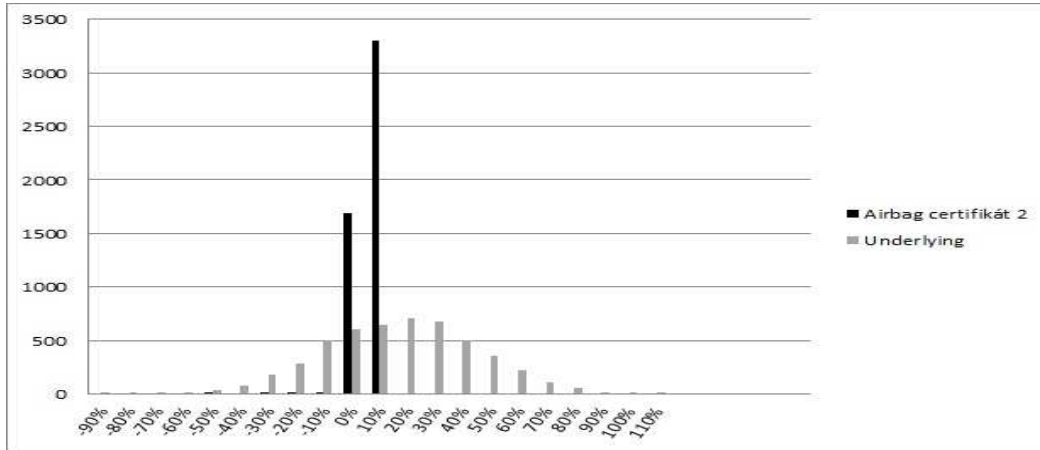
Figure 3 Differences in the Frequency of Returns (Airbag Certificate 1 and Underlying)



Source: Author's construction

Airbag certificate 2 is considered as more conservative investment. It offers protection against the loss of value of invested capital to a level 60% of the initial value of the underlying asset (the value of underlying asset at the date of certificate issue). Probability distribution of yield frequencies is very similar to a certificate airbag 1, as shown by figures 3 and 4 below.

Figure 4 Frequencies of Returns of Airbag Certificate 2 and Returns of Underlying Asset



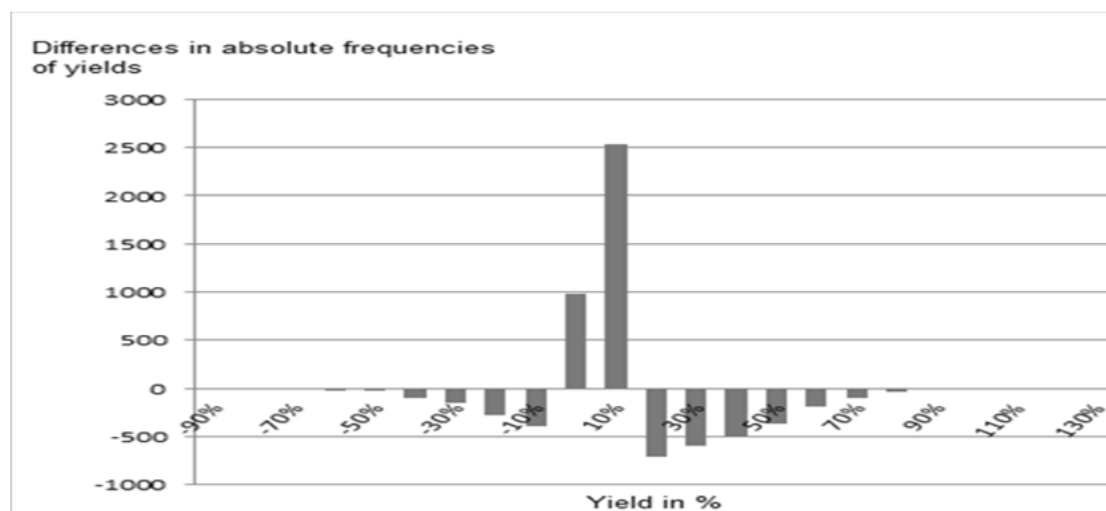
Source: Author's construction

With regard to a maximum yield of both examined certificates falls within the interval 0 - 10%, by both certificates were achieved return in this range in 3226 cases out of 5000 cases examined.

The difference can be observed rather assuming that the underlying asset has lost their value. Due to the higher level of investment protection by airbag certificate no. 2 it was reached zero appreciation of investment in 1751 cases compared to 1607 cases by airbag certificate no. 1.

Loss of more than 20% was for example achieved by airbag certificate no. 2 in only two cases, whereas by airbag certificate 1 in 29 cases. Figure 5 demonstrates the differences in the absolute frequency of the underlying asset yields and of the airbag certificate no. 2 yields.

Figure 5 Differences in the Frequency of Returns (Airbag Certificate 2 and Underlying)



Source: Author's construction

Table no. 2 below provides information on the characteristics of compared investments.

Table 2 The Characteristics of the Examined Investments

	Bayer	Airbag certificate 1	Airbag certificate 2
Expected (average) yield	10.64%	3.53%	1.797%
Standard deviation	27.21%	6.04%	2.04%
VaR (5 %)	34%	6%	2%
Median of yields	10.14%	7.35%	3.04%
Skewness	-0.21	-3.23	-5.83
Kurtosis	-1.02	17.20	77.83

Source: Author's construction

4 Conclusions

Airbag certificates are structured products which offer a modified yield-risk profile of investment (compared to direct investment in underlying asset) to retail investors. Based on the research it was found that under current market conditions it is possible to issue an airbag certificate only on condition that his underlying asset brings dividend yields, which can be used to finance the product structure. Another option is to limit yield potential of the investment (either lower participation rate in growth of the value of underlying, or selling a call option and thus introducing a parameter cap). This article was working with airbag certificates with parameter cap. Upon reaching cap level, investor achieves maximum yield, which cannot be exceeded. Researched airbag certificates offer an investment alternative with a partial guarantee on invested capital. If we consider the market risk, airbag certificates are less risky products than direct investment in underlying (see standard deviation and Value at Risk indicator in table no. 2). Lower risk, however, is compensated by lower expected return and limiting yield potential above the parameter cap. On the other side airbag certificates evince (compared to direct investment in the underlying asset) higher negative skewness and higher positive kurtosis, which means that by using of the certificates it is a higher probability of achieving revenue over the expected average yield and that the majority of yields is located close to the mean value. The median yield achieved the maximum possible yield of certificates. When changing market conditions, it would be interesting to examine how changes the characteristics of the investment using of airbag certificates without limitation of maximum yield.

References

- Blümke, A. (2009). *How to invest in structured products*, 1st ed. Chichester: John Wiley & Sons Ltd.
- Börse Frankfurt (2016). *ZertifikateBörse*. Retrieved from: <http://www.zertifikate.boerse-frankfurt.de>.
- Hommel, U., Schiereck, D. (2004). *Der Nutzen derivativer Finanzprodukte für Privatanleger*. 1st ed. Oestrich-Winkel: European Business School.
- Hull, J. *Optionen, Futures und andere Derivate*. 6th ed. München: Pearson Studium.
- Leonteq Securities (2015). *Termsheet of 22. 5. 2015*. Retrieved from: <https://services.payoff.ch/api/products/2863340/documents/375108/download>.
- Svoboda, M. (2005). *Jak ovládnout finanční trhy*, 1st ed. Brno: CP Books.

Friendship of Stock Indices

László Nagy¹, Mihály Ormos¹

¹ Budapest University of Technology and Economics
Faculty of Economic and Social Sciences, Department of Finance
Magyar tudósok körútja 2, H-1117 Budapest, Hungary
E-mail: nagyl@finance.bme.hu and ormos@finance.bme.hu

Abstract: *The aim of this study is to cluster different stock indices based on historical time series data. The current research shows that tail events have minor effect on the equity index structure. It also turns out that major part of the total variance can be explained by clusters. In addition, cluster wise regressions are reliable, hence CAPM with clusters gives real information about risk and reward.*

Keywords: cluster analysis, equity index networks, machine learning

JEL codes: G11, G12, C53

1 Introduction

The main goal of this study is to provide quantitative techniques to discover the equity index network structure.

The baseline concept follows the CAPM, in which similarity measures are calculated from correlations between logarithmic returns (Yalamova 2009). The anomalies of CAPM indicate a two dimensional mean-beta framework that gives only a simplified picture of the real market structure. The proposed non-linear similarity kernels are able to deal with higher order terms, hence clusters would be more accurate.

We show that normalized Laplacian based spectral clustering techniques can be used for recognizing well separated clusters in the global financial markets. Analyzing the correlation structure of stock indices turns out clusters are homogenously connected with each other, hence the normalized Newman-Girvan modularity matrix brings better clustering results (Bolla 2013).

2 Methodology and Data

The current study presents detailed analysis of 59 stock indices. We apply USD denominated stock splits and dividends adjusted daily closing prices between 26/9/1990 and 21/9/2015. Data is provided by Thomson Reuters.

In order to underline the highly different characteristics of individual stock indices we present some monthly descriptive statistics.

Table 1 Descriptive Statistics of Monthly Returns

Index	Mean	Variance	Skewness
.CSI300	0.018	0.056	-0.336
.XU100	0	0.026	-0.809
.DJI	0.012	0.009	-0.819
.UAX	-0.034	0.037	-0.721
.WORLD	0.004	0.002	-1.889

Source: Own computation

Notes: Table 1 shows the descriptive statistics of the monthly returns, where CSI300, XU100, DJI, UAX, WORLD represent the Shanghai Composite 300, Brose Istanbul 100, Dow Jones, Ukraine UX index and MSCI World index respectively.

Our selection criterion for covered stock indices is based on their classification in IMF Economic Outlook 2015 and the MSCI WORLD Index composition in 2015. In our analysis we allocate approximately the same weight to each region. Although, the number of

countries is not equal in each region and the market capitalization differs as well, we rebalance the sample by choosing approximately ten indices from each IMF group.

We are also interested in the role of well diversified indices e.g. MSCI WORLD and EURO STOXX600, hence we put them into the analysis.

Spectral clustering

In the 20th century, the appearance of large, complex data sets brought new challenges to develop methods which can be used to understand complicated structures. Spectral clustering techniques provide optimal, lower dimensional representation of multidimensional data sets. The idea is to represent the data structure as a weighted graph, and cut the graph along the different clusters. This approach leads to penalized cut optimization problems. Linear algebra and cluster analysis give powerful methods to find the optimal representations and minimized cuts.

Similarity matrix

If we would like to cluster different items, first the measurement of similarity has to be decided. In this study similarity of two stock indices (i, j) will be denoted by $W_{i,j}$. The goal is to penal differences and reward similarities. Logarithmic returns are easy to handle and keep all the information about the price processes.

$$r_i(t) = \ln\left(\frac{S_i(t)}{S_i(t-1)}\right) \quad (1)$$

where $S_i(t)$ represents the price of index i . The current study analyses multiple similarity approaches.

First, the Markowitz based squared correlation is considered as a similarity metric.

$$W_{i,j} = \text{Corr}^2(r_i, r_j) \quad (2)$$

We argue this approach because logarithmic returns are not normally distributed, hence non-linear effects also could be important. However; correlation is linear, hence squared correlation similarities take into account only linear dependences.

The problem of higher-order moments can easily be solved by using symmetric and positive-definite kernel functions. The idea comes from the functional analysis. Data can be transformed into a reproducing kernel Hilbert space (RKHS) where applying the usual statistics provide the same outcomes which can be reached by using non-linear statistics in the original Hilbert space. In practice, the Gaussian-kernel is widely used (Leibon et al. 2008).

$$W_{i,j} = \exp(-\|r_i - r_j\|^2) \quad (3)$$

We notice that, if the sets of the relevant information and sensitivities are similar, then the relative entropy of the distribution of return processes is small. Otherwise, we can say stock indices are sensitive to different sets of information in a different manner (Ormos and Zibriczky 2014). This means similarity function has to be monotonically decreasing in symmetric Kullback-Leibler distance, thus we can construct a similarity measure such that:

$$W_{i,j} = \frac{1}{1 + [KL(p(r_i) \| p(r_j)) + KL(p(r_j) \| p(r_i))]/2} \quad (4)$$

where $p(r_i)$ denotes the probability distribution function of logarithmic returns of index i and $KL(p(r_i) \| p(r_j)) \stackrel{\text{def}}{=} \sum_x p(r_i = x) \ln\left(\frac{p(r_i = x)}{p(r_j = x)}\right)$ is the relative entropy of indices i and j .

Another perspective says that large deviations are riskier, hence similarities should be defined with tail distributions. We calculate the differences of return series and count the number of at least two standard deviation peaks. The logic implies indices are similar if their price processes jump together. Similarity function has to be decreasing in the number of large deviations, hence we propose the following metric;

$$W_{i,j} = \frac{1}{1 + \sum_{t=1}^T \delta(|z_i(t) - z_j(t)| > 2)} \quad (5)$$

where z_i represents the normalized return of index i .

In the current study we compare each approaches.

Normalized modularity

The equity index structure is strongly connected. We can not say that events in Africa do not have any kind of effects on European markets, hence we have to find methods which can be used to cluster dense graphs.

Let $G(V_{N \times 1}, W_{N \times N})$ be a weighted graph, where V denotes the set of vertices and W represents the weights of the edges. A k -partition of graph $G(V, W)$ can be defined as the partition of vertices such that $\cup_{a=1}^k V_a = V$ and $V_i \cap V_j = \emptyset \forall i, j \in \{1, \dots, k\}$.

The $W_{i,j}$ value represents the strength of the connection between nodes (i, j) . If we assume that nodes are independently connected, then the guess of weight $W_{i,j}$ will be the product of the average connection strength of i and j . The average connection strength d_i and d_j are given by W ,

$$d_i = \frac{1}{N} \sum_{u=1}^N W_{i,u}.$$

Thus, $W_{i,j} - d_i d_j$ captures the information of the network structure (Bolla 2011), hence if we would like to maximize the sum of information in each cluster, then we get:

$$\max_{P_k \in \mathcal{P}_k} \sum_{a=1}^k \sum_{i,j \in V_a} (W_{i,j} - d_i d_j) \quad (6)$$

where P_k stands for specific k -partition in \mathcal{P}_k , which represents the set of all possible k -partitions. Let $M := W - dd^T$ denotes the modularity matrix of $G(V, W)$. If we would like to get clusters with similar volumes then we have to add some penalty to Equation (6) hence we get the normalized Newman-Girvan cut.

$$\max_{P_k \in \mathcal{P}_k} \sum_{a=1}^k \frac{1}{\text{Vol}(V_a)} \sum_{i,j \in V_a} (W_{i,j} - d_i d_j) \quad (7)$$

where $\text{Vol}(V_a) = \sum_{u \in V_a} d_u$. Let us define the so called normalized modularity matrix;

$$M_D := D^{-1/2} M D^{-1/2} \quad (8)$$

If we would like to cluster a weighted graph $G(V, W)$ then eigenvectors of its modularity matrix (M) and normalized modularity matrices (M_D) can be used. Modularity and normalized modularity matrices are symmetric, and 0 is always in the spectrum of M_D .

$$M_D = \sum_{i=1}^N \lambda_i u_i u_i^T = \sum_{i=1}^{N-1} \lambda_i u_i u_i^T \quad (8.1)$$

where $1 > \lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_N \geq -1$ denote the eigenvalues of M_D .

If we would like to maximize Equation (7) we can use the k -means clustering algorithm on the optimal k -dimensional representation of vertices,

$$\left(D^{-\frac{1}{2}} u_1, \dots, D^{-\frac{1}{2}} u_k \right)^T. \quad (8.2)$$

where u_1, \dots, u_k denote the corresponding eigenvectors of $|\lambda_1(M_D)| \geq \dots \geq |\lambda_k(M_D)|$. Moreover, if the normalized modularity matrix has large positive eigenvalues, then the graph has well separated clusters, otherwise clusters are strongly connected. Another natural approach is to minimize the normalized cut (Luxburg 2007)

$$\min_{P_k \in \mathcal{P}_k} \sum_{a=1}^{k-1} \sum_{b=a+1}^k \left(\frac{1}{\text{Vol}(V_a)} + \frac{1}{\text{Vol}(V_b)} \right) W_{i,j} \quad (9)$$

The optimization problem is similar to Equation (7). Instead of the normalized-modularity matrix the normalized Laplace matrix gives the solution (Shi and Malik 2000).

$$L_D := D^{-\frac{1}{2}} (D - W) D^{-\frac{1}{2}} \quad (10)$$

This technique works when clusters are well separated otherwise normalized modularity gives better figures.

Algorithm

In empirical analysis, the following steps are the backbone of the calculation (Filippone et al. 2007): (1) Constructing similarity matrix (W), (2) Calculating normalized modularity matrix (M_D), (3) Based on the spectral gap, determine the number of clusters and optimal k-dimensional representation, (4) Apply k-means clustering

Assessment of clustering methods

Relevance of different clustering techniques can be tested in multiple ways. The most common metrics follows a regression based logic. In this framework we suppose that variance has two components, the within and the between cluster components. Therefore, the explanatory power of given clusters can be described as

$$\frac{\sum_{j=1}^k \sum_{i=1}^{N_i} (X_{i,j} - \bar{X})^2 - \sum_{i=1}^k \sum_{j=1}^{N_i} (X_{i,j} - \bar{X}_i)^2}{\sum_{i,j=1}^{N_i N_j} (X_{i,j} - \bar{X})^2} \tag{11}$$

where k represents the number of clusters, N_i shows the size of clusters and \bar{X} , \bar{X}_i stands for the total and cluster wise average (Zhao 2015). The formula penalizes dispersions within clusters, hence dense clusters would give number close to 1. Moreover, calculating the ratios with different number of clusters highlights the optimal number of clusters as well.

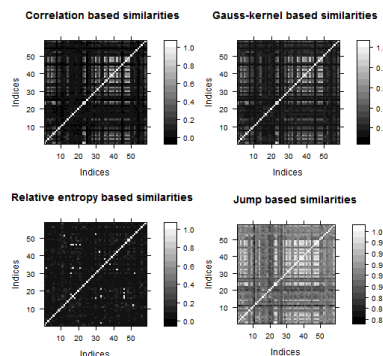
3 Results and Discussion

Current study presents a broad analysis of the equity index network structure. Logarithmic returns of 59 stock indices are clustered in different ways. The investigation reveals stock indices are homogenously connected and large price movements have limited effect on the network structure.

Similarity metrics

Defining similarity is a key aspect in clustering. In general it is hardly possible to find an optimal kernel, but different approaches can be tested and compared on specific data sets. This study analysis correlation, jump, entropy and Gaussian based similarity kernels. Calculating the similarity matrices we expect strongly connected indices have coefficients close to one, whereas loosely connected close to zero.

Figure 1 Level Pots of Daily Similarity Matrices



Source: Own computation

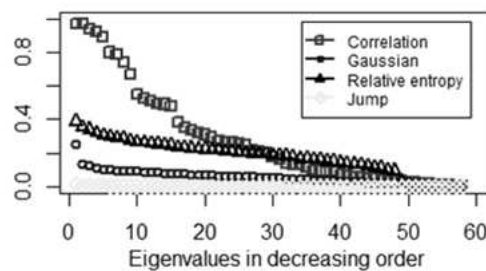
Different similarity measures imply similar patterns which are in line with our a priori intuition. However, the spectrum of normalized Laplace and normalized modularity matrices help us to find the most adequate kernel function, because the wider the spectral gap the better the clustering property. This means, we have to find similarity metrics which implies large gaps in the spectrum of normalized Laplacian and modularity matrix.

Empirical evidences (Figure 2. and Figure 3.) show relative entropy and Gaussian-kernel also can be used to cluster the stock index network, while correlation and jump based similarities are not promising.

Correlation based similarity approach implies roughly uniform eigenvalue density on $[0,1]$. This means, a lot of gaps appear in the spectrum, hence we could not say anything about the optimal number of clusters. Moreover, lower dimensional representations will not contain all the information, because of some of the large eigenvalues are not considered. These hurdles highlight the problems of squared correlation similarity matrices.

Counting at least two standard deviation jumps results small number of eigenvalues with large multiplicity. Therefore, lower dimension representation can not be used to cluster the data points. Accordingly, jumps are random that do not say much about the network structure.

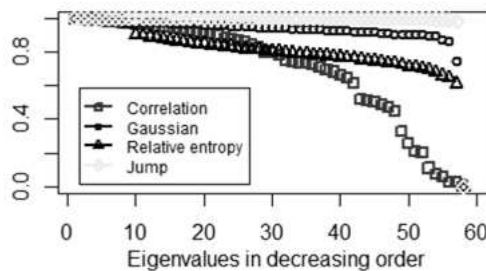
Figure 2 Eigenvalues of Normalized Modularity Matrix in Decreasing Order



Source: Own computation

Gaussian and relative entropy based similarity matrices imply auspicious figures. Especially in normalized modularity case, we get large well separated eigenvalues, which are necessary to transform the data into a lower dimensional space.

Figure 3 Eigenvalues of Normalized Laplacian Matrix in Decreasing Order



Source: Own computation

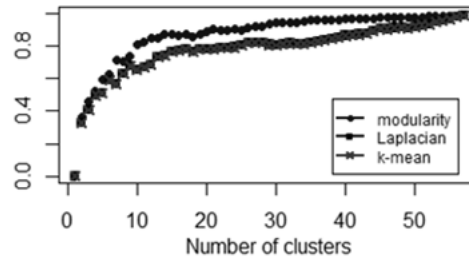
Notice that, these results are in line with Figure 1. Because, normalized Laplacian minimize the normalized cut (Equation (9)), which is small if and only if clusters are loosely connected. Whereas, modularity approach maximize the information of clustering, hence it can be used in homogeneous network structure as well.

Investigating the spectrums, especially the positions of spectral gaps, gives some guidance on the optimal number of clusters. Considering the previous results the spectrums of Gaussian and relative entropy based normalized modularity matrices are suitable. Figure 2. shows indices could be put into 2, 3 or 5 clusters.

We apply the elbow method to identify the optimal number of clusters. This approach is rather computation intensive, because of the percentage of variance explained as a function of clusters has to be estimated (Eq. 11); thus, the whole process has to be repeated many times. However, in our case we have 59 stock indices, hence the elbow

method can be used as well. Figure 5. and 7. give evidences for using 2, 3, 4 or 5 clusters.

Figure 4 Explained Percentage Variance of Gaussian-kernel Based Clusters of Representations



Source: Own computation

The Figure 2 and 3 show Gaussian-kernel implies the clearest spectrum property. Relative entropy based kernel also gives usable results. Whereas, jump and correlation based approaches are ineffective.

Comparing normalized modularity and Laplacian

We propose to use an accuracy ratio (Engelmann et al. 2003) based measure to compare the efficiency of different clustering techniques.

Notice that, if items are put into clusters randomly, then variance explanation function (Eq 11) would be linear in the number of different clusters. This observation lets us to use rating system based techniques. Calculating the area between the variance explanation function of the random and the different spectral clustering methods generates an appropriate statistic.

Considering this metric (Zhao 2015), it can be seen, Gaussian-kernel over performs relative entropy based approach, because in each case its variance explanation function is steeper.

Henceforth, Gaussian-kernel based normalized modularity matrix is used.

Equity index network structure

Spectral gap (Figure 2) and variance analyses (Figure 4) imply equity indices can be studied by using 2, 3 and 5 clusters.

The explanatory power of two clusters is 38%. This means roughly one-third of the total variance comes from the sample heterogeneity.

If we increase the number of clusters and investigate the three cluster case we get similar explanatory power. However, spectral gap appears between the third and fourth eigenvalues (Figure 2.), so theoretically three cluster is proposed.

The next gap is between the fifth and sixth eigenvalues. Explanation power of five clusters is 52%. This means, half of the total variance of data can be explained by five clusters.

Additional clusters have little explanatory power which is in line with spectrum properties.

In practice, mean-variance plots can be used to represent risks and rewards. Intuitively, indices with similar risk and return can thought to be similar. This approach applies k-means algorithm to cluster the two dimensional (mean, standard deviation) representation of logarithmic returns.

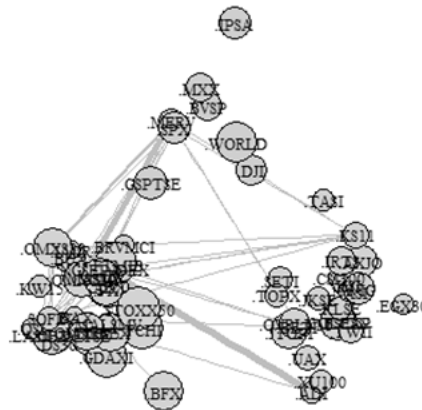
We have seen this naïve method does not give optimal cuts. However; if we calculate Gaussian similarities and normalized modularity matrix based representation, then we

get clusters with higher variance explanatory power. We have seen stock indices can be put into 2, 3 or 5 clusters.

In Figure 6. we can see clusters which are optimizing the modularity cut are concave in mean-variance framework. If we have a closer look at the indices in Table 2. we could say qualitative approach also works, because east-west geographical clustering would imply almost similar results.

Putting the indices into three different clusters gives a complicated figure, but we could still say first cluster is dominated by European countries, second by American and third is a mixture of indices from the rest of the world.

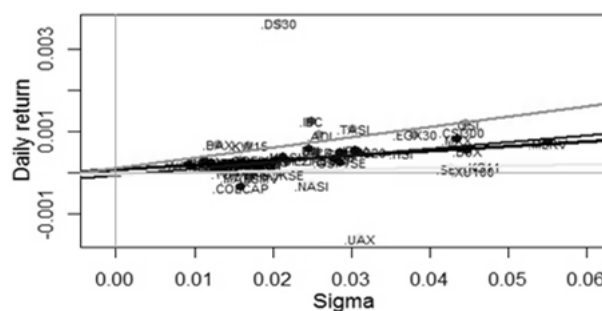
Figure 5 Three Gaussian-kernel Based Normalized Modularity Clusters



Source: Own computation

Calculating five different clusters help us to have a deeper understanding on the network. The first surprising result is despite of the penalty of different cluster sizes Dhaka stock exchange (.DS30) is separated into cluster three. In addition, cluster four contains only two African and two American indices. Another interesting result is the first cluster. Arabian indices except Morocco are put into this cluster. Cluster two contains developed while cluster five contains emerging markets.

Figure 6 Five Gaussian-kernel Based Normalized Modularity Clusters



Source: Own computation

If we would like to understand the connection between risk and reward we can use linear regression. However, without clustering the sample regression does not give reliable figures (Table 3). In order to clear this hurdle we calculate cluster wise regressions.

We suppose that stock markets in different clusters behave differently. Therefore, the relationship between risk and returns can also differ. This can help us to analyze the connections between mean and variance. Figure 6 and Table 3 show higher standard deviations implies higher returns, because of regression lines slope upwards. Besides, it also turns out connections between returns and standard deviations are strong in Arabian and developed market cases. On the other hand, emerging markets show different

statistics. Index returns in the fifth cluster are not linear in standard deviation, hence emerging market returns can not be estimated in the Markowitz framework.

Table 3 Descriptive Statistics of Daily Linear Regressions

	p-value of intercept	p-value of s.d.	R²
Total Sample	0.62	0.12	0.05
First cluster	0.62	0.02	0.68
Second cluster	0.29	0.00	0.59
Fifth cluster	0.93	0.71	0.01

Source: Own computation

Notes: This table shows the p statistics and R^2 values of daily linear regressions. Returns are regressed on standard deviations. Calculation is done for total, only the first, second and fifth clusters.

4 Conclusions

Spectral clustering techniques can be used to discover the equity index structure. On the one hand, clusters help us to overcome the hardship of heterogeneity. We have seen, considerable part of the total variance can be explained by them. On the other hand various similarity approaches have unveiled tail events have little effect on the dense network structure. It has also turned out that Gaussian-kernel based clusters are in line with qualitative categorizations. In addition, cluster wise linear regressions give significant results. All of these imply non-linear effects can be eliminated by spectral clustering, thus regular mean-variance representation gives cluster wise reliable figures. From policy point of view our paper shows that naïve diversification does not generate risk reduction; however a cluster wise index picking can help increasing the diversification effect.

Acknowledgements

Mihály Ormos acknowledges the support by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences. László Nagy acknowledges the support by the Pallas Athéné Domus Scientiae Foundation.

References

- Engelmann, B., Hayden, E., Tasche, D. (2003). Measuring the Discriminative Power of Rating Systems. *Banking and Financial Supervision*, vol. 01.
- Leibon, G., Pauls, S. D, Rockmore, D., Savell, R. (2008). Topological Structures in the Equities Market Network. *PNAS*, Vol. 105, pp. 20589-20594.
- Shi, J., Malik, J. (2000). Normalized cuts and image segmentation. *Pattern Analysis and Machine Intelligence*. IEEE, Transactions, pp. 888-905.
- Bolla, M. (2011). Penalized version of Newman-Girvan modularity and their relation to normalized cuts and k-means clustering. *Physical review*, vol. 84.
- Bolla, M. (2013). Spectral Clustering and Biclustering. *Learning Large Graphs and Contingency Tables*. Wiley.
- Filippone, M., Camastra, F., Masulli, F., Rovetta, S. (2007). A survey of kernel and spectral methods for clustering. *Pattern recognition*, vol. 41, pp. 176-190.
- Ormos, M., Zibriczky, D. (2014). Entropy-Based Financial Asset Pricing. *PLoS ONE*, vol. 9.
- Yalamova, R. (2009). Correlations in Financial Time Series during Extreme Events. Spectral Clustering and Partition Decoupling Method. *Proc. of World Congress on Eng.*
- Luxburg, U.von. (2007). Tutorial on Spectral Clustering. *Statistics and Computing*, vol. 17, pp. 395-416.
- Zhao, Y. (2015). R and Data Mining: Examples and Case Study. *Elsevier*.

CCTB and CCCTB Implementation and its Impact on the Tax Bases Allocated in the Slovak Republic

Danuše Nerudová¹, Veronika Solilová²

Mendel University in Brno
Faculty of Business and Economics, Department of Accounting and Taxes
Zemědělská 1, 613 00 Brno, Czech Republic

¹ E-mail: danuse.nerudova@mendelu.cz

² E-mail: veronika.solilova@mendelu.cz

Abstract: *On 17th June 2015 the European Commission has introduced an action plan for fairer taxation of corporates within the EU. Very important part of the action plan represents the re-launching of CCCTB in the EU through two steps. Firstly, only common rules for tax base construction (CCTB) should be introduced with the possibility of cross-border loss-offsetting instead of consolidation regime. Common consolidated corporate tax base should be introduced only in the second step. The paper deals with the impacts of both implementation stages on the tax bases allocated in the Slovak Republic. The research shows that in case of cross-border loss offsetting, Slovak Republic would be facing the decrease of the allocated corporate tax bases by 0.27 %. On the other hand, the implementation of full CCCTB would result into the increase of the corporate tax bases allocated in the Slovak Republic by 3.02 %.*

Keywords: CCCTB, CCTB, allocation, corporate tax base, European Union

JEL codes: H26, G38, F38, K34

1 Introduction

Current situation on the Internal Market, where companies are facing 28 different corporate taxation systems does not represent advantage for the companies any longer. Not only the loopholes between the national corporate taxation systems allows the multinational groups to use the technics of aggressive tax planning in order to decrease the tax bases in high tax jurisdictions, but on the other hand are increasing the compliance costs of taxation for both, tax administration and companies themselves. The complexity of current taxation systems hinders the expansion of small and medium sized enterprises on the foreign markets. Due to this fact, European Commission had always the effort to structurally harmonize the area of corporate taxation, which was not very successful so far.

The efforts to establish common rules for tax base construction goes back to 2001, when the debate on the Internal Market without obstacles was initiated. In this connection, the European Commission has established a working group on common consolidated corporate tax base (hereinafter as CCCTB). This working group has come up after more than 7 years of work with the CCCTB draft directive on 16th March 2011, comprising the basic framework of CCCTB functioning in the European Union.

It is necessary to mention, that in the time of CCCTB draft directive was published, the system was perceived by Member States as the tool for harmonization of corporate taxation and therefore giving up of national sovereignty. As a result of this nine Member States were against the proposal. However, base erosion and profit shifting which majority of Member States are currently facing led European Commission to relaunch the project again.

On 17th June 2015, the European Commission has published the Action plan for fair and efficient corporate tax systems in the European Union, in which the CCCTB is understood as a tool for fight against tax evasion and tax fraud. In this light the Commission suggest to implement the system in two steps. Firstly, to implement only the common rules for corporate tax base construction and only in second step full CCCTB. Having in mind that the most attractive part of the project represented by the consolidation scheme is

missing in the first step, Commission is suggesting as temporary solution the introduction of possibility of cross-border loss offsetting.

The aim of the paper is to simulate the impacts of introduction of cross-border loss offsetting (i.e. first implementation step) and the impacts of full CCCTB implementation on the tax bases allocated in Slovak Republic. The paper presents the partial results of the research within the FairTax project grant agreement no. 649439.

Theoretical Background

The first study dealing with the impact of CCCTB implementation on the tax bases allocated in individual Member States was the study performed by (Fuest et al., 2007). The results showed that the possibility of loss-offsetting within the group would lead to the decrease in the overall European corporate tax base. According to the study, biggest decreases would occur in Netherlands and Ireland. On the other hand, in situation of implementation of allocation formula, the decrease in allocated tax bases would be facing smaller countries and countries with advantageous taxation regimes.

Another research performed by (Devereux & Loretz, 2007) indicated that the overall tax revenues in the European Union could decrease by 1 % after CCCTB implementation. Some of the member states as Hungary, Czech Republic or Slovak Republic might gain additional tax revenues as a results of tax sharing mechanism in the form of allocation formula.

Further, the situation after CCCTB implementation was researched by (Van der Horst et al., 2007). According to the author the results of the implementation are dependent on the rate of difference between the corporate tax rates. He concludes that countries with the broad corporate tax bases might benefit from the system, while countries with narrow corporate tax base might lose.

The study by (Oestreicher & Koch, 2007) indicates that in case of obligatory CCCTB implementation in the EU the decrease of overall corporate tax revenues by 4.45 %, and in case of voluntary implementation by 4.57%.

(Cline et al., 2010) concludes that in case of obligatory implementation of CCCTB, the overall corporate tax revenues might increase by 0.2%. However, in case of individual Member States it could result in to decrease by 8.4% in case of Denmark, or to increase by 6% in case of France. Voluntary implementation of CCCTB would according to authors might lead to the decrease in overall corporate tax revenues by 0.6 % and concurrently to the decrease in average corporate tax base by 2.2%.

Detailed research of the possible implementation scenarios and their impact on the tax revenues of the Czech Republic has been researched by (Nerudová & Solilová, 2015a), (Nerudová & Solilová, 2015b) and (Solilová & Nerudová, 2016). The results show that in case of obligatory implementation, the Czech Republic would additionally gain 3.39 % of corporate tax revenue in comparison with current situation. However, in situation of cross-border loss offsetting, the Czech Republic would lose 0.78 % of current corporate tax revenues.

The impact of CCCTB implementation on the Slovak Republic has already been researched by (Domonkos et al., 2013). Based on the sample of 11 biggest companies in the Slovak Republic the authors conclude that the implementation of CCCTB would lead to a 31.9 % decrease in tax revenues for the Slovak Republic in 2009 and to drop by 14.6 % in 2010.

2 Methodology and Data

The research is based on the company data gained from Amadeus database provided by Bureau van Dijk. The update no. 2552 from December 2015 was used in order to gain the relevant data. The empirical analysis is based on similar assumptions and methodology as used by (Nerudová & Solilová, 2014). With respect to the fact that the aim of the paper is to analyze the impacts on the corporate tax bases allocated in the

Slovak Republic, it was necessary to gain the data of companies, which are fulfilling two-layer cumulative condition comprised in CCCTB directive proposal (i.e. at least 50.01 % of ownership rights and more than 75 % of voting rights) conditioning the subject to consolidation and group taxation scheme.

Following, the dataset of companies was divided into two groups. First group comprised 52 689 entities – Slovak parent companies and Slovak subsidiaries, while the second comprised 728 entities - EU subsidiaries with parent companies in the Slovak Republic. Consequently, we have applied four possible models of group taxation regimes, which are currently applied within the European Union (i.e. full consolidation, pooling, intra-group loss transfer and no group taxation scheme applied in the country) according to the country of the residency of parent company in the group in order to map the current situation in corporate tax base allocation in the Slovak Republic.

Further, in order to apply below stated allocation formula, the information on different financial indicators had to be gained – i.e. information on total sales, payroll, number of employees and total assets.

$$shareX = \left(\frac{1}{3} \frac{S^X}{S^{group}} + \frac{1}{3} \left(\frac{1}{2} \frac{P^X}{P^{group}} + \frac{1}{2} \frac{E^X}{E^{group}} \right) + \frac{1}{3} \frac{A^X}{A^{group}} \right) * CCCTB \quad (1)$$

where *S* represents total sales, *P* payroll, *E* stands for number of employees and *A* represents total assets.

In that connection it is necessary to mention, that information on some of the financial indicators was often missing. In order to eliminate the negative impacts of missing data, in accordance with (Nerudová & Solilová, 2014), we have selected three methods for missing data imputation – regression, imputation and Monte Carlo method and run the sensitivity analysis. The aim was to research the most suitable method for missing data imputation (i.e. the method which is distorting the allocation of the group tax bases across the EU Member States the least).

The regression methods are considered to be as the basic method for estimation of missing data. The below stated equations represent the linear regression model, which was employed to estimate the missing data - number of employees, sales and payroll. The model can be expressed following:

$$No. Employees _ imputed = koeficient\beta_0 + TFA * koeficinet\beta_1 \quad (2)$$

$$Operating _ revenue = koeficient\beta_0 + TFA * koeficinet\beta_1 \quad (3)$$

$$Payroll = koeficient\beta_0 + No. Employees _ imputed * koeficinet\beta_1 \quad (4)$$

As the independent variables were used tangible fixed assets (TFA), for the estimation of number of employees (No. Employees_imputed) and sales (Operating_revenue) and number of employees for the estimation of payroll (Payroll).

This model was also used for the estimation of missing data through Monte Carlo method – i.e. Markov Chain Monte Carlo correlation, which assume that the missing data are random. In accordance with (Schafer & Graham, 2002) twenty iterations were applied in order to prevent correlations and to eliminate the bias. Following, we have performed multivariate regression.

Another method, which can be applied in case of missing data, represents the single imputation method. This method imputes the missing data by probable values and therefore allows to continue in the analysis. The missing information on sales was added by the information on recorded assets and the ratio of average operational revenues to average assets in case of companies from the same industry sector. The relation is expressed by following equation:

$$Operating _ revenue = (AOperR \div ATFA) * TFA _ reported \quad (5)$$

The missing data on number of employees was added through the application of the information on fixed tangible assets and the ratio of average number of employees to average fixed assets in case of companies from the same industry sector. The relation is expressed by following equation:

$$No.employees_imputed = (ANoE \div ATFA) * TFA_reported \quad (6)$$

The missing data on payroll was added through the application of the number of employees and the ratio of average payroll to average number of employees in case of companies from the same industry sector. The relation is expressed by following equation:

$$Payroll = (APayr / ANoE) * No.employees_imputed \quad (7)$$

Following, the sensitivity analysis was performed in order to find out the most suitable method for missing data imputation. Based on the results, we have decided to impute the missing data through above stated regression model, for this method allows to impute the data with the smallest deviation from real data.

3 Results and Discussion

Currently, majority of MNEs are taxed as separate entities in the European Union, in countries, in which they are tax residents (with the exception of Netherlands, which apply full consolidation scheme). As was already mentioned above, CCCTB allows full consolidation which will result into the changes in allocated corporate tax bases of EU Member States, especially those, which do not allow to apply group taxation schemes at all.

The aim of the paper is to simulate the impacts of introduction of cross-border loss offsetting (i.e. first implementation step) and the impacts of full CCCTB implementation on the tax bases allocated in Slovak Republic. Therefore, we have filtered from the Amadeus database all the companies fulfilling the two layer cumulative criteria for entering into the group taxation scheme under CCCTB, having either parent or subsidiary company resident in the Slovak Republic. Secondly, we have selected only the entities with known information on profit or loss before taxation and on fixed tangible assets, as those indicators are crucial for further application of methods for missing data imputation. Based on this procedure, we have gained two datasets of companies – 52 698 companies in group 1 representing SK subsidiaries of EU parent companies and 728 companies in group 2 representing SK parent companies with EU subsidiaries.

Consequently, the detailed analysis of the financial statements of the companies was performed, in order to gain the information on the financial indicators employed in the allocation formula suggested by CCCTB and also to gain the information on profit or loss before the taxation. Further, we have mapped the current situation of group tax bases allocation with respect to the Slovak Republic in the defined two groups. The data are shown in following table 1.

Table 1 Current Situation in Group 1 and 2

Current situation				Current situation			
GROUP 1 - SK subsidiaries of EU parent company				GROUP 2 - Sub. outside of SK (parent company in SK)			
code	sub_country	profit before tax*	profit before tax in %	code	sub_country	profit before tax*	profit before tax in %
AT	Slovakia	170.06	4.74	SK	Austria	0	0.0
BE	Slovakia	16.11	0.45	SK	Bulgaria	0.25	0.5029
BG	Slovakia	1.38	0.04	SK	Croatia	0.04	0.0795
CY	Slovakia	374.54	10.44	SK	Cyprus	0	0.0
CZ	Slovakia	134.65	3.75	SK	Czech Republic	41.74	83.6434
DE	Slovakia	955.03	26.63	SK	Estonia	0.54	1.0836
DK	Slovakia	20.74	0.58	SK	Germany	0	0.0
EE	Slovakia	0	0.00	SK	Hungary	0.10	0.2092
ES	Slovakia	35.63	0.99	SK	Italy	1.42	2.8417
FI	Slovakia	9.67	0.27	SK	Latvia	0.62	1.2371
FR	Slovakia	294.02	8.20	SK	Luxembourg	0	0.0
GB	Slovakia	96.03	2.68	SK	Netherlands	0.67	1.3402
GR	Slovakia	0.57	0.02	SK	Poland	1.58	3.1763
HR	Slovakia	1.33	0.04	SK	Portugal	0	0.0
HU	Slovakia	31.59	0.88	SK	Romania	2.38	4.7673
IE	Slovakia	30.93	0.86	SK	Slovenia	0.0015	0.0032
IT	Slovakia	72.45	2.02	SK	Spain	0.56	1.1158
LT	Slovakia	0.14	0.00	SK	United Kingdom	0	0.0
LU	Slovakia	22.59	0.63	Total		49.90	100
LV	Slovakia	1.47	0.04				
MT	Slovakia	0	0.00				
NL	Slovakia	31.98	0.89				
PL	Slovakia	31.18	0.87				
PT	Slovakia	0.51	0.01				
RO	Slovakia	1.34	0.04				
SE	Slovakia	29.76	0.83				
SI	Slovakia	0.69	0.02				
SK	Slovakia	1 222.34	34.08				
Total SK		3 586.7	100				

*in mil EUR

Source: Amadeus database and own calculations

As can be seen from above stated tables 1, in current situation, the first group creates the tax base of EUR 3 586.7 mil. in Slovak Republic, while the second group created the tax base of EUR 49.9 mil. in Slovak Republic.

Further, we have researched the situation, when the first implementation step would occur – i.e. the possibility of cross-border loss offsetting. This element would influence the corporate tax base which creates in Slovak Republic the second group – i.e. Slovak parent companies with their subsidiaries abroad. The simulation is shown in Table 2.

Table 2 Cross-Border Loss-Offsetting

Cross-border loss-offsetting – Group 2			
Guocoun try-code	sub_country	total_losses_2014 in mil. EUR	
		Abs.	%
SK	Austria	0	0
SK	Bulgaria	-0.0097	0.10
SK	Croatia	-0.10	1.04
SK	Cyprus	0	0
SK	Czech Republic	-8.43	86.68
SK	Estonia	0	0
SK	Germany	0	0
SK	Hungary	-0.21	2.17
SK	Italy	0	0
SK	Latvia	0	0
SK	Luxembourg	0	0
SK	Netherlands	0	0
SK	Poland	0	0
SK	Portugal	0	0
SK	Romania	-0.97	10.02
SK	Slovenia	0	0
SK	Spain	0	0
SK	United Kingdom	0	0
Total losses in mil. EUR		-9.72	100
Profit before tax in SK			
Total	in mil. EUR	3 586.73	
change %		-0.27	

Source: Own calculations

As is obvious from the above stated table, the introduction of first implementation step in Slovak Republic would result into the decrease of total corporate tax base by 0.27 %.

Consequently, in order to simulate second implementation step – i.e. full CCCTB, the missing data were imputed by three methods – regression, imputation and Monte Carlo Method and the sensitivity analysis was performed in order to research the method which is the most suitable for imputation (for details see methodological part). The analysis showed that pure regression is the best method for missing data imputation in case of Slovak Republic. The results are summarized in following Table 3, which also shows the comparison of the results with current situation. As is obvious from the table, in case of the full CCCTB implementation, Slovak Republic would gain additional tax bases in the first group in the total amount of EUR 96.7 mil. and in the second group in the total amount of EUR 13.21 mil – i.e. that the overall corporate tax bases allocated in the Slovak Republic would increase after the second implementation step by 3.02 %.

Table 3 Comparison of the Results (in Mil. EUR)

GROUP 1 - SK subsidiaries of EU parent company			GROUP 2 - Sub. outside of SK (parent company in SK)		
Current situation			Current situation		
Country	total_profit before tax_2014	CCCTB - Profit before tax 2014	Country	total_profit before tax_2014	CCCTB - Profit before tax 2014
AT	170.06	106.18	AT	0	0.12
BE	16.11	17.28	BG	0.25	0.11
BG	1.38	1.8	CY	0	0
CY	374.54	51.14	CZ	41.74	34.62
CZ	134.65	104.19	DE	0	0.16
DE	955.03	1 311.56	EE	0.54	0.62
DK	20.74	78.72	ES	0.56	0.65
EE	0	7.53	GB	0	1.41
ES	35.63	16.42	HR	0.04	0.048
FI	9.67	14.89	HU	0.10	0.19
FR	294.02	258.87	IT	1.42	0.72
GB	96.03	279.52	LU	0	0
GR	0.57	0.64	LV	0.62	0.54
HR	1.33	0.46	NL	0.67	20.39
HU	31.59	68.24	PL	1.58	1.23
IE	30.93	17.95	PT	0	0
IT	72.45	57.39	RO	2.38	2.31
LT	0.14	0.21	SI	0.0015	0.0015
LU	22.59	19.3	Total	49.90	63.11
LV	1.47	1.68	Change		+ 13.21
MT	0	0.02			
NL	31.98	96.69			
PL	31.18	14.61			
PT	0.51	2.30			
RO	1.34	0.75			
SE	29.76	78.04			
SI	0.69	0.49			
SK	1 222.34	1 077.50			
Total	3 586.7	3 683.40			
Change		+ 96.70			

Source: Amadeus database, own calculation

4 Conclusions

Currently, CCCTB represents the tool for the fight against the aggressive tax planning as a result of the existent loopholes between the national corporate tax systems. Due to this fact, on 17th July 2015, as a part of the Action plan for fair and efficient taxation, the Commission has relaunched the CCCTB project. This time in two implementation steps. Firstly, only common rules for corporate tax base construction should be implemented, together with the possibility of the cross-border loss offsetting. Only then, in second step full CCCTB system should be implemented.

The aim of the paper was to simulate the impacts of introduction of cross-border loss offsetting (i.e. first implementation step) and the impacts of full CCCTB implementation on the tax bases allocated in Slovak Republic. Based on the results of the research we conclude, that the introduction of first implementation step in Slovak Republic would result into the decrease of total corporate tax base by 0.27 %. And further, in case of the full CCCTB implementation, Slovak Republic would gain additional tax bases in the first group in the total amount of EUR 96.7 mil. and in the second group in the total amount of EUR 13.21 mil – i.e. that the overall corporate tax bases allocated in the Slovak Republic would increase after the second implementation step by 3.02 %.

Those results significantly differ from the results obtained by (Domonkos et al, 2013). This is caused mainly, by the fact, that their research was done on the sample of 11 companies only, while our dataset comprised 53 426 companies. Moreover, contrary to our research, which was done for the year 2014, the research performed by (Domonkos et al, 2013) is based on significantly different data – years 2009 and 2010 – i.e. the years of the financial crises, which resulted into the significant changes in groups of MNEs.

Acknowledgments

The paper presents the results of the research in the HORIZON2020 project FairTax No. 649439.

References

- Cline, R., Neubig, T., Phillips, A., Sanger, C., Walsh, A. (2010). *Study on the economic and budgetary impact of the introduction of a Common Consolidated Corporate Tax Base in the European Union*. Ernst & Young LLP.
- Devereux. M.P., Loretz, S. (2007). Increased efficiency through consolidation and formula apportionment in the European Union? Oxford University, Centre for Business Taxation, *Working paper*, no. 12.
- Domonkos, T., Domonkos, Š., Dolinajcová, M., Grisáková, N. (2013). The Effect of the Formula Apportionment of the Common Consolidated Corporate Tax Base on Tax Revenue in the Slovak Republic, *Journal of Economics*, Vol 61, No. 5, pp. 453-467.
- Fuest, C., Hemmelgam, T., Ramb, F. (2007). How would the introduction of an EU-wide formula apportionment affect the distribution and size of the corporate tax base? An analysis based on German multinationals. *International Tax and Public Finance*, Vol.14, No.5, pp. 605-626.
- Nerudová, D., Solilová, V. (2014). Missing data and its impact on the CCCTB determination. Amsterdam: Elsevier, *Procedia Economics and Finance*, Vol. 12, No. 1, pp. 462-471.
- Nerudová, D., Solilová, V. (2015a). Kvantifikace Dopadů zavedení společného konsolidovaného základu daně v Evropské Unii do celkového základu daně korporací vykazovaného v České republice, *Politická ekonomie*, Vol. 63, No. 4, pp. 322 – 339.
- Nerudová, D., Solilová, V. (2015b). The Impact of the CCCTB Introduction on the Distribution of the Group Tax Bases Across the EU: The Study for the Czech Republic, *Prague Economics Papers*, Vol. 24, No. 4
- Oestreicher, A., Koch, R. (2007). The Revenue Consequences of Using CCCTB to Determine Taxable Income in EU Member States, Finance, Accounting and Taxation Research Unit Revised Working Paper 07-001, Georg-August-Universität Göttingen.
- Schafer, J. L., Graham, J. W. (2002). Missing Data: Our View of the State of the Art, *Psychological Methods*, Vol 7, No. 2, pp. 147-177.

Solilová, V. - Nerudová, D. (2016). Implementation of Common Consolidated Corporate Tax Base and its Implications for Non-participating Country: A Case Study for the Czech republic. *Journal of Economics*. Vol. 64, No. 3, pp. 282-298.

Van Der Horst, A., Bettendorf, L., Rojas-Romagosa, H. (2007). Will corporate tax consolidation improve efficiency in the EU? CPB Documents 141, CPB Netherlands Bureau for Economic Policy Analysis.

Study of Financial Literacy in the Field of Insurance Products

Josef Nesleha¹, Karel Urbanovsky²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: josef.nesleha@econ.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipova 41a, 602 00 Brno, Czech Republic
E-mail: urbanovsky.muni@gmail.com

Abstract: *The protection of customers who take out life insurance becomes to be more important, as there is an increasing number of such products. Therefore, it is more likely that customers do not have all decisive information they need to deal with an insured event. The goal of this article is to verify the level of financial literacy in the field of life insurance products. Consequently, the goal is to investigate whether customers of insurance companies are provided with sufficient amount of information related to the products they look for, or whether some important information is missing, and such clients have to search for it on their own. The research is based on an electronic questionnaire. The target audience of this research is limited to those who have already taken out life insurance, since this group of people should be more familiar with conditions, restrictions and other features of such products. In terms of used methods, Pearson chi-squared test is employed in order to reveal a link between financial literacy of insurance products and between different criteria. Other methods are descriptive statistics and basic statistical data processes.*

Keywords: insurance, financial literacy, customer, protection

JEL codes: D18, G22

1 Introduction

Financial literacy has become an important part of educational system in the Czech Republic and other countries around the Europe and the whole world. As the role of it is increasing, the whole society starts to be exposed to financial literacy more than ever. It goes for financial literacy related to insurance products and the insurance market as well.

Financial literacy represents a set of knowledge which is necessary for a correct and appropriate decision in terms of one's investments, debts and other financially orientated issues. It consists of three parts – money, price and budget literacy.

The insurance market is characterized by the predominance of the supply-side, which means that clients are likely to find easily products and services they correspond to their needs and expectations. Therefore, it is important to know what clients want to know when they buy a new insurance product. The consumers have to get information about the financial advisor, insurance company, and insurance product and have to be asking about their wants and needs (EBF, 2009; OECD, 2005). But do they really get all information which they want? In general, we can divide determinants of the demand for the insurance into several groups according to their character as a personal, demographic, and economic, respectively financial, political, institutional, and also cultural (Beck and Webb, 2003). Also demand for insurance products is positively correlated with income in most of previous studies (Campbell, 1980). Differences in expected retirement age should also result in various (and difficult to predict) demand for insurance products, assuming similar income levels (Lee et al., 2010)

Statistics from the Czech Insurance Association imply that total insurance premium in life insurance is 44.5 billion CZK or 1.6 billion EUR (2015). This number has an increasing character within the last years. On the other hand, the number of contracts in life

insurance has decreased - from 5,705,973 contracts at the end of 2015 to 5,665,045 contracts at the end of March 2016.

The insurance companies with the biggest market share (over five percent): Česká pojišťovna (19.1%), Kooperativa pojišťovna (15.2%), PČS (13.8%), NN pojišťovna (9.5%), Generali pojišťovna (7.9%), ČSOB pojišťovna (7.2%), Allianz pojišťovna (6.5%), other ones are: ČPP pojišťovna, UNIQA, Metlife pojišťovna, Komerční pojišťovna, AXA and AEGON. There are also other insurance companies working on the Czech market, yet this share market is lower than one percent (Czech Insurance Association, 2016).

The goal of this article is to verify the level of financial literacy in the field of life insurance products. In relation to this goal, the study also investigates whether clients of the most famous insurance companies in the Czech Republic are familiar with products and services they use. This study should, therefore, outline the basic trends in the financial literacy related to insurance products. Consequently, the basic revelations might be employed for another deeper research.

For the purposes of the goal verification, there have been three research questions designed.

- Which type/s of respondents is/are aware of insurance risks they have incorporated in their insurance policies?
- Do insurance company's clients dispose knowledge related to steps which are necessary to undertake when solving out an insurance event?
- Which of the main and most famous Czech insurance companies provide their clients with sufficient amount of information in relation to insurance events settlement?

2 Methodology and Data

For the purposes of the survey, an electronic questionnaire was used in order to gain relevant data. When gathering data, the target audience was limited to those respondents who have their permanent residence in the Czech Republic and at the same time they have already taken out life insurance by one of the Czech insurance companies.

Respondents were asked 34 questions. In the beginning they were supposed to answer several questions related to demographic data, such as gender, age, education, etc. Most of the questions were focused on their insurance policies, products and other related aspects aiming at verifying their financial literacy and trends in regards to the financial literacy.

The whole data file consists of 110 respondents in the age between 18 and 65 years. Concerning to gender composition it is almost equal, with approximately 47.5% males. In regards to the used methods, descriptive statistics and the Pearson chi-square tests were used.

3 Results and Discussion

The following section is devoted to set research questions, which have been stated in the introduction. The questions are following:

- Which type/s of respondents is/are aware of insurance risks they have incorporated in their insurance policies?
- Do insurance company's clients dispose knowledge related to steps which are necessary to undertake when solving out an insurance event?
- Which of the main and most famous Czech insurance companies provide their clients with sufficient amount of information in relation to insurance events settlement?

Research question no. 1

The first research question deals with client's awareness of insurance risk/s in their policies. For the purposes of this question respondents have been divided by the following criteria:

- Belonging to the economic sector (from the point of work or study)
- Age
- Education

The first table (Table 1) summarizes comparison of people working or studying in the economic sector with those who do not work or study in this field. It is obvious that there is likely a positive trend, since approximately 69% of "economically oriented" respondents are aware of insurance risks, while for those who do not study or work in the economic sector, only 31% are aware of it.

Table 1 Comparison of Respondents Working or Studying in Economic Sector and Non-Economic Sector

	Economic sector	Non-economic sector
Number of respondents who are aware of insurance risks	69.2%	21.4%
Number of respondents who are not aware of insurance risks	30.8%	78.6%

Source: Author's own computation, processed in Microsoft Excel

Despite suffering from the limited number of observations, this trend is worth verifying by using parametric statistical test. The results of the Pearson's chi-squared test are stated in the table below (Table 2).

Table 2 Results of Pearson's Chi-Square Test

Chi-square statistics	df	p-value	Cramer's V
20.606	1	0.0001	0.432

Source: Author's own computation; processed in STATISTICA

The chi-square test verifies null hypothesis stating that both variables (which have nominal character) are independent. Alternative hypothesis claims that the variables are not independent. The computed p-value almost reaches zero, which leads to the null hypothesis rejection. Therefore, there is a proven relationship between these two variables. The test is completed by computation of Cramer's V. Its realization estimates approximately 43% relationship between the variables.

Table 3 Comparison of Respondents on the Basis of Age

	18 - 24	25 - 35	36 - 65
Number of respondents who are aware of insurance risks	44.4%	35.1%	22.4%
Number of respondents who are not aware of insurance risks	55.6%	64.9%	77.6%

Source: Author's own computation; Microsoft Excel

The table (Table 3) summarizes trends in respondent's knowledge related to insurance risks for various age groups. The verification is, as well as in the previous case, supported by conducting a parametric test. Since the variables have also nominal character, the same test is employed in order to verify the relationship between these two variables.

Table 4 Results of Pearson's Chi-Square Test

Chi-square statistics	df	p-value	Cramer's V
4.233	2	0.1204	0.198

Source: Author's own computation; processed in STATISTICA

The test does not reject the hypothesis (stating that both the variables are independent each other), since the computed p-value is higher than the significance level (5%).

Table 5 Comparison of Respondents on the Basis of Education

	Primary and secondary school	University grade
Number of respondents who are aware of insurance risks	26.7%	35.0%
Number of respondents who are not aware of insurance risks	73.3%	65.0%

Source: Author's own computation, processed in Microsoft Excel

Table 6 Results of Pearson's Chi-Square Test

Chi-square statistics	df	p-value
0.6881	1	0.4067

Source: Author's own computation; processed in STATISTICA

The similar procedure is conducted in order to test dependency of education on knowledge related to the content of insurance products. The test does not reject the hypothesis (stating that both the variables are independent each other), since the computed p-value is higher than the significance level (5%).

Research questions no. 2 and no. 3

The goal of the second question is to verify whether clients have all important information they need to have when dealing with an insurance event. The results are stated in the following table (Table 7).

Table 7 Comparison of Respondents According to Whether They Know How to Solve Out an Insurance Event

	Yes	No
Česká pojišťovna	32.1%	67.9%
Pojišťovna České spořitelny	53.4%	46.6%
Kooperativa pojišťovna	31.8%	68.2%
NN pojišťovna	72.3%	27.7%
Allianz pojišťovna	25.8%	74.2%
Metlife pojišťovna	35.4%	64.6%
ČSOB pojišťovna	28.8%	71.2%
Other clients	13.6%	86.4%
Average	38.2%	61.8%

Source: Author's own computation; processed in Microsoft Excel

The table distinguishes respondents who know how to solve out an insurance event and those who do not know. These respondents are divided by insurance companies. It is obvious that for most of the involved insurance companies, clients are insecure in terms of processes how to solve out an insurance event. There are only two insurance companies (Pojišťovna České spořitelny and NN pojišťovna) with more than 50% of clients who know procedures they have to undertake in order to deal with an insurance event.

However, majority of insurance companies “trade” with clients who have very limited knowledge in terms of solving out insurance events, based on the data from the table. In other words, this result reveals that majority of clients do not know how to solve out an insurance events. Yet it does not say anything about reasons why they do not dispose such type of knowledge.

In terms of information, clients would appreciate to have at disposal, most of the clients call for comparison of more insurance companies when deciding on entering a contract, prices of individual and separate insurance risks added in an insurance policy, ways to pay insurance premium and they also call for knowing the probability of individual risks they secure against.

As stated before, since the insurance market is defined by predominance on the supply-side, the insurance companies are forced to provide their clients with more suitable products, so that they live up to their expectations. In the conducted research, the respondents have stated that the most demanding information when taking out life insurance is:

- The price of particular risks they secure against
- Probability of an insurance event
- Statistics related to insurance events in the Czech Republic
- Insurance claim for particular types of risks
- Experience related to insurance events solving out processes
- Advantage/s of particular insurance products over products provided by other insurance companies

Discussion

The results have revealed several trends related to life insurance products which are provided by the insurance companies operating in the Czech Republic. However, there are some issues to be discussed. In spite of obtaining several worth findings, this study involves a couple of drawbacks to be mentioned. These drawbacks might be exploited in further research. First of all, the study is based on only 110 observations. Since the target audience (people who have taken out life insurance in the Czech Republic) is narrow, the possibilities to gain more valid observations are highly limited. This limitation affects mainly those tests and comparisons in which more variables or factors are involved, for instance, comparison of the Czech insurance companies.

Consequently, the study is limited by set research questions, which might result in loss of important and worth findings. On the other hand, the authors plan to investigate other trends and consequences. The goal of this study was, in other words, to reveal basic trends and problematic areas in the field of financial literacy related to insurance products.

4 Conclusions

This paper focuses on financial literacy related to life insurance products in the Czech Republic. For the purposes of the paper, there are three questions to be verified. The particular questions are following.

- Which type/s of respondents is/are aware of insurance risks they have incorporated in their insurance policies?
- Do insurance company’s clients dispose knowledge related to steps which are necessary to undertake when solving out an insurance event?
- Which of the main and most famous Czech insurance companies provide their clients with sufficient amount of information in relation to insurance events settlement?

When segmenting the respondents based on different criteria, belonging to the economic field turned out to be statistically significant. The respondents who study or work in this field do not suffer lack of information concerning the ways to solve out an insurance event. On the other hand, the age has not proved to be a significant criterion. The p-

value slightly exceeded the set significance level. The education has not proved to be an important criterion either.

In regards to the comparison of the Czech insurance companies from the point of the clients who know and do not know how to solve out an insurance event, the best proportion reached the companies NN Pojišťovna and Pojišťovna České spořitelny. However, according to the results of the study, majority of the Czech insurance companies suffer the lack of clients how are aware of procedures how to solve out insurance events when they appear.

Acknowledgments

Support of Masaryk University within the project MUNI/A/0916/2015 "*Behavioral and knowledge aspects of trading and evaluation of financial assets*" is gratefully acknowledged.

References

Beck, T., Webb, I. (2003). Economic, Demographic, and Institutional Determinants of Life Insurance Consumption across Countries. *World Bank Economic Review*, vol. 17(1), pp. 51 - 88.

Campbell, R.A. (1980). The Demand For Life Insurance: An Application of the Economics of Uncertainty. *The Journal of Finance*, vol. 35(5), pp. 616 - 634.

Czech Insurance Association. (2016). Retrieved from: <http://www.cap.cz>.

EBF (2009). Financial literacy – empowering consumers to make the right choices, European Banking Federation. Retrieved from: http://www.ebf-fbe.eu/uploads/documents/publications/Reports/Fin20Literature/D0305C-2009-EBF_Financial_Education_-_rev7-26-9_webversion-2009-00831-01-E.pdf.

Lee, S-J., Kwon, S. I., Chung, S. Y. (2010). Determinants of Household Demand for Insurance: The Case of Korea. *Geneva Papers on Risk and Insurance – Issues and Practice*, vol. 35, pp. S82 - S91.

OECD (2005). Importance of Financial Literacy in the Global Economy. Retrieved from: <http://www.oecd.org/general/35883324.pdf>.

Local Economic Impact of Domestic and International Students: Case of University of Economics in Bratislava

Tetyana Nestorenko¹, Nadiya Dubrovina², Jana Péliová³

¹ Berdyansk State Pedagogical University
Faculty of Economics and Management,
Economics of Entrepreneurship and Economic Theory Department
Shmidta 4, 71100 Berdyansk, Ukraine
E-mail: tetyana.nestorenko@gmail.com

² University of Economics in Bratislava
Faculty of National Economy, Department of Finance
Dolnozemska cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: nadija@mail.ru

³ University of Economics in Bratislava
Faculty of National Economy, Department of Finance
Dolnozemska cesta 1, 852 35 Bratislava, Slovak Republic
E-mail: jana.peliova@euba.sk

Abstract: *The economic role of universities should be considered not only in terms of their contribution to the creation of human capital as a key factor of economic growth. By teaching of international students, universities thus impact on city's economy and contribute to increase of service exports. In their turn, international students have the economic impact on a host city. The study examines the University of Economics in Bratislava (EUBA) as an exporter of education, and employs survey data for calculating direct economic effects of international students for Bratislava. The calculations of this impact are conducted on the basis of the survey data of international students of University of Economics in Bratislava (2015/2016 academic year). The main areas of local expenditure by international students of EUBA are defined. The direct effect of economic impact of EUBA international students is calculated. We compare this economic with the direct economic impact of domestic students of EUBA on the local economy.*

Keywords: *university, international students, domestic students, economic impact, Bratislava*

JEL codes: *I23, I25, R12*

1 Introduction

In recent decades, there is a significant increase in the number of students receiving higher education outside their own country. In 2007 the global number of mobile students has grown by 53% since 1999 (with an average annual increase of 5.5%) and by 2.5 times since 1975 with an average annual increase of 11.7% throughout period 1975-2007 (UNESCO-UIS, 2009). Some estimates predict that the demand for higher education worldwide will have expanded from 97 million international students in 2000 to over 262 million by 2025 (UNESCO, 2009). According to the UNESCO Institute of Statistics, international students are those students "who have crossed a national or territorial border for the purposes of education and are now enrolled outside their country of origin" (UNESCO-UIS, 2009).

One of the most attractive place in the world as an educational destination and as a partner to exchange is the European Union (EU). At the present time, the internationalization of higher education outside Europe has become a strategic objective of EU governments and universities, and virtually all institutions and countries provide suggestions for international students to think about the possible cooperation and collaboration with the wider global academic community.

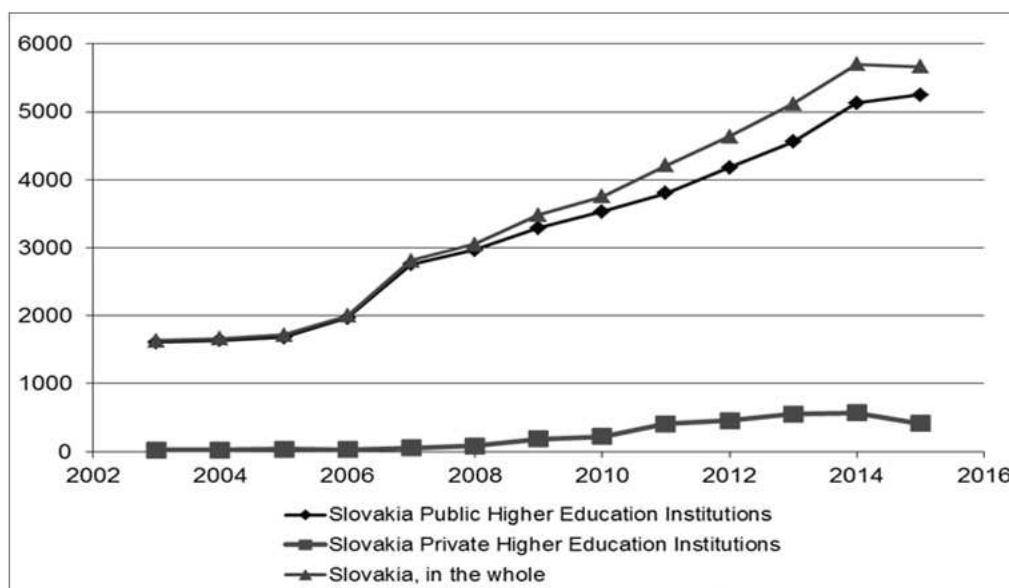
Many factors contribute to the growth of the number of international students in European Union. Among these factors are the following:

- the abolition of passport and customs controls between the countries which have signed the Schengen Agreement and the free movement of citizens of these countries within the Schengen area
- convergence and harmonization of higher education systems of most European countries and some countries outside of Europe, and the establishment of a European Higher Education Area within the Bologna process
- the education abroad is considered by students as a chance to broaden cultural and intellectual horizons (UNESCO-UIS, 2009)
- wishing of students from less developed countries and from developing countries to avoid the frustrations of under-resourced universities at home countries (UNESCO-UIS, 2009).

The accession to the Bologna Process (1999), the entry into the European Union (2005), and joining the Schengen Area (2007) contributed to a more active participation of Slovakia into the global process of mobility of international students.

Reducing barriers in crossing borders in 2007 led to an increase in the number of international students at public higher education institutions in Slovakia by more than 40%, at private higher education institutions – by 33% (Figure 1). In 2003/2004 – 2015/2016 there was a steady increase in the number of international students in Slovak public higher education institutions. The number of international students enrolled in the Bachelor's, Master's and Doctoral programs, increased by 3.4 times, while the number of Slovak students increased by less than 10% over that period.

Figure 1 The Number of International Students in Higher Education Institutions in Slovakia (2003/2004 – 2015/2016)



Source: Own adjustment based on UIPS data

For 12 years (since 2003/2004) there have been significant changes in the number of students of private higher education institutions. The number of domestic students has increased by 9 times over this period. In the 2015/2016 academic year compared with the 2003/2004 year the number of international students has increased by 19.5 times. However, this significant increase is due to, first of all, the low base. In the early 2000s less than 50 international students has learned in all private higher education institutions of Slovakia. The rapid increase in the number of international students in Slovakia occurred after the country's accession to the Schengen area and its active involvement in the international exchange of students within the framework Erasmus and Erasmus+ programs.

The impact of universities on a host city is very wide. We can distinguish the effects on employment growth, salary growth, tax base, increasing the local production of goods and services through the development of business environment for social benefits in the form of human capital development and community development.

Students, including the international ones, have a positive impact on the local economy. Various studies carried out in some European countries, in the United States, Australia, Canada, New Zealand confirm this thesis (for example, BECK et al., 1995; BUTCHER, 2002; MUNRO et al., 2009; KUNIN, 2012; KOTOSZ, 2013; REHÁK et al., 2014; DŽUPKA, 2014; HUDEC et al., 2015).

The university acts as a subject of international activities by providing educational services to international students. The economic benefits of international students should be considered at different levels: how the university, which trains foreigners in a city, region and country. The larger geographic area will be taken into account, the more economic impact will be.

The main purpose of this paper is to consider direct economic impact of EUBA international student on the local economy – economy city of Bratislava. Also we compare the direct economic impact of international and domestic students on Bratislava's economy (on the example of economic impact of EUBA students).

2 Methodology and Data

The largest student's city in Slovakia is Bratislava. In Bratislava there are 5 of 20 public higher education institutions (Academy of Fine Arts and Design in Bratislava, Academy of Performing Arts in Bratislava, Comenius University in Bratislava, Slovak University of Technology in Bratislava, and University of Economics in Bratislava). 2 of 3 state higher education institutions are situated on the territory of Slovak capital (Academy of the Police Force in Bratislava, Slovak Medical University in Bratislava). The every second Slovak private higher education institutions acts in Bratislava (Bratislava International School of Liberal Arts in Bratislava, Media Academy, School of Media and Marketing Communication in Bratislava, Pan-European University in Bratislava, School Goethe Uni Bratislava, School of Economics and Management in Public Administration in Bratislava, School of Management/City University in Trenčín/Bratislava, St. Elizabeth University of Health Care and Social Work in Bratislava). Also the University College of International and Public Relations Prague in Bratislava provides its activity in the territory of Bratislava as one of foreign higher education institutions.

University of Economics in Bratislava (EUBA) is characterized by the lowest share of international students among the public higher education institutions located in Bratislava. In 2015/2016 academic year only 1.37% of the total numbers of students were international students. The increase of this share from 0.96% (2003/2004 academic year) to 1.37% (2015/2016 academic year) was mainly due to the reduction in the base comparison: in EUBA the total number of students reduced from 8629 to 7099 for 12 years.

However, the total number of international students at the universities of Bratislava (both public and private) has increased over the study period more than 3.3 times. This indicates a growing the economic impact of international students on the host city – Bratislava.

To evaluate the economic impact of the university students on city's economy are taken into account only those costs which would not have happened if the university does not exist. We asked the international students of Bachelor, Master's and Doctoral degree studies at the University of Economics in Bratislava to answer the questions about their income and expenditures in Bratislava. We use a standard methodology called impact studies to quantify the additional revenue into the local economy, which bring international students.

The diversity of our sample makes estimating an average amount very difficult. It is difficult, for example, to combine the answers of both the students who have completed their programs, and therefore have records of their expenses, and those who are still in Bratislava and whose budgets are in flux.

The questionnaire contained 15 questions. It consisted of three parts. Questions of the first part were devoted to identifying the local profile of international students. Questions in the second part were focused on definition of incomes and expenditures profile of international students. Answers questions in the third part allowed to form the demographic profile of international students.

For comparison the economic impact of international and domestic students were used the results of the study of REHÁK, SEKELSKÝ, 2014.

3 Results and Discussion

In April 2016 the questionnaires have been sent to EUBA international students via e-mail. We received the replies from 33% of the total number of international students.

12.5% of the responses were not taken into account in determining the economic impact of international students on Bratislava, because if the University of Economics in Bratislava did not exist, these students have studied in another university in Bratislava. It means, that for this part of international students place of education is more important, then the University of Economics in Bratislava itself.

Expenditures of EUBA domestic students in 2012/2013 academic year (REHÁK, SEKELSKÝ, 2014) we have adjusted to the inflation rate in Slovakia in 2013-2015.

Table 1 Structure of Local Expenditures of the EUBA Full-time Students per Month during the Academic Year

#	Expenditure	Domestic students		International students (2015/2016)
		Before taking* inflation into account	Taking inflation into account	
1.	Food and non-alcoholic beverages	48.88	49.37	109,29
2.	Alcoholic beverages and tobacco	13.64	13.78	42,14
3.	Coffee houses, bars, restaurants a hotels	21.88	22.10	42,86
4.	Clothing and shoes	16.91	17.08	26,14
5.	Recreation, free time and culture 10,96	10.96	11.09	38,86
6.	Other goods and services	10.00	10.10	12,68
7.	Housing (rents)	42.82	43.24	157,18
8.	Housing costs	1.24	1.25	19,43
9.	Furniture and maintenance	0.99	1.00	0,36
10.	Health	3.44	3.47	3,04
11.	Transportation	23.38	23.61	15,71
12.	Postal and telecommunication services	7.54	7.61	7,29
13.	Education	4.39	4.43	2,32
14.	Other expenditures	2.48	2.50	8,06
15.	Other not specified	0.52	0.53	17,32
16.	The average tuition fee	-	-	90.89
17.	Total expenditures	208.16	210.22	593.57

Source: Own calculation based on questionnaires of EUBA international students and REHÁK, SEKELSKÝ, 2014.

Average, the direct economic impact of international student is 2.8 times more than direct economic impact of domestic student. But the total direct economic impact of students on to economy of Bratislava depends on number of students. On the condition that structure of the students living in Bratislava and abroad, in 2015 is the same as in the conduct of the survey (REHÁK, SEKELSKÝ, 2014), we get the following results. Direct economic impact of EUBA domestic students is 677101 euros per month or 6.77 million euros per academic year (in average 10 months).

Due to international students' responses the average period of stay for university study consists 6.4 months. It means that annual total expenditures of EUBA international students are 322427.22 euros. Of course, this amount is much more less, than the direct economic impact of EUBA domestic students (6.77 million euros).

4 Conclusions

Recently there has been rapid growth in the number of students who study abroad. In the 2015/2016 academic year in Slovakia the number of international students increased by 2.9 times as compared to 2003/2004. The leading place in the training of students belongs to universities of Bratislava: more than half of the international students who came to Slovakia from other countries in 2003/2004 and in 2015/2016 academic years studied in Bratislava. Conducted study on the example of the University of Economics in Bratislava showed that the economic impact of an international student on the Bratislava's economy more than domestic student's none (593.57 euros and 210.22 euros, respectively).

However, the total direct impact of EUBA international students on the economy of Bratislava is insignificantly. More vigorous activity of the University of Economics in Bratislava on the international market of higher education, the increase in the number of international students at the EUBA will enhance the its level of impact on the economy of Bratislava.

Acknowledgments

This research was supported by the Visegrad Fund, grant N°51501858 «Factors of formation of space: the role of the economic benefits of higher education qualification". We are thankful to doc. Ing. Štefan Rehák, PhD. for his helpful advice in the preparation of the questionnaire for this research.

References

- Beck, R., Elliott, D., Meisel, J., Wagner, M. (1995). *Economic Impact Studies of Regional Public Colleges and Universities*. Center for Business and Economic Research, University of Kentucky, pp. 249-253.
- Butcher, A. (2002). *A Report on the Demographic, Social and Economic Impact of International Students on North Shore City*. School of Social and Cultural Studies, Massey University, Auckland.
- Džupka, P. (2014). Ekonomický dopad projektu Košice Európske hlavné mesto kultúry 2013. In *Evaluácia Košice Európske hlavné mesto kultúry 2014*. Evaluačná správa 2012-2014. Technická univerzita v Košiciach.
- Hudec, O., Šebová, M., Džupka, P. (2015). Ekonomický vplyv Technickej univerzity v Košiciach na mesto Košice.
- Infometrics Consulting. (2000). *Economic impact analysis of foreign fee-paying students*. Unpublished manuscript, Education International Marketing Network.
- Kotosz, B. (2013). The Local Economic Impact of Higher Education Institutions in Hungary. In *Intellectual Capital Management*. Global Perspectives on Higher Education, Science and Technology. IICM, Zanjan. pp. 45-60.

Kunin, R., Associates, Inc. (2012). *Economic Impact of International Education in Canada*. Retrieved from: http://www.international.gc.ca/education/assets/pdfs/economic_impact_en.pdf.

Munro, M., Turok, I., Livingston, M. (2009). Students in cities: a preliminary analysis of their patterns and effects. *Environment and Planning*, vol. 41, pp. 1805-1825.

Nestorenko, T., Pavlyk, Kh. (2015). *University, social enterprise, and economic development: searching for the missing links at the regional (city) levels*. Rozwój szkolnictwa wyższego narzędziem marketingu miasta, Wydawnictwo Wyższej Szkoły Technicznej w Katowicach, Katowice 2015, pp. 21-27.

Oxford Economics (2012). *The Economic Impact of the University of Exeter's International Students*. Retrieved from: www.exeter.ac.uk/international.

Rehák, Š., Džupka, P., Sekelský, L., Šebová, M. (2015). *Lokálne ekonomické vplyvy univerzít*. Vydavateľstvo EKONÓM.

Rehák, Š., Sekelský, L. (2014). Ekonomické vplyvy vysokoškolských študentov na hostiteľské mesto. Prípadová štúdia Ekonomickej univerzity v Bratislave. *Ekonomické rozhľady*, vol. 43 (1), 1/2014, pp. 70-81.

Steinacker, A. (2005). *The economic effect of urban colleges on their surrounding communities*. *Urban Studies*, vol. 42 (7), pp. 1161-1175.

UNESCO (2009). *A New Dynamic: Private Higher Education*. World Conference on Higher Education.

UNESCO-UIS (2009). *Global Education Digest. Comparing Education Statistics Across the World*. UNESCO Institute for Statistics.

Ústav informácií a prognóz školstva: Štatistické ročenky 2003/2004 – 2015/2016.

The Performance Ranking of Chosen Manufacturing Division

Inka Neumaierová¹, Ivan Neumaier²

¹University of Economics, Prague
Faculty of Business Administration, Department of Strategy
Winston Churchill Sq. 4, 130 67 Prague 3, Czech Republic
E-mail: neumaier@vse.cz

²Ministry of Industry and Trade of the Czech Republic
Department of Economic Analyses
Na Františku 32, 110 15 Prague 1, Czech Republic
E-mail: neumaier@mpo.cz

Abstract: *The goal of the article is to create the performance ranking of production groups within manufacturing division CZ-NACE 32 - Other manufacturing. We would like to know, which group was the most powerful driver of this heterogeneous division in course of 2008 – 2014. For determination of order is used criterion of Economic Value Added, which is considered as a crucial indicator of competitiveness. It facilitate to view on the behaviour of the chosen group in the chronological order. Further we are taking in account the "Relative Economic Value Added", which enable to make comparisons among groups. The results show, that the best performing productive group is CZ-NACE 32.4 – Production of toys, followed by group 32.5 – Production of medical and dental tools and equipment.*

Keywords: ranking, performance, other manufacturing, Economic Value Added, spread

JEL codes: M210, G300, O430

1 Introduction

Competitiveness is mostly evaluated at enterprise level or whole country level. We have decided to assess the competitiveness of a division, as this is interesting from both theoretical and practical perspectives. The article aims to show how to assess the competitiveness of a division and to express it through ranking.

Ranking can be defined as a method to create ranking lists according to defined indicators (Šmarda, 2006). Ranking can be categorised as a scoring model. The selection of criteria substantially influences the final outcome of ranking.

Our case includes two single-criterion ranking lists. The division is tested through the amount of economic value added it yielded in the timeframe of 2008 to 2014. In addition, attention is paid to the relative economic value added.

The object of ranking consists of the CZ-NACE Division 32: Other manufacturing, which includes heterogeneous groups, distinguished by the nature of inputs, production technologies, as well as by the nature of outputs. It includes the Manufacture of jewellery and bijouterie, musical instruments, sports goods, games and toys, medical and dental instruments and supplies, and others n.e.c. (such as school and office supplies, Manufacture of brushes, Manufacture of safety matches, umbrellas and sunshades, etc.).

The ranking list created addresses the diagnostic and evaluative research problem, which is formulated as the question: Who was the greatest driver of competitiveness for the period of 2008 to 2014 in the CZ-NACE Division 32: Other manufacturing?

Analysts of the division, as well as investors, can use the ranking list.

2 Methodology and Data

Our assumptions are based on secondary statistical data, i.e., data from the Czech Statistical Office's annual statement P5-01 for the period of 2008 to 2014 (Ministry of Industry and Trade of the Czech Republic [MIT], 2015). The statement includes a selection of data from the balance sheet, income statement and supplementary data,

such as the average accounting number of employees, number of working proprietors, investments.

The data represent all enterprises in the division, i.e., those employing zero and more employees, including self-employed businesspeople. The category of enterprises with 20 and more employees includes all enterprises in the division. For the category of enterprises with fewer than 20 employees the Czech Statistical Office conducted a sample survey and grossing up for the unselected enterprises as a whole. Enterprises are classified in CZ-NACE (classification of economic activities) according to their predominant activities.

We have chosen CZ-NACE 32 Other manufacturing, and the groups included in it. The following groups are included: CZ-NACE 32.1 Manufacture of jewellery, bijouterie and related articles, CZ-NACE 32.2 Manufacture of musical instruments, CZ-NACE 32.3 Manufacture of sports goods, CZ-NACE 32.4 Manufacture of games and toys, CZ-NACE 32.5 Manufacture of medical and dental instruments and supplies, CZ-NACE 32.9 Manufacturing not elsewhere classified. The products in these groups differ by their manufacturing processes, input materials, as well as areas of use.

The group is characterised by data aggregation for enterprises that belong to the group. For instance, assets for the group equal the sum of assets of the individual enterprises.

We aim to create a ranking list indicating how the groups within the division perform. We will regard the group that contributes to the division's competitiveness the most as being the greatest driver.

Various methods can be used to examine competitiveness. The basic ones include, for example, the profit theory and the method that combines the criteria of profitability, solvency and credibility. To create the ranking list, we sought a criterion that would cover both approaches.

The economic value added is our criterion for creating the ranking list. Our assumptions are based on the conviction that the business sector is not competitive in the long term unless it generates the economic value added.

Economic value added, unlike accounting profit, also reflects the level of taken risk, which is also influenced by the solvency and credibility of the enterprise. By calculating the economic value added the enterprise owner's view and the owner's alternative cost of equity become relevant for evaluating the business activity. This cost expresses the value of equity represented by the amount that could have been earned from an investment alternative involving the same risk and that has been forgone as a result of the existing business activity. A calculation using the INFA methods (Neumaier and Neumaierová, 2002) was used; the Ministry of Industry and Trade of the Czech Republic uses the same calculation.

For an enterprise the economic value added in its measurable form looks as follows:

$$EVA = (ROE - r_e) * E = NP - r_e * E \quad (1)$$

Where

EVA = economic value added

ROE = return on equity

r_e = rate of alternative cost of equity

E = equity

NP = net profit

The formula (1) indicates that the economic value added is expressed in two ways; this is necessary, as we will create two ranking lists: according to EVA and relative EVA. One formula shows what is known as the spread ($ROE - r_e$), which expresses the relative EVA. The other formula is more convenient for aggregating the EVA at group level.

Economic value added at group level:

$$\begin{aligned} \sum EVA &= \sum NP - \sum (r_e * E) = \left(\frac{\sum NP}{\sum E} - \frac{\sum (r_e * E)}{\sum E} \right) * \sum E = \\ &= (ROE_{SECTION} - r_{eSECTION}) * E_{SECTION} \end{aligned} \quad (2)$$

The equation (2) indicates that the economic value added at group level cannot be calculated from aggregated data for the group because we need to know r_e and E for individual enterprises.

As we participated in the preparations of the Manufacturing Industry Panorama at the Ministry of Industry and Trade of the Czech Republic, we have access to the individual data in the P5-01 statement and we calculated the r_e for the individual enterprises in the group and populated the formula (2) for individual groups.

We calculated the economic values added of the groups for the period of 2008 to 2014. We compiled the ranking in each of the reference years separately. The last year of the timeline, i.e., 2014, is the most important one.

The amount of economic value added is an absolute quantity, which is influenced by the amount of equity invested. To rule out the effect of the amount of equity invested, the ranking must be compiled on the basis of relative economic value added. This is similar to the return on equity, with the numerator containing the economic value added rather than net income.

The relative economic value added in its measurable form can be expressed as follows:

$$\frac{EVA}{E} = (ROE - r_e) = spread \quad (3)$$

To evaluate the ranking for the entire period under review, we calculated the average order, the absolute variability of its values using a standard deviation, and the relative variability using a variation coefficient. We selected a level of absolute variability that is easy to interpret. To cover the dynamics, we calculated a linear trend function for each group:

$$T_t = b_0 + b_1 * t \quad (4)$$

Where

T_t = point forecasting for the year concerned

b_0 and b_1 = equation parameters

t = time variable

Parameter b_1 shows the dynamics of changes in the ranking order.

Ranking is a simple order, not taking size of value differences into consideration. For that reason, the size of value differences of each order against the winner of ranking, was included into the calculation for evaluation. Winner of EVA and spread indicators is a group having the highest value. As a result of analysis are intervals of value differences between particular orders.

3 Results and Discussion

Table 1 shows the EVA values of individual groups in millions of CZK from 2008 to 2014. Using these data we created rankings for the individual years (see Table 2).

Group 32.4 Manufacture of games and toys was the greatest driver of CZ-NACE 32 in 2014, followed by the second 32.5 Manufacture of medical and dental instruments and supplies, and the third 32.9 Manufacturing not elsewhere classified. Group 32.3

Manufacture of sports goods took the last position and was the only group with a negative economic value added.

The ranking for the entire period under review is expressed by the average order, with 32.4 being the best group again. The order is identical to that of 2014. To obtain information on the absolute variability of the order, the standard deviation has been calculated. It is lowest in the first and second groups (having deviated from their top positions only once) and highest in the last group. The relative characteristics of variability are expressed by the variation coefficient, which is well below 0.5 for all groups, indicating that the order series are homogeneous in time. Unlike the order in the ranking list, the economic values added are heterogeneous in time (except for Groups 32.4 and 32.5).

The changes in the order dynamics over the period concerned can be estimated from the b1 coefficient of the trend curve. The best trend is shown by Group 32.9, whose position improved by 0.46 every year. This group is the climber of the reference period. Groups 32.5 and 32.2 also improved their positions slightly. By contrast, the position of Group 32.3 deteriorated to the greatest extent.

Table 1 Economic Value Added (in Millions of CZK)

	2008	2009	2010	2011	2012	2013	2014
32.1	-52	-87	-74	-73	-37	-89	69
32.2	-158	-249	-90	-10	4	30	61
32.3	-292	23	-41	-123	-177	-214	-79
32.4	962	1 460	1 334	950	839	609	1 358
32.5	628	1 042	818	869	836	838	709
32.9	-159	-287	-72	-137	52	181	599

Source: Data of the Ministry of Industry and Trade of the Czech Republic, calculations authors

Table 2 Economic Value Added Rankings for the Individual Years

	2008	2009	2010	2011	2012	2013	2014	Avg.	Sx	Vx	b1
32.1	3	4	5	5	5	5	4	4,43	0,73	0,16	0,18
32.2	4	5	6	4	4	4	5	4,57	0,73	0,16	-0,04
32.3	6	3	3	6	6	6	6	5,14	1,36	0,26	0,32
32.4	1	1	1	1	1	2	1	1,14	0,35	0,31	0,07
32.5	2	2	2	2	2	1	2	1,86	0,35	0,19	-0,07
32.9	5	6	4	3	3	3	3	3,86	1,12	0,29	-0,46

Source: Calculations authors

Ranking ordered in a simple way disregards the difference in EVA compared to the winner's EVA. These differences are calculated in Table 3 "Difference in EVA compared to the best group's value". Table 3 shows that the 2014 winner achieved a better EVA of around CZK 700 million compared to the second and third positions, i.e., worth hundreds of millions of CZK, as opposed to almost a double difference compared to the other groups. We can observe the clustering of groups based on the distance from the top-positioned group.

The average EVA differences from the winning group for the entire reference timeframe are tens of millions of CZK for the top group (32.4), as opposed to hundreds of millions of CZK for the second position (32.5), and the average difference in excess of CZK 1 billion for the other groups. The precariousness of the ranking becomes evident in 2011 and 2012, as the difference between the first and second positions was very negligible.

We want to eliminate the effect of the amount of capital invested and focus on the capability of increasing the value of CZK 1 of equity capital invested, i.e., what economic value added can be generated by equity capital of CZK 1. Table 4 shows the calculation of relative economic value added, i.e., the spread. Table 4 provides an interesting view of the mode of spread behaviour over time. The values of variation coefficients for the

individual groups are highly heterogeneous (except for Groups 32.4 and 32.5 again) – to a much greater extent than in the absolute amounts of EVA.

Table 3 Difference in EVA Compared to the Best Group's Value (in Millions of CZK)

	2008	2009	2010	2011	2012	2013	2014	Avg.
32.1	-1 013	-1 547	-1 408	-1 024	-876	-927	-1 289	-1 155
32.2	-1 119	-1 709	-1 424	-961	-835	-808	-1 297	-1 165
32.3	-1 254	-1 437	-1 375	-1 073	-1 015	-1 052	-1 436	-1 235
32.4	0	0	0	0	0	-229	0	-33
32.5	-334	-418	-516	-81	-2	0	-649	-286
32.9	-1 121	-1 747	-1 406	-1 087	-786	-657	-759	-1 080

Source: Calculations authors

Table 4 Spread

	2008	2009	2010	2011	2012	2013	2014
32.1	-3,1%	-4,6%	-3,2%	-2,9%	-1,6%	-3,7%	2,9%
32.2	-22,4%	-44,7%	-16,2%	-1,8%	0,6%	5,0%	9,7%
32.3	-16,7%	1,2%	-2,3%	-6,1%	-8,2%	-10,3%	-4,5%
32.4	20,1%	22,2%	14,2%	9,2%	8,7%	5,6%	11,2%
32.5	8,2%	11,8%	9,4%	9,7%	9,0%	7,8%	7,4%
32.9	-3,3%	-5,7%	-1,3%	-2,5%	0,9%	3,0%	9,8%

Source: Data of the Ministry of Industry and Trade of the Czech Republic, calculations authors

In 2014, Group 32.4 showed the largest spread and consequently took the first position again, while Group 32.3 took the last position again. In the other groups, however, the order by spread size differs from the order by the amount of EVA. Group 32.9 is second and Group 32.2 is third when ordered by spread.

In the ranking for the entire period under review – measured by the average position value – the order of groups is similar to the order by EVA, with the fourth and fifth groups having swapped their positions. With the exception of Group 32.5 the variation coefficients indicate homogeneity of the ranking series by order.

Table 5 Spread Rankings for the Individual Years

	2008	2009	2010	2011	2012	2013	2014	Avg.	Sx	Vx
32.1	3	4	5	5	5	5	5	4,57	0,73	0,16
32.2	6	6	6	3	4	3	3	4,43	1,40	0,32
32.3	5	3	4	6	6	6	6	5,14	1,12	0,22
32.4	1	1	1	2	2	2	1	1,43	0,49	0,35
32.5	2	2	2	1	1	1	4	1,86	0,99	0,53
32.9	4	5	3	4	3	4	2	3,57	0,90	0,25

Source: Calculations authors

4 Conclusions

The advantage of ranking is that it clearly determines the order, and its results are easy to interpret and communicate to the outside world. These benefits made us use it for evaluating the competitiveness of the division selected. A drawback of ranking is that it disregards the differences in values between the individual positions. But we strove to eliminate this drawback.

Compiling a ranking for a single year is easy. However, an evaluation covering more than one period is problematic. We considered several options for such an evaluation but endorsed the simplest solution to evaluate the level and variability in the end – i.e., the arithmetic mean of the order and calculating the standard deviation and variation

coefficient. We evaluated the dynamics by the b_1 parameter value – based on estimating a linear trend function. Using the simplest possible procedure proved to be a good option.

Unlike multi-criteria ranking lists of competitiveness (see, for example, World Economic Forum [WEF], 2016), which are mostly based on evaluators' views, we used a single-criterion ranking list – based on economic facts regarding the economic performance achieved, which is independent of evaluators' views. The ability to generate an economic value added was crucial for determining the position in our ranking list. The simple order was complemented with the statistical characteristics of the position, variability and trend levels, so that the timeline development could be taken into account. Moreover, the differences in values between the individual positions were added to provide an idea of the 'distances' between the individual positions.

We found that Group 32.4 Manufacture of games and toys was the greatest driver of the CZ-NACE Division 32 Other manufacturing – both in 2014 and throughout the period under review, i.e., 2008 to 2014, followed by the second 32.5 Manufacture of medical and dental instruments and supplies. The first and second drivers maintained their positions in time, with their economic values added being far from those of the other groups. These two groups also maintained their leading positions in the evaluation of relative EVA throughout the period under review. Nevertheless, this does not apply to 2014, when Group 32.5 dropped to the fourth position.

References

Ministry of Industry and Trade of the Czech Republic. (2015). *PANORAMA of the Manufacturing Industry of the Czech Republic 2014*. Retrieved from <http://www.mpo.cz/dokument162071.html>.

Neumaier, I., Neumaierová, I. (2002). *Výkonnost a tržní hodnota firmy*, 1. vyd. Praha: Grada.

Šmarda, Z. (2006). Vývoj ratingu firem a jeho význam pro finanční řízení. Retrieved from http://konference.fbm.vutbr.cz/workshop/papers/papers2006/smarda_zdenek.pdf.

World Economic Forum. (2016). *Competitiveness Rankings*. Retrieved from <http://reports.weforum.org/global-competitiveness-report-2015-2016/competitiveness-rankings/>.

The Impact of Demographic Characteristics on Financial Literacy: An Empirical Study in Commercial Banks' Customers

Thi Anh Nhu Nguyen

Tomas Bata University in Zlin
Faculty of Management and Economics
Department of Enterprise Economics
Mostni 5139, 76001 Zlin, Czech Republic
Email: anhnhu80@gmail.com

Abstract: *This study was conducted with the aim of assessing and analyzing financial literacy against the demographic characteristics of customers of commercial banks in emerging financial market in Vietnam. Primary data was collected by a structured questionnaire from 240 respondents in 12 branches of four commercial banks in Ho Chi Minh City. The results of descriptive statistics indicated that the average of basic financial and general investment knowledge of commercial banks' customers in Vietnam is moderated. Regression analyses revealed that levels of education, gender, and age scale (age over 55) are significant factors which enhance the basic financial knowledge and general investment knowledge while income, job status and marital status are insignificant to financial literacy. The results of this study assist to improve the level of personal financial knowledge by creating a wide range of education programs related to financial knowledge as well as implementing further research into this field in Vietnam.*

Keywords: financial literacy, basic financial knowledge, general investment knowledge, demographic characteristics and Vietnam

JEL codes: G19, J10, D14

1 Introduction

Financial literacy is an issue of front line and has great role in determining individual life, than what it had decades back due to the complexity and dynamics in the financial options. The socio economic and technological advancements also contributing for the importance of financial literacy. Financial literacy associated with saving culture of individuals and also ultimate expected to affect future of government direction. Though financial literacy is getting greater attention in developed world the issue in developing country is at infant stage. This is mostly due to the gap in financial literacy among majority of the society in developing country.

Vietnam's population has reached 90 million people, the issue of financial literacy level and personal finance planning is left open. In addition, most of the people assumed to have no knowledge of basic financial literacy. Among other things this could results in lack of financial inclusion and inappropriate utilization of income. Beside this lack of financial literacy knowledge could affect entrepreneurial motives of individuals. Additionally, financial literacy is a recent phenomenon for the literature world and there are limited literatures on the area (Lusardi & Mitchell, 2011; OECD, 2013). Most of the literatures are focused on developed countries and the developing world is left vacuum. Hence this study has played dual role. In one hand it assess the financial literacy level of Vietnamese people by taking customers of commercial banks in Vietnam. On the other hand it strives to identify the determinant factors for the financial literacy levels of Vietnamese people.

This paper is organized as follows: Section 1 provides a review of the current literature about financial literacy and factors of socio - demographic. Section 2 introduces methods and materials. Section 3 analyses the result and discuss the financial literacy of commercial banks' customers in Vietnam. The final section is the conclusion and an examination of areas for future research.

Financial literacy

There has been a growing interest in financial literacy as a core life skill worldwide (OECD, 2012). Governments and citizens have changed their views of risk widely in recent decades. OECD (2012, pp.7) claims that most of the governments are scaling back the social benefits of people, individuals have become more responsible of handling their finance efficiently expecting future benefits. In the same time, with reference to bank habits of individuals, Belás et al. (2014, pp.70) found that "A higher sensitivity of women for prices of banks' products and services is related with responsibility for family finances and therefore women are more economical than men". Moreover, financial literacy can assist individuals use financial products effectively and avoid incurring unnecessary costs in their investment (Capuano & Ramsay, 2011).

It is difficult to reach an agreement on the definition of financial literacy although its importance has been admitted worldwide. There are a number of definitions of financial literacy but financial knowledge is considered the most common basis for the definitions of financial literacy. While some researchers think financial literacy is an understanding of economics in general and how economic conditions and circumstances affect household decisions (Worthington, 2006), others claim that financial literacy is more narrowly defined as money management tools such as budgeting, saving, investing and insurance (Mandell, 2008). Remund (2010) asserts that financial literacy, at its most basic level, is the knowledge and understanding of financial concepts so that individuals can make informed, confident and effective decisions related to money.

In fact, different aspects and methods to measure financial literacy were used in previous studies. This research is carried out based on the questionnaires from these studies of financial literacy which are modified to be appropriate for the objectives in Vietnam. These knowledge questions were carefully selected so that they are closely linked to the ones used widely in studies connected to financial literacy to specific financial outcomes (Hilgert et al., 2003; van Rooij et al., 2011; Lusardi & Mitchell, 2011). These questions are divided into two modules so as to measure basic financial literacy and general investment knowledge.

Socio-demographic characteristics

The relationships between individuals' demographic characteristics and financial literacy have been studied in many researches in which age, gender, education, income, marital status and employment have been the most commonly investigated characteristics (van Rooij et al., 2011; Lusardi & Mitchell, 2011). The purpose of the discussion is to obtain a wider understanding of the importance of these demographic factors for people's levels of financial literacy.

Age has been found to be related to financial literacy in many broad population surveys. For example, in their study in proved that age and financial knowledge follow an inverted U-shaped pattern, being lowest for the younger and the older age groups, but reaching a peak in the middle of the life cycle. The same results are also discovered in Australia in which the youngest (18-24 years) and the oldest (65 years or over) age groups showed the lowest financial literacy scores (ANZ, 2011). Regarding gender, big differences in basic financial literacy between genders have been discovered in the majority of previous studies in which females show lower basic knowledge than males (ANZ, 2011; Lusardi & Mitchell, 2008). Furthermore, in the area of satisfaction of banking customers, Belás et al. (2015) indicates that there is significant difference between men and women in case of attitudes and opinions.

Consistent findings connected to the relationship between education and financial literacy have also been found in prior studies. For instance, in researches into financial literacy and retirement planning in many countries, Lusardi and Mitchell (2011) claim that higher level of education is strongly correlated with financial literacy. Similarly, the educational level is consistently found to be linked to both basic and advanced financial literacy as showed in a study of financial literacy and stock market participation in the Netherlands (Van Rooij et al., 2011). In Australia, the ANZ Survey (2011) revealed that education

qualifications are associated with financial literacy score. However, although education is highly correlated with financial literacy, a large proportion of individuals with university degrees show low levels of advanced financial knowledge, as Van Rooij et al. (2011) warn.

Objectives of the study

The main objective of this study is to assess the financial literacy of Vietnamese people who are customers of commercial banks in Vietnam.

Specifically,

- To evaluate the level of financial literacy of the Vietnamese people
- To identify socio-economic and demographic determinants of financial literacy among Vietnamese people.

2 Methodology and Data

The study is based on primary data collected from customers of commercial banks in Vietnam in January 2016. Survey questions were distributed for the total of randomly selected 240 respondents in 12 branches of four commercial banks in Ho Chi Minh City. Customers of commercial banks are selected as they are expected to have some basic communications on the issue and also as they are concentrated in one area, it is easy to access several respondents in one place. Due to inadequate responses, twenty nine questionnaires were rejected in the tabulation process. The questionnaire consists of 14 multiple-choice questions in two main sections; (1) overall personal financial literacy dividing into two levels: basic financial knowledge and general investment knowledge and (2) socio - demographic data.

Measure of variables

Basic financial knowledge which is one of the dependent variables is constructed based on the study conducted by van Rooij et al. (2011). It consists with four multiple choice questions related to compound interest works, inflation effects, time discounting and how money illusion has impacts on respondents. The other dependent variable, general investment knowledge is constructed based on the study conducted by Bateman et al. (2012). Knowledge of risky assets such as equities and bonds, investment concepts such as long period returns, volatility and risk diversification are taken into consideration in constructing this variable. This variable represent by four multiple choice question. Based on the answers to the four questions of each group, a quantitative measurement of basic financial literacy and general investment understanding was created. The respondents get one mark for each correct answer question.

Socio-economic and demographic characteristics of this study gender, age, and education, job status, marital status and income level of individuals. All of them are dummy variables are considered as independent variable of this study.

Model Specification

The relationship between and among dependent and independent variables are explained using regression analysis.

$$\text{Basic financial knowledge} = \alpha + \beta_1 (\text{Male}) + \beta_2 (\text{Age1}) + \beta_3 (\text{Age2}) + \beta_4 (\text{Age3}) + \beta_5 (\text{Age4}) + \beta_6 (\text{high school}) + \beta_7 (\text{Undergraduate}) + \beta_8 (\text{Graduate degree}) + \beta_9 (\text{Marred}) + \beta_{10} (\text{Employed}) + \beta_{11} (\text{Income1}) + \beta_{12} (\text{Income2}) + \beta_{13} (\text{Income3}) + \varepsilon \quad (1)$$

$$\text{General investment knowledge} = \alpha + \beta_1 (\text{Male}) + \beta_2 (\text{Age1}) + \beta_3 (\text{Age2}) + \beta_4 (\text{Age3}) + \beta_5 (\text{Age4}) + \beta_6 (\text{high school}) + \beta_7 (\text{Undergraduate}) + \beta_8 (\text{Graduate degree}) + \beta_9 (\text{Marred}) + \beta_{10} (\text{Employed}) + \beta_{11} (\text{Income1}) + \beta_{12} (\text{Income2}) + \beta_{13} (\text{Income3}) + \varepsilon \quad (2)$$

Where by,

α : is a constant term; β : is coefficients to be determined; ε is the error term

Age: Age1: age >25 to 35; Age2: age >35 to 45; Age3: age >45 to 55; Age4: age >55

Income1: >9 – 20 million VND; Income2: >20 million VND; Income3: prefer to not answer

Hypotheses

Based on the findings from other empirical studies and related theory, thus the following relationships between the dependent and independent variables are predicted: Demographic characteristics are significantly related to financial literacy.

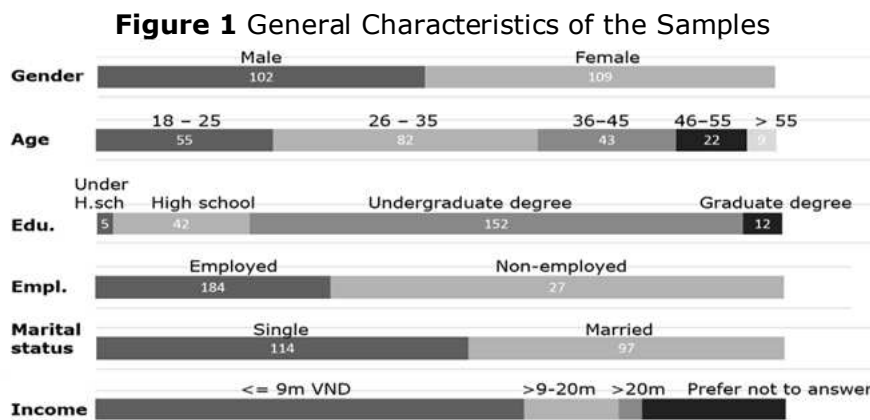
This hypothesis can be broken into details as follows:

- H1: Gender affects financial literacy (+), and male also would be expected higher level of financial literacy than female.
- H2: Age categories affects financial literacy (+/-)
- H3: Level of education affects financial literacy (+)
- H4: Marital status affects financial literacy (+/-)
- H5: Job status affects financial literacy (+/-)
- H6: Income categories affects financial literacy (+/-)

3 Results and Discussion

Overview of the sample

Being designed to conceptualize financial literacy of general population, this sample survey has to cover many aspects and different respondents. In order to provide the real views of respondents to this survey, the researcher selected commercial bank branches as they are convenient and appropriate places to meet respondents. Figure 1 shows the main characteristics of the sample.



Source: Researcher developed based on sample survey

From a total of 211 respondents, 85% of the respondents in this survey have the age from 18 to 45. The percentage of male and female is fairly equal with 48.3% and 51.7% respectively. In terms of education, around 70% have undergraduate education (diploma and bachelor degree). Most of them have an average income level (below or equal to 9 million VND).

Financial literacy

The purpose of the first part of this survey is to measure financial literacy. This part, which assesses respondents’ basic financial knowledge, is mainly about compound interest, inflation, time value of money and money illusion. *Table 1* shows that the first four questions (Q1-Q4) are associated with basic financial knowledge. The result shows that 56.9%, 52.6%, 55.9% and 51.2% of respondents gave a correct answer to the questions related to compound interest, inflation, time value of money and money illusion respectively, whereas about 23% did not know the answer to inflation question and the percentage of those who answered incorrectly to these questions is between 24.6% and 38.4%. Overall, respondents’ general knowledge related to basic financial

concepts can be regarded as medium. Although these concepts may appear familiar and relatively simple, it should be considered that respondents of this survey are a precondition for daily financial transactions. Nevertheless, the percentage of about 50% correct answer to each question can be seen as relatively medium.

Table 1 Frequencies of Responses for Basic Financial Knowledge Questions (N=211): Percentage of Correct, Incorrect, Do not Know Responses

	<i>Correct</i>	<i>Incorrect</i>	<i>Don't know</i>
Q1: Compound interest	56.9%	33.6%	9.5%
Q2: Inflation	52.6%	24.6%	22.8%
Q3: Time value of money	55.9%	27.0%	17.1%
Q4: Money illusion	51.2%	38.4%	10.4%

Source: Researcher developed based on sample survey

Comparing with prior studies in which the same questions about basic financial literacy were asked, there was a relatively big gap in the percentage of respondents' correct answers. For instance, in the studies of Lusardi and Mitchell (2009), van Rooij et al. (2011) and Bateman et al. (2012), respectively 69%, 76.2% and 72% of respondents gave correct answers to the compound interest question, compared with 56.9% in this study. Similarly, for the question connected to inflation, the corresponding percentages of correct answers in these prior studies were 87.1%, 82.6% and 78.4% respectively, while in the current study this figure is only 52.6%. Generally, the percentage of correct answers to questions regarding basic financial knowledge of commercial banks' customer in Vietnam in this survey is lower than those in previous studies. These differences may be partly explained by the fact that the sample of developing countries has less chance of access to knowledge and awareness of personal finance as well as financial products than those of western countries.

The second part of this research explores respondents' knowledge of general investment. The questions were designed to test knowledge of risky assets, such as stocks and bonds, as well as concepts such as long period returns, volatility and risk diversification. *Table 2* below summarizes the result of these questions. Obviously, the lowest percentage of participants (30.3%) gave correct answers to the question related to asset which normally gives the highest return. The second lowest figure of correct answers (50.7%) was associated with the knowledge regarding risk diversification. This suggests that about a half of total respondents have a good understanding of diversification theory in investment portfolio. Over 60% of participants have an understanding of risk asset (Share are normally riskier than bonds?) and volatility (Normally which asset displays the highest fluctuations over time?).

Table 2 Frequencies of Responses for General Investment Knowledge Questions (N=211): Percentage of Correct, Incorrect, Do not Know Responses

	<i>Correct</i>	<i>Incorrect</i>	<i>Don't know</i>
Q5: Risk assets	63.5%	11.8%	24.7%
Q6: Long term period return	30.3%	46.0%	23.7%
Q7: Volatility	60.7%	18.0%	21.3%
Q8: Risk diversification	50.7%	22.7%	26.6%

Source: Researcher developed based on sample survey

In comparison with previous studies, participants in the current study again consistently achieved a lower score when the same questions were asked. For example, for the question on which asset provides the highest return in the long-term, only 30.3% of respondents in this study correctly identified shares, compared with 62.3% in Lusardi and Mitchell (2009), 47.2% in van Rooij et al. (2011), and 55.2% in Bateman et al. (2012).

The overall basic financial knowledge and general financial knowledge score is obtained from the summation of scores of each. Table 3 below summarizes the average and standard deviation of respondents' answers. The average of basic financial and general investment knowledge is about medium, about 2 out of 4, which suggests that the overall financial knowledge can be considered medium.

Table 3 The Mean and Standard Deviation of Respondents' Correct Answers

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Basic financial knowledge	211	4	0	4	2.17	1.142
General investment knowledge	211	4	0	4	2.05	1.262

Source: Researcher developed based on sample survey

According to the correlation analysis (table 04) three demographic characters, Age > 55, High School and graduate have shown significant result with basis financial knowledge. All other characteristics have resulted no correlation with basic financial knowledge. Accordingly, the correlation analysis partially supports H2 and H3 respectively. All other democratic characteristics of respondents are shown insignificant results and are not supported hypotheses relevant to those characteristics.

Table 05 provides correlation analysis of demographic characteristics and general investments knowledge. According to analysis high school, Undergraduate, graduate, job status and income level >20 million VND have resulted positive and negative correlation to general investment knowledge. Accordingly hypotheses derived based on general knowledge of investment have also partially supported same like basic financial knowledge.

Table 4 The Correlations between Basic Financial Knowledge and Demographic Characteristics

	Basic FK	Age > 55	High school	Graduate
Basic FK	1			
Age >55	-.117*	1		
High school	-.179***	0.025	1	
Graduate	.215***	0.058	-0.122	1

Source: Researcher developed based on sample survey

Table 5 The Correlations between General Investment Knowledge and Demographic Characteristics

	General IK	High school	Undergraduate	Graduate	Job status	> 20 million VND
General IK	1					
High school	-.341***	1				
Undergraduate	.311***	-.800**	1			
Graduate	.136**	-0.122	-.394**	1		
Job status	.129*	-.200**	0.109	0.094	1	
> 20 million	.139**	-0.092	0.056	0.069	0.071	1

Source: Researcher developed based on sample survey

*** Correlation is significant at the 0.01 level (2-tailed)

** Correlation is significant at the 0.05 level (2-tailed)

* Correlation is significant at the 0.1 level (2-tailed)

Regression Analysis

Ordinary Least Squares (OLS) regression analysis is performed to see the relationship between basic financial knowledge and general financial knowledge on demographic and economic characteristics. Before running the model, all of classical linear regression assumptions has been tested. There is no collinearity problem as VIF in each case are not more than 3- Beside the Durbin Watson test for autocorrelation shows for both models 1.739 and 1.814 respectively. ANOVA P-Value for both models indicate that the significance of the models. As F- and χ^2 test for heteroscedasticity indicate, there is no evidence for the presence of heteroscedasticity, since the p-values are considerably in excess of 0.05.

The result of model 1 (1) shows gender-male, undergraduate and graduate level of education, and age above 55 are found to significantly relate with basic financial knowledge. In this model, gender in terms of male has positive (.136) and statistically significant effect on the basic financial knowledge. This indicate that compared to female respondents, male respondents are better in having the basic knowledge of financial literacy. Hence, the result supported the first hypothesis. Age has been categorized in to deferent group. In general age has not been found to be significantly affecting the basic financial literacy. However, age group of over 55 are found to be negatively and significantly related with basic level of fincial literacy. This indicate those who are older, shows lower level in basic financial knowledge. Hence, the result partly supports the second hypothesis. The result of model 1 also revealed that as education level increase the basic financial knowledge of the respondents is also increase. Those who have undergraduate and graduate degree level are significantly and positively related with basic financial literacy; as compared with high school and under high school educational level. This result supports the third hypothesis.

The result of model one shows marital status, income level and job status of the respondents have no statistically significant impact of the level of basic financial literacy. Hence, there is no statistical evidence to support the fourth, fifth and sixth hypothesis.

Table 7 Regression Analysis Model (1) and (2)

	Basic financial knowledge (1)			General investment knowledge (2)		
	Coefficient	T	P-value	Coefficient	t	P-value
Male	0.136	1.971	.050* *	0.158	2.446	.015**
Age >25-35	-0.008	-0.09	0.928	0.115	1.361	0.175
Age >35-45	0.091	0.921	0.358	0.092	1.002	0.317
Age >45-55	-0.005	-0.06	0.952	-0.023	-0.283	0.778
Age >55	-0.148	-1.941	.054* *	-0.019	-0.274	0.784
High school	0.257	1.409	0.16	0.3	1.766	.079*
Undergraduate	0.497	2.519	.013* *	0.754	4.103	.000***
Graduate degree	0.46	3.846	.000* **	0.459	4.116	.000***
Employed	0.002	0.031	0.975	0.026	0.386	0.7
Married	-0.033	-0.383	0.702	-0.144	-1.8	.073*
>9-20 million VND	0.019	0.271	0.787	0.067	1.023	0.307
>20 million VND	0.066	0.973	0.332	0.087	1.368	0.173
Prefer no answer	0.047	0.652	0.515	0.096	1.437	0.152
	R2: 0.148	Durbin Watson: 1.739		R2: 0.260	Durbin Watson: 1.814	
	Adjust R2: 0.092			Adjust R2: 0.211		
	F statistics: 0.002			F statistics: 0.001		
	ANOVA P-value: 0.002			ANOVA P-value: 0.001		

Source: Researcher developed based on sample survey

***: P<0.01; **: P<0.05; *: P<0.1

Model 02 (2) of the regression analysis shows the relationship between demographic characteristics and general investment knowledge. According to the test results, gender in terms of male has positive (.158) and statistically significant also effect on the general investment knowledge. This indicate that compared to female respondents, male respondents one again are better in having the investment knowledge of financial literacy. Hence, the result supported the first hypothesis. Especially, respondents with high school of education level is also positive significant with general investment knowledge while they have not shown significant results in basic financial knowledge. This situation can be elaborated practically. General investment knowledge can be obtained by people through life experiences and information from outside the level of education. It has sometimes no relation with formal education. Other interesting conclusion arise from this test results is that marriage has negative impact on general investment knowledge. Even though the married people is significant with general investment knowledge, the coefficient (-0.144) indicates that it is negatively related.

4 Conclusions

Financial literacy level has an enormous effect on financial well-being of individuals. Thus, the purpose of the study is expected to measure the financial literacy of commercial banks' customers in Vietnam. This study focuses on estimating the basic financial knowledge and general investment knowledge and which demographic factors affect those of commercial banks' customers in Vietnam.

For all the discussions made, it is found that the overall financial knowledge can be considered at moderated level. Regarding the empirical discussion of this study, the education variable (undergraduate and graduate levels) found to be of significant positive values as with basic financial knowledge at P-value 0.05. The same happened to the gender variable, especially at P-value 0.05, which females show lower basic knowledge than males. Whereas the age variable which respondents' age over 55 is remarkably negative at P-value 0.05. The age category more than 55 year old is correlated to financial knowledge with an inverted pattern. Marital status, job status and income in this study are not significant of basic financial knowledge.

In term of general investment knowledge, most of the levels of education variable (high school, undergraduate, and graduate) found to be significant positive with general investment knowledge at P-value 0.05. The gender variable showed similar results to the basic financial knowledge, and this was further confirmed in the second model as well.

This result, although a preliminary finding form this exploratory research, suggests that if the experts in personal financial planning and financial institutions supplying personal financial services and products know how to impart knowledge of finance and inform their customers so that they can have access to and use financial services better. Besides, policy makers and education and training institutions would also take advantage of this to improve the understanding of the financial literacy of Vietnamese people in general and commercial banks' customers in specific.

Acknowledgement

The author is thankful to the Internal Grant Agency of FaME TBU No. IGA/FaME/2015/025: The possibilities of the financial performance growth for commercial banks in the context of the credit risk of SME and the customer satisfaction, for financial support to carry out this research.

References

ANZ. (2011). *Adult Financial Literacy in Australia*. Retrieved from: <http://www.anz.com/resources/f/9/f9fc9800493e8ac695c3d7fc8cff90cd/2011-Adult-Financial-Literacy-Full.pdf.pdf?MOD=AJPERES>. Accessed 14 January 2015.

- Bateman, H., Eckert, C., Geweke, J., Louviere, J., Thorp, S., & Satchell, S. (2012). Financial Competence and Expectations Formation: Evidence from Australia*: Financial Competence and Expectations Formation. *Economic Record*, vol. 88(280), pp. 39–63.
- Belás, J., Chochol'áková, A., Gabcová, L. (2015). Satisfaction and loyalty of banking customers: A gender approach. *Economics & Sociology*, vol. 8(1), pp. 176.
- Belás, J., Cipovová, E., Demjan, V. (2014). CURRENT TRENDS IN AREA OF SATISFACTION OF BANK CLIENTS IN THE CZECH REPUBLIC AND SLOVAKIA. *Transformation in Business & Economics*, vol. 13(3).
- Capuano, A., Ramsay, I. (2011). What causes suboptimal financial behaviour? An exploration of financial literacy, social influences and behavioural economics. *An Exploration of Financial Literacy, Social Influences and Behavioural Economics (March 23, 2011)*. *U of Melbourne Legal Studies Research Paper*, (540).
- Hilgert, M. A., Hogarth, J. M., Beverly, S. G. (2003). Household financial management: The connection between knowledge and behavior. *Fed. Res. Bull.*, vol. 89, pp. 309.
- Lusardi, A., Mitchell, O. S. (2008). Planning and Financial Literacy: How Do Women Fare? *American Economic Review*, vol. 98(2), pp. 413–417.
- Lusardi, A., Mitchell, O. S. (2011). Financial literacy around the world: an overview. *Journal of Pension Economics and Finance*, vol. 10(04), pp. 497–508.
- Mandell, L. (2008). The financial literacy of young American adults. *Results of the 2008 National Jump \$ Tart Coalition Survey of High School Seniors and College Students*.
- OECD. (2012). *PISA 2012 Financial Literacy Assessment Framework*. OECD Publishing. Retrieved from: <http://www.oecd.org/pisa/pisaproducts/46962580.pdf>.
- OECD. (2013). *PISA 2012 Assessment and Analytical Framework*. OECD Publishing. Retrieved from: http://www.oecd-ilibrary.org/education/pisa-2012-assessment-and-analytical-framework_9789264190511-en.
- Remund, D. L. (2010). Financial literacy explicated: The case for a clearer definition in an increasingly complex economy. *Journal of Consumer Affairs*, vol. 44(2), pp. 276–295.
- Van Rooij, M., Lusardi, A., Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, vol. 101(2), pp. 449–472.
- Worthington, A. C. (2006). Predicting financial literacy in Australia. Retrieved from: <http://ro.uow.edu.au/commpapers/116/>.

Private Health Insurance and Medical Subscriptions – Two Faces of the Private Pre-paid Funding of Health Care in Poland

Magdalena Osak

Poznań University of Economics and Business
Faculty of Economics, Department of Insurance
Al. Niepodległości 10, 61-875 Poznań, Poland
E-mail: magdalena.osak@ue.poznan.pl

Abstract: *Health care in Poland is financed from mixed sources, both private and public. Similarly to the majority of developed countries, public funds are the main source of financing. However, since the 1990s private expenditure has constituted a significant proportion of the total expenditure on health. Apart from out-of-pocket payments, which are the main source of generating private resources, pre-paid plans are used. The paper presents the legal and market coexistence of private health insurance (PHI) and other pre-paid schemes in the form of the so-called "medical subscriptions". The analysis will be focused, inter alia, on: the value of collected funds, the number of operating providers, and the percentage of the population covered. One of the leading goals will be to stress the specific character of the Polish legal state of affairs among private pre-paid plans. This is especially important when making international comparisons devoted to PHI schemes as a different legal status can influence the findings of the market analysis. The need to draw public attention to legal differences is critically important if they are not rooted in the functional aspect of different mechanisms of funding, which is the case in Poland.*

Keywords: private health insurance, medical subscriptions, pre-paid plans, health care financing, Poland

JEL codes: G22, I13, P46

1 Introduction

Similarly to the majority of developed countries, health care in Poland is financed from mixed sources, both private and public. Since 1999, when the Law on Universal Health Insurance of 6th February 1997 came into effect, social health insurance contributions have been the dominant source of public finance. Additionally, public funds are derived from the state budget and local self-government budgets.

Alongside publicly-financed statutory health insurance, private sources of generating funds for health care exist. For many years, the public and private financial means account for, respectively, approximately 70 and 30 percent of the total expenditure. Having fallen from 90% at the beginning of the 1990s, the share of public spending has not changed substantially over years (OECD, 2012, pp. 48). It means that for more than twenty years Poland has constantly belonged to a group of countries with a relatively high level of private resources spent on health care (OECD, 2016). What has played the dominant role among private resources are out-of-pocket payments (OOP). Apart from OOP, private pre-paid schemes have been developing and used as a source of accumulating money for health services. In Poland, these schemes are split into two separate types of commercial products: private health insurance (PHI) and the so-called "medical subscription". The latter is offered not by insurers, but by specific health providers termed "subscription-based health providers" (see Thomson and Mossialos, 2009, pp. 38).

The literature does not provide a single definition of private health insurance (see OECD, 2004; Swiss Re, 2007; CEA, 2011). Using different contexts and criteria, a variety of insurance products are referred to as PHI. They include, among others, indemnity insurance (medical insurance), hospital cash policies, critical illness insurance, disability insurance (Swiss Re, 2007; Osak, 2008). What is a common attribute of all these products is the fact that the insured will be entitled to guaranteed benefits only if an

event occurred influences the health status of an insured person (Osak, 2011). Based on the nature of benefits, each of health insurance products can be classified in one of the two broad types of health insurance: reimbursement (indemnity) insurance or fixed benefit insurance (Swiss Re 2015). The fixed benefit plans are not relevant to funding health care. They merely guarantee flat rate payments not related to the real cost of treatment. Additionally, the amount received by an insured person is not required to be spent on medical services at all. Contrary to these, the reimbursement type of health insurance ensures the financing of access to health care and, owing to this, protects the beneficiary against current costs of medical services.

Another criterion used to distinguish different types of health insurance is the method of the calculation and financing of an amount to be paid for the insurance cover (OECD, 2004; Sowada, 2014). Public (social) health insurance is financed through the payroll tax contribution. The contribution is based on the purchaser's ability to pay rather than on his or her risk associated with health and demographic status and the scope and estimated costs of the benefits to be covered by insurance company. A risk related premium characterizes private health insurance.

Further considerations focus only on the reimbursement type of private health insurance. The differences between voluntary and compulsory health insurance were not dealt with in the article as PHI and medical subscriptions in Poland operate only on the voluntary basis.

2 Methodology and Data

The subject of this paper is to describe and to compare two private pre-paid mechanisms of health care funding existing in Poland. The comparison will be done applying the legal and functional point of view. To process the theoretical approach to this issue, the description method is used. Finally, the aim of this paper is to show the functional similarities between PHI and medical subscriptions and, simultaneously, to stress the significant legal differences between these two pre-paid mechanisms. To achieve this aim, resources obtained from the study of relevant literature will be used.

The awareness of the legal status of these mechanisms is crucial to understand and to compare internationally the statistical data showing the role of PHI in the financing of health care in Poland. In order to present how the "unexpected" differences in a legal status can influence the findings from the international comparative market analysis, the statistics presented by the Polish Financial Supervision Authority (KNF – *Komisja Nadzoru Finansowego*), the Polish Insurance Association (PIU – *Polska Izba Ubezpieczeń*), the Central Statistical Office of Poland (GUS – *Główny Urząd Statystyczny*) and OECD will be used as a data source as well.

3 Results and Discussion

PHI and medical subscription: the mechanism of functioning and the legal basis of operation

As agreed, (private) health insurance is a formal arrangement in which the insured (beneficiaries) are protected from the costs of medical services that are covered by the health insurance plan offered by an insurer. By establishing a sufficient insurance portfolio (thus, the insurance fund as well), the insurance company – applying statistical methods – spreads an individual financial risk in time (through the pre-paid system of insurance premium) and between entities that constitute the components of the portfolio, thus in space – pooling (see OECD, 2004; WHO, 2000). At the same time, the insurance company is not afraid of having to finance medical procedures used with regard to a single patient, but fears the risk of the shortage of resources raised from insurance premiums (within a given portfolio) for financing all medical services that the insured demanded and the expected mark-ups in a financial year. The accuracy of the estimation of these expenses is determined by the law of large numbers, thus, the larger and more homogeneous the portfolio of the insured is, the more accurate the evaluation can be.

What is a medical subscription then? Does it use the same mechanism as insurance? In principle, subscription-based institutions ensure that they will provide medical services indicated in the agreement, and the client is obliged to pay a specified fee in advance periodically (usually once a month). These payments feed the fund for covering any costs of future services to those entitled to them or produce a budget surplus. A medical subscription agreement may be concluded directly between a medical service provider and a patient (individual subscription), but it is usually employers that purchase a medical subscription for their employees and, optionally, for the members of their families (group employee subscription). There is a striking similarity between the ways in which a subscription and its forms and medical insurance function.

Medical subscriptions also appear in the literature as "pre-paid packages of medical services" (OECD 2012, pp. 50) and "quasi-insurance coverage" (Kozierkiewicz 2009). The latter term clearly emphasizes common functional features of the two instruments.

In the Polish law, an insurance agreement may be concluded only with an insurance company (art. 805 of C.C.). Consequently, insurance may be offered only by an insurer. To operate in the insurance business, a company needs to obtain a permit from a competent supervisory authority (at present KNF), after a wide spectrum of conditions, including high capital requirements, are met. Among insurance activities that only insurers are allowed to perform is the rating of insurance premiums (art. 4 of IRAA). When charging a subscription fee, the representatives of subscription-based companies refute accusations that they operate in the insurance business without a proper license. They argue that "the subscription is a promise to provide services rather than insurance", "the concluded agreements do not include statements about a premium or compensation", or "the fee is charged at a flat rate."

The above quoted arguments are not convincing, though. Looking from the angle of the guaranteed insurance benefit (in cash or in kind), insurance is a promise to provide such a benefit in future, in case a specific event occurs. As regards a medical subscription, just like in the case of insurance, the fee is chargeable no matter whether during the term of agreement the event which triggers the obligation to provide medical service provision occurs. The pre-paid subscription is not returned either when the subscriber has not received a medical benefit. What is more, the subscription fee is not assigned to the client's individual account which would be used later to finance, until the resources are used up, the costs of medical benefits used. Hence, the medical subscription does not bear any resemblance to the model of a medical savings account, which is by no means a form of insurance (OECD, 2004). The fee charged is not also the price paid for the use of the pre-established number of medical benefits of a specific kind, but it also grants a "dormant" right to such benefits in future. Whether this right is exercised is largely determined by a random factor, i.e. falling ill in the specific period in which the subscription is valid. The lack of randomness concerns only a part of the whole range of benefits guaranteed by a subscription (it is confined to a group employee subscription only), i.e. the obligatory health examinations as specified under occupational health care provisions (Kamiński, 2000).

The fact that a potential client knows the amount of a subscription fee before he or she declares his or her willingness to conclude a medical service provision agreement does not make a given service become insurance. The price may also be revealed, for example, in the case of the community rating model, when each participant of the portfolio (an insured person) pays the same amount. Moreover, in the case of voluntary agreements – and a medical subscription falls within this category – the service provider does not have to conclude the agreement with each interested person. Prior to that, the service provider may thus calculate the flat rate fee assuming specific profiles of clients. If a potential customer fails to meet the expected criteria (e.g. those concerning age), the company may refuse to sign the agreement.

Terse arguments that medical subscriptions are not equivalent to medical insurance have ceased to be sufficient as subscription-based companies have expanded into new fields of activity, such as running their own hospitals, which will be discussed later. Costs of

hospital services are classified as catastrophic costs and financing them on the basis of pre-payments requires the application of statistical and actuarial tools, which corresponds to the rating of premiums in the insurance business.

When incorporating European directives (initially The First „Non-life Insurance“ Directive 73/239/EEC and the current so-called Solvency II Directive 2009/138/EC) into national law, the Polish legislator requires each insurance undertaking to limit its business activities to the business of insurance and operations directly arising thereof from and to the exclusion of all other commercial business. The introduction of the restriction of the line of business forbids health insurers - not only in Poland, but also in the whole EU - to combine offering health insurance cover with health care provider's activity as one legal entity. It means that insurers are not allowed to organize their health insurance business following the example of American Health Maintenance Organizations (HMOs), which medical subscription-based health providers in fact do. On the other hand, it should be clear that the business diversity prohibition does not preclude an insurance company from holding shares, within the limits of investment policy, in non-insurance businesses (Sauter, 2011, pp. 15-16). Consequently, it is possible for a health insurer to belong to the same capitally interrelated group as health providers (e.g. clinics or hospitals), as well as to create contractual business ties with separate health providers to make them involved in the network working like a preferred provider organization in the US. Polish insurers make use of both these possibilities.

When operating in the insurance business, an insurance company is subject to constant supervision by a competent authority and is obliged to meet all legal norms on a permanent basis. Subscription-based companies, in turn, have to meet all regulations concerning the issues of the organization and quality (including security as well) of medical service provision. For obvious reasons, insurers are not subject to such strict standards, because they cannot provide medical benefits, but they can only finance them. It should also be pointed out that insurers also purchase medical benefits for their insured from subscription-based companies.

Subscription-based firms do not operate under the insurance law, so their products are not – from the legal point of view – insurance covers. However, they actually perform the same tasks, or pursue the same goals, as regards customers. The principal task is the financing of the costs related to the treatment of a patient (in case of ill-health) (Kamiński, 2000). Differences between PHI and a medical subscription are visible at the level of law regulations rather than in the field of functions they fulfil as regards consumers. Thus, a medical subscription is not only a product that would be competitive to private health insurance, but it is actually its substitute.

In the years 2000-2006, the then insurance supervision authorities voiced their reservations about the illegal insurance activity of subscription-based companies. In the project financed by the World Bank in 2000, the following statement referred to the controversial activity of subscription-based firms: “Under the current legal circumstances, we may expect (...) further notifications to the prosecutor's office, concerning the deeds that bear all the hallmarks of an offence (...) consisting in running a business activity without a proper permit. In particular, the initiation of criminal proceedings in the first case of this type and reaching the stage of issuing charges should lead to changes in the organization of the whole sector” of privately funded health care (Kamiński, 2000, pp. 7). Although it was more than a decade ago, the legal situation regarding the foundations of subscription activity has not basically changed. The “warming” of relations between insurers and subscription-based firms was a credit to changes in tax regulations, which contributed to subscriptions' losing their privileged position.

PHI and medical subscription in Poland: market state of affairs from the point of view of health care funding

The introduction of medical subscriptions preceded the launch of PHI coverage in the Polish market and gained popularity thanks to favourable tax solutions and making subscriptions a part of motivational systems in a number of enterprises in Poland. This

historical and social background explains – at least partially – the lasting advantage of medical subscriptions over private health insurance in terms of popularity.

Subscription-based companies are first of all “closed chains of own centres.” Own medical centres are facilities which operate under a common name, but from the legal point of view they may be separate entities which are fully dependent on the “brand” enterprise in terms of capital. The inclusion of partner branches run by local medical subjects or even medical practices in a network of health care providers is done in a subsidiary way (Kalbarczyk, 2015).

Subscriptions date back to the 1990s. It was then that a few subscription-based companies like Luxmed, LIM, Medcover and Enelmed were established in Warsaw (Gorajek, 2013). Within a short time, all the service providers transformed from local entities into chain companies, expanding into the whole country – beginning, however, from the largest cities in Poland.

In 2007, as Luxmed was acquired by Mid Europa Partners (private equity fund), the process of the consolidation of medical chains started. The newly established Lux Med Group took over, among others, subscription-based companies such as LIM, Medycyna Rodzinna or Promedis. In September 2012, Mid Europa Partners fund sold Lux Med Group to Bupa. After the consolidation of the market, three main players remained on the stage. Apart from them, the supply side is quite fragmented. It was not a long time ago that it was estimated that there were approximately 200 subscription-based companies in Poland (Thomson and Mossialos, 2009, p. 38). Table 1 presents the most important information about the largest companies in the medical subscription sector. These enterprises extend their product range providing financial services based on a fee for service payment.

Table 1 Main Characteristics of the Leader Subscription-Based Entities in Poland, 2014

Company	Owners	Number of own medical centres (incl. hospitals)	Number of partnership facilities	Number of clients, m		Revenues, PLN, bn
					incl. based on subscriptions	
Lux Med Group	BUPA PLC	190 (7)	1600	1.4	0.8	>1
Medicover	Luxemburg-based Medicover Group	32 (1)	600	0.65	0.48	c. 0.87
Enel-Med	Rozwadowski family members, Generali PTE, PZU PTE	25 (2)	1400	0.3	0.15	c. 0.21
Polmed	Management & Krokus Private Equity	20 (0)	3000	N.A.	0.15	c. 0.061

PTE – General Pension Society

Source: Author’s compilation based on data from (Rotaub, 2015; Kowollik, 2016)

The offer of private health insurance began to develop at the end of the 1990s when the reform of social health insurance was initiated in Poland. This offer has been gradually and progressively changing. Since 2005, insurance covers which guarantee the financing of hospital services have been offered. Initially, they ensured the financing of only specifically enumerated surgical procedures. Since 2011, the cover for financing diagnostic hospitalization has been available as well (Osak and Handschke, 2012). In 2012, the first standalone product drug insurance was made available.

As regards providers of PHI, two qualitative changes are worth emphasizing (Osak and Handschke, 2012). Firstly, in June 2010, the first – and still the only one - insurer to offer exclusively health insurance appeared in the market. There are no legal norms in Poland which would enforce the specialization of health insurers, so any specialization is actually voluntary. Secondly, two biggest subscription-based companies (Medicover and Luxmed) decided to start insurance activity parallel to subscription. It was formally done through Swedish insurance companies which officially announced the onset of operations in the Polish market based on a single license principle. The extension of the scope of activities was connected with the opening of private hospitals belonging to these entities. As it was mentioned before, the calculation of the costs of the guaranteed hospital treatment based on pre-payment necessitates the application of tools used for insurance premium valuation. This is confirmed by both service providers' decisions regarding the distribution of hospital "subscriptions" in the form of insurance. Thereby the construction of medical subscription in its pure form is based on occupational medicine in the case of group employee subscription. The packages also include primary and secondary treatments, but do not contain hospital procedures.

In 2014, for the first time we observed the extension of business activity in the reverse direction, i.e. from an insurer to a subscription-based company. PZU established PZU Zdrowie SA, which was a kind of TPA (Third Party Administration). The new subsidiary not only operates a chain of medical providers for PZU Group, but it also experiments with an offer of medical subscriptions. Thus, one of the most recognizable insurance brands in Poland joined – for legal reasons, through a separate business entity – subscription-based companies.

At the end of the year 2015, insurance business in Poland was conducted by 57 domestic insurance undertakings (27 life insurers and 30 non-life ones). At that time, 12 companies of the whole group offered private health insurance (5 life insurers and 7 non-life ones including one mutual entity).

There is no widely available data which would accurately show both the volume of the medical subscription market and the size of the PHI market. The notion of these both prepaid mechanisms does not appear in the official statistics published by the Polish Financial Supervision Authority (KNF) or the Central Statistical Office of Poland (GUS). In the KNF's statistics, we do find the aggregated data with reference to sickness insurance if supplemental to the main kind of life insurance as well as data on sickness insurance within the non-life insurance branch. The total sum of gross written premium for this kind of products amounted to almost PLN 1.6 billion in 2015 (KNF, 2015). However, it is impossible to extract from this set of data the exact figures regarding the insurance cover relevant to financing health care, as it was defined in the introduction. Recently, this situation has slightly improved thanks to the PIU (Polish Insurance Association), which began publishing data concerning PHI in terms of gross written premium and the number of insured people, divided into individual and group insurance. The data is published in the form of press releases. All the available data is presented in table 2.

Table 2 Reimbursement PHI according to the Polish Insurance Association Data

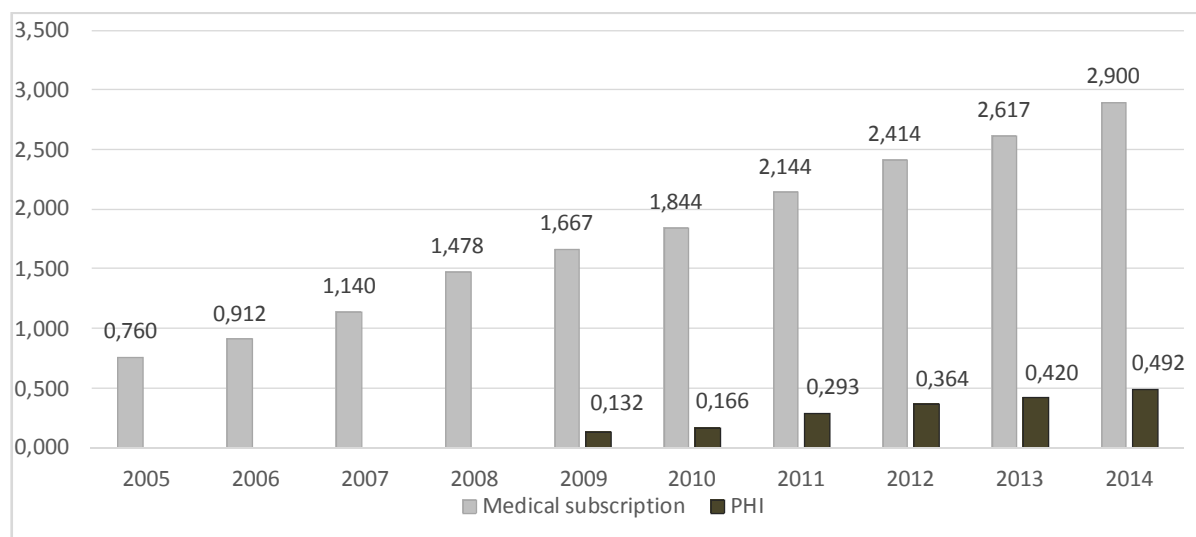
	2012	2013	2014	2015
Gross written premium, m PLN (total)	312.33	336.83	400.91	483.00
individual	49.23	62.38	68.84	N.A.
group	263.10	274.45	332.07	N.A.
Number of insured (total)	707,902	850,296	1,210,179	1,432,000
individual	35,019	35,400	173,721	272,000
group	672,883	814,896	1,036,458	1,160,00

Source: Author's compilation according to data from (PIU, 2015; PIU, 2016)

PMR Research has published a detailed analysis of the PHI and medical subscriptions market for ten years. These publications, however, are usually commercial, paid reports.

Figure 1 presents the data based on those reports which were made available free of charge.

Figure 1 Value of the Medical Subscription and PHI Market in Poland, in Bn PLN



*For 2014 there is an unverified estimation, because of the lack of data available free of charge
Source: author's compilation according to data from (PMR, 2014) based on (Kuskowska, 2014)

Additional information concerning the pre-paid mechanisms of health care funding is revealed in the data published by OECD. In Poland, this data is prepared by GUS on the basis of the uniform system of health accounts adopted by OECD, WHO and Eurostat. Table 3 presents the proportion of private funding in the current health care expenses.

Table 3 Private Schemes in Current Health Expenditure on Health in Poland, 2005-2013

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Private sector, %	31.3	30.8	29.9	28.3	28.3	28.3	29.1	30.2	29.2
Incl. private insurance	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	4.0
Incl. Household OOP	27.7	27.1	26.3	24.4	24.4	23.7	24.0	24.3	23.6
Incl. Corporations (other than insurance)	1.9	2.0	2.0	2.1	2.3	2.6	3.1	3.6	0.6
PHI in m PLN	341.8	367.4	413.8	504.2	573.3	658.5	725.5	761.7	4,237.9

Source: Author's compilation according to data from (OECD, 2016)

Since 2013, national health accounts have been prepared according to a new methodology called SHA2011. Since that time, current expenses for health care have become the basic analytical category in place of current expenses plus capital expenditure (the so-called total health expenditure). On account of this change, a new category was applied for the whole period under analysis in the table 3. The most important change, however, concerns the qualification of expenses that employers went to for group employee subscriptions. Since the data for 2013, they have been moved from the category of „corporations” to the one of „private insurance”. This change is another proof that the way a medical subscription functions is essentially analogical to the insurance method. Thus, the absolute value of insurance funding quoted for 2013 may be read as total expenditure on private health insurance and medical subscriptions, both in the individual and group form for both mechanisms of resource accumulation. It

should be noted, however, that this value is by almost one billion higher than the amount for the same year resulting from figure 1. The difference may be attributed to the fact that different institutions adopt different assumptions for the evaluation of private expenses (including private pre-paid mechanisms). As mentioned in the methodological notes for Poland, in OECD (2016), experts' estimations for the evaluation of expenditures on medical subscriptions and the PHI were used. As a result, it is still difficult to accurately estimate a share of PHI and medical subscriptions in the financing of health care due to the lack of complete data.

4 Conclusions

As a result of legal regulations, PHI and medical subscriptions have existed simultaneously as two separate market products since the beginning of healthcare financing transformation in Poland. The offer of such subscriptions is specific only to post-communist countries since in most countries such "packages" are offered as insurance coverage (Kuskowska 2014). Both of these products play a supplementary role to the social health insurance as the main scheme of collecting money for health care. It means that PHI and a medical subscription have been bought because of the problems with quick access to the publicly financed health care. Finally, a medical subscription is a product that is competitive to PHI.

The simultaneous existence of PHI along with a medical subscription causes a certain degree of chaos when it comes to the evaluation of importance of these two types of products in health care financing. Currently available data may provide only the approximate picture of the role of PHI and medical subscriptions as a mechanism of the accumulation of resources for health care. Although there are differences between data published by different institutions, all of them show that since the beginning of this coexistence, medical subscriptions have been more popular than PHI, both with regard to the volume of collected resources and to the number of beneficiaries. The functional similarity (sameness actually) of both mechanisms makes consumers confuse them, because, from their perspective (from the point of view of people seeking the guarantee of access to health benefits), legal differences are unacknowledged or irrelevant. The condition of the private health insurance sector might be improved by legal regulations which would delimit the area of involvement of subscription-based companies as health care providers exclusively rather than being payers for such services at the same time. From a realistic perspective, the indicated changes in law seem to be – after almost twenty years of the existence of subscription-based companies in Poland – impossible.

References

- CEA (2011). *Private Medical Insurance in the European Union*. Brussels.
- Gorajek, M. (2013). Rynek prywatnych usług medycznych w Polsce i na świecie. In: Guzel, Z., Fal, D. M., Lipka, A., *Medycyna ubezpieczeniowa: underwriting, orzecznictwo, ubezpieczenia zdrowotne*. Warszawa: Poltext, pp. 304-313.
- IRAA. *The Act on Insurance and Reinsurance Activity of 11 September 2015* (J. L. of 2015 item 1844).
- Kalbarczyk, W.P. (2015). *Sieć placówek medycznych*, cz. 1. Miesięcznik Ubezpieczeniowy, nr 2, pp. 47-48.
- Kamiński, R. (2001). *Prywatne ubezpieczenia zdrowotne w Polsce 2000*. Warszawa: Inicjatywy Sektora Prywatnego w Zakresie Ubezpieczenia Zdrowotnego i Świadczeń Zdrowotnych w Polsce (World Bank project No. 3466-POL TOR 3.4.14/A).
- KNF (2015). *Quarterly Bulletin*. Insurance Market IV/2015. Statistical Statement KNF-02.
- Kowollik, A. (2016). *ENEL-MED SA Initiating Coverage*. East Value Research. Retrieved from: http://eastvalueresearch.com/wp-content/uploads/2015/04/Enel-Med_InitiatingCoverage_18012016.pdf.

- Kozierkiewicz, A. (2009). Poland. In: Thomson, S., Mossialos, E. (2009), *Private Health Insurance in the European Union, Final report prepared for the European Commission, LSE Health and Social Care, London School of Economics and Political Science*, pp. 278-288.
- Kuskowska, M. (2014). *Polish Private Healthcare Market Still Dominated by Medical Subscriptions Services*, Pharma Poland News. Issue no 8 (101), pp. 6-7.
- OECD (2004). *Proposal for a Taxonomy of Health Insurance*. OECD Health Project.
- OECD (2012). *OECD Economic Surveys: Poland 2012*, Paris: OECD Publishing.
- OECD (2016). *Health Expenditure and Financing: Health Expenditure Indicators*, OECD Health Statistics (database). Accessed on 10th May 2016.
- Osak, M. (2008). Ryzyko zdrowotne jako podstawa wyodrębniania ubezpieczeń zdrowotnych. In: Handschke, J., ed., *Studia z ubezpieczeń gospodarczych i społecznych*. Poznań: Wydawnictwo Akademii Ekonomicznej w Poznaniu, pp. 148-167.
- Osak, M. (2011). Ubezpieczenia zdrowotne – miejsce w ustawowej systematyce ubezpieczeń. In: Lisowski, J., *Studia ubezpieczeniowe. Społeczno-gospodarcze aspekty funkcjonowania rynku ubezpieczeniowego*. Poznań: Uniwersytet Ekonomiczny w Poznaniu, pp. 192-206.
- Osak, M., Handschke, J. (2012). *Private Health Insurance Product – Polish Experience in Comparison to the European State of Affairs*. International Journal of Economics and Financial Studies, vol. 4, no 1, pp. 133-141.
- PIU (2015). *Rynek ubezpieczeń zdrowotnych po 2014r.* Retrieved from: <http://piu.org.pl/analizy/project/1878/pagination/2>.
- PIU (2016). *Wyniki rynku ubezpieczeń zdrowotnych w 2015r.* Retrieved from: <http://piu.org.pl/analizy/project/1940/pagination/1>.
- PMR (2014). *Private healthcare market in Poland 2014*. Development forecasts for 2014-2018.
- Rotaub, R. (2015). *Kiedy ubezpieczyciel wejdzie na rynek medyczny*. Rynek Zdrowia published on 26th of February.
- Sauter, W. (2011). *Health Insurance and EU Law*. TILEC Discussion Paper, No. 2011-034. Retrieved from: <http://ssrn.com/abstract=1876304>.
- Sowada, C. (2014). *Dodatkowe, prywatne ubezpieczenia zdrowotne. Rozwiązania w krajach Unii Europejskiej. Wnioski dla Polski*. Katowice: Kamssoft.
- Swiss Re (2007). *To Your Health: Diagnosing the State of Health Care and the Global Private Medical Insurance Industry*. Sigma, no 6/2007.
- Swiss Re (2015). *Keeping Healthy in Emerging Markets: Insurance Can Help*. Sigma, no 1/2015.
- The Civil Code of 23 April 1964 (with further amendments) consolidated text of 17 February 2016 (J. L. of 2016 item 380).
- Thomson, S., Mossialos, E. (2009). *Private Health Insurance in the European Union, Final report prepared for the European Commission, LSE Health and Social Care, London School of Economics and Political Science*.
- WHO (2000). *The World Health Report 2000*. Health Systems: Improving Performance, World Health Organization 2000.

Payment Card Frauds with a Hidden Camera, Touch Sensors and a Counterfeit Payment Card and Protection Techniques against these Types of Frauds

Gabriela Oškrdalová

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: oskrdalo@econ.muni.cz

Abstract: *Frauds with a hidden camera, touch sensors and a counterfeit payment card belong to the basic types of frauds in the e-banking and e-shopping field. The principle of frauds with a hidden camera and touch sensors is the same - by installing of a special equipment to obtain the PIN code. The knowledge of user's PIN code is not sufficient to abuse the payment card. Therefore these frauds are often combined with a Lebanese loop, a theft of a payment card or with skimming and producing of a counterfeit payment card. Recommendations to reduce security risks are variable. The aim of this paper is to describe payment card frauds with a hidden camera, touch sensors and a counterfeit payment card, identify the usual ways for realizing these types of frauds and its warning signs, create a scheme of the usual ways for these types of payment card frauds, introduce and interpret results of own quantitative research focused on knowledge of these frauds and define the basic recommendations for payment card users, banks and other subjects to reduce security risks connected with using of payment cards.*

Keywords: e-banking, payment card, security, risk, fraud

JEL codes: G020, G210, G290

1 Introduction

Frauds with a hidden camera, touch sensors and a counterfeit payment card belong to the basic types of frauds in the e-banking and e-shopping field in the Czech Republic and all over the world, as well as skimming, Lebanese loop, phishing, pharming, spoofing, trashing and theft of a payment card. In this context, it should be noted, nowadays particular types of mentioned frauds are relatively often combined together. The payment card fraud with a hidden camera or touch sensors can be defined generally as a criminal mechanism when an ATM, a payment terminal or an entrance door to self-service area, eventually their surroundings is modified by a defrauder by installing of a special additional equipment – a hidden camera or touch sensors to gain user's (victim's) PIN code or other sensitive information about the user (victim) and his/her payment card. The knowledge of user's PIN code is not sufficient to abuse the payment card. Therefore using of the hidden camera or touch sensors is often combined with a Lebanese loop, a planned subsequent theft of the user's payment card or with skimming and producing of a counterfeit payment card. If the defrauder has user's original payment card or a counterfeit payment card and knows the right PIN code, he/she can withdraw cash, pay for goods and services at shops and e-shops etc.

The aim of this paper is to describe payment card frauds with a hidden camera, touch sensors and a counterfeit payment card, identify the usual ways for realizing these types of frauds and its warning signs, create a scheme of the usual ways for these types of payment card frauds, introduce and interpret results of own quantitative research focused on knowledge of these frauds and define the basic recommendations for payment card users, banks and other subjects to reduce security risks connected with using of payment cards.

2 Methodology and Data

Data for own quantitative research (focused on knowledge of frauds with a hidden camera, touch sensors and a counterfeit payment card) were collected electronically in 2012. The target group were people studying at Faculty of Economics and Administration of Masaryk University, number of respondents was 910. It is important to note on the definition of target group, that formulated conclusions can be generalized to the population of people studying at economic colleges in the Czech Republic, for them the research sample is representative. A part of the realized and here presented research was focused on frauds in the e-banking and e-shopping field. Respondents should mark type (or types) of fraud in the e-banking and e-shopping field, which principle they know. Collected data are evaluated by methods of descriptive statistics (especially by the statistic number of respondents who know the principle of frauds with a hidden camera/number of respondents, number of respondents who know the principle of frauds with touch sensors/number of respondents, number of respondents who know the principle of frauds with a counterfeit payment card/number of respondents).

Normative and positivist methodologies have been employed to reach the aim. The positivist methodology is used in parts, when researched issues are described only, not evaluated. The normative methodology is used, when it is not possible or desirable to avoid evaluating researched facts. The normative methodology is used to define the basic recommendations for payment card users, banks and other subjects to reduce security risks connected with using of payment cards too. The paper's aim is reached by using of general science methods, primarily description, analysis, synthesis and deduction.

3 Results and Discussion

As it was recognized, generally a payment card fraud with a hidden camera can be defined as a criminal mechanism when an ATM, a payment terminal or an entrance door to self-service area, eventually their surroundings is modified by a defrauder by installing of a special additional equipment – a hidden camera to gain user's (victim's) PIN code or other sensitive information about the user (victim) and his/her payment card. The knowledge of user's PIN code is not sufficient to abuse the payment card. Therefore using of the hidden camera is often combined with a Lebanese loop, a planned subsequent theft of the user's payment card or with skimming and producing of a counterfeit payment card. If the defrauder has user's original payment card or counterfeit payment card and knows the right PIN code, he/she can withdraw cash, pay for goods and services at shops and e-shops etc. In this context, it should be noted, if the defrauder obtained by the hidden camera the user's PIN code and other sensitive information about the payment card, he/she can abuse the payment card on internet, without its physical presence.

A payment card fraud with touch sensors can be defined as a criminal mechanism when an ATM, a payment terminal or an entrance door to self-service area is modified by a defrauder by installing of a special additional equipment – touch sensors to gain user's (victim's) PIN code. In this case the knowledge of user's PIN code is not sufficient to abuse the payment card too. Therefore using of touch sensors is often combined with other types of frauds. It is similar to frauds with a hidden camera.

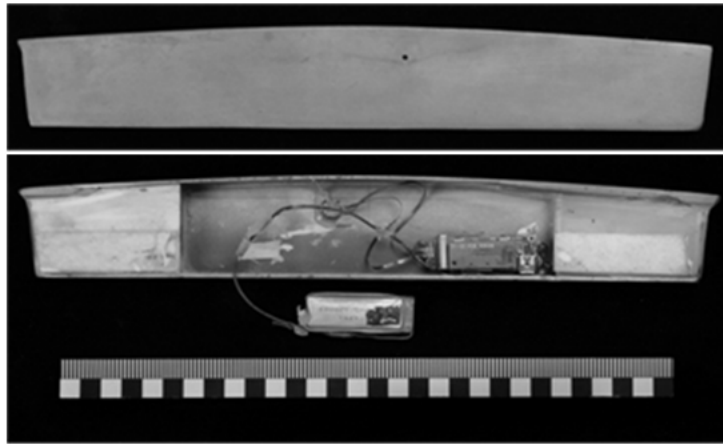
The principle of frauds with a hidden camera and touch sensors is the same. The defrauder installs a special equipment – a hidden camera or touch sensors with the aim to obtain sensitive information about the user's payment card, especially his/her PIN code. It should be noted, that nowadays special additional equipments installed on ATMs, payment terminals, entrance doors to self-service area and in their surroundings can be on very high quality level which increases the success probability of this attack.

In the Figure 1 we can see an example of using of a hidden camera on an ATM.

The study Cashless payment frauds in the Czech Republic (Klufa, Scholz and Kozlová, 2012) points out, that it is necessary to become aware of the fact, that a record

equipment of a mobile telephone can be used as a hidden camera. During careless use of a payment card sensitive information as the number of payment card, validity, CVCV code and signature can be recorded, for example when a victim – payment card user waits in a queue and pays by his/her payment card in presence of other person – defrauder, he/she can records payment card information by his/her mobile telephone.

Figure 1 Fraud with a Hidden Camera on an ATM – Example



Source: Police of the Czech Republic (2016). ÚOOZ SKPV : Skimming (in Czech). Police of the Czech Republic. Retrieved from: <http://www.policie.cz/clanek/skimming.aspx>.

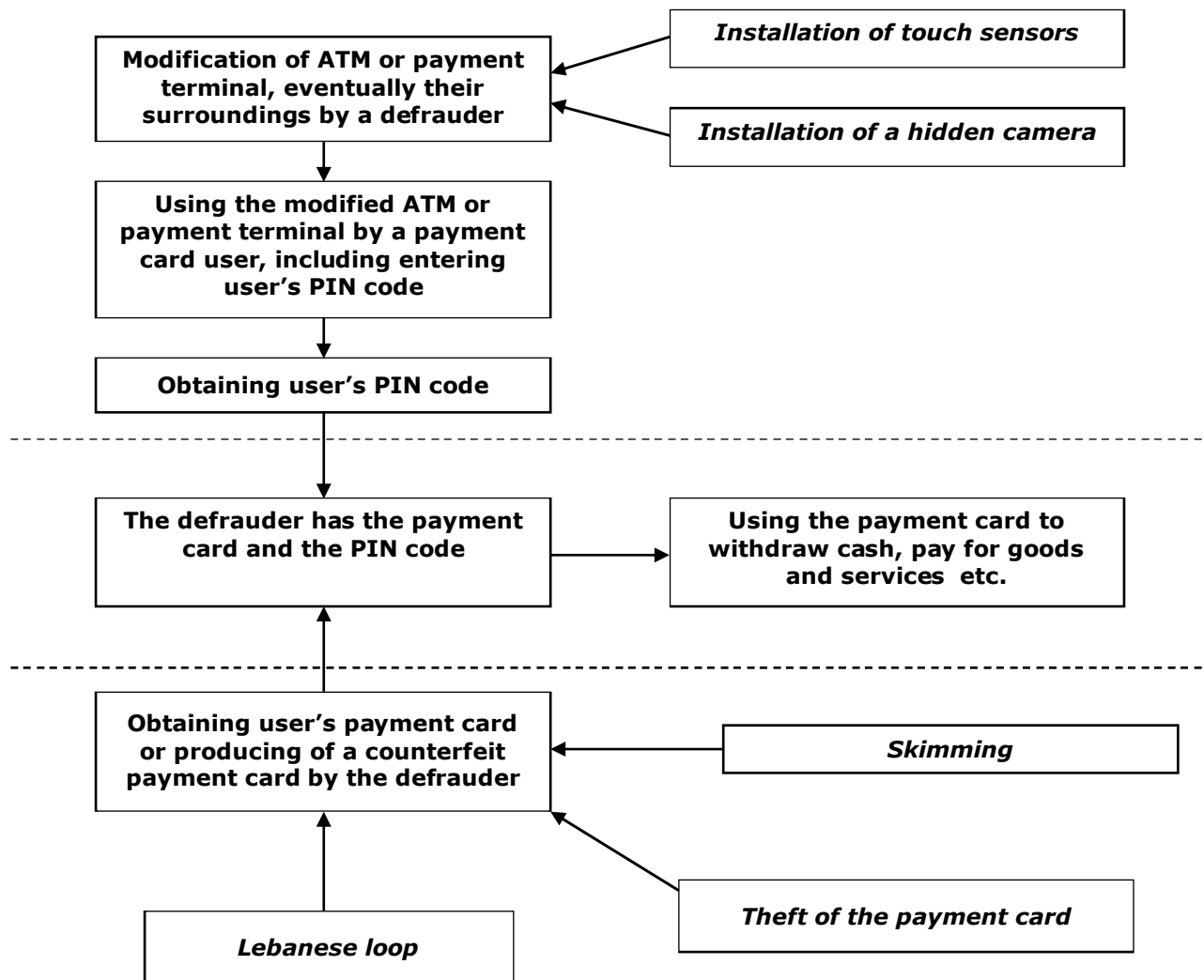
The usual ways for realizing of frauds with a hidden camera or touch sensors are following: In the beginning a defrauder accesses to an ATM, a payment terminal or an entrance door to self-service area and modifies the ATM, the payment terminal, the entrance door to self-service area or their surroundings by installing a special additional equipment - a small hidden camera or touch sensors to gain user's (victim's) PIN code or other sensitive information. If a payment card user uses the modified ATM, payment terminal or entrance door to self-service area and enters his/her PIN code, the defrauder obtain it, in some cases with other sensitive information. The knowledge of user's PIN code is not sufficient to abuse the payment card. Therefore using of the hidden camera or touch sensors is often combined with a Lebanese loop, a planned subsequent theft of the user's payment card or with skimming and producing of a counterfeit payment card. If the defrauder has user's original payment card or a counterfeit payment card and knows the right PIN code, he/she can withdraw cash, pay for goods and services at shops and e-shops etc. As it was noted, one of possible ways for realizing this fraud is using obtained sensitive information about user's payment card on internet without physical presence of the payment card.

The third mentioned fraud is the fraud with a counterfeit payment card. To producing of a counterfeit payment card by the defrauder is necessary to gain sensitive information about a victim – payment card user, more precisely about his/her payment card. The defrauder often gains sensitive information by skimming, when the original data are copied from the magnetic strip on the payment card unknown to the payment card holder – the authorized person (more information about skimming are published for example in Oškrdalová (2012)). If the defrauder has the sensitive information, he/she can produce a counterfeit payment card by a special equipment to produce or modify payment cards (Bank Card Association (2012) defines counterfeit payment cards as payment cards which were produced without the issuer's permission or which were issued as valid payment cards and then they were modified visually or their electronic data were modified.). According to Klufa, Scholz and Kozlová (2012) criminal groups from various parts of the world participate in counterfeiting of payment cards currently. Moreover nowadays the equipment to produce counterfeit payment cards can be the size of a personal suitcase and is able to produce a counterfeit payment card during a few minutes since gaining of sensitive information. These facts increase the security risk and success probability of this attack.

Scheme of payment card frauds with a hidden camera, touch sensors and a counterfeit payment card.

As we have noted there are the usual ways for realizing of payment card frauds with a hidden camera, touch sensors and a counterfeit payment card. These ways are represented in the following figure "Payment card fraud with a hidden camera or touch sensors".

Figure 2 Payment Card Fraud with a Hidden Camera or Touch Sensors



Source: Author

Knowledge of frauds with a hidden camera, touch sensors and a counterfeit payment card

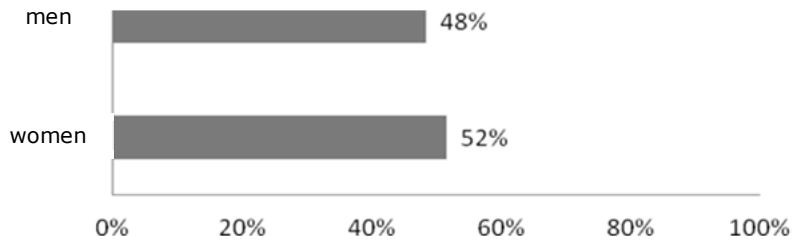
In the previous text we could see, the role of payment card user is important to reduce security risks connected with using of payment cards. His/her knowledge, skills, behaviour etc. can contribute significantly to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card too.

In the following section the results of own quantitative research are presented, focused on knowledge of frauds with a hidden camera, touch sensors and a counterfeit payment card. The mentioned research was realized during writing my dissertation, data were collected electronically in 2012. The target group were people studying at Faculty of Economics and Administration of Masaryk University, number of respondents was 910. The structure of the sample is represented in Graph 1 (by sex, age and education). It is important to note on the definition of target group, that formulated conclusions can

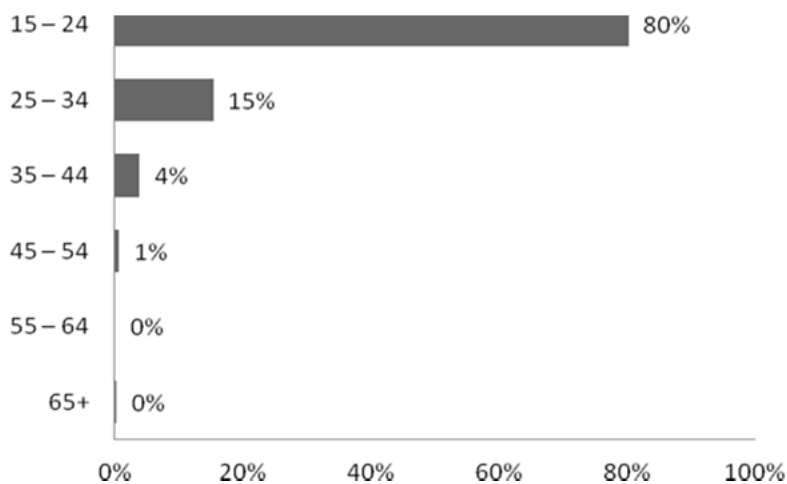
be generalized to the population of people studying at economic colleges in the Czech Republic, for them the research sample is representative. More information about this research is in Oškrdalová (2013).

Figure 1 Structure of the Sample
Basis: All respondents, n = 910

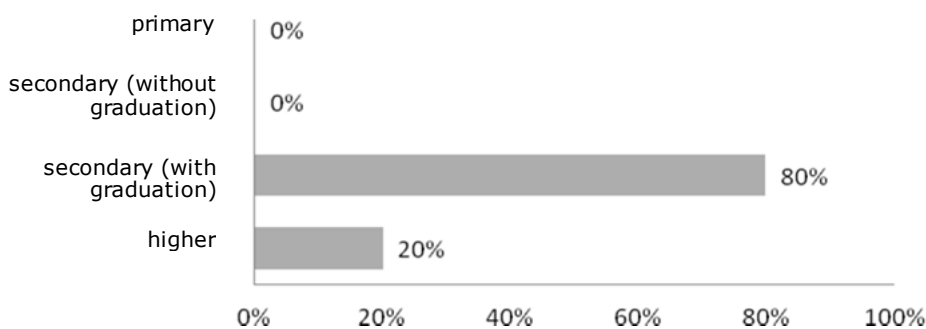
Sex



Age



Education



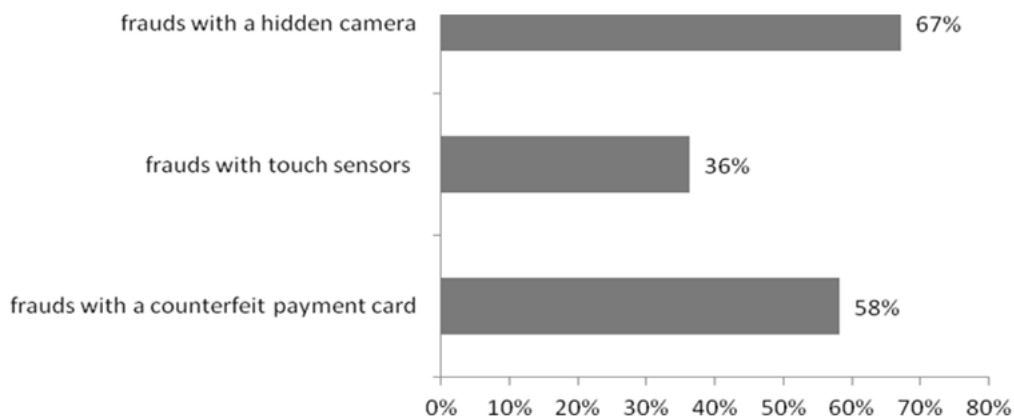
Source: Author

A part of the research was focused on frauds in the e-banking and e-shopping field. Respondents should mark type (or types) of fraud in the e-banking and e-shopping field, which principle they know. As we can see in Graph 2, it is not true, that all respondents know frauds with a hidden camera, touch sensors and a counterfeit payment card. Frauds with a hidden camera are the most known of these frauds - 67 % respondents know the principle of this fraud. 58 % respondents know frauds with a counterfeit payment card. Less than one half of respondents know frauds with touch sensors – only

36 % respondents. Respondents' knowledge of these three frauds is not sufficient. In this context, it should be noted, that the role of payment card user is important (or his/her behaviour and knowledge are important), because the user can contribute to reduce security risks connected with using of payment cards in case frauds with a hidden camera, touch sensors and a counterfeit payment card. The basic recommendations for payment card users to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card are introduced in the part 3.3 Recommendations to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card.

Figure 2 Knowledge of Frauds with a Hidden Camera, Touch Sensors and a Counterfeit Payment Card

Basis: All respondents, n = 910



Source: Author

Recommendations to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card

Recommendations to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card are variable. There are recommendations for banks, shops accepting payment cards, payment card users and other subjects.

With regard to banks and shops accepting payment cards we should mention, that their possibilities to reduce the risk of payment card frauds with a hidden camera and touch sensors are considerably limited. We can mention monitoring of ATMs, payment terminals, entrance doors to self-services areas and their surroundings to reveal unauthorized installation of an additional special equipment as a hidden camera or touch sensors. To successful monitoring knowledge of the ATM, payment terminal, entrance door to self-service area and its surroundings is necessary. It should be checked that basic parts of the ATM, payment terminal or equipment - board on entrance door to self-service area are not removable, badly fastened etc. Technical solutions of ATMs, payment terminals, entrance doors to self-services, eventually their surroundings, that prevents frauds from installing a special additional equipment, belong to these recommendations too. Banks and shops can highlight discreet zones and warn payment card users about their observance. To reduce the risk banks and shops accepting payment cards can inform payment card users about security risks and rules for correct and safe using of payment cards and remind it repeatedly. These rules and bank phone contact (for example to block the payment card) should be mentioned on ATMs or nearby ATMs or at shops.

To reduce the risk of frauds with a counterfeit payment card we can mention recommendations to protection of sensitive information which are necessary to produce the counterfeit payment card. Because the risk of gaining sensitive information can not

be eliminated completely, there are recommendations for banks, payment card companies, associations and other subjects to identify counterfeit payment cards and to prevent defrauders from their using. According to Juřík (2003, p. 227) to these recommendations protective elements of payment cards, the switchover from payment cards with magnetic strips to payment cards with chips etc. belong.

As we have noted there are recommendations for payment card users too. To reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card it contributes when payment card user knows and observes basic security rules for correct and safe using of payment cards. For example, we can mention "do not share the PIN code with anyone", "do not write the PIN code on the payment card", "do not keep the PIN code near the payment card", "choose and use a safe, strong PIN code", "check an ATM, a payment terminal or an entrance door to self-service area and their surroundings" - is this equipment modified or not?, was an additional equipment installed?, is using of a payment card observed by somebody? To successful check payment card user's knowledge of the ATM, payment terminal, entrance door to self-service area and their surroundings is necessary. It should be checked that basic parts of the ATM, payment terminal or equipment - board on entrance door to self-service area are not removable, badly fastened etc. (but it is true that nowadays frauds with a hidden camera or touch sensors, especially special additional equipments installed on ATMs, payment terminals etc. can be on very high quality level which increases the success probability of this attack). When using a payment card, a payment card user should not be disturbed, should be concentrated and should not allow anybody to distract his/her attention. If payment card user has a suspicion, he/she should interrupt the transaction and contact the bank or police. Interruption of the transaction is right in cases when the personal safety zone is disrupted. When entering a PIN code, a payment card user should blot out the keypad by the opposite hand to prevent a fraud from obtaining his/her PIN code. According to Police of the Czech Republic (2012) the PIN code should be not used as an enter code by equipments on entrance doors to self-service area.

In connection with these security recommendations we should remind common e-banking services security recommendations as "use day, week or month limits for e-banking (in this case especially payment card) transaction", "check carefully your bank account and payment card statements, when you get them", "if you find a discrepancy in your bank account and payment card statements (for example a transaction you have not made by your payment card), you should contact your bank, payment card issuer and complain about this transaction" too.

In view of the fact that frauds with a hidden camera, touch sensors and a counterfeit payment card are often combined with other types of frauds in the e-banking and e-shopping field it should be observed recommendations to reduce the risk of skimming (for example in Oškrdalová (2012)), Lebanese loop (for example in Oškrdalová (2015)) etc.

4 Conclusions

Frauds with a hidden camera, touch sensors and a counterfeit payment card belong to the basic types of frauds in the e-banking and e-shopping field in the Czech Republic and all over the world. The payment card fraud with a hidden camera or touch sensors can be defined generally as a criminal mechanism when an ATM, a payment terminal or an entrance door to self-service area, eventually their surroundings is modified by a defrauder by installing of a special additional equipment - a hidden camera or touch sensors to gain user's (victim's) PIN code or other sensitive information about the user (victim) and his/her payment card. The knowledge of user's PIN code is not sufficient to abuse the payment card. Therefore using of the hidden camera is often combined with a Lebanese loop, a planned subsequent theft of the user's payment card or with skimming and producing of a counterfeit payment card. If the defrauder has user's

original payment card or a counterfeit payment card and knows the right PIN code, he/she can withdraw cash, pay for goods and services at shops and e-shops etc.

Recommendations to reduce the risk of frauds with a hidden camera, touch sensors and a counterfeit payment card are variable. There are recommendations for banks, shops accepting payment cards, payment card companies and associations and payment card users too.

Acknowledgments

The paper was created with the support of institutional support of Ministry of Education, Youth and Sports.

References

Bank Card Association (2012). Types of frauds : Frauds with a counterfeit payment card (in Czech). *Bank Card Association*. Retrieved from: http://www.bankovnikarty.cz/pages/czech/media_bezpecnost.html#Podvody_pad%C4%9BBlanou_kartou.

Juřík, P. (2003). *Encyclopedia of payment cards: History, present and future of money and payment cards* (in Czech), 1st ed. Praha: Grada Publishing.

Klufa, F., Scholz, P., Kozlová, M. (2012). Cashless payment frauds in the Czech Republic (in Czech). *Czech Consumer Association*. Retrieved from: http://www.konzument.cz/publikace/soubory/pruvodce_spotrebitele/A5_bezhotovostni_podvody.pdf.

Oškrdalová, G. (2012). Analysis of skimming in the Czech Republic and protection techniques against skimming. In: *Proceedings of the international scientific conference European Financial Systems 2012*, pp. 166 – 171.

Oškrdalová, G. (2013). *Modeling of security risks of e-shop and e-banking* (in Czech). Dissertation.

Oškrdalová, G. (2015). Lebanese loop and protection techniques against this type of fraud. In: *Proceedings of the 12th International Scientific Conference European Financial Systems 2015*, pp. 443 – 450.

Police of the Czech Republic (2012). Do you know risks connected with possession of a payment card? (in Czech). *Svitavy: Official information portal of the town Svitavy*. Retrieved from: http://www.svitavy.cz/userfiles/files/prevence_kriminality/Poradenstvi/Ocrana_platebnich_karet.pdf.

Police of the Czech Republic (2016). ÚOOZ SKPV: Skimming (in Czech). *Police of the Czech Republic*. Retrieved from: <http://www.policie.cz/clanek/skimming.aspx>.

Comparison of Health Care Results in Public Health Systems of European Countries

Viera Pacáková¹, Pavla Jindrová², David Zapletal³

¹ University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 84, 532 10 Pardubice, Czech Republic
E-mail: Viera.Pacakova@upce.cz

² University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 84, 532 10 Pardubice, Czech Republic
E-mail: Pavla.Jindrova@upce.cz

³ University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 84, 532 10 Pardubice, Czech Republic
E-mail: David.Zapletal@upce.cz

Abstract: *Health of citizens is a precondition for economic prosperity. Ensuring optimal functioning of health systems at limited financial resources of countries and regions is a difficult task. Its solution requires a lot of information that can be obtained only by appropriate analysis of data collected by authorized world, European and national institutions. About the state of public health systems there are collected and published a number of data on the regional, national, EU or OECD countries, continental and the world level. These databases can be used for comparative analyses on health status, risk factors to health, health care resources and utilization, as well as health expenditure and financing. Huge differences in health and healthcare exist between and within countries and regions. The aim of this article is to present the results of application of multivariate comparison statistical methods, regression analysis, factor analysis and cluster analysis, which provide an overview of the health care status and public health systems expenditures, various causal relations and regional differences or similarities. This information is essential to the development of national and international health policies for treatment and financial budget of public health systems.*

Keywords: public health systems, health status, comparison, multivariate methods

JEL codes: I11, I13, I14, C38, F36

1 Introduction

Quality health care system is a priority for the citizens of each country. Citizens' health is a core EU priority. EU health policy complements national policies to ensure that everyone living in the EU has access to quality healthcare. Cancer, heart disease, diabetes, respiratory, mental and other chronic diseases represent great suffering to citizens and represent a huge cost to society and the economy. It is estimated that they will cost the global economy around €22,5 trillion between 2012 and 2030 (EU, 2013).

Huge differences in health and healthcare exist between and within EU countries and regions. The level of disease and the age at which people die are strongly influenced by factors such as employment, income, education and ethnicity, as well as access to healthcare. For example, life expectancy at birth varies by 10 years between EU countries (EU, 2013). Huge differences in health also exist between social groups across the EU and within Member States. People with a lower level of education, a lower occupational class or a lower level of income, people in deprived areas and in poverty, the unemployed, the homeless, the disabled, the mentally or chronically ill, the elderly on low pensions and single parents tend to experience higher levels of disease and premature death.

Health is a precondition for economic prosperity; efficient spending on health can promote growth, so Europe needs smart investments in health. Cost-effective and efficient health expenditure can increase the quantity and the productivity of labor by increasing healthy life expectancy. Ensuring optimal functioning of health systems at limited financial resources of countries and regions is a very difficult task. Its solution requires a lot of information that can be obtained only by appropriate analysis of data collected by authorized world, European and national institutions.

The main aim of the article is to compare the health status and health outcomes in European countries, depending on risk factors, health expenditures and health care resources using appropriate statistical methods.

2 Methodology and Data

About the state of public health there are collected and published a number of data on the regional, national, EU countries, continental and the world level. These databases contain mostly time-space series of reporting aggregate data of diseases or deaths according to various diagnosis and a lot indicators of health care in the public and partly private sector.

The basic source of data is the database of the *World Health Organization* (WHO) for Europe, which provides a selection of core health statistics covering basic demographics, health status, health determinants and risk factors, and health-care resources, utilization and expenditure in the 53 countries of the WHO European Region. The analysis is focused on all EU countries that are completed by Norway and Switzerland, i.e. 30 countries. In accordance with the stated objectives we have chosen these variables (Source: WHO, Eurostat available from <http://www.who.int/en/>; <http://ec.europa.eu/eurostat>):

A. Health expenditure

- X1 Total health expenditure, PPP\$ per capita, 2013
- X2 Gross domestic product (GDP), US\$ per capita, 2013

B. Health status

- X3 Life expectancy at birth (years), 2011
- X4 Life expectancy at age 65 (years), 2012
- X5 Probability of dying before age 5 per 1000 live births, 2012

C. The incidence of serious diseases

- X6 SDR, diseases of circulatory system, all ages, per 100 000, 2012
- X7 SDR, ischemic heart disease, all ages, per 100 000, 2012
- X8 SDR, cerebrovascular diseases, all ages, per 100 000, 2012
- X9 SDR, malignant neoplasms, all ages, per 100 000, 2012
- X10 SDR, trachea/bronchus/lung cancer, all ages, per 100 000, 2012
- X11 SDR, diabetes, all ages, per 100 000, 2012

D. Risk factors

- X12 Age-standardized prevalence of overweight (defined as BMI \geq 25 kg/m²) in people aged 18 years and over, WHO estimates (%), 2010
- X13 % of regular daily smokers in the population, age 15+, 2013
- X14 Pure alcohol consumption, litres per capita, age 15+, 2011

E. Health care resources

- X15 Hospital beds per 100 000, 2013
- X16 Physicians per 100 000, 2013
- X17 Pharmacists (PP) per 100 000, 2013
- X18 Average length of stay, all hospitals 2013

For analysis the most recent available data were used. The data of some variables have a one or two year's lag but the minimal change for most of these indicators is typical during the years. Application of multivariate statistical methods, such as correlation analysis, factor analysis and cluster analysis, preferably with graphical output, provides an overview of the gravity of the health situation by monitoring indicators, various causal relations and regional similarities or differences (Pacáková and Jindrová, 2014). The selected statistical methods were applied using MS Excel and statistical software packages Statgraphics Centurion XV and Statistica 12.

3 Results and Discussion

Statistical analysis begins with examination of causal relationships between variables. For this we use Spearman rank correlations (Šoltés, 2008) between each pair of variables. These correlation coefficients range between -1 and +1 and measure the strength of the association between the variables. In contrast to the more common Pearson correlations, the Spearman coefficients are computed from the ranks of the data values rather than from the values themselves. Consequently, they are less sensitive to outliers than the Pearson coefficients.

The values of Spearman coefficients provide a number of interesting facts. Variable X1-total health expenditure, PPP\$ per capita, is strongly positively correlated with variables X2 ($r_{1,2} = 0,957$), X3 ($r_{1,3} = 0,748$), X4 ($r_{1,4} = 0,786$), strongly negatively correlated with variables X6 ($r_{1,6} = -0,808$), X8 ($r_{1,8} = -0,875$), moderately potent negatively correlated with variables X5 ($r_{1,5} = -0,510$), X9 ($r_{1,9} = -0,524$) and X13 ($r_{1,13} = -0,584$) and a weakly correlated with variables X10, X11, X12, X14 and with all variables X15-X18 of health care resources. Variables X15-X18 are poorly correlated with all other variables, only one Spearman rank coefficients slightly exceeds 0,5.

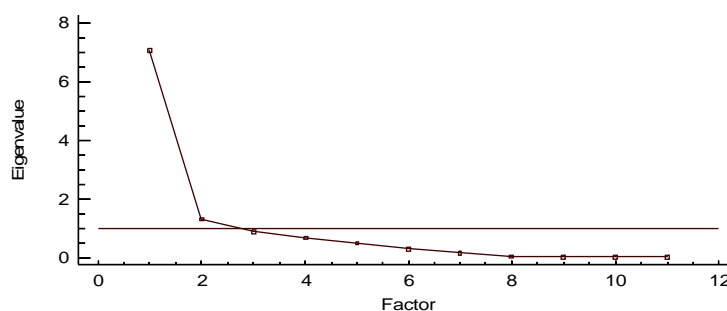
The dependence of the variables X3, X4, expressed by the Spearman rank correlation is $r_{3,4} = 0,915$. Both variables X3, X4 are strongly positive correlated with variables X1, X2 and strongly negative with variables X6 ($r_{3,6} = -0,814$, $r_{4,6} = -0,813$), X7 ($r_{3,7} = -0,738$, $r_{4,7} = -0,729$), X8 ($r_{3,8} = -0,821$, $r_{4,8} = -0,815$), X9 ($r_{3,9} = 0,742$, $r_{4,9} = -0,733$) and are a weakly correlated with all other variables.

Based on these results, we tried to apply the factor analysis on 11 variables: X1, X2, X3, X4, X5, X6, X7, X8, X9, X13, X14.

Factor analysis results

The purpose of factor analysis (Stankovičová and Vojtková, 2007) is to obtain a small number of factors which account for most of the variability in the 11 variables. Factor is a linear combination of the original variables. In this case, two factors have been extracted (Figure 1), since two factors had eigenvalues greater than to 1,0. Together they account for 76,093 % of the variability in the original data. Since we have selected the principal components method, the initial communality estimates have been set to assume that all of the variability in the data is due to common factors.

Figure 1 Scree Plot



Source: Own calculation, output from Statgraphics Centurion XV

The *Scree Plot* (Hebák et al., 2004) can be very helpful in determining the number of factors to extract, because displays the eigenvalues associated with a component or factor in descending order versus the number of the components or factors. We use scree plots to visually assess which factors explain most of the variability in the data.

Factor loadings (Table 1) present the correlation between the original variables and the factors and they are the key to understanding the nature of a particular factor. Rotation is useful method used to rotate the factor loading matrix after it has been extracted. *Varimax rotation* maximizes the variance of the squared loadings in each column (Johnson and Wichern, 2007).

Table 1 Factor Loading Matrix after Varimax Rotation

Variable	Factor 1	Factor 2
X1	-0,829504	-0,231396
X2	-0,772249	-0,212522
X3	-0,807011	-0,538974
X4	-0,831973	-0,453525
X5	0,868977	-0,088421
X6	0,883450	0,382960
X7	0,614292	0,599055
X8	0,922428	0,186451
X9	0,421982	0,698485
X13	0,643112	0,098378
X14	-0,092937	0,858875

Source: Own calculation, output from Statgraphics Centurion XV

Substantive interpretation of two extracted factors is based on the significant higher loadings. Factor 1 (*F1*), which explains 64,266 % variability of the variability in the data, has 6 significant loadings with positive signs with variables X5-X13, and significant loadings with negative signs with variables X1-X4. Therefore, this factor can be interpreted as a *factor of favourable conditions and health care results*. The low value of this factor means high level of health expenditure and life expectancy and a low level of serious diseases incidence. The higher the values of Factor 1 the worse are conditions and health care results. Significant positive correlation with variables X7, X9 and X14 is the reason that we interpret Factor 2 (*F2*) as a *factor of negative consequences and factors of health*. The higher the ischemic heart disease, malignant neoplasms incidence and pure alcohol consumption, the higher is the value of Factor 2 and vice versa.

Table 2 Table of Factor Scores

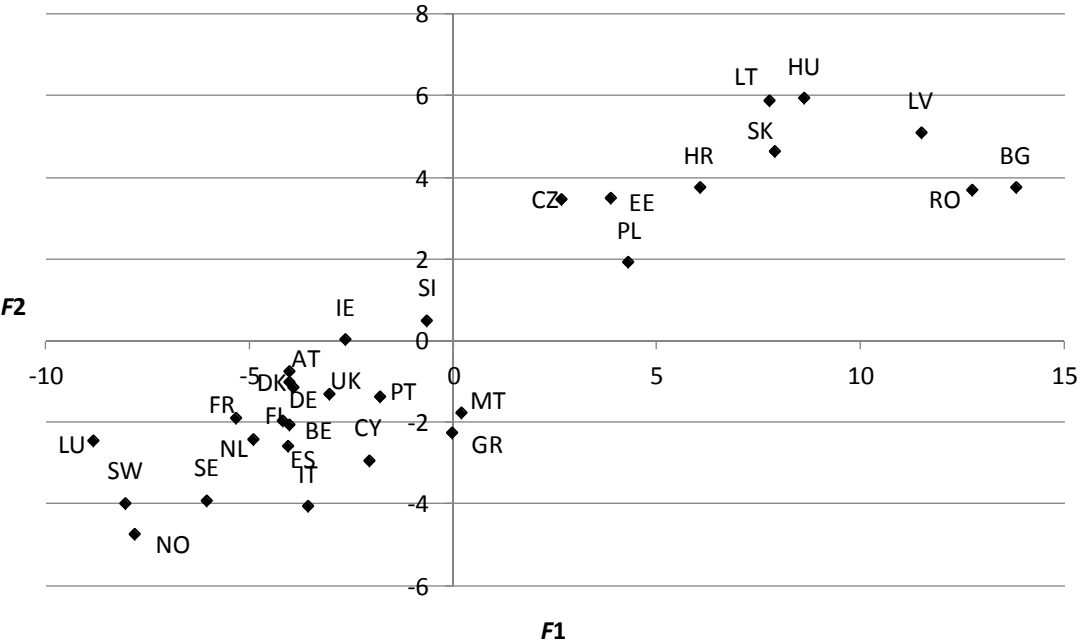
Country	F1	F2	Country	F1	F2
Austria - AT	-4,039	-0,721	Latvia - LV	11,483	5,102
Belgium - BE	-4,041	-2,043	Lithuania - LT	7,759	5,912
Bulgaria - BG	13,798	3,761	Luxembourg - LU	-8,834	-2,421
Croatia - HR	6,048	3,767	Malta - MT	0,179	-1,762
Cyprus - CY	-2,083	-2,919	Netherlands - NL	-4,930	-2,401
Czech Republic - CZ	2,654	3,464	Norway - NO	-7,847	-4,714
Denmark - DK	-4,048	-1,010	Poland - PL	4,282	1,932
Estonia - EE	3,844	3,513	Portugal - PT	-1,807	-1,343
Finland - FI	-4,182	-1,959	Romania - RO	12,722	3,698
France - FR	-5,353	-1,885	Slovakia - SK	7,898	4,653
Germany - DE	-3,935	-1,121	Slovenia - SI	-0,667	0,503
Greece - EL	-0,045	-2,234	Spain - ES	-4,077	-2,574
Hungary - HU	8,620	5,953	Sweden - SE	-6,054	-3,898
Ireland - IE	-2,659	0,037	Switzerland - SW	-8,057	-3,965
Italy - IT	-3,575	-4,042	United Kingdom -UK	-3,059	-1,282

Source: Own calculation, output from Statgraphics Centurion XV

Table 2 shows the factor scores for each selected country. A country with a low value of $F1$, together with a low value of $F2$ has (by interpretation of these factors) *favourable conditions and health care status*. On the other hand countries with high values of $F1$ and $F2$ are in bad situation concerning the health status and risk factors.

Graphical display (Figure 2) of selected countries in a two-dimensional coordinate system with axes $F1$ and $F2$ allows us to quickly assess the health situation in each country and allows also compare situation in all selected countries.

Figure 2 Location Selected Countries in the Coordinate System of the Factors $F1$ and $F2$



Source: Own processing according to Table 2

Cluster analysis results

Cluster analysis (Hair et al., 2007) is an analytical technique that can be used to develop meaningful subgroups of object, in our case of countries. The objective is to classify a sample of objects into a small number of mutually exclusive groups based on the similarities among the objects. The clusters are groups of observations with similar characteristics.

In order to create clusters of observations, it is important to have a measure of "similarity" so that like objects may be joined together. When observations are to be clustered, the closeness is typically measured by the distance between observations in the p dimensional space of the variables. We have used *Euclidian distance* for measuring the distance between two items (i.e. countries), represented by x and y

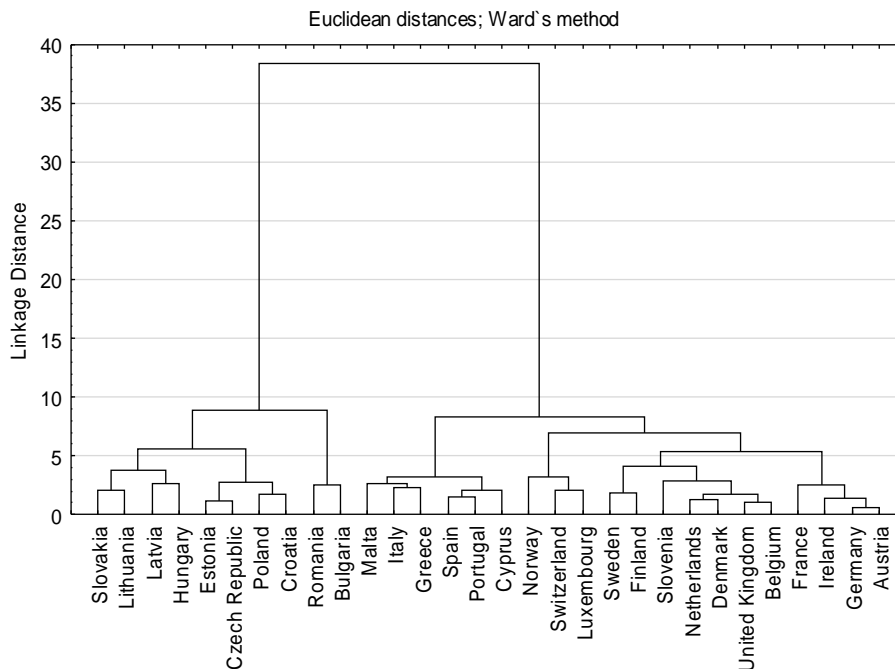
$$d(x, y) = \sqrt{\sum_{i=1}^p (x_i - y_i)^2} \tag{1}$$

A number of different algorithms are provided for generating clusters. Some of the algorithms are *agglomerative*, beginning with separate clusters for each observation and then joining clusters together based upon their similarity. To form the clusters, the procedure began with each observation in a separate group. It then combined the two observations which were closest together to form a new group. After re-computing the distance between the groups, the two groups then closest together are combined. This process is repeated until only 1 group remained.

Ward's method which has been used for clustering defines the distance between two clusters in terms of the increase in the sum of squared deviations around the cluster

means that would occur if the two clusters were joined. The results of the analysis are displayed in several ways, including a dendrogram. Working from the bottom up, the dendrogram shows the sequence of joins that were made between clusters. Lines are drawn connecting the clustered that are joined at each step, while the vertical axis displays the distance between the clusters when they were joined.

Figure 3 The Dendrogram of Cluster Analysis



Source: Own calculation, output from Statistica 12

The results of cluster analysis by 11 variables, the same as in factor analysis, are consistent with the results of factor analysis, as we can see from dendrogram on Figure 3. Cluster, consisting of the old EU countries, complemented by the Norway and Switzerland, has been joined with a cluster of new EU member states on a very large distance. It means that the health situation in these two groups of countries noticeably different and according to the results of factor analysis to the disadvantage of new members of the EU.

Multidimensional comparative analysis

Multidimensional comparative analysis (Sokolowski, 1999) deals with the methods and techniques of comparing multi-feature objects, in our case selected European countries. The objective is establishing a linear ordering among a set of objects in a multidimensional space of features, from the point of view of certain characteristics which cannot be measured in a direct way (the level of socio-economic development, the standard of living, product quality, economic performance, public health situation ...).

At the beginning of the analysis, the type of each variable should be defined. It is necessary to identify whether the "great" values of a variable positively influence the analysed processes (such variables are called stimulants) or whether their "small" values are favourable (these are called destimulants). In comparative analyses of public health by 11 variables the stimulants are X1, X2, X3, X4, destimulants X5 – X9, X13, X14. The variables of the third type, nominants (which have an "optimal" level and deviations either upwards or downwards are undesirable), like X15 – X18) are not suitable for this analysis.

The initial variables employed in composing an aggregate measure are, usually, measured in different units. The aim of normalisation is to bring them to comparability.

Normalisation is performed according to the formulas (Stankovičová and Vojtková, 2007):

$$\text{for stimulants} \rightarrow b_{ij} = \frac{x_{ij}}{x_{\max,j}} \cdot 100 \quad (2)$$

$$\text{for destimulants} \rightarrow b_{ij} = \frac{x_{\min,j}}{x_{ij}} \cdot 100 \quad (3)$$

The aggregate measure of health care level for each country has been calculated as the average of the point $b_{ij}, i = 1, 2, \dots, 30$. According to the formulas (2), (3) obviously applies that the more higher the value of the average score, the higher the level of health care. The rank assigned to the countries by ascending order from 1 to 30 we can see in Table 3.

Table 3 The Results of Multidimensional Comparative Analysis

Rank	Countries	Points	Rank	Countries	Points
1	Luxembourg	79,822	16	Ireland	61,973
2	Switzerland	78,260	17	Cyprus	61,705
3	Norway	78,022	18	Greece	61,668
4	Sweden	74,475	19	Malta	61,334
5	France	72,753	20	Slovenia	58,709
6	Netherlands	70,688	21	Estonia	52,970
7	Finland	70,208	22	Czech Republic	50,519
8	Belgium	68,517	23	Lithuania	50,344
9	Spain	66,894	24	Poland	49,022
10	Denmark	66,462	25	Slovakia	48,699
11	United Kingdom	66,324	26	Romania	46,475
12	Italy	65,737	27	Croatia	46,130
13	Germany	64,227	28	Latvia	44,914
14	Austria	63,858	29	Bulgaria	44,429
15	Portugal	63,194	30	Hungary	42,636

Source: Own calculation

The highest level of health care was observed in Luxembourg, then followed Switzerland, Norway, Sweden, France ... the latest position is occupied by Hungary. The last ten include all former socialist countries.

Table 4 shows the Spearman rank coefficients between each pair of variables X_1 (total health expenditure), B, C, D, E . Variables B, C, D, E are aggregate (synthetic) variables which have been computed by formulas (2), (3) from variables X_3, X_4, X_5 of health status – variable B , from variables $X_6 - X_{11}$ of the incidence of serious diseases – variable C , from variables $X_{12} - X_{14}$ of risk factors – variable D and from variables $X_{15} - X_{18}$ of health care resources – variable E .

Table 4 Spearman Rank Coefficients

	X_1	B	C	D	E
X_1		0,694	0,741	0,517	0,089
B	0,694		0,706	0,377	0,095
C	0,741	0,706		0,456	0,002
D	0,517	0,377	0,456		-0,048
E	0,089	0,095	0,002	-0,048	

Source: Own calculation

As shown in Table 4, variable E is not correlated with any of the variables $X1, B, C, D$. We can say that the high values of variables which characterize health care resources (var. E) have no effect on health status (var. B), on incidence of serious diseases (var. C) and on risk factors (var. D) in selected European countries. Health care resources are also not correlated with the total health expenditure (var. $X1$), the value of Spearman correlation coefficient is only 0,089. Interesting results also provide Spearman Rank Coefficients of synthetic variable D of risk factors with other synthetic variables. It confirms the low impact of risk factors on health status ($r_{B,D} = 0,377$) and moderate impact of risk factors on the incidence of serious diseases ($r_{C,D} = 0,456$).

4 Conclusions

The results of statistical analysis confirm the appropriateness of the used methods and the suitability of the chosen variables of health situation in EU countries. The chosen methods enable to extract two common factors instead of the original 11 variables. This allowed obtaining transparent and visual information about the health care situation in the EU countries completed by Norway and Switzerland and the possibility of graphical presentation of results. Cluster analysis and multidimensional comparative analysis supplemented and deepened results of factor analysis. It means that the health situation in the group of the old and the new members of European Union is noticeably different and according to the results of factor analysis to the disadvantage of the new members of EU. The multidimensional comparative analysis provides some surprising results, such insignificant impact of health care resources variables in the health status of the European countries. This suggests ineffective functioning of the public health systems.

References

- EU (2013): *Public health*. Luxembourg: Publications Office of the European Union. Retrieved from: http://ec.europa.eu/health/health_policies/docs/improving_health_for_all_eu_citizens_en.pdf.
- Eurostat database. Retrieved from: <http://ec.europa.eu/eurostat>
- Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., Tatham, R. L. (2007). *Multivariate Data Analysis*. Sixth Ed. New Jersey: Pearson Education.
- Hebák, P., Hustopecký, J., Jarošová, E., I. Pecáková, I. (2004). *Vícerozměrné statistické metody (Multivariate statistical methods)*. Praha: Informatorium.
- Johnson, R. A., Wichern, D. W. (2007). *Applied Multivariate Statistical Analysis*. Sixth Ed. New Jersey: Pearson Prentice Hall.
- Pacáková, V., Jindrová, P. (2014) Quantification of Selected Factors of Longevity. In: *Proceedings of the 2014 International Conference on Economics and Applied Statistics (EAS '14)*, Saint Petersburg, pp. 218-221.
- Sokolowski, A. (1999). Regional Differences in Living Standards in Eastern European Countries – Changes during the Transition. *Research Support Scheme*, Open Society Institute. Retrieved from: <http://rss.archives.ceu.hu/archive/00001052/01/52.pdf>.
- Stankovičová, I., Vojtková, M. (2007). *Viacrozmerné štatistické metódy s aplikáciami (Multivariate statistical methods with applications)*. Bratislava: IURA Edition.
- Šoltés, E. (2008). *Regresná a korelačná analýza s aplikáciami (Regression and correlation analysis with applications)*. Bratislava: Iura Edition.
- World Health Organization (WHO) database. Retrieved from: <http://www.who.int/en/>.

The Policy of Monetary Easing of Central Banks

Dalibor Pánek

Masaryk University
Faculty of Economics and Administration
Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: panek@econ.muni.cz

Abstract: *The text explains the essence of the concept of the policy of monetary easing. Contains the reasons, methods and objectives of the policy of monetary easing carried out in the selected central banks. Compares the effects and the connection of the policy of monetary easing with the selected macroeconomic variables and evaluate the achieved goals in this area of activity of the central bank. Selected macro-economic trends are monitored in the period of the last seven years. The text covers the comparison of the development of the macroeconomic values. In the conclusion the author evaluates the success of the policy of monetary easing of central banks and summarizes the fulfillment of macroeconomic goals.*

Kywords: central bank, policy of monetary easing, macroeconomic goal, effectiveness of instrument

JEL code: G28

1 Introduction

The tool of the main interest rates of central banks to revive the economy in time of crisis became a dummy. Interest rates have reached gradually to zero level. The central bank therefore started to use for the recovery of the economy the non-standard monetary policy tools. In this category tools to rank policy of quantitative easing, negative interest rates and foreign exchange intervention. A brief assessment of the achievement of the macroeconomic objectives of the instruments quantitative easing by central banks is the aim of this text.

Quantitative easing is the implementation of non-standard monetary policy at the zero level of the interest rates of the central bank. Interest rate instruments have ceased to perform their main function in the economy. Monetary easing is carried out by the regular purchase of financial assets by the central bank from commercial banks or other financial institutions.

The portfolio of assets suitable for the repurchase of the central bank usually consists of government bonds, securities of money market and mortgage bonds. The aim of regular asset purchases by the central bank is to kick-start economic growth and achieve inflation in specified level.

For text processing, the author took advantage of the tools the US central bank, the central bank of the European union and the central bank of the Czech Republic. The text used the graphs of the time series of selected macroeconomic values in the years 2009 – 2015, methods of description, analysis, comparison, and prediction.

2 Methodology and Data

The bursting of the bubble in the mortgage market and the subsequent weakening of the financial system had the US Federal reserve (the Fed) addressed in 2008 by reducing the interest the federal funds rate at level of 0-0,25 %. In 2006 year was the interest rate level 5.25 %. The reduction in the interest rate exhausted the possibilities of further easing of monetary policy using traditional instruments. The Fed implement further monetary easing the use of non-standard monetary policy tools.

Monetary policy easing was carried out in three periods. The first began in 2008, second in 2010, the third part of the release began in 2012 and was officially completed in the

year 2014. The structure of the purchased assets consisted of government bonds, mortgage bonds and bonds of mortgage agencies. Purchases in the total volume of about 4 trillion USD were made in the years 2008 - 2014.

The European Central Bank (ECB) addressed the crisis situation like the Fed. Interest rates decreased in 2009 to a level of 1 % for the main refinancing rate. The interbank market influenced by mutual mistrust and the ECB used the new tools to support the economy.

The first tool was a program to strengthen credit support to banks (Enhanced Credit Support Programme - ESCP) established in 2008. The ECB provided banks with unlimited weekly liquidity for the rate of the main refinancing operations against adequate collateral to maturity of one year. In 2009, the program included purchases of bank bonds and bonds ABS. In total, the ECB bought private debt for about EUR 150 billion.

In 2010 the ECB used program for the securities markets (Securities Markets Programme - SMP). The ECB bought government bonds for about 219 billion EUR, buying bonds of Italy, Spain, Greece, Portugal and Ireland.

The introduction of the long-term refinancing operations announced by the ECB in 2011 (Long-Term Refinancing Operations - LTRO). The maturity of loans is 3 years with interest rate of main refinancing operations. The aim of the loans was to support bank lending, the total volume of operations was about 1 trillion EUR. In 2015 the loans from the LTRO from a large part of the banks repaid.

Other operations to support credit market (Targeted Longer-Term Refinancing Operations - TLTRO) conducted by the European central bank in 2014. The reason was the decline in inflation expectations in the euro area and kick start economic growth. The program includes 8 auctions with a total volume of EUR 1 trillion with refinancing rate to 0.05%. Disbursement of funds will be completed in 2016, the loans are repayable in 2018.

A classic quantitative easing began the ECB purchase of government bonds on the secondary market in 2015. The premise of the termination of operations in September 2016. Redemptions include bonds of the governments of the member countries of the eurozone and bonds of agencies and European institutions. The total monthly volume of purchased assets is set at 60 billion EUR.

The Czech national bank as a result of the debt crisis also made use of the non-standard monetary instruments. The first was the delivery repo operations aimed at increasing the liquidity of the banking sector in 2008. The second tool is foreign exchange intervention to the exchange rate hedging obligation for the domestic currency notified in the year 2013.

The delivery repo operations were remunerated at a fixed rate current 2T repo increased by 10 basis points and 30 basis points for the three-month maturity. Collateral (collateral) use of Czech state bonds. The maximum amount of drawdown of the banking sector was achieved in 2008 the amount of 38 billion CZK. In 2009 these funds were repaid.

The use of exchange rate as another instrument of easing monetary policy is decided by CNB in November 2013. The main reason was monetary deflationary tendencies and a target the recovery of the economy due to the weakening of the domestic currency.

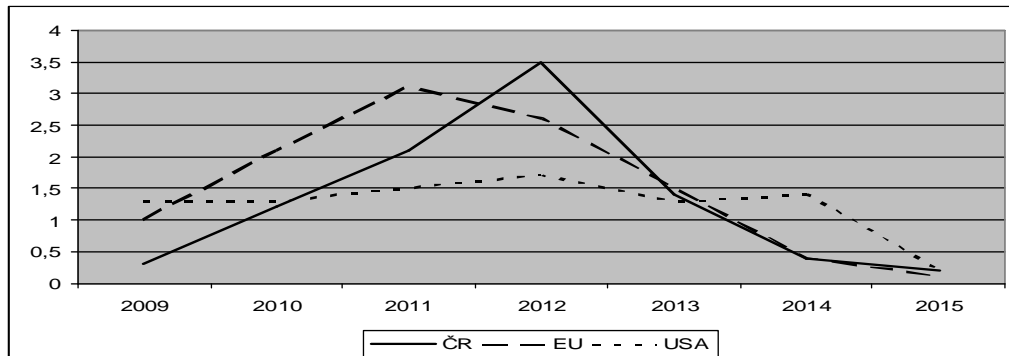
The exchange rate commitment of the CNB was the central bank established in value of 27 EUR/CZK. The commitment was set as asymmetric (one-sided), prevents over-dressing of the domestic currency. Depreciation of the Czech crown, the central bank does not and leaves act supply and demand in the foreign exchange market. The volume and date of cessation interventions has not been determined, the presumption of termination is in 2017. The total volume of interventions reached 503 billion CZK for the month of March 2016.

3 Results and Discussion

The use of non-standard monetary policy instruments of central banks and effect the influence of the objectives shows development of selected macroeconomic values, year-on-year inflation, GDP growth rate and unemployment.

Year-on-year inflation

Figure 1 Inflation in the Years 2009 – 2015 (in %)



Source: Czech central bank. Retrieved from: http://cnb.cz/cs/menova_politika//zpravy_o_inflaci/ and data terminal Bloomberg

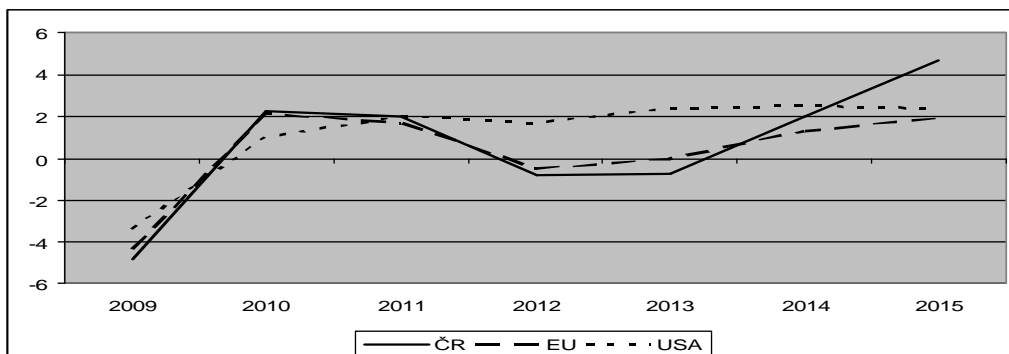
The graph shows that the fulfillment of the envisaged objectives the resumption of growth of inflation has failed. In the United States in recent years exhibited stagnation in the credit market due to low credit demand. Enhance the liquidity of banks policy of monetary easing has not been reflected in the growth of the credit market but in the growth of bank reserves (an increase of the monetary base by 400 %).

In the EU countries get value of inflation significantly below 2 %. In 2011, headline inflation reached the value of 3 %, followed by a steady decline in influenced by the decline in oil prices. To further support the credit market the next release (TLTRO) did not bring the achievement of the inflation target.

In the Czech republic headline inflation came under the desired value in the years 2009, 2010 and from 2013. Foreign exchange interventions of the CNB to weaken the domestic currency and the recovery of the economy did not cause price growth. Low demand has not been affected by the postponement of consumption but a slow rise in household income. The decline in the price level is influenced by the price of oil and the other items of the price structure.

The rate of growth of GDP

Figure 2 Growth of GDP in the Years 2009 – 2015 (in %)



Source: Czech central bank. Retrieved from: http://cnb.cz/cs/menova_politika//zpravy_o_inflaci/ and data terminal Bloomberg

The influence of policy instruments monetary easing in GDP growth is usually delayed at least one year. The policy of monetary easing in the US boosted the liquidity of the banking sector. There has been an increase in the monetary base not the money supply. As not to stimulate demand and affect economic growth. In the economy takes the price of stagnation, a possible increase in interest rates will intensify the anti-inflationary tendency.

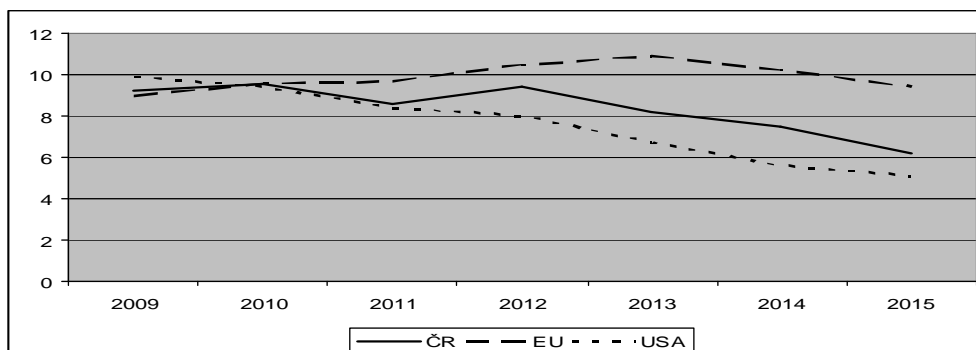
The European Central Bank used the influence of the global financial crisis, the number of non-standard monetary policy measures. Liquidity supplied to the financial system by the central bank did not materialise in the real economy. The proof is a long-term reduction of the credit market and its decline and stagnation since 2012. The bank's cheap loans (LTRO) used to buy profitable bonds of troubled EU countries to increase their profits. However, it was achieved to reduce the voltage on the bond market. Currently ECB interest rates have reached lows, the related effect of the depreciation of European currency using the central bank to strengthening economies of European countries.

The Czech Republic is a small open economy dependent on foreign trade. The development of GDP relate to the development of the economy of the Euro area. The Czech economy was going through a downturn in 2012 and 2013. To the recovery of the economy occurred in the years 2013 - 2015. In addition to foreign exchange interventions influenced the development of the economy the increase in consumption of households and government.

The contribution of foreign exchange intervention of the central bank for exporting companies was limited by their inputs imported from abroad. Limited was even a decrease in real revenue of households due to the weakening of the domestic currency and the value of savings.

The unemployment rate

Figure 3 Unemployment Rate in the Years 2009 – 2015 (in %)



Source: Czech central bank. Retrieved from: http://cnb.cz/cs/stat.rady_pkg.strom/, Eurostat. Retrieved from: <http://eurostat.ec.europa.eu/nui/> and data terminal Bloomberg

The unemployment rate in the US job market was in the year 2015 only 5.5%. From the peak of the crisis in 2009 (9.9%) decreased by half. Outside support the economy instruments of release can influence the value of the methodology to calculate of unemployment. Of the labour force excludes discouraged workers or people who have stopped looking for work.

The influence of non-standard instruments of monetary policy on unemployment in EU countries is difficult to specify due to the divergence of fiscal policy. The European Central Bank with their instruments considerably calmed down in times of crisis financial markets. The pursuit of the stabilization of the economies favorably acted on the rate of unemployment. The reality remains, that in the EU at 2015 is higher unemployment (9.5%) than in 2009 (9.0%).

The proportion of unemployed persons in Czech Republic decreased since 2009 (9.2%) by 3% at 2015 (6.2%). The Czech labour market include from the point of view on the whole

of the EU to the countries with the lowest unemployment. It is difficult to establish the impact of foreign exchange interventions on the share of unemployment, a substantial effect played also the economic recovery of the EU countries.

4 Conclusions

The recovery of the economy leads the central bank to the expansionary monetary policy. The influence of the reduction in interest rates at the zero value of the approach of the central bank to the use of non-standard monetary policy tools. Quantitative monetary easing use of the central bank to revive the economy and achieve inflation target. Unconventional instruments of central banks are the widespread basis for monetary policies, their current results, however, are not unambiguous.

Quantitative easing central banks have not achieved the inflation targets. Did not cause sufficient growth of the money supply generated by the provision of bank loans to non-bank entities. The essence of the credit expansion is sufficient creditworthiness of prospective borrowers and the capital strength of banks. The liquidity supplied by the central bank on the interbank market is not from the point of view of inflation insufficient factor. For the growth of inflation is a necessary expansion of the credit market, which is stagnating in the euro zone since 2012, the Czech credit market recorded a slight increase in the area of long-term loans. The central bank currently fixes the deflationary economic tendencies.

In november 2013, launched the czech central bank a series of foreign exchange interventions with the aim of the weakening of the odomestic currency to boost economic growth. Foreign exchange intervention to weaken the domestic currency they have in the economy questionable impact. They are designed mainly to exporting companies, their influence is limited by foreign imports of business inputs.

Czech households the weakening of the domestic currency actually decreased their income and deposits. The development of the macroeconomic indicators does not reflect uniquely on the contribution of interventions. The growth of the economy in the years 2014 and 2015 will certainly also affects the economic recovery of the euro area and the increase in household consumption (4%) and the government. Positive interventions to take effect in the management of the central bank, in the years 2013 – 2015 to offset its accumulated loss from previous years of 124 billion CZK. The risk of the opposite development risk after the termination of foreign exchange interventions.

Low interest rates of central banks at the level of the zero values represent the risk when their increase. The effectiveness of this tool of monetary policy will be reduced the influence of high liquidity of commercial banks. The increase in deposits the central banks and the minimum pumping facilities by commercial banks adversely affect the management of central banks.

References

Bernanke, B. (2013). *The Federal Reserve and the Financial Crisis*. Princeton: Princeton University Press.

Czech national bank. *Měnověpolitické nástroje*. Retrieved from: http://www.cnb.cz/cs/menova_politika/mp_nastroje/index.html/.

Czech national bank. *Měnový kurz jako nástroj měnové politiky*. Retrieved from: https://www.cnb.cz/cs/menovy_kurz_jako_nastroj_menove_politiky/

Czech national bank. *Zprávy o inflaci*. Retrieved from: http://www.cnb.cz/cs/menova_politika/zpravy_o_inflaci/.

DRAGHI, M. *Introductory statement to the press conference*. European Central Bank. Retrieved from: <http://ecb.europa.eu/press/pressconf/2015/html/is150305.en.html/>.

Eurostat - Data Explorer. *Eurostat*. Retrieved from: <http://appsso.eurostat.ec.europa.eu/nui/>.

Composition of Pension Funds' Investment Portfolio and its Impact on Profit

Mário Papík¹

¹ Comenius University in Bratislava
Faculty of Management, Department of Economics and Finance
Odbojárov 10, P.O. Box 95, 820 05 Bratislava, Slovakia
E-mail: mario.papik@gmail.com

Abstract: *In 2004, pension reform with fundamental influence on the function of the pension system was implemented in Slovakia. After the pension system reform, each Slovak citizen can save their money in pension funds. Since January 2013, pension fund management companies have had to establish at least two pension funds, one guaranteed bond fund and at least one unguaranteed equity fund. Nowadays, pension funds own a wide range of assets. The aim of this article is to monitor the composition of financial assets and relation between pension funds' profit and components of financial assets they own. This relation will be described by linear regression model which aims to determine significant variables affecting the profit of these funds. The underlying model data will be chosen from balance sheet and income statements of Slovakia-based pension funds, managed by six pension fund management companies, from the time period 2009 to 2014. The results of this research contribute to a better understanding of the importance of certain types of financial assets owned by pension funds, and thus help improve the legislative management of pension funds in Slovakia and their impact on macroeconomics.*

Keywords: pension funds, assets, composition of assets, financial revenues

JEL codes: G11, G23

1 Introduction

Pension funds are companies which provide financial intermediary. Their aim is to accumulate capital from the savers, invest and regularly pay it as pension to savers. Pension insurance can be considered as an alternative to life insurance which usually protect from standard risks e.g. critical illness. (Rentková and Janač, 2016) Many pension fund management companies obtain market share at the expense of companies providing life insurance. (Polouček et al., 2009)

Pension funds are experiencing a huge boom nowadays. Adverse demographic changes created by an adverse ratio between productive population and retired population cause difficulties with paying the pension from the state budget in developed countries. (Chovancová et al., 2005) Because of this, higher number of individuals have to save their money in pension funds on their own for a long period.

In the past, the relation between composition of pension funds' assets and their revenues was researched by Amir and Benartzi (1998), who found some correlation between these variables. Nowadays the topic of allocation assets in pension funds is researched for instance by a team of authors led by Louton (2015) or Naczyk and Domonkos (2016), who also analysed the influence of legislative reforms on this sector. All present researches have one lack in common i.e. owned assets studied only at the level of the basic classification (equity, debt securities, real estate and other assets), while ignoring the specific characteristics of the portfolio components such as expected maturity, currency or accounting classification.

Subsectors of insurance companies and pension funds belong to the most dynamically emerging parts of the financial sector. Quarter-on-quarter, the volume of financial assets in these subsectors has grown in average by 2% during the last three years. At the beginning of the first quarter, the volume of these assets represented 15% of total amount of financial assets owned by all financial institution in Slovakia. (Papík, 2015)

Since January of 2013, each Slovak pension fund management company has to manage at least two pension funds. At least one guaranteed bond fund and one unguaranteed equity fund.

Nowadays six pension fund management companies exist in Slovakia. They manage in all 20 pension funds, of which six are bond, six are equity, five are indexed and three are mixed funds.

2 Methodology and Data

The aim of the research is to analyse composition of pension funds' investment portfolio in Slovakia. This information allow to monitor trends in preferred assets easier. For this purpose, data were collected from balance sheets, income statements and notes of 6 Slovak pension management companies, which managed together 23 pension funds during monitored period. These data were collected since 2009 to 2014. Because of pension index funds own are passive funds and their assets don't depend on decision of portfolio manager, data of these pension funds was removed from analysis.

The data became input values of linear regression model, which monitor relationship between amount of the various assets and profits of pension funds. Result of these article is to interpret, how much of measure of financial instruments contribute to making pension funds' profits, which of these financial instruments have the biggest impact of them and building linear regression model, which could describe this relationship.

Studied linear regression model (1) has form

$$PROFIT = \sum_{i=1}^m a_i SECURITIES_i + \sum_{j=1}^j b_j CASH_j + \sum_{k=1}^k c_k RECEIVABLES_k + \varepsilon \quad (1)$$

where $SECURITIES_i$ represent all financial like bonds at fair value through profit or loss, bonds held to maturity, units in mutual funds, stocks and derivatives. Bonds are also classified by maturity and issue currency, units in mutual funds and stocks by currency and derivatives by type.

Under the variable $CASH_j$ are included all cash equivalents, which are classified by currency. Last independent variable is $RECEIVABLES_k$. This variable represent receivables, which are owned by pension funds. Variables a_i , b_j and c_k are coefficients of linear regression model and ε are residuals.

Dependent variable of this model is $PROFIT$. This variable represent comprehensive income of pension funds include income from investments, costs and fees in particular year. Costs and fees of pension funds are at the low level, so they don't have significant effect on results. Pension funds don't create other incomes. All variables were expressed as ratio of the volume of total assets of the pension fund. This variables were also normalized by minimum and maximum method.

Data aren't separated by years and input variables don't have any dependency on time. Data from last period have the same weight on the model as data from the begging of observation period.

Assets and Gains of Pension Funds

"The assets of an entity are a result of past events which increase economic benefits of an entity in the future and can be reliably recognized in the financial statements on the balance sheet" (Šostroneková and Kajanová, 2009).

Pension funds' assets are mostly composed of bonds. According to the Act no. 334/2011 §88, these can be valued either by market value (fair value through profit or loss) or by amortized cost value (held to maturity). When bonds are held to maturity, the bond value of portfolios is protected from the yield curve move. Because of this amendment to the Act, bonds held to maturity were not a part of pension funds' portfolio before 2012. Nowadays more than 70% of total asset owned by these funds are composed of bonds. This is due to fact that bond funds are the biggest ones as far as the volume of owned asset is concerned. The Act no. 43/2004 Coll. on old-age and social pension savings

allows for these funds to own only investments of financial and bond character and transactions aiming to reduce the exchange risk and interest rate risk. Additionally, since 2012 debt securities had been the main constituents in case of equity funds too.

As for the maturity of bonds, the development has been quite visible too. Over the last five years it has been prolonged because the volume of bonds with the maturity longer than five years has increased from almost 4% to 37% and the volume of bonds with maturity up to one year has decreased from more than 40% to 0%. Such development results from the decrease of interest rates.

The growing trend can be seen in the case of stocks and units in mutual funds, whose ownership has been supported by the mentioned amendment no. 334/2011 which affected the amount of owned funds retained in receivables. Therefore, the volume of receivables was reduced by 10%.

Exceptionally, derivatives and precious metals occur among the pension funds' assets. When pension funds own some derivatives, it is in order to hedge the positions against currency risk by means of swap contracts. Amounts of these assets are very low and therefore this value is close to 0% in Table 1.

Table 1 Pension Funds' Assets during 2009 – 2014

	2009	2010	2011	2012	2013	2014
Bonds at fair value through profit or loss (per agreed maturity)	68.7%	69.1%	71.7%	68.5%	62.3%	65.0%
<i>Up to one month</i>	0.7%	2.0%	0.2%	0.3%	0.0%	0.0%
<i>Up to three months</i>	4.1%	1.4%	0.1%	0.0%	0.0%	0.0%
<i>Up to six months</i>	0.0%	0.0%	1.6%	0.1%	0.0%	0.0%
<i>Up to one year</i>	38.7%	27.8%	15.7%	8.4%	0.4%	0.0%
<i>Up to two years</i>	2.0%	5.1%	6.8%	2.4%	1.4%	1.5%
<i>Up to five years</i>	19.2%	23.6%	35.2%	34.4%	23.2%	25.2%
<i>Over five years</i>	3.9%	7.8%	13.2%	22.6%	36.9%	37.4%
Bonds held to maturity (per agreed maturity)	0.0%	0.0%	0.0%	1.0%	4.6%	6.8%
<i>Up to one month</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Up to three months</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Up to six months</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Up to one year</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Up to two years</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Up to five years</i>	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
<i>Over five years</i>	0.0%	0.0%	0.0%	0.9%	4.6%	6.8%
Stocks	0.6%	0.1%	0.0%	3.2%	7.2%	8.2%
Units in mutual funds	0.0%	0.0%	0.0%	2.5%	2.8%	3.0%
Derivatives	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Currency</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Precious metals	0.0%	0.0%	0.0%	0.2%	0.1%	0.1%
<i>Gold</i>	0.0%	0.0%	0.0%	0.2%	0.1%	0.1%
Receivables	24.9%	27.9%	24.7%	22.7%	19.6%	15.4%
<i>Short term receivables</i>	24.9%	26.4%	23.6%	21.5%	18.7%	9.9%
<i>Long term receivables</i>	0.0%	1.4%	1.2%	1.1%	0.9%	5.4%
<i>Over one up to two years</i>	0.0%	1.4%	1.2%	0.9%	0.5%	3.9%
<i>Over two up to five years</i>	0.0%	0.0%	0.0%	0.0%	0.4%	1.5%
<i>Over five years</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cash and cash equivalents	5.8%	3.0%	2.8%	1.8%	3.5%	1.4%

Source: Own elaboration; data from balance sheets of pension funds

Looking at the assets allocation by currency, we find that over 95% of them are due for euro. During the last few years, the assets owned in another currencies such as United States dollars, Czech crown or Polish zloty slightly increased. In case of Czech crown and Polish zloty it was mostly increase of amount of government bonds denominated in these

currencies, while in case of United States dollar it were mainly stocks and units in mutual funds.

Table 2 Pension Funds' Assets during 2009 – 2014 Classified by Currency

	2009	2010	2011	2012	2013	2014
Euro	99.7%	99.8%	97.8%	97.9%	97.4%	95.5%
<i>Bonds at fair value through profit or loss</i>	68.7%	69.1%	71.6%	68.2%	62.0%	64.2%
<i>Bonds held to maturity</i>	0.0%	0.0%	0.0%	1.0%	4.6%	6.8%
<i>Stocks</i>	0.3%	0.1%	0.0%	2.4%	5.9%	6.7%
<i>Units in mutual funds</i>	0.0%	0.0%	0.0%	1.8%	1.9%	1.9%
<i>Short term receivables</i>	24.9%	26.4%	22.3%	21.5%	18.7%	9.2%
<i>Long term receivables</i>	0.0%	1.3%	1.1%	1.1%	0.9%	5.4%
<i>Cash and cash equivalents</i>	5.8%	3.0%	2.8%	1.8%	3.4%	1.3%
United States dollars	0.2%	0.0%	0.0%	0.9%	1.6%	2.4%
<i>Bonds at fair value through profit or loss</i>	0.0%	0.0%	0.0%	0.1%	0.2%	0.5%
<i>Stocks</i>	0.2%	0.0%	0.0%	0.2%	0.5%	0.6%
<i>Units in mutual funds</i>	0.0%	0.0%	0.0%	0.6%	0.9%	1.1%
<i>Short term receivables</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>Cash and cash equivalents</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Czech crown	0.0%	0.0%	0.1%	0.6%	0.5%	0.5%
<i>Bonds at fair value through profit or loss</i>	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%
<i>Stocks</i>	0.0%	0.0%	0.0%	0.6%	0.4%	0.4%
Polish zloty	0.0%	0.0%	0.0%	0.2%	0.1%	0.5%
<i>Bonds at fair value through profit or loss</i>	0.0%	0.0%	0.0%	0.2%	0.0%	0.3%
<i>Stocks</i>	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
<i>Cash and cash equivalents</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%
Japan yen	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
<i>Stocks</i>	0.1%	0.0%	0.0%	0.0%	0.1%	0.2%
Other currencies	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%
<i>Stocks</i>	0.0%	0.0%	0.0%	0.0%	0.2%	0.2%

Source: Own elaboration; data from balance sheets of pension funds

"The Act on Accounting 431/2002 in Slovakia defines revenues as increases in economic benefits during an entity's financial year, which can be measured reliably, while costs are defined as their decrease." (Kajanová, 2014) Similar definition is provided by the International Accounting Standard 18. The main source of pension funds' revenues are credit interests, dividends, and differences arising from transactions with securities or exchange rates. Funds' expenses are usually composed of operating costs, fees, commissions and provisions.

At the aggregate level profit was made by pension funds during the reporting period. At the level of individual funds only three pension funds were able to make a loss between 2009 and 2014. The individual aggregate total expenses, revenues and comprehensive gains are introduced in Table 3.

Table 3 Pension Funds' Expenses, Revenues and Comprehensive Gains during 2009 – 2014

Percentage of assets	2009	2010	2011	2012	2013	2014
Total expenses	0.0%	0.5%	0.0%	0.3%	0.5%	0.7%
Total revenues	0.6%	0.9%	1.1%	2.7%	1.7%	4.1%
Total comprehensive gains	0.6%	0.5%	1.1%	2.4%	1.2%	3.4%

Source: Own elaboration; data from income statements of pension funds

3 Results and Discussion

Of all of tested linear regression models, the best results were achieved by model, consisting of up to one year bonds at fair value through profit or loss, up to five years bonds at fair value through profit or loss, over five years bonds at fair value through profit or loss, units of the mutual funds denominated in euros, stocks denominated in euros, short term receivables in euros and cash equivalents denominated in United States dollars and in Czech crowns. According to the model, these eight components of assets have significant influence on total revenues of Slovak pension funds.

List of significant model variables calculated in statistic program R, as well as estimated model coefficients, standard errors, t-values and p-values are specified in following part. It is obvious that p-value is lower than 0.005 in all these eight variables. Residual standard error for model (1) is 10.12 on 92 degrees of freedom, multiple R-squared 0.961 and adjuster R-squared is 0.9576.

Table 4 Linear Regression Model for Pension Funds

Coefficients	Estimate	Std. Error	t value	Pr(> t)
Securities: Bonds FVTPL up to 1 year	0.35510	0.04296	8.266	1.01e-12 ***
Securities: Bonds FVTPL up to 5 years	0.27769	0.03222	8.618	1.84e-13 ***
Securities: Bonds FVTPL more than 5 years	0.31720	0.03989	7.953	4.52e-12 ***
Securities: Units in mutual funds FVTPL in EUR	0.71404	0.06749	10.580	< 2e-16 ***
Securities: Stocks FVTPL	0.52261	0.05347	9.773	6.85e-16 ***
Cash in USD	0.26131	0.07746	3.373	0.00109 **
Cash in CZK	0.21660	0.07731	2.802	0.00619 **
Short term receivables in EUR	0.26029	0.03987	6.529	3.57e-09 ***

Source: Own elaboration; output from function lm() in R-statistics

Linear regression model has similar results by analyzing variance (ANOVA), which confirms the results of this model (1). P-value was lower than 0.005 in all eight cases of independent variables of linear regression model for pension funds.

Table 5 Analysis of Variance of Linear Regression Model for Pension Funds

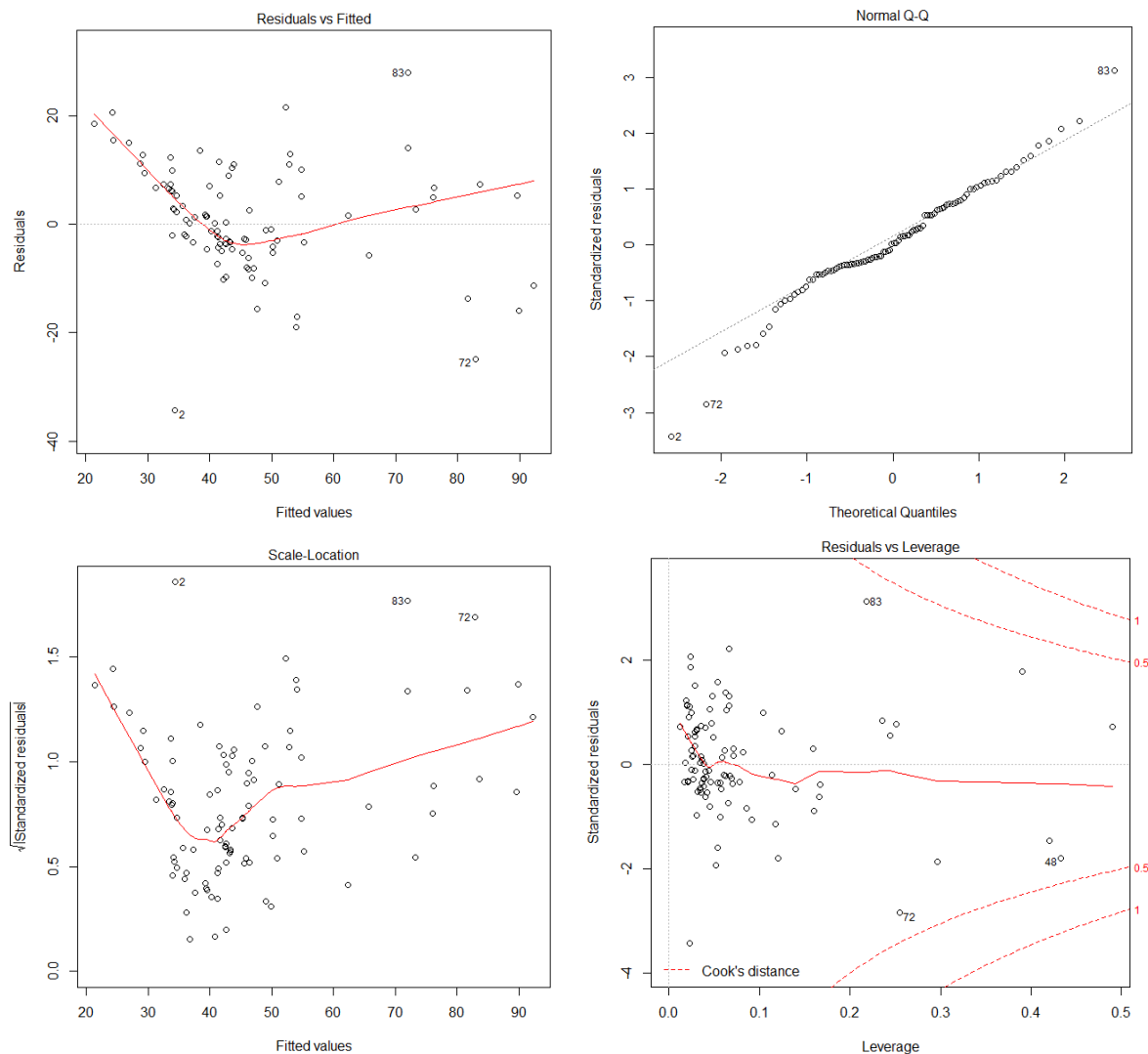
Coefficients	Sum Sq	Df	F value	Pr(>F)
Securities: Bonds FVTPL up to 1 year	6998.3	1	68.3240	1.005e-12 ***
Securities: Bonds FVTPL up to 5 years	7607.4	1	74.2704	1.841e-13 ***
Securities: Bonds FVTPL more than 5 years	6478.0	1	63.2448	4.517e-12 ***
Securities: Units in mutual funds FVTPL	11465.2	1	111.9346	< 2.2e-16 ***

in EUR				
Securities: Stocks FVTPL	9783.2	1	95.5130	6.852e-16 ***
Cash in USD	1165.6	1	11.92	0.001088 **
Cash in CZK	804.1	1	7.05	0.006194 **
Short term receivables in EUR	4366.3	1	42.6284	3.573e-09 ***
Residuals	9423.4	92		

Source: Own elaboration; output from function Anova() in R-statistics

Basic characteristics of created model are shown in Figure 1. From Residuals vs. Fitted part of this picture it is obvious that data are non-normal distributed and model doesn't approximate them very well. Neither Box-Cox nor Yeo-Johnson transformations nor removing of outliers don't bring normality to analysed data. The main reason for it is that composition of indexed and equity funds is totally different from asset composition of mixed or bond funds. Solution, how to improve present model, is creating 2 separate models, one for indexed and equity funds and one for mixed and bond funds. Dividing dataset into two can would help bring normality of data and consequently two created models could better approximate researched variables.

Figure 1 Model (1) Characteristics' Graphs (Residuals vs. Fitted, Normal Q-Q, Scale-Location, Residuals vs Leverage)



Source: Own elaboration by R statistics; data from income statements of pension funds

Created model shows, not only assets, which pension funds own in the largest volumes, have the greatest influence on making revenues. Among these variables are for instance cash in U.S. dollars and Czech crown, units of the mutual funds denominated in euros, or stocks denominated in euros. Last two mentioned variables have the largest impact on constructed model, because of revenues from these assets are higher than from other analysed variables.

Regression model shows that proportion of our eight independent variables estimates the comprehensive income very well. Coefficients of these variables reflect the strength of impact each variable has on dependent variable. Combination of these independent variables can allow to predict the dependent variable profit.

4 Conclusions

The legislation on pension funds imposes a duty on pension fund management company to manage at least two funds: one bond guaranteed fund and one equity unguaranteed fund. The amendment also allows two ways of valuation bonds: market value and amortized cost value. Both of these aspects have influenced the development of composition of the pension funds' assets in Slovakia.

After 2012, amounts of shares, stocks and bonds held to maturity started to grow in pension funds' portfolio. During the monitored period 65% to 70% of the total assets owned by pension funds were debt securities. The structure of these securities changed after bonds with a maturity up to one year were reimbursed by bonds with maturity of five or more years. The reason for this development can be the falling interest rates in Europe.

The second trend is the reduction of the volume of receivables. During monitored period this value decreased by 10%. The reason for this trend is the need to accelerate the transformation of investment funds tied-up in receivables into investment instruments, which bring higher returns.

As can be seen from the analyses of revenues and expenses, pension funds made profit only up to 0.5 % and 3.5% of total amount of assets during monitored period. Fees and commissions, transaction costs and operative costs constituted at the most 0.7% of total amount of assets.

Research has shown that there is a linear relationship between comprehensive gains and compositions of pension fund's portfolio in Slovakia, where eight significant independent variables were identified. Among these variables belong up to one year bonds at fair value through profit or loss, up to five years bonds at fair value through profit or loss, over five years bonds at fair value through profit or loss, units of the mutual funds denominated in euros, stocks denominated in euros, cash equivalents denominated in United States dollars and cash equivalents denominated in Czech crowns and short term receivables in euros. Units of the mutual funds denominated in euros and stocks denominated in euros have the largest influence on making gains from these eight variables. Similar research in the field of insurance companies shows that only three variables, units in mutual funds at fair value through profit or loss, debt securities available for sale and debt securities held to maturity, have significant effect on revenues of these companies. (Papík, 2016) This research also disregards other classifications such as expected maturity or currency. Results of both researches suggest that amount of riskier assets like stocks or units in mutual funds can have a positive impact on insurance companies' income, but also on the pension funds. Analysis also shows that big amounts of bonds can also improve the level of financial institutions' income. Identified eight independent variables can help predict following comprehensive income of pension funds.

The created model provides basic framework, which provides a base for next research in this field. When reverse control of the model was made through Residuals vs. Fitted or Normal Q-Q graphs, it was found that it was found the model does not reach very good results due to the non-normality of data. Neither removing of outliers nor Box-Cox and Yeo-Johnson transformations don't bring normality to analysed data. The solution to this

problem may be division of single pension funds' model into two separate models, one for equity and indexed funds and another one for mixed and bond funds. These two groups of funds are significantly similar and that could improve the results of data transformation and also the creation of a model in the future. Another possible way of the next research is to compare pension funds' sector with sectors of other financial institutions, or to compare pension funds across the countries.

Acknowledgments

This article was supported by grant Comenius University 69/2016 "Impact Investment Products to Economic Added Value of Financial Institutions".

References

- Act 334/2011 Z.z. ktorým sa mení a dopĺňa zákon č. 43/2004 Z. z. o starobnom dôchodkovom sporení a o zmene a doplnení niektorých zákonov v znení neskorších predpisov a o zmene a doplnení zákona č. 461/2003 Z. z. o sociálnom poistení v znení neskorších predpisov.
- Amir, E., Benartzi, S., (1998). The Expected Rate of Return on Pension Funds and Asset Allocation as Predictors of Portfolio Performance. *Account. Rev.* 73, pp. 335–352.
- Chovancová, B. (2005). *Kolektívne investovanie podielové a penzijné fondy*. 1. ed. Bratislava: IURA Edition.
- International Accounting Standards, (2009). *IAS 18 — Revenue*. Retrieved from: <http://www.iasplus.com/en/standards/ias/ias18>.
- Kajanová, J. (2014). *Podvojný účtovníctvo: Vybrané účtovné prípady*. Bratislava: Kartprint.
- Louton, D., McCarthy, J., Rush, S., Saraoglu, H., Sosa, O., (2015). *Tactical asset allocation for US pension investors: How tactical should the plan be?*. *J. Asset Manag.* 16, pp. 427–436.
- Naczyk, M., Domonkos, S., (2016). The Financial Crisis and Varieties of Pension Privatization Reversals in Eastern Europe. *Governance* 29, pp. 167–184.
- Papík, M. (2015). Comparison of Asset Structure of Insurance Companies and Pension Funds. *Globalization and its socio-economic consequences: part 2.*, vol.1, pp. 551-558.
- Papík, M. (2016). The Impact of Investment Portfolio of Insurance Companies on their Profit. *Management in Theory & Practice*, vol. 1.
- Polouček, S. et al. (2009). *Peníze, banky a finanční trhy*. 1. ed. Praha: C. H. Beck.
- Rentková, K., Janač, J. (2016). The optimal sum insured in life insurance. *Innovation management and education excellence vision 2020: from regional development sustainability to global growth*, vol. 1, pp. 1975-1982.
- Saunders, A. (2008). *Financial Institutions Management*. 2. ed. New York: McGraw-Hill/Irwin.
- Šostroneková, M., Kajanová, J. (2009). *Podvojný účtovníctvo podnikateľa po prechode na euro*. 1. ed. Bratislava: Epos.

Contribution to the Research for Adequate and Sustainable Pensions – The Study of the Slovak Republic and the Czech Republic

Erika Pastoráková¹, Zuzana Brokešová¹, Tomáš Ondruška¹, Eleonóra Zsapková²

1 University of Economics in Bratislava
Faculty of National Economy, Department of Insurance
Dolnozemska cesta 1, 851 01 Bratislava, Slovakia
E-mail: erika.pastorakova@euba.sk
E-mail: zuzana.brokesova@euba.sk
E-mail: tomas.ondruska@euba.sk

2 University of Economics in Bratislava
Faculty of Applied Languages, Department of English Language
Dolnozemska cesta 1, 851 01 Bratislava, Slovakia
E-mail: eleonora.zsapkova@euba.sk

Abstract: Pension systems have been under great pressure in the last years due to the changes of paradigms which formed the basis for these systems. Therefore systems are undergoing more or less important changes starting with increasing the age of retirement, lowering the amount of pensions and finally introducing a new pension system as it happened in Sweden in the year 2000. The European Commission ("EC") is aware of the necessity to reform pension systems and therefore the EC asked EIOPA to help and search for measures which are necessary for creating the common market in the area of personal pension products. The EC in the White Paper on Adequate, Safe and Sustainable Pensions encourages to look for and develop supplementary private pension systems and appeals to member states to support them by optimization of tax and other stimuli (Brussels, 16.2.2012). The paper's ambition is to contribute to the discussion concerning the pension systems. It concentrates on the demographic and economic starting points and predictions valid for the Slovak Republic and the Czech Republic and it discusses the possibilities of more radical changes in the pension systems that have already been realised in some countries.

Keywords: pension systems, Aaron's rule, population aging, individual old-age security, dependency ratio

JEL codes: J11, H55, H75, J32, G22

1 Introduction

Representatives of the theoretical as well as empirical research argue about the efficiency of individual pension systems but generally speaking we can agree with the statement that there is no miraculous pension system (Vittas, 1998). Today all known systems have problems and none of them can tackle hanger-on, moral hazard, unfavourable choice or the existence of transaction costs. Pension systems have to deal with these problems as they stand for long-term contracts exceeding 40 and more years. In our paper we perceive a pension system as a way of securing income for the period when an individual is not able to rely on his own productive strength. We also pay attention to the questions connected with stated specifications and evaluate the understanding of different extent of securing earnings, merits and tendency to make savings. In our paper we also argue about the substance of risk and the grounds for insurance terminology in the area of aging and indemnity for old age. Our aim is to contribute to discussion concerning pension systems. It directs attention to demographic and economic starting points and predictions valid for the Slovak Republic and the Czech Republic. Our paper offers possible solutions using examples from the countries which have already made more radical changes in pension systems.

The Economic Substance of Contemporary Pension Systems

Nowadays pension systems are the result of wider social and economic factors as traditions, historical and political development, experiences and attitudes of living generations, economic standard and international associations (Loužek, 2006). Therefore pension systems differ in different countries and when evaluating them we have to be aware of these differences. If we do not perceive them we cannot judge these problems adequately. The first pension systems arose in interaction with conditions existing at that time (Germany in 1889, Sweden in 1913, Great Britain in 1908 with following changes e.g. in 1940; in 1922 the Soviet Union accepted complex plans for social insurance as a part of the socialist economy). At the same time pension systems are a part of the social system of each country with clearly defined aim starting with minimal social welfare to universal social security (Novák. M., Skalák, P. 2014).

In the Slovak Republic and the Czech Republic pension systems are functioning on several pillars (Slaný, A. et al 2011). While in the Slovak Republic there is a three-pillar system, in the Czech Republic the process of ending the second pillar started in January 2016 and it has not been possible to enter this pillar since July 2015 (Krebs, V., Prusa, L. 2013). Cancelling the second pillar means the third pillar becomes an important system of individual savings for the old-age period. We consider emphasising the increased rate of individual security for old age as an important factor which can help contemporary pension systems.

We have to mention also the three-pillar model of the World Bank which was introduced as a reform strategy in the publication *Averting the Old-Age Crisis: Policies to Protect the Old and Promote Growth*. The inner structure of this model differs from systems in the Slovak Republic or the Czech Republic. Specialists in the working group recommend for individual countries multipillar pension scheme, which should consist of mandatory, publically managed unfunded pillar and mandatory privately managed fully-funded pillar as well as supplementary voluntary fully-funded pillar. The first pillar is statutory but it must be perceived in a broader sense than it is understood in the Slovak Republic and the Czech Republic. The second pillar is represented by private-employer pension funds which have varied structures in different countries - insurance companies, banks and pension funds. Contributions from employees and employers exist in different combinations. Resources are accumulated, secured, guaranteed and paid in different ways. The third pillar is understood as supplementary pension savings - life insurance, personal pensions, reverse mortgages and many other financial products which serve for securing an individual for old age.

2 Methodology and Data

In the Slovak Republic and the Czech Republic pension systems are based on the dominance of so called system of unfunded financing. They are exposed not only to growing expenditures but also to the fall of revenues especially due to higher dynamics on the labour market, the growing number of entrepreneurs and also the higher rate of unemployment. We agree with opinions (Kubíček, 2004; Loužek, 2006) that the demographic development is not the only source of contemporary problems of pension systems irrespective of unfunded or fully-funded systems. To quantify the suitability of unfunded or fully-funded pension systems they use so called *Aaron's rule* (Aaron, 1966) by which the rate of return of private pension funds is compared with the rate of return in the unfunded system like this:

$$m + g > r, \tag{1}$$

where m means the growth of population, g - rate of growth of average wages and r - revenues from private pension funds on the capital market.

It follows from this rule that if the rate of return of private pension funds is higher than the growth of population and the rate of growth of average wages, the fully-funded system should be more profitable. On the contrary, if the population growth and the

average wage increases more quickly than revenues from private funds, the unfunded system of financing pensions is more profitable. But Aaron's rule has his limits, too. It is very difficult to apply it when evaluating mixed systems, which are formed by the unfunded system as well as by funds. Another drawback of this rule is that Aaron established his analysis on examining fixed situations and did not take into account the changing rate of pension contributions or the transaction costs for potential change from one system to another.

When evaluating the possibilities of pension systems it is better to realize clearly the starting points which are the numbers of contributors and the numbers of pensioners. The demographic situation is determined and it reflects the society's development during approximately the period of 100 years. The characteristic features are mainly these: considerable shift of population waves to the higher age and in the conditions of the Slovak republic and the Czech Republic there is also the substantial feminization of old age which is the consequence of big differences in the mean longevity in favour of women (Infostat, 2013). Therefore both countries face demographic changes at the present decline of the ratio between average pension and average wage. In the next table we state data about the share of population in the age 65 and over, or 80 and over on selected values.

Table 1 Share of 65 + 80 + Individuals on Selected Values of Population

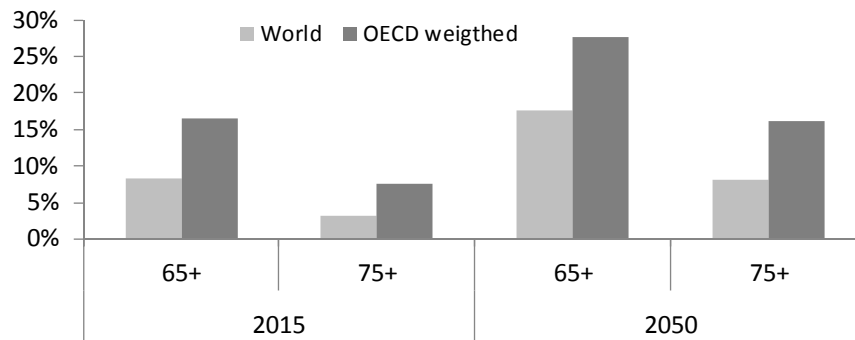
	2010	2020	2030	2040	2050
Elderly population (65 and over) as % of total population - Slovakia	12,3	16,4	20,7	24,4	29,9
Very elderly population (80 and over) as % of total population - Slovakia	2,7	3,2	4,7	7,5	8,8
Very elderly population (80 and over) as % of elderly population - Slovakia	22,3	19,6	22,9	30,6	29,4
Very elderly population (80 and over) as % of working age population - Slovakia	3,8	4,7	7,3	11,8	15,3
Elderly population (65 and over) as % of total population - Czech Republic	15,4	19,8	22,1	25,1	28,8
Very elderly population (80 and over) as % of total population - Czech Republic	3,6	4,0	6,5	7,9	8,7
Very elderly population (80 and over) as % of elderly population - Czech Republic	23,5	20,4	29,4	31,5	30,1
Very elderly population (80 and over) as % of working age population - Czech Republic	5,1	6,3	10,1	12,8	15,2

Source: Based on data from the Social Insurance Agency in Slovakia, 2016

Data show facts that in the Slovak Republic as well as in the Czech Republic we have to be prepared for the growing share of senior citizens in the whole population including the growth of senior citizens in the working population, too. The growth of share of the group of elderly population 80 and over in the population is very significant. In the Slovak Republic as well as in the Czech Republic the group 80 and over will represent almost 30 % of the whole number of senior citizens.

Problems connected with aging of the population are topical for all countries. It is assumed globally that the share of population of the age 65 and over will increase from contemporary 8 % up to 18 % in the year 2050; this increase will be substantial especially in the OECD countries where the growth from present 17% up to 25% is expected. In the OECD countries there will be a considerable growth of the share of population of the age 75 and over - from contemporary 8% up to 16% in the year 2050. These changes are shown in the next graph.

Figure 1 Share of Elderly Older than 65 and 75 in the Total Population



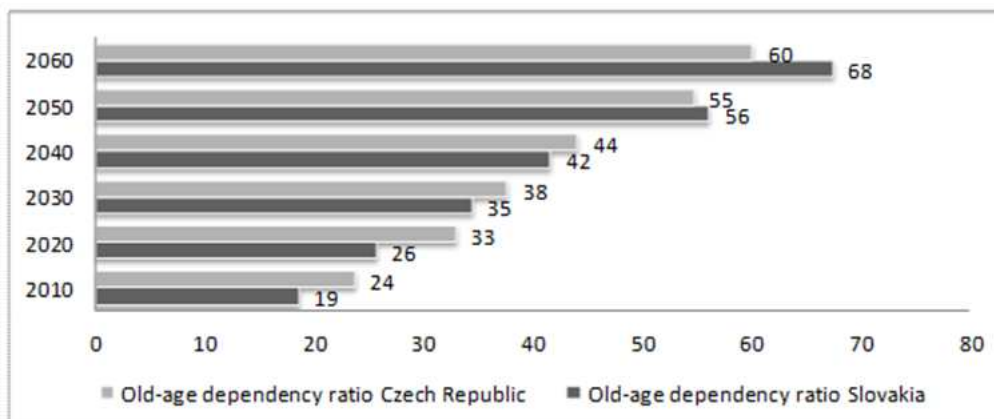
Source: Pensions at a Glance 2015, OECD and G20 indicators

Taking into consideration our knowledge we are more inclined to agree with opinions (Murphy, 1999) that it is necessary to change the approach which is having a fundamental attribute - it is not the question of choosing between unfunded or fully-funded financing of pension systems but it is the question of quantitative parameters and change of viewing the pension system. The change concerns especially a shift from insurance (while some people do not consider "risk of old age" as risk) to old-age savings.

3 Results and Discussion

Individual countries approach changes in functioning of their pension systems differently; they start with increasing retirement age and end up with changing the functioning of the whole system (Ševčík, M. et al, 2013). We do not support radical changes because they can bring advantages only to a certain group of people while the situation of another group can become even worse. In our opinion radical changes in pension system are not suitable for the Slovak Republic or the Czech Republic as there would not be the Pareto - efficiency shift. In connection with pension systems we should answer the primary question concerning the scope of old - age pensions. The requirement of the EC following from the material *The White Paper on Adequate, Safe and Sustainable Pensions* is clear: to guarantee the adequate pension security. As the basic quantity of functioning of the unfunded system is the ratio of the share of population in productive age to the number of inhabitants in post - productive age, so called dependency ratio, it is more difficult to meet this requirement than it was in the Slovak Republic and the Czech Republic in the past. The next graph shows a significant pressure under which the present systems in the Slovak Republic and the Czech Republic are.

Figure 2 Dependency Ratio – Czech Republic, Slovakia



Source: Based on data from the Social Insurance Agency in Slovakia, 2016

The share of population of the age 65 and over to the population of 20 – 64 is a key ratio for unfunded systems. It follows from the graph that while in the Czech Republic the dependency ratio will be higher until the year 2040, in the Slovak Republic this ratio will be radically worsened before the year 2050. There will be so called inner aging of the Slovak population as well as a problem with birth of the second child which nowadays is not so striking in the Czech Republic as it is in the Slovak Republic. The aging trend is irrevocable. In our opinion economists should concentrate especially on the factors which can be changed. One of them is the tendency to create savings for old-age period. We consider low motivation of individuals to create savings to be one of the key problems of present setting of the system of pension insurance. Creating savings means lowering the present consumption with the perspective of improving conditions in the future. So an individual gives up the possibility to satisfy his present needs in a certain scope to be able to increase his standard of living in the future. Therefore an explicit communication towards an individual is needed about the level of security for old age secured by the state. The Social Insurance Company can send letters to individuals with information about the pension they would receive if they retired. Motivating elements are also important, e.g. tax deductible item in case an individual paid contributions to one of systems to secure for old age (Tumpach, M. et al 2014). In the Slovak Republic it is necessary to return to this tool while in the Czech Republic this tax deductible item is being increased (Vávrová, E. 2014; Dubrovina, N, Péliová, J. 2015) Another possibility is to introduce private pension system into already existing system of pension security. We state examples of contemporary experiences from selected countries in the next table.

Table 2 Application of Private Pension Systems in the Countries of the EU

Member countries can be divided into four groups	Countries - examples
countries do not use financing from private resources to a large extent and they do not want any changes although there has been a minimum growth of pension security from private resources;	Spain, France, Luxembourg, Malta
countries in which one part of their pension promises has always been based on private pension programs but where the position of these programs strengthened and it is still developing. While unfunded pension systems offer protection against the poverty of pensioners, they do not necessarily secure completely adequate amount of pensions in sense of compensatory income and therefore they are combined with private systems covered with capital;	Denmark, Ireland, Netherlands, Sweden (*), United Kingdom
countries which have lately transformed their legal pension systems to include a pillar of mandatory capital covered private pension systems and financed them with shifting some parts of the whole amount of contribution to pensions from the unfunded pension system. The decision has been made in majority of these countries to base important parts of adequate amount of pensions in the future on these systems which will contribute, as it is expected, to preventing poverty as well as to securing an adequate compensation of income;	Bulgaria, Estonia, Latvia, Lithuania, Hungary, Poland, Rumania, Slovakia, Sweden (*)
countries have unfunded systems of social security which are connected with the amount of earnings but they are passing through with one part of their promises to extension of already existing or newly formed saving private pension schemes.	Belgium, Germany, Italy, Austria

(*) Sweden belongs to both groups

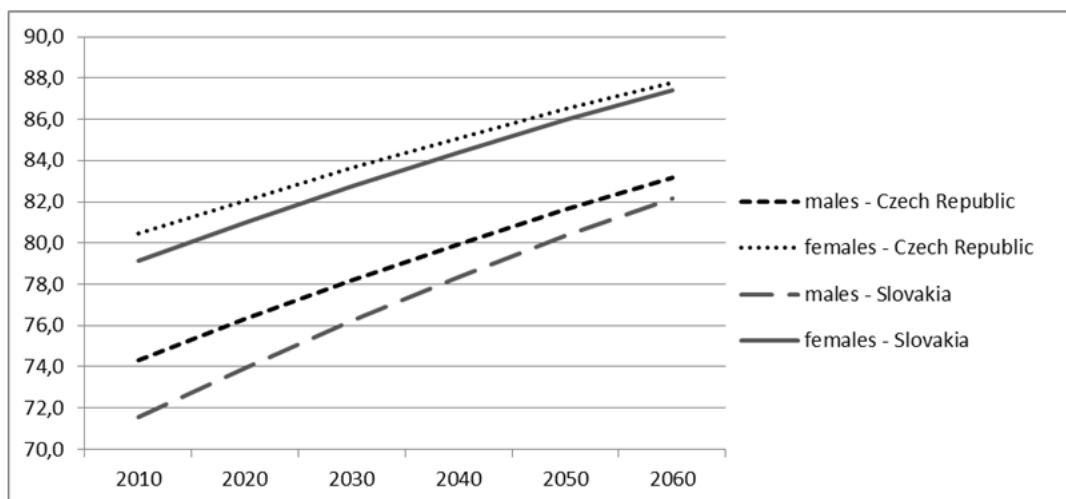
Source: Private pension schemes Their role in adequate and sustainable pensions, EU, 2010

In connection with individual´s savings for retirement we have to admit that opinions are different. Feldstein (1974) argues that the social insurance weakens private saving and has a negative influence on the economic growth. On the contrary Barro (1978) stated a

hypothesis that the effect of social insurance on savings in the dynastic model of a family with intergeneration transfers will be neutral. In his opinion the mandatory pension system does not create any new social “wealth” and it only replaces voluntary private savings.

In our paper we would like to pay attention also to the activity of the European Commission which tries to find also a universal product for securing an individual for old age that would be unified for the whole European area. In this context we would like to appeal to the existence of differences between females and males in mean longevity; we think that this fact should be taken into consideration when creating a pension product. We stress this fact because on the market of commercial insurance we witnessed the implementation of ban to discriminate females and males in the sphere of accessing insurance products. The EC directive, known as the Gender Directive which introduced the rule about the same insurance premium for both genders, determines that two individuals cannot have different amount of premium within the same type of insurance only because they have different genders. We do not consider the implementation of this rule also to the area of pensions as the suitable one. It could cause digression from the real risk which can appear in the sphere of pensions as e.g. in values of mean longevity at birth. In the next graph we show differences of this value between females and males in Slovakia and the Czech Republic.

Figure 3 Life Expectancy at Birth



Source: Based on data from the Social Insurance Agency in Slovakia, 2016

In this context it is necessary to mention also studies which proved positive correlation between the amount of life earnings and longevity of an individual (Mitchell, Zeldes, 1996). And here is the possibility to deny the basic principle – social solidarity of the rich with the poor or redistribution among generations from the rich to the poor. If the life expectancy of individuals with higher income is higher than the life expectancy of individuals with lower income then the amount of total received pension will significantly exceed the pension received by individuals with lower life income.

Today our aim is to realize the starting points and variables which we are not able to change and in the framework of these possibilities to find solutions which will secure adequate and sustainable pensions. The common features of countries which decided to make more fundamental changes are that they associated a pension system in a larger degree with merits, the employers began to play a more important role and they support own activities of individuals to secure for their post productive period. The best evaluated pension systems are in the Netherlands, Australia and Sweden. In the Netherlands the pension scheme is based on two pillars: the flat public system and employees’ system. Although employees’ pension system is optional, it is offered nearly by 91% employers. In Sweden there is a pension system with several pillars and with a capitalization

constituent. Sweden is an example of a country in which every year people get “an orange pension envelope” with detailed information about the development of their accumulated capital and the estimate of their possible future claims at different scenarios of development. The pension system in Australia has also several pillars with distinctive elements of merits and pressure on an individual to secure for old age. These examples can be inspiration for us when solving problems which will be significantly greater in our countries.

We consider as a negative fact that it is constantly repeated that the reason of problems of pension systems is aging of the population. In our opinion it can cause the situation when the older people will be perceived as exploiting the young and working generation. Therefore we suggest to change the way how the problem of pension systems is discussed and approached in such a way that other causes of failure will be stressed, too.

It is very important to use correct terms. We would like to contribute to the discussion about pension systems also by the debate about frequently used argument of so called misuse of insurance terminology. Liberal economists usually stress this shortage of unfunded pension systems. Criticism concerns the meaning of words which evoke the fact that the pension fund is created from contributions and that contributors are entitled or they have the right for the pension. It is clear that the fund is not created in the unfunded system and we also agree with the fact that the word contribution is another expression for a tax. At the same time contributions are not created on the basis of risk and basically an individual has to enter the system. Therefore it is suitable to call a system as a way based on the intergeneration reallocation with mandatory contributions.

4 Conclusions

In different countries pension systems differ as their form is the result of wider social and economic factors. But all of them have to tackle similar problems from which the most discussed is aging of the population. In our paper we point out that aging is not the only cause of contemporary problems of pension schemes because there are several factors which participate in this area. Therefore the choice of suitable pension system for a certain country is a very complicated question. Taking into consideration the macroeconomic starting points in the Czech Republic and the Slovak Republic we agree with opinions that the choice between unfunded and fully-funded financing is not fundamental but that the most important is the question of quantitative parameters and changed point of view concerning the pension system. The change concerns especially a shift from contemporary perceiving of pension security to saving for old age. We think that low motivation of individuals to create savings can be considered as one of the key problems of contemporary system of pension insurance. We are aware of the fact that an individual by the act of saving gives up the possibility to satisfy his present needs in a certain scope to be able to increase his standard of living in the future and it means that his present consumption is decreased. Without introducing this key element it would be very difficult to tackle the situation about the year 2060 when the dependency ratio in the Slovak Republic and the Czech Republic will be on the level which has never existed before in the history of pension systems. At the same time we stress the fact that females and males show different parameters in mean longevity and this fact has to be taken into consideration when creating a pension product. It is necessary to remind this fact as the EU is looking for the universal product which would secure individuals for old age. In our paper we show the examples of countries which have very well assessed pension systems. Their common features are: several pillars, the element of merits and the support of individual security of individuals for their post productive period.

Acknowledgments

This research was made possible by the VEGA research grants ‘Insurance relationship as a key element of the insurance sector operation in the context of socio-economic changes’ (No. 1/0431/14) and ‘Economic and social aspects of the information

asymmetry in the insurance market' (No. 1/0849/15) sponsored by the Ministry of Education, Science, Research and Sport of the Slovak Republic.

References

- Aaron, H. J. (1966). The Social Insurance Paradox. *Canadian Journal of Economics and Political Science*, vol. 32, pp. 371-74.
- Barro, R. (1978). *The Impact of Social Security on Private Savings?* Washington, American Enterprise Institute.
- Dubrovina, N, Péliová, J. (2015). Optimal Strategies for Tax Policy and Social Policy Tools Mix. *European Financial Systems 2015*, 12th international Scientific Conference, Masaryk University, Brno, CZECH REPUBLIC, pp. 106-113.
- Feldstein, M. (1974). Social Security. Induced Retirement, and Aggregate Capital Accumulation. *Journal of Political Economy*, vol. 82, No. 5, pp. 905-27.
- Infostat (2013). *Prognóza populačného vývoja Slovenskej republiky do roku 2060*. Bratislava, marec 2013.
- Krebs, V, Prusa, L. (2013). Solidarity and Equivalence in Social System - Current Problems. *Economic Policy in the European Union Member Countries*, Proceedings of 12th international scientific conference, pts I and II., pp. 444-451.
- Kubíček, J. (2004). Fondový penzijní systém v konvergující ekonomice. *Finance a úvěr*, vol. 54, No. 11-12, pp. 478-499.
- Loužek, M. (2006). *Má důchodová reforma se zadlužením smysl?* Politická ekonomie 2, pp. 247-260.
- Mitchell, O. S., Zeldes, S. P. (1996). Social Security Privatization – a Structure for Analysis. *American Economic Review*, No 86, vol. 2, pp. 363-367.
- Murphy, K. (1999). *Social Security S.O.S. Capital Ideas*, vol. 2, No. 1.
- Novák. M., Skalák, P. (2014). Influence of international trade on economic growth. *European financial systems 2014*, proceedings of the 11th International scientific conference, Lednice, june 12-13, 2014. Brno, Masaryk University, p. 433-440.
- Ševčík, M., Váňa, D., Ševčíková, M. (2013). Politická ekonomie, hospodářská politika a hospodářské dějiny v rámci pedagogických a vědeckých aktivit Vysoké školy ekonomické od druhé poloviny 20. století. *Politická ekonomie*, vol. 61, No. 4, pp. 481 – 501.
- Slaný, A. (2011). *Konkurenceschopnost, růstová výkonnost a stabilita české ekonomiky*. 1. vyd. Brno: Masarykova univerzita.
- Tumpach, M, Manová, E, Meluchová, J. (2014). Relevantnosť národného podnikového finančného výkazníctva v Slovenskej republike z pohľadu veriteľov ako neprivilegovaných používateľov. *Ekonomický časopis - journal for economic theory, economic policy, social and economic forecasting, Journal of economics: journal for economic theory, economic policy, social and economic forecasting*. Bratislava, Ekonomický ústav SAV: Prognostický ústav SAV, roč. 62, č. 5, pp. 495-507.
- Vávrová, E. (2014). *Finanční řízení komerčních pojišťoven*. 1st ed. Prague: Grada Publishing
- Vittas, D. (1998). Švýcarský Chilepur – vzor pro penzijní reformy?. *Finance a úvěr*, No. 1, pp. 76-88.

Economies of Scale in M&A in the Manufacturing Industry in the Czech Republic

Jan Pěta, Mária Režňáková

Brno University of Technology
Faculty of Business and Management, Department of Finance
Kolejní 2906/4, 612 00 Brno, Czech Republic
E-mail: peta@fbm.vutbr.cz, reznakova@fbm.vutbr.cz

Abstract: *This paper presents partial results of the research focused on the success of completed M&A transactions in the manufacturing industry in the Czech Republic. The M&A topic has been frequently debated owing to the impossibility of unambiguously determining the associated effects. One of the M&A reasons consists in achieving the economies of scale, which should be reflected in decreasing costs. Our research is based on the sample of 59 transactions taking place in 2004 – 2011. The transactions involved 102 companies. These companies were examined for seven years, i.e. three years before the merger, and three years after the merger. The obtained data on the transactions were analysed separately for the group of successful and unsuccessful transactions. The success of the transactions was assessed by the amount of the achieved sales and the net income in the three years following the transaction. The aim of our research was to determine whether the mergers resulted in achieving economies of scale and in what areas. Testing the indicators was based on the Mann-Whitney U test. The research results have shown that only part of the mergers have been successful. The performed statistical tests confirmed the assumption that in the case of successful M&A transactions, there are savings in labour costs.*

Keywords: mergers and acquisitions, economies of scale, Mann-Whitney U test, manufacturing

JEL codes: G34

1 Introduction

The interest in examining the efficiency of mergers and acquisitions (M&A) is related to the ambiguity of the results of mergers. On the one hand, the volume of the worldwide-completed M&As has been growing, while there has also been a rise in the number and volume of mergers completed by business entities in the Czech Republic. On the other hand, there has been a concentration of assets and economic power into an ever-smaller number of entities, which may result in distorting the competition and denying the effects expected from M&As. This assumption is also confirmed by the fact that only a part of completed M&As may be deemed successful according to the standard efficiency benchmarks.

The M&A success may be assessed in terms of the pursued objectives. Scientific literature has dealt with the research and systematisation of the M&A motives for a long time. Mukherjee et al. (2004) state that the number of M&A reasons equals the number of transactions. Nevertheless, based on research into the motives for mergers completed in 1990 – 2001, they consider the most frequent motives to be the synergy (37 %), diversification (29 %), and restructuring (11 %). They arrived at this classification on the basis of a questionnaire survey of managers of the companies in question. Within the survey, up to 90% of the managers identified the operational synergies as the M&A reason. The remaining 10% falls equally on the financial synergies and the growth in the market force. According to Chatterjee (1986), operational synergies includes an improved use of the limited resources, resulting in the manufacturing and/or administrative efficiency, i.e. enabling to achieve the economies of scale. The economies of scale are typical mainly in horizontal M&As. They are reflected in increasing revenues due to a higher volume of products and services on offer, or possibly due to the sale of insufficiently used assets. According to Trautwein (1990), operational synergies may be achieved through an increased sales force or transfer of knowledge. Ross et al. (2008, p.

850) state that the source of increasing operating income includes improved marketing, an improved distribution network, and a product mix. According to Brealey et al. (2008), the economies of scale may occur as a result of merging the management, accounting, financial auditing, or development of the merged companies. As an example, the author quotes the American banking sector in the early 1990s. Similarly, Mellen and Evans (2010, p. 84) mention cost reduction by means of consolidating functions, positions and improved use of fixed assets, which results in a decrease in overhead costs.

Economies of scale may also be achieved in the context of vertical integration. This type of savings is achieved when a company obtains the possibility to control the production process (merging with a supplier) or possibly acquires distribution channels subsequently used for the sale of its own products (merging with the customer). In the case of vertical M&As, the company may, on the one hand, control the quality of supplied raw materials, while it also, in general, increases its profits, since it eliminates at least one degree of the profit margin which existed prior to the transaction. Brealey et al. (2008) mention the example of mid-20th century, when General Motors produced most parts in companies belonging to its group in terms of ownership. Additional economies may be achieved by means of coordinating related activities. Ross et al. (2008) mention the example of companies working with wood, which often own a logging company or a wood sawmill. Gaughan (2007) mentions a similar example, being the association of the carmaker General Motors with General Motors Acceptance Corporation, which provides low-cost loans for purchasing cars.

This paper presents the results of the ongoing research focused on the research into M&A efficiency in the manufacturing industry in the Czech Republic. Due to the fact that the motive of synergy is one of the most frequently cited reasons for mergers, we will focus on evaluating the success of synergies and economies of scale, reflected in the decrease of costs. We proceed from the assumption that the merger may result in a higher efficiency of certain activities than when performed separately. On the basis of the above assumption, the research hypothesis has been determined as follows:

Successful M&A transactions achieve operational synergies reflected in a decline in the cost intensity.

The cost intensity is to be measured using the following indicators:

- The ratio of the costs of sales to revenues, representing any potential economies in the area of manufacturing, in particular, materials, energy, and services. Savings may be a result of an increased bargaining power of the newly established company in relation to business partners, as well as consequent reduction in the cost of purchased materials, subcontracts, etc. (for instance, see Ficbauer and Režňáková, 2014; Pavelková, 2009).
- The ratio of labour costs to revenues, representing the economies in the personnel area at varying sales. The merged companies may consolidate certain functions, thus achieving relative savings per sales unit. This M&A reason is mentioned, for instance, by Brealey et al. (2008). Similarly, Sedláček et al. (2013) note that the most frequent reason for completed M&A transactions in the Czech Republic consists in simplifying the administration, which may be accompanied with savings in labour costs.

2 Methodology and Data

As mentioned earlier, the research focuses on the M&A efficiency taking place in the manufacturing industry in the Czech Republic (Section C according to CZ-NACE). We have focused on the research in this sector due to its relative importance (38% of the total output in the Czech Republic) and the highest number of the completed mergers in the examined period (see Table 1). It is possible to capture the effect of the completed transaction only in the case that in the examined period, only one transaction took place in the previously defined period. Based on the results of the previous research, obtained through secondary research, we examined the effect of the merger three years upon

completing the M&A and three years before the M&A transaction, i.e. 7 years in total. The research thus featured only those transactions which were not accompanied with any other transactions within seven years. The transaction effect was assessed on the basis of the published financial results, i.e. based on the publicly available accounting data (financial statements available from www.justice.cz). The latest available data included 2014, and therefore the examination period for including the transaction in the research was determined as 2004 to 2011, i.e. the transactions taking place in this period. The following criteria have been used for the purposes of defining the research sample (M&A):

- The transaction was performed by companies with the head office in the Czech Republic in 2004 – 2011;
- It was a single transaction in the period of 7 years (three years before and three years after the M&A);
- Financial statements are available in the electronic form.

Table 1 Number of M&A according to the CZ-NACE Classification in 2004 - 2011

Section	M&A number	Share in the total M&A number
Manufacturing industry	183	12.69%
Wholesale and retail	169	11.72%
Professional, scientific and technical activities	40	2.77%
Construction	39	2.70%

Source: Bisnode database

Due to the relatively high number of mergers and the diversity of the completed transactions corresponding to this criterion, we focused on examining the efficiency of the mergers taking place in the sectors of CZ NACE 25 – Manufacturing of metal structures and products and CZ NACE 28 - Manufacturing of machinery and equipment. In the examined period, these two sectors saw M&A transactions meeting the research specifications. Out of the 59 M&A transactions, the data have been available, in the form of financial statements, for only 50 transactions in which 102 companies were involved. Half of the M&A transactions took place in the form of horizontal integration, i.e. the merger of entities operating in the same sector, while the other half in the form of vertical integration, i.e. the merger between suppliers and customers.

On the basis of the results attained after the merger, the examined transactions were divided into successful and unsuccessful ones, i.e. those creating and failing to create synergies. When dividing the transactions, the authors followed the key idea of synergy appreciation that the synergy value comprises the increase in the value of merged companies (for instance, see Mařík, 2011), i.e. $\Delta H = H_{AB} - (H_A + H_B)$. One of the prerequisites of the increase in the company's value is an increase in the revenue and profit margin (which both belong to the value drivers), and therefore the completed transactions were above all divided on the basis of the achieved changes in the revenues and profits (the so-called merger effect). In addition to the revenue indicator, measuring the company's growth frequently uses the number of staff and the size of total assets (Fiala, Hedija, 2015). The staff numbers are not published by all companies, and for this reason, this indicator could not be examined. The authors have also rejected the indicator of total assets, as the transaction might have been followed by the sale of unused assets or the occurrence of the goodwill item as a consequence of revaluation of the acquired assets, which cannot be deemed as a synergy effect.

The change in the sales was quantified on the basis of the theoretical value of sales (T_T) and actual sales achieved after the transaction (T_A), i.e. $\Delta T = T_A - T_T$. The theoretical value of sales was determined as the sum of the forecasted sales of the entities entering into the transaction. The theoretical values of the sales were forecasted for each undertaking separately on the basis of the development of the sales before the merger,

i.e. as if the merger did not occur. The change in the profit was quantified in a similar manner.

As the successful M&As were identified those transactions which reflected a positive synergy effect, i.e. the actual value of sales or profits after the merger are higher than the sums of the forecasted values (theoretical values). The second examined group consisted of unsuccessful M&A transactions which did not show any positive effect in the specified indicators. A positive effect in the examined indicators was found in 24 transactions, while the remaining 26 M&A transactions did not show the positive effect.

Furthermore, the authors also examined the development of the expense-to-revenue ratio of individual transactions. The aim was to investigate whether following the merger, there is an intensive growth which is related to the savings of available resources. The synergy effect of the M&A transaction was demonstrated in 48% of the examined transactions. The analysis of the development of the expense-to-revenue ratio verified the assumption that successful M&A transactions also achieved cost savings which may be considered as economies of scale. In addition, the analysis included basic statistical indicators of mean, median and standard deviation. This analysis has been supplemented with testing whether the indicators of the expense-to-revenue ratio following the merger (M&A) reach a different value in the group of successful transactions and the group of unsuccessful transactions, and whether the difference is statistically significant. For this purpose, the nonparametric Mann-Whitney U test was used. This is an alternative method of the t-test, which is used on condition that the assumption of data normality according to Kasuya (2001) has not been met. Pereira and Leslie (2010) mention that the test is suitable in cases where the examined groups are independent, i.e. there is no cross correlation between individual values of both groups.

The calculation of the test is based on the serial numbers of individual variation rows. According to Bedáňová (2011), it is necessary first to create the so-called "composite selection", i.e. all transactions should be arranged in a single ascending order regardless of their original group. In the second step, the individual values in the composite selection are assigned with the ranking. The lowest value is assigned with the serial number one; the highest value is assigned with the highest serial number (in our case 50). This coding will contribute to the elimination of extreme values which negatively affect the research results. If multiple values coincide, they are assigned with an average ranking. The selection arranged in this manner is then used for calculating the sum of the rankings within each examined group (labelled R_U and R_N). Consequently, it is necessary to calculate the test statistics according to the following relationships:

$$U_U = n_U * n_N + \frac{n_U * (n_U + 1)}{2} - R_U \quad (1)$$

$$U_N = n_U * n_N + \frac{n_N * (n_N + 1)}{2} - R_N \quad (2)$$

Where: U_U = test statistic of successful transactions

U_N = test statistic of unsuccessful transactions

n_U = number of transactions included in the group of successful transactions

n_N = number of transactions included in the group of unsuccessful transactions

R_U = sum of rankings related to the values of successful transactions

R_N = sum of rankings related to the values of unsuccessful transactions

The smaller of the test statistics, i.e. $U = \min(U_U, U_N)$ is subsequently used as a test criterion assessed with the critical value of the Mann-Whitney test (Bedáňová, 2011).

3 Results and Discussion

The following table shows the development of the expense-to-revenue ratio for the both groups of examined M&A transactions:

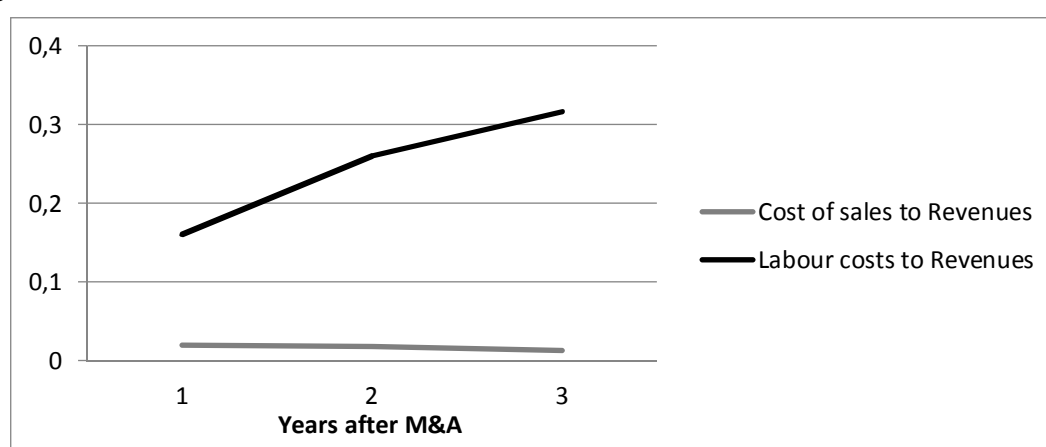
Table 2 Statistical Values of the Expense-to-Revenue Ratio before and after M&A

		Successful M&A						
Period		-3	-2	-1	M&A	1	2	3
Cost of sales to Revenues	Mean	0.7307	0.6872	0.6865	0.7092	0.7046	0.6364	0.7148
	Median	0.6663	0.6900	0.6893	0.6886	0.6883	0.6246	0.6247
	Std. dev.	0.2691	0.2004	0.1989	0.2047	0.2006	0.1990	0.2248
Labour costs to Revenues	Mean	0.0985	0.1102	0.1175	0.1188	0.1190	0.1100	0.1153
	Median	0.1177	0.1151	0.1279	0.1433	0.1427	0.1342	0.1283
	Std. dev.	0.0901	0.1081	0.1338	0.0905	0.0945	0.0986	0.0968
		Unsuccessful M&A						
Cost of sales to Revenues	Mean	0.5792	0.6361	0.6229	0.6146	0.6118	0.6287	0.6225
	Median	0.5972	0.5628	0.6066	0.5898	0.6076	0.6302	0.5686
	Std. dev.	0.3016	0.2402	0.2196	0.2091	0.2030	0.1948	0.2247
Labour costs to Revenues	Mean	0.1073	0.1043	0.1078	0.1205	0.1275	0.1217	0.1294
	Median	0.1223	0.1283	0.1342	0.1418	0.1683	0.1564	0.1576
	Std. dev.	0.1347	0.1239	0.1074	0.0900	0.0894	0.0959	0.1067

Source: Own research

The average values in the third year after the completed M&A, compared to the year before the transaction in the case of successful M&As grew by 4.10% in the case of the cost of sales to revenues ratio and dropped by 1.90% in the case of the labour costs to revenues ratio. On the other hand, the average values of the expense-to-revenue ratio in the same period in the group of unsuccessful M&A remained stable or grew by 20% in the case of labour costs. The results support the formulated hypothesis only for labour intensity.

There was also a similar development in the median values of both expense-to-revenue ratios. There was a gradual increase in the difference between the values of the expense-to-revenue ratio in both groups, while a more significant difference was found in the case of the labour costs to revenue ratio (see Figure 1).

Figure 1 Difference in the Medians of Successful and Unsuccessful M&A Transactions

Source: Own research

The chart shows that there is an insignificant difference in the development of the cost of sales to revenues ratio between successful and unsuccessful M&A transactions. The highest difference is achieved right in the first year following the transaction: there was an improvement, i.e. a decline in the examined indicator in the group of unsuccessful transactions. Even in the second year following the M&A transaction, the unsuccessful

mergers achieve a better result. However, in the third year following the merger, deterioration was found in such an extent that there is a significant growth of this indicator in the group of unsuccessful transactions.

In the case of the indicator of the labour costs to revenues ratio, the highest growth in the difference of medians occurs in the second year after the transaction. It may be deduced that the merged companies failed to achieve economies in the management, administration and human resources in general.

Both examined groups feature transactions showing the opposite development than the group in which they were included. In the group of successful M&A transactions, there are companies which saw the deteriorating ratio of the costs of sales to revenues or even the labour costs to revenues. The group of successful M&As contains six transactions with a simultaneous increase in the expense-to-revenue ratios. Conversely, the group of unsuccessful transactions, there are four of them which saw a decline in both expense-to-revenue ratios. In both cases, these are horizontal transactions. Over 50% of the sales of these companies were due to export. With one exception, all ten transactions were completed in the period of 2008 to 2011, i.e. in the period when the economic development in the Czech Republic was affected by the global financial crisis.

Even though in the case of the so-called successful transactions, there was an increase in the share of the labour costs in the revenues in six M&A transactions, the increase was not significant. In addition, the average value of this indicator was lower than the group average. This may be considered as a reason for a higher increase in the labour costs than the increase in revenues. A similar development may also be found in the cost of sales indicator.

The obtained results were further subject to the statistical test of independence. For this purpose, the Mann-Whitney U test was used for determining the conformity of variances in successful and unsuccessful M&A transactions. The results are shown in Table 3.

Table 3 P-value Mann-Whitney U Test after the M&A Completion

	1st year after M&A	2nd year after M&A	3rd year after M&A
Cost of sales/Revenues	0.5668	0.9149	0.5668
Labour costs/Revenues	0.0368	0.0059	0.0021

Source: Own research

The ratio of the cost of sales and the revenues shows that there is no statistically significant difference between the groups; in addition, in the second year after the M&A completion, the variance of both groups shows the data conformity on the level of p-value 0.9149. Conversely, the ratio of labour costs to revenues shows a statistically significant difference in all the examined periods. The difference of both groups increases over time, as implied by the decreasing p-value.

The last issued addressed by the authors is the analysis of the development of expense-to-revenues ratios before the merger, i.e. whether an identified difference in the development of the examined indicators may also be observed before the M&A transaction. For this purpose, the potential values of the indicators were calculated based on the data taken from the accounts of the individual companies. Mean values of these parameters were compared using the Mann-Whitney U test.

Table 4 P-value Mann-Whitney U Test before the M&A Completion

	3rd year before M&A	2nd year before M&A	1st year before M&A
Cost of sales/Revenues	0.4316	0.0725	0.3364
Labour costs/Revenues	0.8082	0.8842	0.9923

Source: Own research

The results show that neither indicator in the examined years preceding the transaction shows a significant difference. A change in the values of these indicators after the M&A transaction may actually be considered as the effect of the merger, i.e. the synergies and economies of scale.

4 Conclusions

Within the examined sample of 50 M&A transactions of engineering companies (excluding the car-making industry) taking place in 2004 – 2011, it was found that 48% of the transactions resulted in an increase in the revenues and profits within three years following the merger. They may thus be labelled as mergers achieving the synergy effect. Furthermore, it was found out that successful M&A transactions were accompanied with the economies of scale in the area of labour costs. On the other hand, we have not verified the assumption that in the case of successful M&As, there are also economies in the consumption of material, energy and services. Even though there was a slight decline in the values of the cost of sales to revenues ratio, the decline was not statistically significant in the examined period. The first two years after the M&A saw in both groups, i.e. the successful and unsuccessful transactions, a decline in the average values of this indicator. A difference did not occur until the three year after the merger. For this reason, it was impossible to confirm the assumption on attaining economies of scale for operational activities.

The difference in the mean values of the cost intensity between the group of successful and unsuccessful transactions may not be identified in the period before the merger. The achieved savings may thus be unambiguously regarded as the merger effect.

Acknowledgments

The paper is an outcome of the research project "Selected Issues of Financial Management in the International Environment", funded by the Internal Grant Agency of the Brno University of Technology, registration number FP-S-15-2877.

References

- Bedáňová, I. (2011). *Nemarametrické testy*. Retrieved from: <http://cit.vfu.cz/statpotr/POTR/Teorie/Predn4/MannWhit.htm>.
- Brealey, R. A., Myers, S. C., Allen, F. (2008). *Principles of corporate finance*, 9th ed. Boston, Mass: McGraw-Hill.
- Fiala, R., Hedija, V. (2015). The Relationship Between Firm Size and Firm Growth: The Case of the Czech Republic. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, vol. 63(5), pp. 1639-1644.
- Ficbauer, D., Režňáková, M. (2014). Holding Company and Its Performance. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, vol. 62(2), pp. 329-337.
- Gaughan, P. A. (2007). *Mergers, acquisitions, and corporate restructurings*, 4th ed. Hoboken, N. J.: Wiley.
- Chatterjee, S. (1986). Types of synergy and economic value: The impact of acquisitions on merging and rival firms. *Strategic Management Journal*, vol. 7(2), pp. 119-139.
- Kasuya, E. (2001). Mann-Whitney U test when variances are unequal. *Animal Behaviour*, vol. 61(6), pp. 1247-1249.
- Mařík, M. (2011). *Metody oceňování podniku: proces ocenění - základní metody a postupy*, 3rd. ed. Praha: Ekopress.
- Mellen, C. M., Evens, F. C. (2010). *Valuation for M&A: building value in private companies*, 2nd ed. Hoboken, N. J.: Wiley.

- Ministerstvo spravedlnosti ČR (2016). *Veřejný rejstřík sbírka listin*. Retrieved from: www.justice.cz.
- Mukherjee, T. K., Kiyamaz, H., Bake, H. K. (2004). Merger Motives and Target Valuation: A Survey of Evidence from CFOs. *Journal Of Applied Finance*, vol. 14(2), pp. 7-24.
- Pavelková, D. (2009). *Klastry a jejich vliv na výkonnost firem*. Praha: Grada.
- Pereira, S. M. C., Leslie, G. (2010). Testing differences between two samples of continuous data. *Australian Critical Care*, vol. 23(3), pp. 160-166.
- Ross, S. A., Westerfield, R., Jordan, B. D. (2008). *Fundamentals of corporate finance*, 8th ed. Boston: McGraw-Hill/Irwin.
- Sedláček, J., Valouch, P., Konečný, A. (2013). Synergic motives and economic success of mergers of Czech companies. *Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, vol. 61(7), pp. 2721-2727.
- Trautwein, F. (1990). Merger motives and merger prescriptions. *Strategic Management Journal*, vol. 11(4), pp. 283-295.

Examination of Stock Market “Temperature” Using Price-Dividend Dependence for European Shares

Sergey Petrov¹, Oksana Kashina², Roman Murashkin³

¹ Lobachevsky State University of Nizhny Novgorod
Institute of Economics and Entrepreneurship, Department of Finance and Credit
Bolshaya Pokrovskaya street 37, 603000 Nizhny Novgorod, Russian Federation
E-mail: petrov_ss@list.ru

² Lobachevsky State University of Nizhny Novgorod
Institute of Economics and Entrepreneurship, Department of Finance and Credit
Bolshaya Pokrovskaya street 37, 603000 Nizhny Novgorod, Russian Federation
E-mail: oksana_kashina@mail.ru

³ Lobachevsky State University of Nizhny Novgorod
Institute of Economics and Entrepreneurship, Department of Finance and Credit
Bolshaya Pokrovskaya street 37, 603000 Nizhny Novgorod, Russian Federation
E-mail: murashkin@mail.ru

Abstract: *The paper aims to investigate some European stock markets (whether they are overheated or undervalued) on the basis of price-dividend dependence analysis for a number of liquid shares. Our approach applies the procedure of revealing of shareholders' expectations through econometric analysis of share price movement compared to changes in the dividend payments. As a result one may comprehend whether speculative motive of shareholders is responsible for market evaluating of the share or, on the contrary, shareholders are predominantly attracted by dividend payments on it. In such a way analysis of changes in price-dividend dependence for representative group of assets makes it possible to monitor when stock market overheats and generates a bubble. Moreover, the model developed permits to investigate how the company's industry is related to predominant motive of the representative shareholder when investors' expectations are substantially heterogeneous.*

Keywords: heterogeneous expectations of investors, overvalued and undervalued shares, dividend discount model for common stock pricing, price-dividend dependence analysis, overheated stock market

JEL codes: C12, G11, G12, G15, G17

1 Introduction

Diagnostics of share market sentiment (when we “intuitively” estimate it as undervalued or overvalued) traditionally was the subject of some fundamental models. A notion of intrinsic value of stock (Graham, 2004) is currently alien to the fully consistent asset pricing theory (Cochrane et al. (2008) and Cochrane (2011)) operating with its expected return. At the same time the notion is often used by investment analysts; so such “intuitive” characteristics may be regarded to be essentially productive.

One of well-known technique for share market sentiment’s diagnostics uses an examination of historical price-dividend dependence for a number of shares (see e.g. Hussainey (2010) and Engsted (2010)). Originally, the dependence had been attracting attention of researchers who tested dividend discount model for shares (see references in Shiller (2014)). Campbell and Shiller (1988) found that share price volatility can’t be explained by variations of the discount rate reflecting shareholders’ expectations. Many studies of stock market efficiency (see references in Shiller (2014)) had been analyzing price-dividend dependence for shares; they had been directly referring to the problem of investors’ expectations rationality.

A procedure of revealing of predominant shareholders’ motives for the time frame under study was developed in a number of author’s papers (Petrov and Kashina, 2016). Similar method was also used by Majanga (2015), however, his analysis is not quite accurate

because the author neglects a future sale of share). Classical Gordon model approximation ("constant-growth model" (Gordon, 1959)) provides "a reference point" for the procedure. The model's distinctive feature is that share price and dividend increase proportionally (the equivalent proposition is that investors' expectations either of share price growth or of dividend growth are the same (Petrov and Kashina, 2016); in a real sense both propositions should be regarded as time-averaged). Generalizing the approach assuming the dividend increase uniformly, to the case of limited period of investments (classical Gordon model consider perpetual period of investments (Gordon, 1959)), authors had developed a technique permitting to reveal how "representative shareholder" had been estimating prospective share price growth over the time frame under study. The technique made it possible to classify a share to one of the most typical groups:

- "dividend shares" – securities whose holders didn't consider share price growth as their priority;
- "speculative shares" – securities attracted investors who were primarily interested in share price growth;
- "Gordonian shares" – securities were characterized above;

Note that our analysis (Petrov et al., 2015) has also revealed investors' expectations specific for "zero-growth model" (Gordon, 1959) for some individual shares. However, these shares are "unique", so we don't separate them as a whole group.

Obviously, if speculative motive of shareholders is significant for the majority of stock, we can consider stock market as overvalued; perhaps, it gives rise to a "bubble" (an example of the bubble in the USA in the 1990s is well described in the literature (see, for example, Shiller (2014))).

The procedure developed by the authors was verified (Petrov and Kashina, 2016) for a number of shares traded in the USA and in Russia (American and Russian stock markets were regarded as samples of well-developed and emerging markets). The present paper purposes to study share market sentiment for developed stock markets in Europe over the euro-zone existence time frame (approximately from 2000 until now).

2 Methodology and Data

Consider the framework for examination of shareholders' expectations following (Petrov and Kashina, 2016). Let t is the current time; assume that "representative investor" intends to hold a share within n years thereafter; he or she purposes to receive stock dividends $D_{t+1}, D_{t+2}, \dots, D_{t+n}$ and then to sell the share (denote its expected resale price as P_{t+n}). If the investor estimates the discount rate as r , he or she may calculate the appropriate share price P_t using standard dividend discount model (see Petrov and Kashina (2016) and also Gordon, 1959).

$$P_t = \sum_{k=1}^n \frac{D_k}{(1+r)^k} + \frac{P_{t+n}}{(1+r)^n}, \quad (1)$$

Next, let us assume that investor suppose the future dividend dynamics is similar to hypothesis of classical constant-growth model (Gordon, 1959)

$$D_{k+1} = D_k(1+g), \quad (2)$$

where $k=0, 1, \dots, (n-1)$; g is the expected growth rate in the firm's dividends. Recurrent dependence (2) is quite natural for "ordinary" investor's notion; it is difficult to believe that investor estimates future dividend dynamics as irregular. In accordance with the idea the growth rate g is characterized "the degree of investor's optimism". In such

instance present values of expected dividends in the formula (1) can be summed as finite geometric sequence with the ratio

$$q = \frac{1+g}{1+r}. \quad (3)$$

So investor's evaluation of the share is decomposed into two parts: present value of dividend income and present value of income from sale of the share (Petrov and Kashina, 2016)

$$P_t = \frac{D_{t+1}}{r-g}(1-q^n) + \frac{P_{t+n}}{(1+r)^n}. \quad (4)$$

Considering historical dependence $P_t(D_{t+1})$ for any time frame one can try to explain it using relation (4), although the other variables in the relation are "concealed". In general, price-dividend dependence arising from relation (4) is not evident. Even if we suppose parameters r , g and n as constant (in the average) over the time frame under study, there's no cause for presumption that expected resale price P_{t+n} will not change in time.

However, if one regress P_t against D_{t+1} for the series of annual empirical price and dividend data using ordinary least square method

$$P_t = \beta \cdot D_{t+1} + \alpha, \quad (5)$$

relation (4) may be helpful to get an idea of shareholders' expectations. As usual (Fama (1970)), a certain problem appears in this case: the right-hand side of the relation (4) includes expected ("ex-ante") values (dividend D_{t+1} and share price P_{t+n}); on the contrary, historical data are always "ex-post". A well-known method (see Petrov and Kashina (2016); the technique for verification of "ex-ante" relations based on historical data was widely used by Fama (1970)) may be applied to avoid this point; thus we may use equation (4) to interpret empirical dependence between historical (ex-post) annual values of share price P_t and subsequent dividend payments per share D_{t+1} .

Petrov and Kashina (2016) have shown that parameters of the regression equation (5) can inform about "representative shareholder's" expectations of share price growth (compared to the company's growth). If the model (5) is statistically significant, 3 different types of its trend line position (and 3 different types of shareholders' expectations respectively) are possible.

- Price-dividend dependence $P_t(D_{t+1})$ will be proportional ($\alpha = 0$) if both summands in the right-hand side of the relation (4) vary with time proportionally (put it differently, expected income from sale of the share P_{t+n} varies with time in accordance with dynamics of dividend D_{t+1}). As it is shown by Petrov and Kashina (2016), this price-dividend dependence is also typical for shares evaluating in agreement with classical Gordon model that follows from equation (4) in the limiting case $n \gg 1$ (thereafter – "Gordonian" shares).
- Trend line of empirical dependence $P_t(D_{t+1})$ will be shifted up from the origin of coordinates ($\alpha > 0$) if the growth of expected income from sale of the share P_{t+n} is behind the growth of dividend D_{t+1} ; similar shareholders' expectations are referred to as "pessimistic" by Petrov and Kashina (2016); we can classified such shares as "dividend". If "pessimistic" expectations prevail among shareholders, stock market, in all appearances, may be considered as "undervalued".

- On the contrary, if trend line of empirical dependence $P_t(D_{t+1})$ is shifted down from the origin of coordinates ($\alpha < 0$), the expectations of income from sale of the share P_{t+n} progress faster than dividend D_{t+1} grows. Obviously, demand for such shares is stimulated by speculative motives of their holders (thereafter – “speculative” shares). If most of shareholders’ capital is invested in speculative shares, stock market tends to be overheated.

3 Results and Discussion

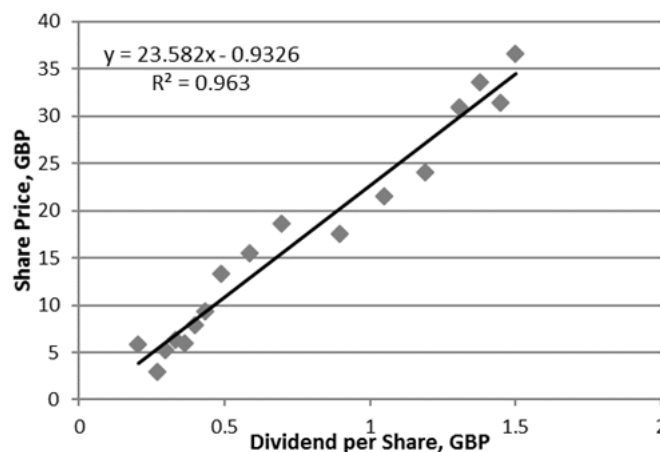
Analysis of the Model Applicability for Revealing of European Shareholders’ Motives

To reveal shareholders’ expectations for major European securities we have studied price-dividend dependence for 30 shares listed in main European stock trading venues: London Stock Exchange, Euronext Paris and Germany's venue Xetra. The shares under examination belong to eight different sectors of economy including automotive industry, banking, chemicals, consumer products manufacturing, pharmaceutical, sector of high technology, oil & gas industry and telecommunication. An assembly of primary data covers the period from 2000 to 2015; this time frame was chosen for investigation owing to the Euro entering into circulation in the 2000s; some problems appear when we try to compare these data with earlier information.

First, we have to define how to associate share price P_t in the equation (4) with its experimental values. Formally (according to the logic of dividend discount model), equation (4) relates share price *at the end of a year* (its number is t) with dividend payment of the next $(t+1)^{th}$ year. However, such method of specification for share price P_t can cause some calculating errors because of well-known calendar effects (such as January Effect). To avoid them we have considered share price averaged *over the beginning* of the $(t+1)^{th}$ year (over the first quarter) as the dependent variable P_t in equation (4); averaging daily values of closing price we smoothed its chaotic fluctuations.

Next, annual time series of share price P_t for selected corporations were compared with appropriate time series of dividend D_{t+1} ; we didn’t take into account interim dividend payouts. The results of the analysis permit to conclude that most of the selected shares demonstrate significant price-dividend dependence over the time frame under examination.

Figure 1 The Historical Price-Dividend Dependence (1999-2015) and the Regression Line for British American Tobacco PLC Shares



Source: Authors’ calculations based on the data from website: <http://finance.yahoo.com/>

Fig. 1 illustrates an example of the dependence for British American Tobacco PLC shares. The vertical coordinate of each point on the chart indicates share price P_t (in GBP) for specific year; the horizontal coordinate reflects annual dividend per share (in GBP also) for the next year (D_{t+1}). The Figure demonstrates that changes in share price are closely related to dynamics of dividend payments. Coefficient α of the regression line calculating using equation (5) is close to zero (within the calculating error); this fact allows us to characterize the share under study as "Gordonian" (see the previous section).

Investigation of Price-Dividend Dependence for European Shares

Either price-dividend dependence or the appropriate linear regression were also constructed for other selected shares; the results of the analysis are presented in the Table 1. The shares under study are clustered depending on their issuers' sector of economy; coefficients α and β characterize regression line's position (its shift from the origin and its slope coefficient respectively). Parameter of t -statistic describes statistical significance of coefficients α and β ; values of R-Square, F-statistic and Model Significance illustrate the model's performance.

The results presented in Table 1 allow to conclude that linear price-dividend dependence is rather significant for at least 20 securities of the selected group. Meanwhile, there are some securities whose holders don't consider dividend payments as predominate income; inessential price-dividend dependence is, in a sense, coherent to the company-issuer's sector of economy. Specifically, statistical significance of linear regression is relatively low for the shares of Telecommunications and Oil & Gas Production sectors.

Table 1 Parameters of Price-Dividend Dependence Regression Model for Shares of European Companies

Issuer	α	t-statistic c α	β	t-statistic c β	R Square	F-statistic c	Significance F
Automotive							
BMW AG	20.550	2.001	20.550	2.966	0.386	8.795	0.010
Daimler AG	24.653	2.625	17.485	2.613	0.328	6.827	0.020
Renault SA	35.432	6.211	12.014	4.450	0.623	19.801	0.001
Volkswagen AG	48.044	1.840	34.507	3.155	0.475	9.952	0.009
Banking							
Barclays PLC	51.324	3.086	-2.806	0.266	0.005	0.071	0.794
BNP Paribas SA	24.989	5.625	15.365	6.089	0.712	37.075	0.000
Commerzbank AG	10.074	2.820	12.073	2.790	0.526	7.782	0.027
Deutsche Bank AG	37.343	6.259	6.550	3.358	0.446	11.276	0.005
HSBC Holdings PLC	34.243	4.290	10.496	3.715	0.479	13.805	0.002
Societe Generale Group	23.904	5.423	15.804	9.901	0.891	98.030	0.000
Chemicals							
Air Liquide SA	-1.630	0.093	39.076	0.000	0.800	48.121	0.000
BASF SE	32.965	3.732	14.108	3.048	0.399	9.289	0.009
Linde AG	-22.74	3.208	54.129	15.972	0.948	255.1	0.000
Solvay SA	37.563	1.953	18.112	2.326	0.311	5.410	0.038
Consumer Products							
British American Tobacco PLC	-0.933	0.890	23.582	19.766	0.963	390.68	0.000
Beiersdorf AG	60.128	8.287	-10.61	2.127	0.232	4.526	0.050
Danone SA	129.50	10.543	-55.42	5.102	0.667	26.027	0.000
Pernod-Ricard SA	71.020	4.051	-4.767	0.541	0.024	0.293	0.598
Biotech & Pharma							

Bayer AG	-17.14	1.874	52.008	7.983	0.820	63.735	0.000
GlaxoSmithKline PLC	1554.8	7.252	-1.825	0.515	0.017	0.266	0.614
Merck KGaA	162.04	4.246	-72.96	2.921	0.363	8.535	0.011
Sanofi	30.265	5.858	7.450	1.950	0.257	3.803	0.077
Technology							
Cap Gemini SA	39.053	3.907	2.300	0.257	0.005	0.066	0.801
Infineon Technologies	1.958	1.548	46.657	5.336	0.877	28.473	0.006
SAP SE	18.778	4.623	38.005	6.643	0.786	44.132	0.000
Oil & Gas							
BP PLC	55.508	5.052	-1.051	0.207	0.003	0.043	0.839
Royal Dutch Shell PLC	60.552	2.829	1.424	0.220	0.006	0.048	0.832
TOTAL SA	82.065	5.857	-4.753	0.839	0.048	0.704	0.415
Telecom							
Deutsche Telekom AG	15.692	4.405	-3.477	0.604	0.027	0.364	0.556
Orange SA	18.453	4.652	0.250	0.068	0.000	0.005	0.947
Vodafone Group PLC	26.428	7.828	0.160	0.111	0.001	0.012	0.914

Source: Authors' calculations based on the data from website: <http://finance.yahoo.com/>

Some of the shares under study can be referred to the "Gordonian" type: the most evident examples are securities of Air Liquide SA and Infineon Technologies AG (and, of course, the shares of British American Tobacco PLC's discussed above). Petrov and Kashina (2016) have disclosed the outstanding feature of "Gordonian" shares: empirical price-dividend dependence makes it possible to estimate their discount rate. For instance, as far as the average year-on-year growth of dividend for the British American Tobacco PLC's shares amounts to 14%, its discount rate equals to (see Petrov and Kashina (2016))

$$r = \frac{D_{t+1}}{P_t} + g \approx 0.18$$

Several securities among the group under study may be characterized as speculative (see section 2); the most vivid examples are the shares of Linde AG and Bayer AG. Share price growth for these assets notably exceeds the growth of dividend over the period of research. In all appearances, speculative shareholders' expectations are not typical for the greater part of European stock; therefore, European stock markets can't be described as "overheated" (in contrast, a number of speculative shares is considerably more in the USA (see Petrov and Kashina, 2016)). Analyzing the results of the Table 1, one can conclude that shareholders' expectations are rather pessimistic for the majority of European stock (at least 15 assets having statistically significant price-dividend dependence from the group under study, are characterized as "dividend shares"). It is interesting to note that pessimistic shareholders' expectations are specific to some total sectors of economy; shares of Automotive and Banking sectors are obvious examples.

Thus, examining a "temperature" of European stock market using the model developed, we infer that most of shareholders are not attracted by expected share price growth; the conclusion is in accordance with well-known fact of low investment activity in European economy.

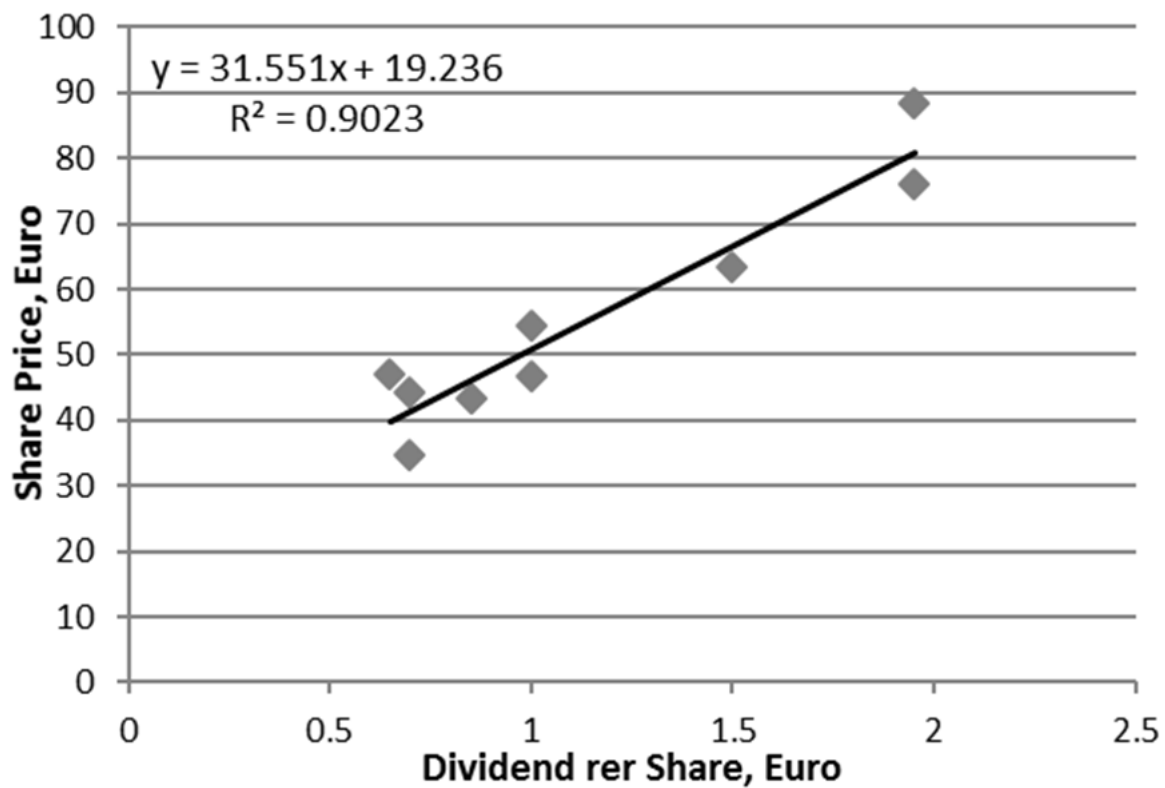
Global Financial Crisis (2008) and the Evolution of European Shareholders' Expectations

Moreover, the analysis carried out have shown that a character of price-dividend dependence considerably changed for a number of securities over the time frame under study. If we divide the entire time frame into two periods (2000-2008 and 2009-2015) and apply the technique developed for each period separately, shareholders' expectations are often cardinally different within the first and the second periods. This feature is apparently caused by significant effect of financial crisis (2007-2008) on European stock markets.

For instance, Fig. 2 and Fig. 3 represent price-dividend dependence for shares of BASF SE over the period of 2000-2008 (Fig. 2) and over the period of 2009-2015 (Fig. 3). Obviously, shareholders' expectations are characterized as pessimistic between 2000 and 2008 (coefficient α is appreciably positive, see Fig. 2); on the contrary, speculative motive of shareholders become predominant after the crisis (coefficient α reverses its sign, see Fig. 3).

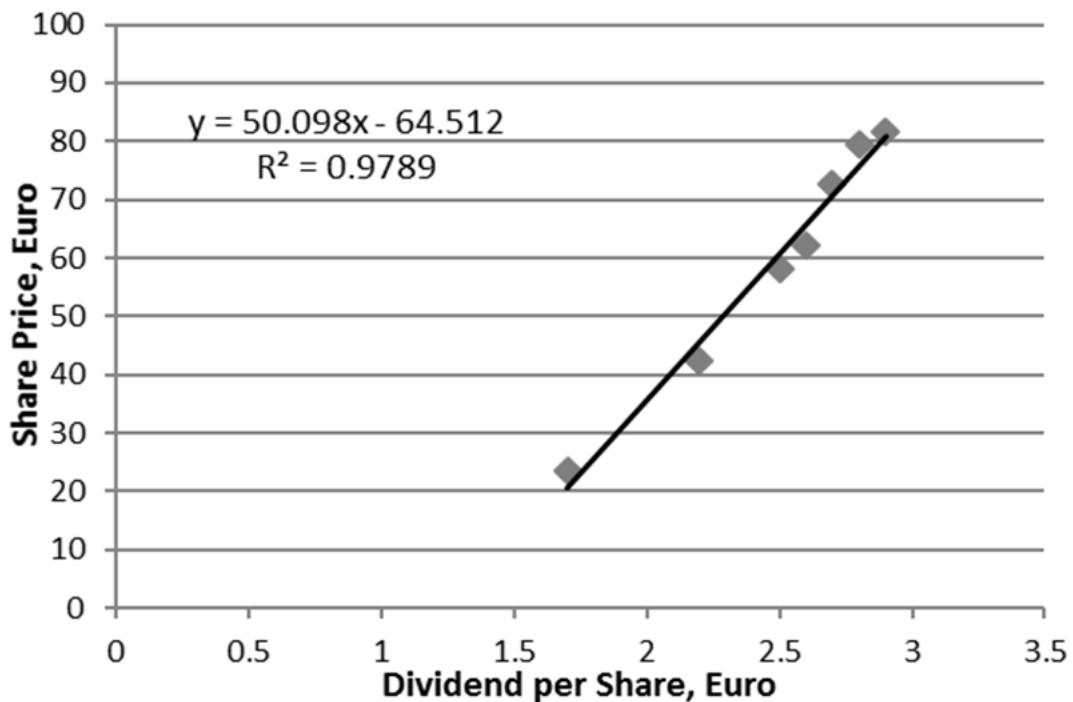
A similar situation of drastic changes in shareholders' expectations after 2008 has been typical for many of stock under study; securities of corporations belonging to Automotive, Chemical industry and also for some Consumer Product corporations may be mentioned as striking examples. These facts suggest that, in comparison with the period preceding the global financial crisis, the influence of speculative factor has increased essentially in European stock market over recent years. Cogitating over the causes of this phenomenon, one should take into account share price drop during the crisis; it seems probable that it had an effect on shareholders' expectations.

Figure 2 The Historical Price-Dividend Dependence for BASF SE Shares (2000-2008)



Source: Authors' calculations based on the data from website: <http://finance.yahoo.com/>

Figure 3 The Historical Price-Dividend Dependence for BASF SE Shares (2009-2015)



Source: Authors' calculations based on the data from website: <http://finance.yahoo.com/>

4 Conclusions

The analysis carried out permits to infer that dynamics of dividend payments impacts essentially on the changes in share price for a lot of securities trading in the European stock market. Dividend payments are relevant factor determining investment attractiveness for the considerable part of European shares.

A number of European shares belongs to "Gordonian" type that assumes proportional growth of share price and dividend over some period of time. For some shares under study one can observe speculative investors' expectations implying an essential increase of their market price. Nevertheless, the majority of European assets are characterized by "pessimistic" shareholders' expectations; their investors are attracted by dividend payments but not the future share price growth. The proportion between the quantities of shares referred to different groups allows us to make a conclusion about a low investment activity in European stock market.

Moreover, substantial alteration has been found in a character of price-dividend dependence for a number of securities. The authors connect the fact with the influence of the financial crisis of 2007-2008 on investment attractiveness of some European stock. Analysis of price-dividend dependence for such securities has revealed that the significance of speculative motive has considerably increased during the last few years. So we can conclude that while general European stock market trends are showing relatively low "temperature" (at first sight), the present-day processes confirm the growth of shareholders' speculative expectations.

At last, the question of relation between the character of shareholders' expectations and stock market "temperature" needs in further study. In exceptionally cases we meet with very fast share price growth; the "Gordonian" shares of British American Tobacco PLC's discussed above are an example. However, in our opinion such securities most probably can soon become overvalued (because appropriate growth in dividend can't continue over time).

Acknowledgments

We would like to thank the Institute of Economics and Entrepreneurship, the Lobachevsky State University of Nizhny Novgorod for financial support.

References

- Campbell, J., Shiller, R. (1987). Cointegration and Tests of Present Value Models. *The Journal of Political Economy*, vol. 95, no. 5, pp. 1062-1088.
- Cochrane, J. (2011). Presidential Address: Discount Rates. *The Journal of Finance*, vol. LXVI, no. 4, pp. 1047-1108.
- Cochrane, J., Longstaff, F., Santa-Clara, P. (2008). Two Trees. *The Review of Financial Studies*, vol. 21, no. 1, pp. 347-385.
- Engsted, T., Pedersen, T. (2010). The dividend-price ratio does predict dividend growth: International evidence. *Journal of Empirical Finance*, vol. 17, no. 4, pp. 585-605.
- Fama, E. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *The Journal of Finance*, vol. 25, no. 2, pp. 383-417.
- Gordon, M. (1959). Dividends, Earnings, and Stock Prices. *The Review of Economics and Statistics*, vol. 41, no. 2, pp. 99-105.
- Graham, B. (2004). *The Intelligent Investor*. New York: Harper Collins Publishers Inc.
- Hussainey, K., Mgbame, C., Aruoriwo, M. (2010). Dividend Policy and Share Price Volatility: UK Evidence. *Journal of Risk Finance*, vol. 12, no. 1, pp. 57-68.
- Majanga, B. (2015). The Dividend Effect on Stock Price-An Empirical Analysis of Malawi Listed Companies. *Accounting and Finance Research*, vol. 4, no. 3, pp. 99-105.
- Petrov, S., Barkhatova, D., Kashina, O., Murashkin, R. (2015). Revealing of investors' expectations in the stock exchange using fundamental analysis models. *Audit and financial analysis*, vol. 6, pp. 324-331.
- Petrov, S. S., Kashina, O. I. (2016). Revealing of Stockholders' Expectations Using Price-Dividend Dependence in Developed and in Emerging Markets In: PALEČKOVÁ, I. and SZAROWSKÁ, I., ed., *Proceedings of the 15th International Conference on Finance and Banking*. Karviná: Silesian University, pp. 301-310.
- Shiller, R. (2014). Speculative Asset Prices. *American Economic Review*, vol. 104, no. 6, pp. 1486-1517.

Personal Finance in Terms of Income and Expenditure Aspects

Marlena Piekut

Warsaw University of Technology
The College of Economics and Social Sciences
ul. Łukasiewicza 17, 09-400 Płock, Poland
E-mail: piekutm@pw.plock.pl

Abstract: *The aim of this paper was to emerge the groups of households having similar level of both incomes and expenditures per equivalent unit and to give their in socio-economic, demographic characteristic as well as the characteristic connected with the household localization. The data came from unpublished CSO data for household budget investigations. The applied testing methods were both k-means cluster analysis and discriminant function analysis. Five groups of households were distinguished, they differ with respect to their incomes and expenditures. The determinant most seriously affecting both incomes and expenditures of the households turned out the following: household head education level, household size and its socio-economic situation. Households with the lowest incomes and expenditures were connected with variables such as lower household head education level, larger number of family members and the location in rural areas. On the other side, the households with the best financial situation were the ones in which household head had university degree, was employed at white-collar position and the household was placed in a city.*

Keywords: consumption, households, expenditures

JEL codes: D12, G02

1 Introduction

Household finances include savings, investment and expenditures made by the household (Wikarczyk, 2016). This paper covers analysis only the part of personal finances, i.e. household incomes and expenditures. The disposable income level per capita illustrates the level of household welfare and is the basic determinant of satisfying the basic living requirements.

The aim of this paper was to emerge the groups of households having similar level of both incomes and expenditures per equivalent unit and to identify the factors deciding on such level of household incomes and expenditures. Grouping the people in society, considering income and expenditure level as well as socio-demographic characteristics of the emerged groups, illustrates social stratification. It is also the indication for politicians, especially from social welfare service, how to shape the social assistance for the groups in which the consumption of goods and services has unsatisfactory level.

Due to limited length of the paper, the illustrative material (graphs and tables) have been restricted to the necessary minimum. The specific cognitive value of the paper is the presentation of income and expenditure differentiation as well as pointing the household features connected with the defined income and expenditure level.

2 Methodology and Data

The data source was unpublished CSO (GUS) data for household budget investigations in 2012.

The subjects of interest were total disposable incomes and expenditures per equivalent unit. Equivalent units illustrate the influence of demographic type of the household on the household expenses (the modified OECD equivalence scale has been used). This scale, first proposed by Haagenars et al. (1994), assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child (What..., [http](http://)). It means that for a four-person household, consisting of two adults and two children has equivalence units equals 2.1 (1+0.5+0.3+0.3).

The household disposable income is the amount of money that a household earns, or gains, each year after taxes and transfers. It represents the money available to a household for spending on goods or services and also savings (unrealized spending).

The total expenditures consist of consumption goods and services, i.e. **non-durable, semi-durable and durable household goods as well as donations to other households, some taxes and non-current payments**, advance tax payment or social insurance contributions and the other expenses not intended directly for consumption purposes (Metodologia..., 2011).

The applied research methods were both *k*-means cluster analysis (using data mining technique) and discriminant analysis.

The objective of *k*-means clustering method is total variance reduction between groups (Dulli et al., 2009). The grouping procedure follows a way to classify a given data set through a certain number of clusters (assume *k* clusters). The next step is to define *k* centroids (weight centre) and to assign each object to the cluster, for which the centroid is the closest (according to Euclidean distance idea) (Everitt et al., 2011). After such an assignment, the centroids are modified on the basis of current cluster contents, then objects are consecutively assigned in a similar way. This procedure is followed until the objects cannot be partitioned any more. If two objects are relatively similar, they are assigned to the same group and criteria concerning their similarity are updated, considering the new data set in the group.

The *k*-means algorithm is relatively simple and easy. Using data-mining techniques, the implementation of a *v*-fold cross-validation algorithm enables automatic determining the number of clusters in the data (Demski, 2008). The general idea of the *v*-fold cross-validation algorithm is to divide the overall training sample into randomly drawn subsamples. It has been assumed that $V = 10$, i.e. the determined size grouping is calculated as $V = 10$ folds, thereafter one subsample is left out, so the further observations are made for the $V-1$ subsamples; the left subsample is then used as the testing sample in the *v*-fold cross-validation. Thus, each of the subsamples is used $V - 1 = 9$ folds in the training sample and once in the testing sample (Sroka and Dacko, 2010).

It has been assumed that the cluster number should range from 4 to 25. The best quality groupings were automatically generated by Statistica software.

Specific features of individual groups were revealed by discriminant function analysis. The basic idea underlying discriminant function analysis is to determine whether groups differ with regard to the mean for a variable, and then to use that variable to predict group membership. If the means for a variable are significantly different in different groups, then we can say that the variable discriminates these groups (Dulli et al., 2009).

To resolve the significance if the variable discriminates the groups, important statistics are used: F-test and Wilks' lambda distribution. F-test performs in one-way analysis. The value of F-test statistics for a particular variable indicates its statistical significance in group discrimination. The larger is contribution of the variable in predicting the membership in the group, the bigger is significance of this variable. Wilks' Lambda points out which variable contribute significance in model discriminant function. The Wilks' lambda ranges from 0 to 1; 0 means excellent discriminant power (groups well separated) value 1 – no discriminant power (groups poorly separated); in other words: the lower is the value, the better is the quality of estimated model (Rószkiewicz, 2002).

Discriminant analysis is interpreted by means of standardized coefficients: discriminant function coefficient and structure coefficient. The discriminant function coefficient (discriminant function weight) denotes the quantitative, statistical contribution of each origin variable to the discriminant function. The coefficients are the basis for determining the discriminatory power and direction of influence individual variables on dependent variable (Prusak, 2005).

The structure coefficients (correlation coefficients, discriminant loadings) denote the simple statistical correlations between the original variables and the root. These coefficients measure the strength of association between two variables. They are often used for real interpretation of the discriminant functions, because of showing simple correlations between variables and functions, whereas discriminant weights are obtained for each variable.

Discriminant function analysis uses canonical roots for description some "latent" variables and they should indicate and identify these "latent" variables. The canonical root is a secondary variable, consisting of same or all of the original variables (Laskowski, 2005). The first root takes the greatest part in the unexplained variation and the second provides second most, and so on. However, the subsequent roots have specific contribution in terms of variation unexplained by the first roots.

Discriminant function is used to distinguish both the grouping variable (dependent variable) and independent variable in the model. The variables should not be strongly correlated and should have sufficient variability and also should significantly influence the grouping variable.

In this research, the grouping variable was the variable defining household membership of a specific group distinguished in cluster analysis. The independent variables were household features such as: number of people in a household, age and the education level of the household head, life-cycle stage, household socio-economic category, usable floor area, and agricultural acreage. Some qualitative variables were also applied in the model, for example the education level of the household head. These unmeasurable, qualitative variables could be applied only after the conversion of quality features into binary, i.e. *zero-one* (0-1) indicator variables. The *zero-one* (0-1) variable has two values: 0 (absence of the feature) or 1.

3 Results and Discussion

As a result *k*-mean cluster analysis five groups of households have been distinguished, diverse in respect of their total disposable income level and expenditures per equivalent unit. The 1st cluster that comprised the smallest household percentage (1.7%) had the greatest level of both total disposable income and expenditures per equivalent unit. It was the only cluster in which the expenditure level was greater than income level.

Table 3 Characteristics of Polish Household Group in Distinguished Clusters

Groups	Household number	Household percentage in the cluster (%)	Disposable income per equivalent unit PLN	Total expenditures per equivalent unit PLN
I	636	1.7	6258	6530
II	12651	33.8	972	726
III	7509	20.1	2322	2014
IV	13971	37.3	1601	1271
V	2660	7.1	3540	3199
Total	37427	100.0	1750	1462

Source: Self-study based on unpublished CSO (GUS) data.

Relatively high disposable income and expenditures can be found in 5th cluster covering 7.1 % of the households. The greatest saving growth was also observed in this cluster (341 PLN per capita). The 3rd cluster was the next in terms of the both income and expenditure quantity. It consisted of 20.1 % of households, and monthly saving growth in this cluster was 308 PLN per capita. The smallest total level of income and

expenditures was denoted for households in 2nd cluster, covering 33.8 % of the households. The saving growth was also the smallest in this cluster - 241 PLN per capita.

Another researcher found that the smallest households most often present predominance of expenditures over incomes (Gorczyca, 2005).

The relation between characteristics of households and distinguished clusters was possible by discriminant analysis. In identification analysis 21 variables have been taken into consideration. They concerned demographical, social and economical features of household members as well as their dwelling place and agricultural land characteristics.

The independent variables included: 1. household size, 2. agricultural acreage, 3. age of household head; as well as the following 0-1 variables: 4. - 6. the education level of household head (elementary, basic vocational education or higher education), 7.- 11. socio-economic group (blue-collar workers, white-collar workers, self-employed, farmers, retirees), 12. - 16. dwelling place class (towns with the number of inhabitants: 500 000 and more, 200 000 - 499 000; 20000 - 99 000, less than 20 000 and villages); and family/single people life-cycle phase (young newly married couples with no children, young married couples with dependent children under six, young married couples with dependent children over six, older married couples with children at university, older married couples/ single people with no children living with them, in labor force).

Based on F-test, it has been assessed that the most discriminating were the variables describing the education level of household head (F-test for variables: higher education of household head = 466; elementary education of household head = 394; basic vocational education of household head = 139) and socio-economic group (F-test for variables: self-employed = 237, white-collar workers = 214), and also household size (F-test = 376). The smallest power of influence showed binary (0-1) variables defining dwelling place (towns with the number of inhabitants less than 20 000 (test F = 6.9), towns with the number of inhabitants 20 000 - 99 000 (test F = 3.3)), and variables defining agricultural acreage (test F = 14.0) and the age of household head (test F=14.0). However, binary (0-1) variables defining dwelling place (towns with the number of inhabitants 200 000 - 499 000 and family life-cycle phase (young married couples with children under six, married couples with school-aged children) were not statistically significant ($p > 0,05$).

The value of Wilks' lambda for prepared model was 0.667, with F (88.15)=181 ($p < 0.005$). The values of Wilks' lambda are between 0 (excellent discriminant power) and 1 (no discriminant power); the smaller is the value, the better the estimation quality. In this study, the value is not too high, which indicates that other existing variables are connected with household incomes and expenditures. Household members are influenced by numerous variables, either endogenous or exogenous ones.

Four discriminant functions were distinguished, three of them were statistically significant for $p < 0.005$. Models obtained by theoretical operation of successive removal of roots gave less and less contribution in explanation of tested variable. The contributions of subsequent roots were specific and concerned the variability not explained by previous roots. Absolutely the greatest contribution made the first root. The canonical correlation coefficients (which has the value in the range $< 0, 1 >$ and the greater the value is, the larger the discriminant power) was 0.553 for the first function, 0.190 for the second and 0.048 for the third one.

The cumulated percent of variance indicated that the first discriminant function explained 91.6% of inter-group variance, the second function - 7.8 %, the third function - 0.5 %, and the fourth one - the remaining part of previously unexplained inter-group variance, i.e. 0.1%.

Table 4 Discriminant Analysis Summary - Values for Subsequent Roots

Root number	Specified value	Canonical correlation coefficient	Wilks' lambda	Chi-square	Degrees of freedom	p-value
0	0.440	0.553	0.667	15143	88	0.0000
1	0.037	0.190	0.961	1482	63	0.0000
2	0.002	0.048	0.997	109	40	0.0000
3	0.001	0.024	0.999	21	19	0.3355

Source: Self-study based on unpublished CSO (GUS) data.

The individual roots distributed households into cluster groups. The groups of the most differentiating clusters corresponded with opposed, i.e. outermost values of canonical means. The most essential first root separated four clusters, i.e. the 1st, 3rd, 4th and 6th with positive values from the 2nd cluster that had negative value; the second root differentiated 1st, 2nd and 5th clusters (having positive values) from the 3rd and 4th(having negative values).

The first root separated mainly the 1st and 5th clusters (having positive values) from the 2nd cluster (having negative values). The essential variables in discriminant process for the first canonical root were: household size and binary variables encoding the education level of household head, households with white-collar workers, and households located in towns with the number of inhabitants 500 000 and also in the villages.

The values of correlation and discriminant coefficients indicated that household comprising 1st and 5th clusters consisted, more often than in the other clusters, of high-educated household head, households with white-collar workers and households localized in largest towns. On the other side, in the 2nd cluster the household were usually numerous, localized in a village and the household head had at most basic vocational education.

Over 2/3 of the households in the 1st cluster and about 57% in the 5th cluster were headed by high-educated people. In contrast, in the 2nd were about 5 % households headed by high-educated people, whereas there were almost ¾ households in which the head had at least basic vocational education.

The average household size in the 2nd cluster was over 3.3 people. It was the greatest value of all the clusters, whereas in the 1st cluster and in the 5th cluster average household size was, respectively, 2.1 and 2.2, i.e. it was the smallest value of all clusters.

The main source of livelihood for about half of households in the 1st cluster and in the 5th cluster was blue-collar job, while in the 2nd cluster such a job was the main income source for only 11% of households.

As it was mentioned above, the clusters differentiated from one another also within the variable defining household localization. So, 41 % households in the 1st cluster and over 30 % households in the 5th cluster were placed in the largest cities (number of inhabitants over 500 000), whereas in the 2nd cluster less than 5 % were localized at metropolitan regions.

Thus, the first canonical root distinguished the households with the most favourable financial status from the households with difficult financial status.

The second canonical root distinguished the 1st and 5th clusters (having positive values) from the 4th cluster (with negative values). In the 2nd cluster, the greatest power in the household income/expenditure model showed the variables defining age and education level of the household head and also household size.

As for the 4th cluster, more often than in the other clusters, older age of household head (where the pensions were the main source of livelihood) and the households localized at smaller towns (less than 100 000 inhabitants) were observed. The average age (years) of household head in the 4th cluster was 52.2 (the greatest value of the clusters), while in the 1st cluster it was - 46.6 (the smallest value of the clusters), and for the 5th cluster it was 47.9. In the 4th cluster for over 32 % of households, the main source of livelihood was a pension, whereas in the 1st cluster the pension was main income only for 15 % of households and in the 5th cluster – for 21 %, which seems to be logical considering the age of household head. In the 4th cluster many more i.e. almost 1/3 of households (while in the 1st cluster - 18% and in the 5th cluster - about 1/4) were localized in towns with inhabitants number less than 100 000. In the 4th cluster the percentage of households with the head having university degree was also relatively low – about 17 %.

The third canonical root explained the household variability, not explained previously. On the basis on correlation coefficient, it has been observed that households in the 1st cluster were more often than others connected with self-employment. In the 1st cluster households with self-employment as the main source of livelihood was over 19 %, while in the others it was from only 6 % (in the 4th cluster) to 13 % of households (in the 5th cluster).

The expenditures on satisfying the basic living requirements together with incomes decide on the household welfare. Other researchers emphasize the influence of such variables as socio-economic groups, household head education level, age of household members, biological type personal composition and the kind of professional activity. Great differentiation of financial situation depending on dwelling place is also accentuated (Kasprzyk and Leszczyńska, 2012). Especially dissatisfying economic conditions are observed in Polish rural area, they are determined by household socio-economic features (Podolec, 2010). Some researchers accentuate that education is the main determinant for the social divisions in income and expenditure aspect (Gutkowska and Piekut, 2014), not only in Poland (Psacharopoulos and Patrinos, 2004).

4 Conclusions

Summarizing the conducted analysis of personal finance statistical spectrum in income and expenditure aspect, it can be stated the following. The disposable incomes per capita in Polish households only in a small fraction of households exceed total expenditures per capita, for the remaining part the disposable incomes are lower than expenditures. Polish society is economically polarized, for the substantial part incomes and expenditures are below the average, and only small fraction of households can be characterized by relatively high income and expenditure per capita. The features deciding on the lowest level of both disposable incomes and total expenditures are numerous households whose head has lower level of education.

In contrast, the features of households with relatively most profitable financial situation are the following: household head with university degree, incomes coming from white-collar jobs, dwelling in the largest cities and statistically lower age of household head.

The presented analysis enables better understanding of income and expenditure behaviours of Polish households; such information may be useful in forming economic policy in the state.

References

- Demski, T. (2008). Data mining I – kurs podstawowy. *Materiały kursowe*, Kraków: StatSoft.
- Dulli, U., Furini, S., Peron, E. (2009). *Data mining: metodi e strategie*, Italia: Springer Science & Business Media.
- Everitt, R. S., Landau, S., Lesse, M., Stahl, D. (2011). *Cluster Analysis*, 5th Edition, Wiley Series in Probability and Statistics, John Wiley and Sons, Publication.

Gorczyca, M. (2005). Zróżnicowanie poziomu, struktury i realnej dynamiki wydatków i dochodów polskich gospodarstw domowych. *Nierówności Społeczne a Wzrost Gospodarczy/Uniwersytet Rzeszowski*, no. 7, pp. 55-73.

Gutkowska, K., Piekut, M. (2014). Konsumpcja w wiejskich gospodarstwach domowych. *Kwartalnik Wieś i Rolnictwo*, vol. 4(165), pp. 159-178.

Hagenaars, A., Vos K. de, Zaidi M.A. (1994). *Poverty Statistics in the Late 1980s: Research Based on Micro-data*, Luxembourg: Office for Official Publications of the European Communities.

Kasprzyk, B., Leszczyńska, M. (2012). Dochody i wydatki jako determinanty dobrobytu ekonomicznego gospodarstw domowych w Polsce – ujęcie regionalne. *Nierówności Społeczne a Wzrost Gospodarczy/Uniwersytet Rzeszowski*, no 28, pp. 263-273.

Laskowski, W. (2005). *Studium realizacji potrzeb żywnościowych ludności Polski na tle wielowymiarowych klasyfikacji i analiz gospodarstw domowych*, Warszawa: Wydawnictwo SGGW.

Metodologia badania budżetów gospodarstw domowych (2011), Warszawa: GUS.

Podolec, B. (2010). Materialna sfera warunków życia gospodarstw domowych na wsi. *Zeszyty Naukowe/Uniwersytet Ekonomiczny w Krakowie*, no 817, pp. 45-58.

Prusak, B. (2005). Nowoczesne metody prognozowania zagrożenia finansowego przedsiębiorstw, Warszawa: Difin.

Psacharopoulos, G, Patrinos, H. A. (2004). Returns to Investment in Education: A Further Update. *Education Economics*, no 12, pp. 111-134.

Rószkiewicz, M. (2002). Narzędzia statystyczne w analizach marketingowych. Warszawa: Wydawnictwo C.H. Beck.

Sroka, W., Dacko, M. (2010). Ocena czynników rozwoju przodujących gospodarstw rolniczych z wykorzystaniem metody drzew regresyjnych typu C and RT. *Zagadnienia Ekonomiki Rolnej*, no 2.

OECD. *What are equivalence scales?*. Retrieved from: <http://www.oecd.org/eco/growth/OECD-Note-EquivalenceScales.pdf>.

Wikarczyk, A. (2016). Finanse osobiste – istota i zakres. Milic-Czerniak, R., ed., *Finanse osobiste. Kompetencje, narzędzia, instytucje, produkty, decyzje*. Warszawa: Difin.

Willingness of Polish Households to Save for Retirement

Sylwia Pieńkowska-Kamieniecka¹, Damian Walczak²

¹ University of Warmia nad Mazury in Olsztyn
Chair of Social Policy and Insurance, Faculty of Economics
Oczapowskiego 4, 10-719 Olsztyn, Poland
E-mail: sylwia.pienkowska@uwm.edu.pl

² Nicolaus Copernicus University in Torun
Department of Financial Management, Faculty of Economic Sciences and Management
Gagarina 11, 87-100 Torun, Poland
E-mail: dwalczak@umk.pl

Abstract: *Savings are an essential element of planning the future, in particular this objective is attained by saving for old age. The saved amount depends on numerous factors. Additionally, each of them can have the effect of a stimulant or destimulant. This article determines the influence of particular factors, which allowed to formulate specific recommendations for the future. Recommendations, which by influencing e.g. the level of the citizens' education or certainly their income, can result in the future in an increase of the savings amount. The objective of this article is to present the scale of and the determining characteristics of saving, in particular the tendency to save money with the intention to financially secure the old age period. This article uses a representative, nationwide research, namely Diagnoza Społeczna 2015 (Social Diagnosis 2015), conducted with a test group of 11,740 households with 35,279 members.*

Keywords: savings, household, income, financial behaviour, pension

JEL codes: D14, D31, J32, H31, H55

1 Introduction

Households are characterised by diverse level of wealth. Different levels of income obtained during professional career, the tendency rate of leaving a will, precaution, expectations concerning the future, health condition, longevity, decrease in income, affect the dispersion of financial resources in households (Rooij et al., 2011). In order to guarantee financial security, the ability to attain certain financial objectives, households must keep certain financial reserves (Anong and DeVaney, 2010; Lee et al., 2010), i.e. they must save (Yao et al., 2011).

The problem of low level of retirement savings and a low tendency to save for the retirement period concerns societies of a lot of countries (Munnell et al., 2014; GAO, 2015). During the period preceding retirement many households either do not have or have very low amount of savings (Lusardi, 2003). The problem of answering the question whether households save enough for retirement is not clear and simple. The time spent on retirement is a heterogenic experience dependant on the health condition, temper, as well as the level of wealth (Skinner, 2007; Kelly, 1958).

Household saving rates differ significantly among EU countries. According to data from 2012, household gross saving rate in Poland amounted to about 5%, whereas in Germany, Belgium and France it was about 3-times larger (Rocher and Stierle, 2015).

The great majority of research is concentrated on explaining whether the fact of and the household saving rate is influenced by the amount of income (Ang, 2009; Dynan et al., 2004; Huggett and Ventura, 1995; Rószkiewicz, 2008). Based on this research we can conclude that households with higher income usually save more and the savings constitute a larger part of it (Huggett and Ventura, 1995; Hogarth and Anguelov 2003). Furthermore, the saving rate increases proportionally to the increase in income. Dynan et al. explicitly claim that „the rich do, indeed, save more” and that the marginal propensity to save is higher among households with income higher rather than lower (Dynan et al.,

2004). We can distinguish numerous motivations for saving, which do not necessarily have to exclude one another and can serve alternative purpose (Canova et al., 2005).

Apart from income, the fact and the rate of saving, including retirement, are influenced also by, among others, such variables as risk tolerance, social-professional status, financial knowledge, number of children, knowledge and financial awareness (Fisher and Anong, 2012; Jacobs-Lawson and Hershey, 2005; Mahdzan and Tabiani, 2013; Lusardi 2003). Curley and Grinstein-Weiss (2003) also emphasise that because of the lack of economic infrastructure long-term saving plans for old age in rural areas develop significantly slower than in urban areas.

From the research conducted by Mahdzan and Tabiani (2013) it can be concluded that having children affects the saving rate, namely, financial responsibility increases along with the increase in the number of children. More financial resources are needed for education and a better start in their adult life, as well as for a possible inheritance for the children. Also from research conducted by Lusardi (2003) it can be concluded that households which want to leave behind an inheritance accumulate more. However, the number of children positively influencing the saving rate is not explicit or obvious. Other research suggests that having children either causes an increase in the wealth of households (Lusardi, 2003) or this correlation does not exist at all (Dynam et al., 2004). Furthermore, the approach to saving and the level of wealth of the future generations are influenced by the experiences of the older members of a household. In the case of a higher number of household members these experiences are richer and determine the motivations and rules of conduct of other household members. Shea (2002) finds that the children whose parents experienced loss of employment are more wealthy in their adult life, and Waldkirch et al. (2004) finds that people whose older household family members experienced a decrease in consumption after retiring, limit their consumption, which may suggest that the experience of other members can raise the need to save.

A lot of research is focused on determining whether there are differences in saving for retirement between various social-professional groups, in particular whether running one's own business determines a different approach to saving in relation to the households where members are employed by others (Lichtenstein, 2010; Mastrogiacomo and Alessie, 2015). Although running one's own business offers greater autonomy, it also creates additional needs, such as additional saving for retirement on one's own. The self-employed find it increasingly more important to save for retirement than workers, however they do it to a small extent. In particular, young, small companies concentrate more on surviving on the market than saving for old age, as most small businesses fail over the long run (Smith and Griesdorn, 2014). However, workers can use pension schemes sponsored by employers.

The ability and awareness of the necessity to save to secure comfortable retirement is influenced by financial literacy. Low literacy and lack of information causes ignorance about basic financial concepts, which in turn can influence the lack of retirement planning and lack of wealth (Lusardi, 2008). Therefore, the object of numerous research has recently been not only the question of measuring financial knowledge, but also the question of which actions and programmes have the biggest impact on wealth accumulation. Proper financial education turns out to be so significant that without proper knowledge households start to save too late to be able to realise objectives assumed for retirement. Furthermore, it is difficult for them to keep a proper balance between current consumption and future consumption after retiring. Meanwhile, after completing a financial education program, households re-evaluate their plans for retirement and saving (Clark et al., 2003).

The objective of the research conducted in this article is to present the scale of and the factors that determine saving in Poland, in particular the tendency to save money for financial security in old age.

2 Methodology and Data

The article used the data from individual interviews with people included in the research "Diagnoza Społeczna 2015" (Social Diagnosis 2015), conducted on a test group of 11,740 households with 35,279 members. The Social Diagnosis is a comprehensive research on the conditions and quality of life of Polish people in their own opinion, conducted cyclically since the year 2000.

The research presented in this article was based on the research of households using logistic regression, both without (M1 and M3), and with consideration of effects of interaction (M2 and M4) – and appropriate calculations were performed using the IBM program SPSS Statistics 23.0.

In the article the following dependent variables were assumed in the construction of logistic regression models (Cramer, 2013): Y_1 – Do you have any savings? (M1 and M2); Y_2 – Do you have any savings for old age? (M3 and M4).

The above variables took the following form:

$$Y = \begin{cases} 1, & \text{if it occurred} \\ 0, & \text{if it did not occur} \end{cases}$$

Predictors were assumed as dependant variables, which can significantly influence making the decision on saving. For the income variable (0-40,000 PLN) – the base variable was divided into 1,000, so that the unit is 1,000 PLN. The other variables are of character presented in table 1.

Table 1 Descriptive Statistics for the Independent Variables

Variable	Nature of the variables
Income (What was the average monthly net income (in PLN) of your household in 2014?)	continuous variable
People (number of people in a household)	continuous variable
Source of households' income	
Full-time job	0 – No; 1 – Yes,
Farms	0 – No; 1 – Yes,
Self-employment	0 – No; 1 – Yes,
Pension	0 – No; 1 – Yes,
Disability benefit	0 – No; 1 – Yes,
Non-profit sources	0 – No; 1 – Yes,
Several sources for household support that are equally important	0 – No; 1 – Yes,
Type of household	
Marriage without children	0 – No; 1 – Yes,
Marriage with 1 children	0 – No; 1 – Yes,
Marriage with 2 children	0 – No; 1 – Yes,
Marriage with 3 or more children	0 – No; 1 – Yes,
Incomplete family	0 – No; 1 – Yes,
Multifamily	0 – No; 1 – Yes,
Non-family single	0 – No; 1 – Yes,
Non-family multi-person	0 – No; 1 – Yes,
Bank (Does your household use any bank services?)	0 – No; 1 – Yes,
Loans (Does your household have to pay off loans or credit?)	0 – No; 1 – Yes,
Place of residence	0 – rural areas, 1 towns

Insured house (Do you have house insurance?)	0 – No; 1 – Yes
Books (How many books – approximately – are there at your home?)	
1 - none,	0 – No; 1 – Yes,
2 – up to 25 volumes,	0 – No; 1 – Yes,
3- 26-50,	0 – No; 1 – Yes,
4 – 51-100,	0 – No; 1 – Yes,
5 – 101 – 500,	0 – No; 1 – Yes,
6 – more than 500 volumes	0 – No; 1 – Yes,

Source: Own study based on Social Diagnosis 2015.

3 Results and Discussion

It needs to be emphasised that income and having books at home positively influence saving. However, what is important in the scope of the research, those factors have more influence on saving in general understanding, than on saving for a specific purpose, which is saving for old age. This could mean that an increase in income or the number of books has a more significant influence on making decisions in terms of saving in general rather than in the scope of decisions on saving for old age. Over 2-times, for savings understood in general, or 1.4-times, in the case of saving for old age, increase in a chance to have savings in households which have over 500 books in comparison to households which do not have books at all, shows a significant and major influence of this variable. This variable can be identified with education, culture or knowledge of the household members. And as Clark et al. (2003) claim, determining the way education and knowledge affect saving is not simple. Therefore, perhaps it is the amount of books in a household that, as an indirect measure, can constitute a factor that positively influences the level of savings and it is this variable that should be analysed in further research.

Insurance on the possessed house also positively influences the savings rate, which can mean a positive relation resulting from insurance caution (aversion to risk or insurance knowledge) towards the tendency to have savings. This variable is to be read together with the variable concerning books, as an influence of broadly understood knowledge on the tendency to save.

In the case of the number of people in a household as well as debt, also in the question concerning saving for old age, dependencies are smaller than in the question concerning general savings. In this case every additional person in a household or having a debt lowers significantly the possibility to have any savings at all than to have savings for old age.

Living in a city increases the chance to have savings – both any savings at all and savings for old age (excluding the model with interaction, where this variable is insignificant). Here the influence is similar in both cases. Considering the chance to have savings it can be pointed out that for households with income of one thousand zlotys in a city compared to these in rural areas, the likelihood of having savings for old age is higher by 2% (model M4). However, along with the increase of income the chances to have savings at old age in city households increase – for households with the income of 2,000 PLN they are higher by 8%, and for a household with the income of 4,000 PLN (average income in Poland) they are higher by as much as 21%. Whereas an increase of income by one thousand zlotys in rural households results in an increase in the chances to have savings by 11%. Whereas, an increase of income by a thousand zlotys in city households means an increase of chances by 17.6%. The presented results could mean that households in cities have the knowledge and will to save for old age, and in the case of obtaining new financial resources they allot it for old age savings. Whereas, new additional income in rural areas is not invested in retirement savings.

In the case of the influence of the source of support in a household on saving there is a very diverse relation that needs to be pointed out. Compared with salary employees, who

are the reference group, it is the self-employed who are characterised by the largest increase in the probability to have savings for old age. Farmers also save more often than employment contract workers. In the case of models considering interaction it is even as high as twice as much more often. Probably it is a result of the nature of a job. Farmers, similarly to entrepreneurs run their own business, therefore they are able to make economically rational decisions. Secondly, farmers' households or entrepreneurs' households are the same as their business operation, so by saving they think about the future not only of their household but also of their own business.

The number of children in a family significantly and negatively affects the amount of savings for old age. This probably results from the fact that parents are obliged to bear expenses for their children's upbringing, therefore they postpone saving for old age. Each additional child in the family decreases the probability to have savings for old age. For families with one child the chance of having savings is lower by 32.1%, with two children by 34.7% and with three children by as much as 45.0% (M3). In the case of a model that considers interactions, these differences are even larger (M4).

Table 2 Estimates of Logistic Regression Model after Dropping Out Insignificant Variables – the Analysed Dependence: Saving (Total) and Old Age Savings

Variable		Savings	Savings	Old age savings	Old age savings
		M1	M2	M3	M4
Income		1.315***	1.382***	1.129***	1.111***
People		.836***	.847***	0.881*	0.894*
Source of households' income (base = Full-time job)	Farms	.916	2.161***	1.443*	2.008**
	Self-employment	1.224	1.724	1.523*	2.914***
	Pension	1.180**	1.272	1.839***	1.936***
	Disability benefit	.780*	.566*	1.484*	1.676
	Non-profit sources	.744	1.143	1.045	1.778
	Several sources for household support that are equally important	1.011	1.085	1.377**	1.309
Type of household (base = Marriage without children)	Marriage with 1 child	.896	.915	.679***	.658***
	Marriage with 2 children	.994	1.073	.653**	.627**
	Marriage with 3 or more children	1.119	1.344	.550*	.527**
	Incomplete family	.648***	.430***	.615***	.625***
	Multifamily	1.028	1.987**	1.036	1.010
	Non-family single	.831*	.621**	.871	.919
	Non-family multi-person	.516**	.266*	.684	.694
Bank		1.943***	1.843***	.777*	-
Loans		.463***	.465***	.631***	.631***
Place of residence		1.259***	1.236***	1.207*	.963
Insured house		1.666***	1.639***	1.538***	1.523***
Book (base = none)	up to 25 volumes,	1.207*	1.182*	.838	.856
	26-50,	1.461***	1.417***	.886	.910
	51-100,	1.825***	1.751***	1.141	1.169
	101 – 500,	2.288***	2.167***	1.280*	1.287*
	more than 500	2.193***	2.000***	1.435*	1.439*

volumes				
Income * Place of residence	-			1.059*
Farms * Income	.803***			.928
Self-employment * Income	.924			.890**
Pension * Income	.999			.995
Disability benefit * Income	1.245*			.956
Non-profit sources * Income	.837			.781
Several equally important sources of support * Income	.984			1.013
Marriage with 1 child * Income	.990			-
Marriage with 2 children * Income	.977			-
Marriage with 3 or more children * Income	.952			-
Incomplete family * Income	1.155*			-
Multifamily * Income	.868**			-
Non-family single * Income	1.222**			-
Non-family multi-person * Income	1.281			-
Const.	.153***	.132***	.338***	.332***
Cox-Snell's R-squared	0.167	0.174	0.085	0.087
Nagelkerke's R-squared	0.224	0.234	0.119	0.122
Hosmer-Lemeshow (p-value)	0.057	0.047	0.054	0.206
Log likelihood	12,319.975	12,225.363	7,621.352	7,602.504
N	10,405	10,405	6,577	6,577

^a Note: *** p<0.001; ** p<0.01; * p<0.05

Source: Own study based on *Social Diagnosis 2013*.

4 Conclusions

Income, similarly to living in a city, strongly influences the possession of savings for old age. Additionally, it is worth emphasising that the increase of income by a thousand zlotys influences city residents stronger than rural residents in terms of saving for old age.

Broadly understood knowledge is as important as income or place of living. In this case the factors relating to it were the number of books in a household or having home insurance. Both of these predictors have a positive influence, however, similarly to many other variables, stronger in the case of generally understood saving and less strongly in the case of saving for old age. The presented relation probably results from factors that influence saving. Positive stimuli mainly influence the general decision concerning saving. Whereas saving for old age is a derivative, a decision of second importance, made "coldly" and therefore the influence of particular determinants is lower. In the case of saving, especially for old age, not only individual factors are significant, but also environmental, which influence financial behaviour (Nosi et. al., 2014).

Furthermore, Rooij et al. (2011) show that European households will react to the decrease of benefits from public pension schemes by additional retirement saving, however not strongly enough to smooth consumption over the life-cycle. A large responsibility of increasing the awareness concerning the necessity to collect additional financial resources for old age is in the government's hands, which should concentrate most of all on the lower educated and financially illiterate households.

To sum up, in order to increasing the tendency of the Polish to save, mainly in the retirement context, it is necessary not only encourage people to behave in a proper way, but most of all to influence the factors presented in the article, which influence these behaviours.

References

- Ang, J. (2009). Household Saving Behaviour in an Extended Life Cycle Model. Comparative Study of China and India. *Journal of Development Studies*, No. 8, pp. 1344-1359.
- Anong, S. T., DeVaney, S. A. (2010). Determinants of Adequate Emergency Funds Including the Effects of Seeking Professional Advice and Industry Affiliation. *Family and Consumer Sciences Research Journal*, vol. 38, Issue 4, pp. 405-419.
- Canova, L., Rattazzi, A. M., Webley, P. (2005). The hierarchical structure of saving motive. *Journal of Economic Psychology*, vol. 26, Issue 1, pp. 21-34.
- Cramer, J. S. (2003). *Logit Models from Economics and Other Fields*. Cambridge: Cambridge University Press, pp. 9-32.
- Curley, J., Grinstein-Weiss, M. (2003). A comparative analysis of rural and urban saving performance in Individual Development Account programs. *Social Development*, 25(1/2), pp. 89-105.
- Clark, R. L., d'Ambrosio, M. B., McDermed, A. A., Sawant, K. (2003). Financial Education and Retirement Savings. *Paper Presented at Sustainable Community Development: What Works, What Doesn't, and Why*, March 27-28, Washington DC, pp. 1, 6, 7.
- Dynan, K. E., Skinner, J., Zeldes, S. P. (2004). Do the Rich Save More? *Journal of Political Economy*, 112(1) April, pp. 397-444.
- Fisher, P. J., Montalto, C. P. (2011). Loss aversion and saving behavior. Evidence from the 2007 Survey of Consumer Finances. *Journal of Family and Economic Issues*, vol. 32, Issue 1, pp. 4-14.
- Fisher, P. J., Anong, S. T. (2012). Relationship of Saving Motives to Saving Habits. *Association for Financial Counseling and Planning Education*, vol. 23, Issue 1, pp. 65.
- GAO, (2015). Retirement Security. Most Households Approaching Retirement Have Low Savings. Report to the Ranking Member, Subcommittee on Primary Health and Retirement Security, Committee on Health, Education, Labor, and Pensions, U.S. Senate, pp. 7.
- Hogarth, J. M., Anguelov, C. E. (2003). Can the Poor Save? *Financial Counseling and Planning Education*, vol. 14(1). Retrieved from: <https://afcpe.org/assets/pdf/vol1411.pdf>.
- Huggett, M., Ventura, G. (1995). Understanding Why High Income Households Save More Than Low Income Households. *Institute for Empirical Macroeconomics*, Federal Reserve Bank of Minneapolis, Discussion Paper 106, pp. 1.
- Jacobs-Lawson, J. M., Hershey, D. A. (2005). Influence of future time perspective, financial knowledge, and financial risk tolerance on retirement saving behaviors. *Financial Services Review*, vol. 14(4), pp. 331-344.
- Kelly, H. M. (1958). Financial Planning for Retirement. *Journal of Educational Sociology*, vol. 31(8), pp. 306-317.
- Lee, S., Park, M., Monalto, C.P. (2010). The effect of family life cycle and financial management practices on household saving patterns. *Journal of Korean Home Economics Association*, English Edition, 1, pp. 79-92.
- Lichtestein, J. H. (2010). Saving for Retirement: A Look at Small Business Owners. SBA Office for Advocacy. Retrieved from: https://www.sba.gov/sites/default/files/rs362tot_2.pdf.
- Lusardi, A. (2003). *Planning and Saving for Retirement*. Retrieved from: <http://www.dartmouth.edu>.

- Lusardi, A. (2008). Household Saving Behavior: The Role of Financial Literacy, Information, and Financial Education Programs. NBER Working Paper 13824, Cambridge, pp. 2.
- Mahdzan, N. S., Tabiani, S. (2013). The Impact of Financial Literacy on Individual Saving: an Exploratory Study in the Malaysian Context. *Transformations in Business&Economics*, vol. 12, No 1(28), pp. 41-55.
- Mastrogiacomo, M., Alessie, R. (2015). Were are the retirement savings of self-employed? An analysis of "unconventional" retirement. *DNB Working Paper*, No. 454, De Nederlandche Bank Eurosystem.
- Munnell, A.H., Webb, A., Hou, W. (2014). How much should people save? *Center for Retirement Research at Boston College*, Number 14-11, pp. 5.
- Nosi Costanza, D'Agostiono, A., Pagliuca, M.M., Pratesi, S.A. (2014), Saving for old age: Longevity annuity buying intention of Italian young adults. *Journal of Behavioral and Experimental Economics*, vol. 51, pp. 86-89.
- Rocher, S., Stierle, M. H. (2005). Household saving rates in the EU: Why do they differ so much? *European Economy*, Discussion Paper 005, September 2015, pp. 5.
- Rooij, M., Lusardi, A., Alessie, R. (2011). Financial Literacy, Retirement Planning, and Household Wealth. *DNB Working Paper*, No. 313, De Nederlandsche Bank Eurosystem, pp. 2.
- Rószkiewicz, M. (2008). Oszczędzanie. Postawy i zachowania polskich gospodarstw domowych wobec oszczędzania. *AUREUS*, Kraków.
- Skinner, J. (2007). Are You Sure You're Saving Enough for Retirement? *Journal of Economic Perspectives*, vol. 21, No. 3, pp. 60.
- Shea, J. (2002). Childhood Deprivation and Adult Wealth. Mimeo, University of Maryland.
- Smith, H. L., Griesdorn, T. (2014). Do Saving Rules Influence Self-Employed Households' Participation in Tax-Deferred Retirement Plans? *Family and Consumer Sciences Research Journal*, vol. 43, No. 1, pp. 47-60.
- Social Diagnosis 2013. Retrieved from: <http://diagnoza.com/>.
- Waldkirch, A., Ng, S., Cox, D. (2004). Intergenerational Linkages in Consumption Behavior. *The Journal of Human Resources*, XXXIX, vol. 2, pp. 356.
- Yao, R., Wang, F., Weagley, R. O., Liao, L. (2011). Household Savings Motives: Comparing American and Chinese Consumers. *Family&Consumer Sciences Research Journal*, vol. 40, No. 1, pp. 28-44.

Application of DEA Methods for Evaluating Efficiency in Museums, Galleries, and Monuments in the Czech Republic

Michal Plaček¹, Milan Půček², František Ochrana³, Milan Křápek⁴

^{1,3} Charles University
Faculty of Social Sciences, Center for Social and Economics Stragies
Celetná 20, 110 01 Praha, Czech republic
E-mail: michalplacek@seznam.cz, frantisek.ochrana@fsv.cuni.cz

² The National Museum Of Agriculture
Kostelní 44, 170 00 Praha, Czech republic
E-mail: milan.pucek@seznam.cz

⁴ Private College of Economic Studies
Loucká 21, 669 02 Znojmo, Czech republic
E-mail: krapek@svse.cz

Abstract: *The article analyzes the efficiency of a specific section of Czech culture; specifically, in the areas of museums, galleries, and monuments. Based on a literature review we can state that apart from one project on performance indicators designed for benchmarking, evaluations of efficiency and effectiveness in this area have not been fully exploited. Our pilot study focuses on the use of the method of data envelopment analysis for evaluating the efficiency of museums, galleries, and monuments in the Czech Republic. This analysis is applied to entities established by the central government. We draw the necessary data from the annual reports of individual entities for the years 2011-2013. The evaluation criterion is the result of an objective function, where if the value is equal to one, we consider the institution to be efficient, but if the value is 0, the institutions are deemed inefficient. An analysis showed relatively large differences in the efficiency among the individual institutions. There is therefore room for increased efficiency which can be achieved by implementing appropriately structured performance indicators.*

Keywords: museums, DEA, relative efficiency, Czech Republic

JEL codes: H40, H80, C14, D24, M11

1 Introduction

The museum is a specific (non-profit) organization that is governed in their activities by specific legislative standards. In the Czech Republic since 2001, museum activities have been governed by Act no. 122/2000 Coll. Protection of Museum Collections. The law defined new standards of museum work and defined the term "museum" (Section 2 par. 4): "The museum is an institution that receives and collects the products of nature and human creations for scientific and educational purposes, examines the environments from which natural and manmade objects are obtained, creates collections of selected products of nature and human creations, maintains, records and professionally processes, and enables a process for ensuring equal access for all irrespective of their use and accessibility via the provision of selected public services. The purpose of these activities, in principle, is not profit." For the purpose of a the comparison of this definition, it is appropriate to include the definition of the International Association of Museums ICOM (International Council of Museums), in which the museum is defined as follows (ICOM, 2001): "The museum is a permanent non-profit institution in the service of society and its development , open to the public, which acquires, conserves, conducts research, communicates and exhibits of the material evidence of man and his environment for the purpose of study, education and enjoyment. Both definitions are working with non-profit character of the museum, with the concept of service. "

Modern museums in the world, as well as in the Czech Republic, perform many functions. In the literature dealing with the management of museums, museum functions are

usually cited (Ginsburgh, Mairesse, 1997); (Frey, Steiner, 2012) such as (1) the preservation of collections, including compiling, (2) study and (3) communication. To this O'Hagan (1998) states that the basic classical functions of the Museum are collecting and preserving items. The classic definition of the functions, according to e.g. (Moore, 1994) deals with five functions of museums: (1) compile (includes the acquisition and processing of collection items), (2) store (in terms of protection methods, appropriate taxidermy, preservation and handling of collections), (3) study (scientific or academic research), (4) exhibit (accessibility and presentation of collections to the public, public education), (5) communicate (includes introductions of collections and exhibits to interested groups - for example, public schools, the media, the owners of museums, etc.).

The following tables present essential information about the activity and economics sector of museums, monuments and galleries in the Czech Republic.

Table 1 Activities of Museums, Monuments and Galleries by Type of Founder

Number	Government, regions, municipalities	Entrepreneurial entities	Other	Total
Galleries in operation	63	4	5	72
Museums and monuments in operation	342	56	39	437
Branches of museums and galleries in operation	318	8	6	332
Museum and gallery exhibitions	1 734	155	103	1 992
Organized exhibitions	3 882	111	214	4 207
Number of these exhibitions	331	7	22	360
Visitors to expositions and exhibitions	9 365 438	1 153 075	1 132 814	1 165 1327
Organized lectures and other cultural and educational events	14 005	64	347	14 416
Visitors to lectures and other cultural and educational events	1 634 664	12 435	22 485	1 669 584

Source: (NIPOS, 2014)

Table 2 Revenues, Expenditures and Economic Autonomy in the Years 2010-2014 in Thousands of CZK

	2010	2011	2012	2013	2014
Revenues of galleries, museums and monuments	707 075	675 606	718 215	777 060	838 047
Of this total collected entrance fees	235 015	266 074	262 121	327 133	379 527
Non - investment expenses	4 019 608	3 874 071	3 956 811	4 014 756	4 236 940
From this total the purchase of collection items	54 364	51 442	43 077	49 766	54 911
% self-sufficiency	17.6	17.4	18.2	19.4	19.8

Source: (NIPOS, 2014)

It is clear from the table that the expenditures from the museum- galleries-monument sector runs into the billions (CZK.) It therefore undoubtedly makes sense to take efficiency into consideration in this sector. The subject of the research in this study is the problem of "efficiency in museums". So it is only a (partial) view of the more complex (and richer problem) question of museums.

Evaluation of efficiency of museums, galleries and monuments

Studies on museums efficiency can be divided into two categories (Barrio et al., 2009). The first category are studies that focus on evaluating efficiency utilizing groups of performance indicators. This category includes the following studies (Ames, 1990) (Jackson, 1991), (Weil, 1995). The second category are parametric and non-parametric models that assess the efficiency of units, called frontier techniques. For evaluating museum efficiency via parametric models, the following studies can be included (Paulus, 2003), (Mairesse, Eeckaut, 2002). As for the non-parametric methods, the method of data envelope analysis (DEA) must be noted. "DEA has often been used to assess public services thanks to its flexibility, since it imposes less restrictive conditions on the reference technology, and can easily be adapted to multiproduct scenarios. This models allows for the calculation of efficiency indicators through the use of multiple models of linear programming, based on the data from a series of units to be assessed." (Barrio et al., 2009, pp. 259). An approach based on the DEA method is not too common in the field of museums, galleries and monuments. As part of our review of the literature, we found only two studies regarding the application of DEA in evaluating the efficiency of museums, namely (Taher, Ansari, 2012) and (Barrio et al., 2009, pp. 259). This study (Taheri, Ansari, 2012) deals with the evaluation of the technical efficiency of regional museums in Tehran. This study analyzes the technical efficiency of nineteen museums with a focus on the history and cultural heritage for the years 2008-2010. Inputs include all the resources required by the organization for its activities, such as, for example, the square meters of exhibition area, the number of custodians and number of other workers. Outputs may take into consideration the services provided by the museums at all levels. Some measures of services provided by museums include the total number of visitors, the number of schoolchildren visiting the museum, the number of special temporary exhibitions organized by the museum, the number of congresses organized, and the number of research projects undertaken (Tahery, Ansari, 2012, pp.435).

(Barrio et al., 2009) counts among the first and most important applications of this method. The authors applied DEA to assess the technical efficiency of the regional system of museums in Spain. Included among the entered variables in the evaluation of technological efficiency were: the number of employees, size in m², number of rooms, equipment, winter opening hours, summer opening hours, admission, social impact, collection impact, and visitors. According to the resulting values of the dual function, the museums have been subdivided, by relative efficiency, into the following clusters: 1) ideal museum - museum which reaches the highest factorial score and the best value of all variables, 2) intermediate museums - achieves an intermediate position in variable characteristics, 3) embryonic museums - in this category almost all variables achieve below average scores, 4) irregular - museums which achieved the worst levels in relative efficiency; specific museums are also included under this heading.

The aim of this work is to apply the method of DEA to evaluate the relative efficiency of museums, monuments, and galleries run by the central authorities for the years 2011-2013 and perform a ranking of these institutions based on the average dual function for the years 2011-2013.

In our paper we start from the simplifying assumption that the museum is an organization (system), which can be examined from the perspective of the category of "efficiency". This economic view, relying on DEA, is based on the assumption that we are able to identify the necessary inputs for the operation of museums and at the same time, we are able to define the outputs of the activities (functions) of museums.

2 Methodology and Data

Data envelopment analysis is therefore a linear programming procedure for frontier analysis of inputs and outputs. DEA assigns a score of 1 to a unit only when it does not display inefficiencies in the use of inputs and production outputs compared with the relevant units. A score of less than one represents an inefficient unit. This means that the linear combination of the other units in the sample are capable of producing the same vector output using the same vector inputs.

For our analysis we have used data for the years 2011-2013, which was provided by the National Advisory Centre for Culture. Generally, it is difficult to gather data on specific characteristics of museums, galleries and monuments, e.g. financial self-sufficiency, therefore the data was acquired commercially. Only those institutions which were established by the central authorities were included in the evaluations. This amounted to 18 institutions (this number includes all institutions established by central authority). In our analysis, we used the following variables describing inputs: the number of branches, the area in m² for permanent exhibitions, and the budget of the organization. Input indicators therefore describe the resources that are available to the surveyed institutions. The output variables are as follows: the number of organized exhibitions, the number of cultural and educational events for the public, the number of visitors, economic autonomy (own revenues / expenses).

Ranking is formed as the average of the dual function of the monitored institutions for the years 2011 and 2013. According to the average values, we then sort institutions, which are then divided according to the order of quartiles, individual quartiles, and we use the names and the characteristics of which are defined in the study (Barrio et al., 2009).

3 Results and Discussion

The following table presents the results of the DEA method application for evaluating the technical efficiency of museums, galleries and monuments founded by the state for the years 2011-2013. Institutions are sorted by the average value of the dual function.

Table 3 Results of DEA Application on Museums, Galleries, and Monuments which Were Founded by the State

	2011	2012	2013	Average	Classification
Husite Museum in Tábor	1	1	1	1	Ideal Museum
Museum of Roma Culture, Brno	1	1	1	1	Ideal Museum
Museum of Art, Olomouc	1	1	1	1	Ideal Museum
National Museum, Praha	1	1	1	1	Ideal Museum
Monument of National Literature in Prague	1	1	1	1	Ideal Museum
Wallachian Open Air Museum, Rožnov p. Radhoštěm	1	1	1	1	Ideal Museum
The National Institute of Folk Culture, Strážnice	1	0.9999	1	0.9999	Ideal Museum
National Museum of Agriculture, Prague	1	0.9094	1	0.9999	Ideal Museum
Museum of Decorative Arts in Prague	1	1	0.7412	0.9137	Ideal Museum
Silesian Museum, Opava	0.003	1	1	0,6677	Intermediate museum

Moravian Gallery in Brno	0.7726	0.7931	0.3607	0.6421	Intermediate museum
Technical Museum in Brno	1	0.4031	0.2551	0.5527	Intermediate museum
Museum of Glass and Jewellery in Jablonec nad Nisou	0.7896	0.4244	0.4006	0.5382	Intermediate museum
Moravian Museum in Brno	0.1465	1	0.2321	0.4595	Embrionic museum
National Technical Museum in Prague	0.3338	0.4658	0.5017	0.4337	Embrionic museum
Terezin Memorial	0.2817	0.4347	0.4741	0.3969	Embrionic museum
National Gallery in Prague	0.1412	0.3132	0.2999	0.2514	Irregular museum

Source: Authors

As a whole, the system delivers very good results, with the average dual function for the sector being 0.7681, while 61% of the institutions can be classified, according to the dual function value, as ideal museums. Conversely, the share of so-called embryonic museums is very low. The special category, called irregular museums, where institutions achieved a relatively low efficiency includes the National Gallery in Prague. This result can be explained by the very specific mission of the institution. It is also necessary to draw attention to the relatively high differences in values between the dual functions of an ideal museum and an intermediate museum, and conversely, the small differences between the intermediate museums and the embryonic ones.

The composition of the ideal museum category is also very interesting. There is a large Prague museum, but also regional institutions with distinctive missions, for example, The Hussite Museum in Tabor, and the Museum of Roma Culture in Brno.

We also need to interpret the results with respect to the selected indicators, which in our case give great weight to the use of fixed assets, and the economies of scale may also be at work in the large institutions. On the other hand, this analysis does not disclose visitor satisfaction levels, cultural nor social impact of the institution, nor the level of internal organizational culture.

4 Conclusions

The article deals with the application of the DEA method for evaluating the relative efficiency of museums, galleries and monuments established by the state. The theoretical part of the article describes the current studies being carried out in this segment, which have been applied mainly abroad. The practical section presents the results for the Czech Republic for the years 2011-2013. The results are surprising because most institutions achieved a high relative efficiency. Additionally, it was noteworthy that this category contained quite large institutions as well as regional institutions with specific missions.

The obtained results are useful for public policy, and as a tool for evaluating and improving management, and an instrument for allocating resources. However, it is very necessary to weigh the choice of variables to be included in the model. For example, it was easier for us to define variables which describe the use of fixed assets rather than variables expressing social and regional impacts.

The analysis also opens up a number of other (as yet unidentified or unresolved) issues and research questions. These include, in particular, the finding that the "central" (National) museums located in large cities (Prague, Brno, Olomouc) as well as the regional museums located in small towns (Rožnov pod Radhoštěm) both achieved high efficiency ratings. Is it therefore possible to construct a question regarding what factors cause this condition? What role does the marketing of museums play in this effect? To

what extent does management of museums influence the resulting efficiency? What role does the "attractiveness" of an exhibition have for luring visitors? What are the museum visitor demographics when linked to the type of museums, the location, etc.? To what extent does the attendance at museums depend on the factor of the "type of visitor" and factor of the "type of museum"? Does "seasonality" play a role on efficiency (or traffic) in museums? These are all questions that are challenging even for the authors of this study as well as for detailed interdisciplinary research.

References

- Ames, P. J. (1990). Breaking new grounds. Measuring museums merits. *Museum Management and Curatorship*, vol. 9, pp. 137–147.
- Barrio, J. M., Herrero, C. L., Sanz, Á., J. (2009). Measuring the efficiency of heritage institutions: A case study of a regional system of museums in Spain. *Journal of Cultural Heritage*, vol. 10, pp. 258-268.
- Frey, B. S., Meier, S. (2006). The Economics of Museums. In: Ginsburgh, V. A. a Throsby, D. (eds.): *Handbook of the Economics of Art and Culture*, vol. I. Netherlands: Elsevier, pp. 1017-1049.
- Ginsburgh, V., Mairesse, F. (1997). Defining a Museum: Suggestion for an alternative approach. *Museum Management and Curatorship*, vol. 16(1), pp. 15-33.
- ICOM (2001). Profesionní etický kodex muzeí. Mezinárodní rada muzeí (ICOM), 15. valné shromáždění konference ICOM v Buenos Aires v Argentině dne 4. listopadu 1986 ve znění 20. valného shromáždění konference ICOM ve španělské Barceloně dne 6. července 2001. Retrieved from: http://www.cz-museums.cz/web/deni_v_oboru/eticky-kodex-muzei.
- Jackson, J. M. (1991). Performance indicators: promises and pitfalls, in: S. Pearce (Ed.), *Museums Economics and the Community*, Athlone Press, London, pp. 156–172.
- Mairesse, F., Vanden Eeckout, P. (2002). Museum Assessment and FDH Technology: Towards a Global Approach, *Journal of Cultural Economics*, vol. 26, pp. 261–286.
- Moore, K. (1994). Museum management. *Psychology Press*. Routledge, London.
- NIPOS (2014). Kultura české republiky v číslech, vybrané údaje ze statistických šetření. Retrieved from: http://www.nipos-mk.cz/wp-content/uploads/2013/05/1_Kultura-v-%C4%8D%C3%ADslech_2015_web.pdf.
- O'hagan, J. W., (1995). National museums: To charge or not to charge? *Journal of Cultural Economics*, vol. 19(1), pp. 33-47.
- Paulus, O. (2003). Measuring museum performance: A study of museums in France and United States, *International Journal of Arts Management*, vol. 6, pp. 50–62.
- Taheri, H, Ansari, S. (2013). Measuring the relative efficiency of cultural-historical museums in Tehran: DEA approach. *Journal of Cultural Heritage*, vol. 14, pp. 431-438.
- Weil, S. E. (1995). Progress report from the field: the Wintergreen Conference on Performance Indicators for museums, in: S.E. Weil (Ed.), *A Cabinet of Curiosities. Inquiries into Museums and their Prospects*, Smithsonian Institution Press, Washington, 1995, pp. 19–31.

The Impact of Using an External Authority on the Quality of Public Procurement

Michal Plaček¹, Martin Schmidt², František Ochrana³, Milan Půček⁴

^{1,2,3,4} Charles University
Center for Social and Economics Strategies
Celetná 20, 116 36 Prague, Czech Republic
E-mail: michalplacek@seznam.cz

Abstract: *The article deals with the empirical verification part of the hypothesis of "bureaucratic safety" applied to the example of public procurement in the years 2010-2014. We presume that the contracting authorities are trying to minimize the risk of conflict and therefore are entrusting the administration of contracts to external authorities, or perhaps it is their view that these external authorities would administer them in a higher quality fashion. For the purposes of this article, we consider quality to be represented as the odds ratio that the Office for Protection of Competition will conclude that a public contract was managed improperly. The aim of this article is to compare in-house and external administration of public contracts in terms of the probability of an appeal, the initiation of an investigation, and the finding of any violations by the Office for Protection of Competition. For the purposes of our analysis, we used data on 69,959 public contracts, which we paired with 1965 first instance decisions of the Office for the Protection of Competition. We then applied logistic regression to this data. The achieved results are very surprising because we were unable to demonstrate a statistically significant difference between in-house and external administration, which should affect the decisions of the Office for the Protection of Competition. The results are very challenging for public policy since the current size of the procurement market is around 577 billion CZK. Additionally, the amount of transaction costs associated with procurement is very important. Each partial streamlining of public procurement can bring significant savings of public funds.*

Keywords: public contracts, outsourcing, Office for Protection of Competition

JEL codes: H30, H39, H50, H57, H80

1 Introduction

The current level of the procurement market can be estimated to be about 577 trillion CZK (Ministry for Regional Development, 2015). Due to the economic growth which we can expect in the coming years, the volume of public procurements will increase. Public procurement is therefore an important instrument of public policy, having both macroeconomic and microeconomic impacts.

It is for these reasons that a systematic examination of public procurement could result in relatively high savings. The institution of public contracts in the Czech Republic has been dealt with in a relatively large number of studies and professional publications. The following are considered to be the most important areas of investigation: the impact of the competitive effect, and the openness to efficiency in public procurement (Ochrana, Pavel, 2013), (Soudek, Skuhrovec, 2013), (Klazar, Maatyová, 2013), (Pavel, Kubik, 2011), (Nikolovová et. al., 2012), the impact of regulation and the legal environment (Jurčík, 2013, 2015), electronic auctions (Kvasnička, Staněk, Krčál, 2015), (Pavel, Sičáková -Beblavá, 2013), the problem of decentralization (Placek et al., 2016 a), (Plaček, et. al., 2016 b), the problem of overcharging in public contracts (Ochrana, Stehlik, 2015) and corruption in public procurement (Ochrana, Maatyová, 2012), international comparisons (Jurčík, 2013) (Pavel, 2012), (Nemec, Grega, 2015). Following these guidelines, the current scientific discourse has been focusing on the role of regulator, for example (Schmidt, 2014), (Pavel, 2014), or on transaction costs and the behavior of individual players in selection procedures (Jurčík, 2014), (Jurčík, 2015), (Schmidt, 2015), (Pavel, Sičáková - Beblavá, 2012).

Our research builds on the study presented by (Nemec et Al, 2014). In this study, the authors define a hypothesis called "bureaucratic safety" explaining the behavior of the contracting authorities in the Czech Republic. The inspection system and the activities of the regulator at the Office for the Protection of Competition are aimed at checking procedural requirements, but is not systemically set up to scan for 3E. According to this, the contracting authority will establish its own strategy, thereby preferring to avoid any risk. This is reflected, for example, by the preferential selection of the criterion of the lowest price rather than the criterion of the economically advantageous tender when determining the selection criteria for public procurement evaluation. The criterion of the economically advantageous tender may well lead to a more efficient use of public resources, but in the opinion of suppliers, it means a higher risk of investigation by the Office for Protection of Competition. The authors analyzed these claims by documenting the results of a survey among contracting authorities OTIDEA against case studies of regulatory decisions within the public procurement market. This assertion was confirmed by the empirical study conducted by (Jurčik, 2015), which states that in the Czech Republic, the lowest price criterion was used in about 80% of cases, which is much higher than in other EU countries, where, contrarily, the criterion of the economically advantageous tender is prevalent.

The presented explanation is linked to the now classical school of public choice (the model of the bureaucrat eliminating the risk of conflict) and new institutional economics, according to which the parties do not have perfect information, and therefore cannot conclude a perfect contract. This result induces additional transaction costs for using the market.

Our approach is based on the fundamentals described above and an extension of the hypothesis of bureaucracy safety which concerns another form of eliminating the risk of conflict by the bureaucrats. Specifically, this is regarding the transfer of risk from the contracting authority to an external sponsor in the form of outsourcing in order to carry out the administration of tenders. The contracting authority justifies this behavior by its inconsistent legislation and by frequent changes in legislation. Smaller municipalities are especially prone to the issue of not having qualified staff that are be able to administer selection procedures well. Therefore, these authorities act out of fear and choose an opportunistic strategy, and "shift" the responsibility for the proper preparation of tender documents to an external agent in order to minimize errors in the selection process and to reduce the potential risk of hearings related to the selection procedure before the Office for Protection of Competition. Such a strategy is the result of the reasonably opportunistic behavior of these entities, who are aware that they have an insufficient capacity for the professional and quality preparation of tender documentation and also so they may, in case of failure (hearings regarding the public contract before the Office for Protection of Competition), hide behind an external actor as an alibi. Critics of this practice associated it with high transaction costs, corruption and alibiism.

The aim of this article is to compare in-house and external administration of public contracts in terms of the probability of an appeal, the initiation of an investigation, and the finding of any violations by the Office for Protection of Competition. Subsequently, logistic regression will be used to verify that the method of administration used in the public procurement has had a statistically significant effect on the probability that the Office for Protection of Competition will find a violation of the law in a public contract.

2 Methodology and Data

In the empirical analysis, data on public procurement was used, whose publication or assignment was published in the Bulletin of Public Contracts in 2010 and 2014 (ie. including canceled public contracts). There were a total of 69,959 public contracts, with contracts divided into parts being processed as a whole unit. These data were combined with information about the administrative decisions of the OPC (Office for Protection of Competition) issued during the period of January 2011 to March 2015. Data on decisions are published in the Collection of Decisions of the OPC, wherein there were 1965 first

instance decisions. Because this data contains numerous decisions on a single contract as well as some decisions related to contracts which are not published in the journal (e.g. small public contracts or cases where the contracting authority failed to publish data in the journal) or reviews concerning contracts which started before the research period. A total of 867 tracked contracts were listed in the Journal of Public Contracts, which had administrative proceedings led by the OPC. Of this total, 752 proceedings were commenced by petition, and in 258 cases the OPC found violations of the law had been committed by the contracting authority.

Given the nature of the response variables, logistic regression (logit) was used utilizing logistic function during parameter estimation. For the response variable, the OPC's finding of violations of the law by the contracting authority in the public contract (and subsequent imposition of corrective measures or fines) was used. When this occurred, the variable has a value of 1. Barring this, it has a value of 0.

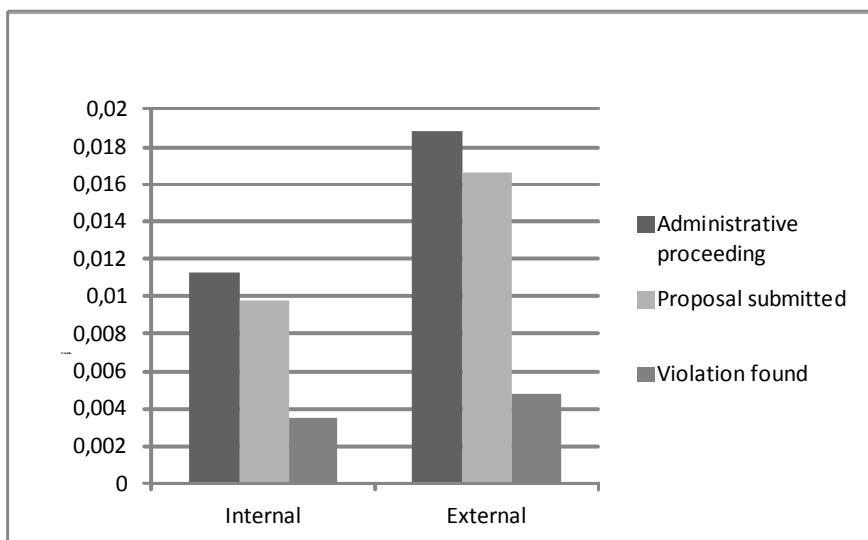
One factor where there is a possible impact on the course of the procurement procedure is related to whether the contract was administered by internal resources within the contracting authority or if external administrators of public contracts (typically, the services of consulting companies or law firms) were utilized. This information was found via the contract details on the administrator's contract specified in the Journal of Public Contracts. The analyzed data indicated that external administrators were used in 14.5% of cases. In order to increase the explanatory power of the model, we have also included other variables other than the kind of administration for the award procedures.

The other explanatory variables are the following: the estimated value of the contract, the type of contracting authority (state, country, municipality, other), the type of award procedure (open procedure, restricted procedure, negotiated procedure without publication, negotiated procedure with publication, direct purchase, others), the type of delivery (construction, services, others), the evaluation according to the bid price, the use of electronic auctions, funding from EU subsidies, division of the contract into parts, and centralized procurement. The results of the model show only the statistically significant variables.

3 Results and Discussion

In this section, we present the results of analysis of the likelihood of an appeal being filed with the Office for Protection of Competition, an investigation commencing, and the finding of a violation of the law via the administration of a public contract.

Figure 1 Probabilities According to Administration



Source: Authors

From the graphical inspection of data, it is clear that when regarding individual situations, the differences in likelihood between the internal and the external form of the award procedure almost minimal. This is contrary to the assumptions defined in theory that external contracting authorities would achieve worse results.

We now focus on the model more specifically when looking at the likelihood that the Office for Protection of Competition will find a violation of the law by the contracting authority. The model results are presented in the following table.

Table 1 Results of the Logit Model, Using Observations 312-69958 (n = 66702), Missing or Incomplete Observations Dropped: 2945 Dependent Variable: Errors

	Coefficient	Std. Error	z	p-value	
const	-6.23522	0.225528	-27.6472	<0.00001	***
Region	-1.06975	0.386785	-2.7657	0.00568	***
evaluation based on the lowest bid price grant	-0.775813	0.128903	-6.0186	<0.00001	***
Regional or local office	0.356535	0.129155	2.7605	0.00577	***
Other authority	0.537669	0.197428	2.7234	0.00646	***
Selection procedure for services	-0.393259	0.205282	-1.9157	0.05540	*
Restricted procedure	0.611102	0.133619	4.5735	<0.00001	***
Negotiated procedure with publication	1.08972	0.203847	5.3458	<0.00001	***
Negotiated procedure without publication	1.78844	0.261327	6.8437	<0.00001	***
	-0.815817	0.452713	-1.8021	0.07154	*
Mean dependent var	0.003763	S.D. dependent var	0.061228		
McFadden R-squared	0.058613	Adjusted R-squared	0.052559		
Log-likelihood	-1554.930	Akaike criterion	3129.861		
Schwarz criterion	3220.941	Hannan-Quinn	3158.014		

Source: Authors

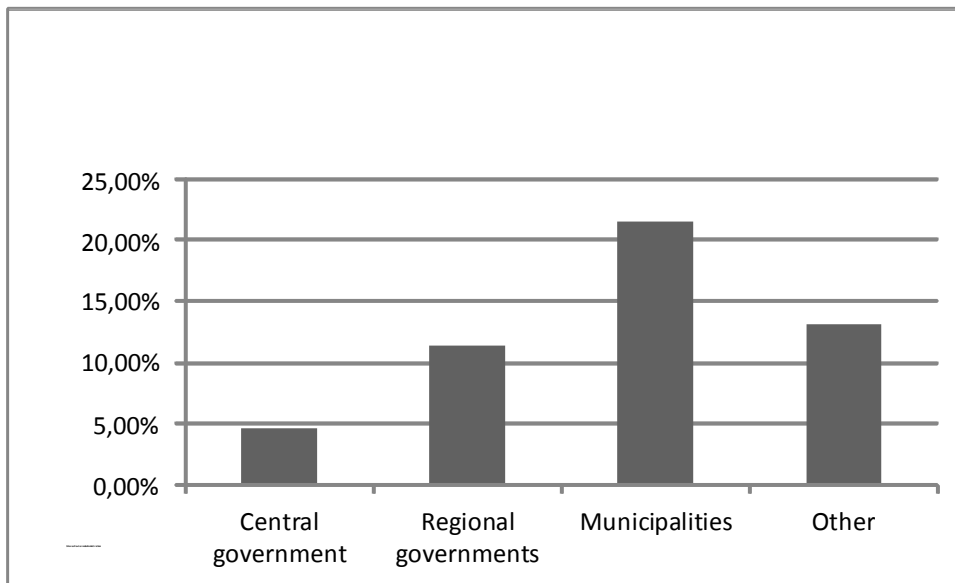
From the results of the model, it is obvious that being either an external or an in-house contracting authority has no statistically significant effect on the decisions of the Office for Protection of Competition regarding violations by a contracting authority. Conversely, some statistically significant variables appeared. They are the type of contracting authority, the type of deliverable, and the degree of openness of the selection procedure. For fairness, we should note the limited scope of the econometric model. This is a result of the limited availability of relevant data and the very essence of the modeled problem, where the decisions of the Office for the Protection of Competition are influenced by a number of external and internal factors, which are impossible to be described by the model seriously.

Despite these facts, we can say that we managed to confirm part of the hypothesis regarding bureaucracy safety, namely that contracting authorities have a tendency to transfer responsibility for the administration of public contracts to external entities, even though the use of these services has no significant influence on the decision of the Office for Protection of Competition regarding fines for the contracting authorities. Conversely, if we focus on the absolute probability, as in probability of a petition being submitted, the

initiation of administrative proceedings, and findings of misconduct, it is only slightly higher for external entities.

It is interesting to discuss the results achieved in the context of the argument about small municipalities not having the resources for skilled workers, and therefore having to use outsourcing. Our model does not directly answer this question, but suggests that the regions (as big contracting authorities) outperformed municipalities in the cases of decisions of the Office for Protection of Competition. In the following figure we show the share of external system administrators for each type of authority.

Figure 2 External Administration According to Type of Contracting Authority



Source: Authors

The picture shows that municipalities reach the highest share of outsourcing. In terms of future research, it would be interesting to decompose these results in terms of municipality size.

4 Conclusions

This article on public procurement in the Czech Republic is concerned with the empirical verification of the hypotheses regarding bureaucratic safety. This hypothesis describes bureaucrats as agents who try to avoid conflict in the case of public procurement. In our case, we verify this hypothesis regarding the case where there is a transfer of risk by the contracting authority to external entities in the form of outsourcing the administration of tenders. Contracting authorities argue that outsourcing will achieve better service (better quality documentation) than in the case of processing in-house. In our approach, we define the quality of the administration of a public contract as the likelihood that the Office for Protection of Competition will find violations of the law and at the same time as the absolute value of the likelihood in the case a competitor will appeal the public contract, or that the contract will be investigated by the Office for Protection of Competition, or that violations will be confirmed.

The analysis of empirical data did not show any statistically significant differences between the in-house and external processing of tender documents for public contracts. We can therefore conclude that the argument from the public authorities that higher quality is achieved by outsourcing is not empirically supported, and the main reason for outsourcing may be just the transfer of risk.

It is very important to discuss this problem in terms of decentralization of public procurement with respect to small municipalities where we do not have enough data

currently to make a relevant assessment. Generally, however, we can conclude that if the objective of public policy is to reduce transaction costs for the administration of tenders, we recommend going through simplification of legislation, providing information, and educational assistance to smaller contracting authorities.

References

- Jurčík, R. (2014). Transaction costs and transparency of public procurement. *Advances in Economics, Law and Political Sciences*, vol. 15, pp. 196-200
- Jurčík, R. (2015). New Trends in the Evaluation of Public Contracts. The Lowest Tender Price or Economic Advantageousness of the Tender? Špalková, D. and Matějová, L. (eds): *Current Trends in Public Sector Research*. Brno: Masaryk University, pp. 125 – 134.
- Jurčík, R. (2013). Komparace ekonomických a právních aspektů slovenské a české právní úpravy veřejných zakázek a připravované změny v oblasti veřejných zakázek v Evropské unii. *Ekonomický časopis/Journal of Economics*, 61 (10), pp. 1091 – 1093.
- Klazar, M., Maatyová, A. (2013). An Evaluation of Public Contracts in Teaching Hospitals in the Czech Republic in the Years from 2006 to 2011. *Finance and the Performance of Firms in Science, Education and Practice*. Zlín: Tomas Bata University in Zlín, pp. 348 – 357.
- Kvasnička, M., Staněk, R., Krčál, M. (2015). Do Auctions Improve Public Procurement? Evidence from the Czech Republic. *DANUBE: Law and Economics Review*, vol. 6 (4), pp. 241-257.
- Ministry for Regional Development. (2015). *Výroční zpráva o stavu veřejných zakázek v České republice za rok 2014*. Retrieved from: http://www.portal-vz.cz/getmedia/e404b766-77d0-488b-8809-6951c53c0eb9/Vyrocni-zprava-o-stavu-verejnych-zakazek-v-Ceske-republice-za-rok-2014_final.pdf.
- Nemec, J., Šumpíková, M., Klazar, S., Grega, M.(2014). Efficiency versus economy in public procurement. In Löster T., Pavelka T. *Conference Proceedings: The 8th International Days of Statistics and Economics*. 1. vyd. Praha: Melandrium.
- Nemec, J., Grega, M. (2015). Factors Influencing Final Price of Public Procurement: evidence from Slovakia. *In Procedia Economics and Finance*. Praha: Elsevier B.V.
- Nikolovová, P., Palguta, J., Pertold, F., Vozár, M. (2012). Veřejné zakázky v ČR. *Co říkají data o chování zadavatelů?*. Study No. 5, Praha: Národohospodářský ústav AV ČR – CERGE.
- Ochrana, F., Stehlík, P. (2015). Předražování veřejných zakázek na stavební práce v České republice. *Ekonomický časopis*, vol. 63(3), pp. 227-238.
- Ochrana, F., Maatyová, A. (2012). Východiska pro utváření transparentního a nekorupčního systému zadávání veřejných zakázek. *Ekonomický časopis/Journal of Economics*, vol. 60 (7), pp. 732 – 745.
- Ochrana, F., Pavel, J. (2013). Analysis of the Impact of Transparency, Corruption, Openness in Competition and Tender Procedures on Public Procurement in the Czech Republic. *Central European Journal of Public Policy*, vol. 7 (2), pp. 114 – 135.
- Pavel, J., Kubík, R. (2011). Faktory ovlivňující intenzitu konkurenčního efektu při zadávání veřejných zakázek na stavební práce v ČR. *Kubátová, K. (ed.): Theoretical and Practical Aspects of Public Finance*. Praha: Oeconomia, pp. 3 – 10.
- Pavel, J., Sičáková-Beblavá, E. (2012). Postkontraktační chování veřejných zadavatelů na Slovensku. *Politická ekonomie*, vol. 60 (5), pp. 635 – 648.
- Pavel, J. (2012).The Situation in the Public Procurement Market in Post-communist Countries: The Case of the Czech Republic. *World Academy of Science, Engineering and Technology*. Amsterdam: WASET, pp. 490 – 495.

Pavel, J. (2014). Factors Affecting the Value of Compliance Costs of Public Procurement. *Sedmíhradská, L. (ed.): Theoretical and Practical Aspects of Public Finance 2014*. Praha: Wolters Kluwer, pp. 222 – 227.

Soudek, J., Skuhrovec, J. (2013). Public Procurement of Homogeneous Goods: the Czech Republic Case Study. *IES Working Paper 05/2013*. Prague: IES FSV. Charles University.

Schmidt, M. (2014). Pokuty za správní delikty ve veřejných zakázkách: ekonometrický model. *Acta oeconomica pragensia: vědecký sborník Vysoké školy ekonomické v Praze, Vysoká škola ekonomická v Praze*, vol. 22 (6), pp. 35-50.

Forecasting Exchange Rate Volatility: Suggestions for Further Research

Tomáš Plíhal

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 603 00 Brno, Czech Republic
E-mail: 370621@mail.muni.cz

Abstract: *The market volatility plays an important role in the world of finance and it is essential part of risk management, asset management and valuation of derivatives. Several models for volatility forecasting exist. The aim of this paper is to provide a theoretical background for further research in forecasting exchange rate volatility. The first part describes essential information about market volatility and its importance. Analysis of commonly used methods for volatility forecasting follows along with a comparison of individual econometric models. Empirical literature, which measures predicting abilities of different models on the real data from the foreign exchange market, is also examined. According to our results, one of the best model for forecasting exchange rate volatility is simple GARCH(1,1) model. However, the latest empirical evidence highlights relatively new HAR-RV model which is able to provide even better results.*

Keywords: exchange rate volatility, forecasting volatility, GARCH model, HAR-RV model

JEL codes: C53, G17

1 Introduction

Trading on the foreign exchange market gained a lot of attention, because this fast and very liquid market provides many investment opportunities. With rising computing power and better data provided, we are able to create more advanced models to capture behavior on such markets.

One of the advantages that this market offers to investors is the possibility of using even small fluctuations in exchange rates to gain profit using high leverage trades. The volatility models are one of the tools that help investors evaluate the risk in such situations.

Another reason for examining the time series of exchange rates is that they are not as frequent target of statistical analysis in comparison with the stock market. Some of the observed differences between the characteristics of time series returns in exchange rates and equities support the idea of separate approach to these markets.

The aim of this paper is to provide theoretical background for further research in forecasting exchange rate volatility. We analyze the current level of knowledge and commonly used methods for volatility forecasting. Subsequently, based on this analysis, we provide suggestions for further possible area of research. This article serves as theoretical background for the topics related to forecasting volatility, especially on the foreign exchange market.

The rest of the study is organized as follows. Section 2 contains definition of volatility and its importance in the world of finance. Section 3 presents commonly used volatility models, specification of these models, and their advantages and drawbacks. Review of the most recent literature, which compares predicting abilities of these models, is in section 4. The last section 5 concludes and suggests methods for further research on forecasting exchange rate volatility.

2 Methodology and Data

What is volatility and why it matters

The term volatility indicates how much and how quickly the price of any given asset changes. In case of foreign exchange market, volatility represents the fluctuation of the exchange rates. The higher the volatility, the greater the range at which the exchange rate moves. We can distinguish between two main types of volatility: historical volatility (also known as statistical) and implied volatility.

Historical volatility is the realized volatility of a financial instrument which is based on the past changes in its price. There are different ways of measuring historical volatility but the underlying basic idea is usually the same. It is often reported as standard deviation of an instrument's yearly logarithmic returns over a specific time period. In general, standard deviation measures the dispersion of a set of data from its mean.

On the other hand, implied volatility represents the volatility of a financial derivative, which is derived from the expected volatility of its underlying asset. It is the opposite of historical volatility, because it shows what the market implies about the volatility in the future. This concept is used predominantly in option pricing. In the other words, it is possible to determine future volatility from the price of the option. For example, in the well-known Black-Scholes option pricing model it is possible to determine all inputs from the market data and then estimate future volatility using numerical methods.

Volatility is also closely linked to the familiar beta coefficient. It is important indicator for investors. The value range from zero to infinity and indicates the relative volatility of the asset to the chosen benchmark. If the beta is equal to one, it indicates that volatility of the given asset is the same as the benchmark. Lower values than one means lower volatility and vice versa.

Understanding and predicting of volatility in the financial markets is a key issue in economics and finance. Volatility is often seen as a measure of risk. Asset whose price has higher volatility should logically be more risky, because its price is difficult to predict. Volatility is also understood as an expression of uncertainty in the market (Schwert 1989). It is a key variable used in many financial applications, from derivatives valuation to asset management and risk management (Value at Risk).

3 Results and Discussion

Basic volatility models

As we mentioned in the previous chapter, there exist two main types of volatility, historical and implied. The same idea applies to volatility models. The historical approach focuses on past data and believes that the history is predictive. On the other hand, in implied volatility models it is the market and not the past who predicts volatility. This approach believes that the market prices already contain the best possible estimate of volatility. In the rest of this article we focus only on the models of historical volatility, because they are more relevant for forecasting volatility on the foreign exchange market.

The simplest model of historical volatility only calculates the variance or standard deviation for a certain time period. This value is then used as a prediction for the next period. These models are still useful as a benchmark for comparing the predictive ability of other models. Their main weakness is that all past data have the same weight. Therefore, data from the last month has the same influence on the variance as data from yesterday. This problem is addressed in so called **EWMA** (Exponentially Weighted Moving Average) models. In this models weights of variable decrease exponentially as we move back through time which simply means that more recent returns have greater weight on the variance.

Probably the most popular model in relation to the historical volatility are **ARCH** (Autoregressive Conditional Heteroskedasticity) type models. This concept was developed by economist Robert F. Engle (1982). A lot of financial time series exhibit so called time-

varying volatility clustering. It means that the volatility itself experiences large fluctuations over time and we are able to spot periods of high volatility and low volatility at various points in time. In simple terms, periods of low volatility are followed by periods of high volatility and vice versa. The main purpose of the ARCH models is to capture these influences. The basic ARCH(q) model is specified as follows:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 \quad (1)$$

, where σ_t^2 is the conditional variance, ε_t is a random variable, and $\alpha_0 \dots \alpha_i$ are estimated coefficients.

The most popular extension of the ARCH model is **GARCH** (Generalized ARCH) introduced by Bollerslev (1986). It is basically an ARCH model with added lagged values of volatility. The GARCH(p,q) model can be written as:

$$\sigma_t^2 = \alpha_0 + \sum_{i=1}^q \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^p \beta_j \sigma_{t-j}^2 \quad (2)$$

However, the model can be extended and modified in many ways, e.g. exponential GARCH (EGARCH), nonlinear GARCH (NGARCH), integrated GARCH (IGARCH) and many others. Each modification of the model can be used to address the specific properties of the given asset or market.

We could also mention **stochastic volatility models**. These models assume that volatility is stochastic process, whereas in GARCH models the conditional volatilities are deterministic. For that reason, the stochastic volatility models have an advantage over the GARCH models. However, they are less used in practice, because they are much harder to fit.

Financial time series could be very challenging for econometric models because of their typical characteristics such as long-memory, fat tails and self-similarity. Standard GARCH and stochastic volatility models are short-memory models which are not able to replicate all of these features. There already exist some alternative long-memory models like FIGARCH or ARFIMA which use fractional difference operators. However, these models are hard to fit and also contain other complications such as lack of clear economic interpretation (Comte and Renault 1998).

Other option is Heterogeneous Autoregressive model of Realized Volatility (**HAR-RV**) introduced by Corsi (2009). The HAR-RV model is able to reproduce most of the properties of financial time series, including long-memory, even if the model itself does not have typical characteristics of long-memory model. This model considers volatilities realized over different interval sizes, and the basic form of the HAR-RV model is defined as:

$$RV_{t+1}^{(d)} = c + \beta^{(d)} RV_t^{(d)} + \beta^{(w)} RV_t^{(w)} + \beta^{(m)} RV_t^{(m)} + \varepsilon_{t+1} \quad (3)$$

, where $RV_t^{(d)}$ is the realized volatility for the previous day, $RV_t^{(w)}$ is the average of realized volatility for previous week (5 trading days), and $RV_t^{(m)}$ is the average for previous month (22 trading days).

Other important advantage of HAR-RV model is that this model is easy to estimate and it is also economically intuitive. Forecasting performance is very good in comparison with more advanced models. OLS properties allow us to add other regressors easily and estimate their significance levels. This makes the model very flexible. Expansion into multi-equation model is also possible. The univariate HAR-RV model could be extended into multivariate model according to Chiriac and Voev (2011), Bauer and Vorkink (2011) or Baruník and Čech (2016).

Empirical evidence

In this section we analyze the most recent empirical literature which compares the predicting abilities of different models of volatility. We focus on papers that used data from foreign exchange market because other financial markets have different properties. Therefore, the results could be inaccurate.

The most accurate volatility models often used high-frequency data and concept of realized volatility (Andersen and Bollerslev 1998). David and Okunev (2009) confirmed that realized volatility provides the most accurate forecast performance compared to implied volatility and daily return models.

Hansen and Lunde (2005) compared forecasting abilities of 330 ARCH-type models. According to their results, basic GARCH(1,1) model was able to provide the best forecasts, when the models were evaluated using the exchange rate data.

However, Pilbeam and Langeland (2015) compared forecasts from symmetric and asymmetric GARCH models with the implied volatility derived from currency options for four dollar parities in period from 2002-2012. They showed that GARCH models are much worse than implied volatility forecasts.

Corsi (2009) measured performance of AR, ARFIMA and HAR-RV models for USD/CHF, S&P500 Futures, and T-Bond Futures. The results showed that the HAR-RV model is much better than short-memory models and comparable with much more complicated long-memory ARFIMA model.

Xiao (2013) investigated stock market indices and exchange rates. She used realized volatility and compared different models, namely simple regression model, two types of stochastic volatility models and HAR-RV model. According to her results, HAR-RV model provided the most accurate forecasts in all cases.

4 Conclusions

This paper investigates common principles and methods for forecasting volatility in the context of foreign exchange markets. We analyzed mainly historical volatility models such as EWMA models, ARCH and GARCH type of models, stochastic volatility and HAR-RV models. One of the most commonly used models is GARCH and its modifications. Empirical literature about this model is very extensive.

However, HAR-RV model introduced by Corsi (2009) definitely deserves our attention. This model is able to reproduce most of the properties of financial time series, including long-memory. This gives it an advantage over the GARCH-type models. It is also easy to fit and modify.

Analysis of the empirical literature about forecasting volatility suggests that the best approach is to use high-frequency data and concept of realized volatility. HAR-RV model is constructed exactly for this purpose. Corsi (2009) and Xiao (2013) compared different models and their results are in favor of HAR-RV models.

The HAR-RV is relatively new model which has a lot of potential to achieve great results. There is still a lot of room for further improvements and developments of this model. Therefore, this model is the best candidate for any research on forecasting volatility on the foreign exchange market.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 is gratefully acknowledged.

References

- Andersen, T. G., Bollerslev, T. (1998). Deutsche Mark–Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer Run Dependencies. *The Journal of Finance*, vol. 53(1), pp. 219-265.
- Baruník, J., Čech, F. (2016). On the modelling and forecasting multivariate realized volatility: Generalized Heterogeneous Autoregressive (GHAR) model. *Journal of Forecasting* (forthcoming).
- Bauer, G. H., Vorkink, K. (2011). Forecasting multivariate realized stock market volatility. *Journal of Econometrics*, vol. 160(1), pp. 93-101.
- Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroskedasticity. *Journal Of Econometrics*, vol. 31(3), pp. 307-327.
- Chiriac, R., Voev, V. (2011). Modelling and forecasting multivariate realized volatility. *Journal of Applied Econometrics*, vol. 26(6), pp. 922-947.
- Comte, F., and Renault, E. (1998). Long Memory in Continuous-Time Stochastic Volatility Models. *Mathematical Finance*, vol. 8(4), pp. 291-323.
- Corsi, F. (2009). A Simple Approximate Long-Memory Model of Realized Volatility. *Journal of Financial Econometrics*, vol. 7(2), pp. 174-196.
- David T. L., S., and Okunev, J. (2009). Forecasting exchange rate volatility: a multiple horizon comparison using historical, realized and implied volatility measures. *Journal Of Forecasting*, vol. 28(6), pp. 465-486.
- Engle, R. F. (1982). Autoregressive Conditional Heteroscedasticity With Estimates Of The Variance Of United Kingdom Inflation. *Econometrica*, vol. 50(4), pp. 987-1007.
- Hansen, P. R., and Lunde, A. (2005). A forecast comparison of volatility models: does anything beat a GARCH(1,1)?. *Journal Of Applied Econometrics*, vol. 20(7), pp. 873-889.
- Pilbeam, K., and Langeland, K. N. (2015). Forecasting Exchange Rate Volatility: GARCH Models versus Implied Volatility Forecasts. *International Economics And Economic Policy*, vol. 12(1), pp. 127-142.
- Schwert, G. W. (1989). Why Does Stock Market Volatility Change Over Time?. *Journal Of Finance*, vol. 44(5), pp. 1115-1153.
- Xiao, L. (2013). Realized Volatility Forecasting: Empirical Evidence from Stock Market Indices and Exchange Rates. *Applied Financial Economics*, vol. 23(1-3), pp. 57-69.

Functioning of Bancassurance in Selected Countries in Which the Financial Group Erste Group Bank Operates

Lenka Přečková¹

¹ Silesian University in Opava
School of Business Administration in Karviná, Department of Finance and Accounting
Univerzitní nám. 1934/3, 733 40 Karviná, Czech Republic
E-mail: preckova@opf.slu.cz

Abstract: *This paper shall evaluate the level of internal integration among bancassurance products and financial institutions belonging to the financial group Erste Group Bank AG in selected countries of Europe. There shall be selected six countries which are located in Central and Eastern Europe: the Czech Republic, Slovak Republic, Hungary, Romania, Croatia and Serbia. These are the countries in which a strategic partnership agreement between the Vienna Insurance Group and the Erste Group Bank was concluded in 2008 which shall be taken into consideration in the evaluation. The research was conducted as of February 1, 2016. This paper aims at determining whether similarities in how the financial group Erste Group Bank is organized also mean similarities in how bancassurance in the selected countries functions. To make this possible, a critical analysis of bancassurance-related literature shall be conducted and a hypothetical basis for the practical evaluation shall be formulated. Characteristics for evaluation of the level of integration inside the financial group and also a banc-assurance product shall be also set. To evaluate how bancassurance functions in practice, a qualitative research based on data available on web sites and also financial and annual reports shall be used. The qualitative research shall contain a detailed analysis, sorting and a comparison of the set characteristics. Finally, it will be determined which attributes are identical and which are different in the integration of financial groups and bancassurance products.*

Keywords: financial group, insurance group, bancassurance, assurfinance

JEL codes: G21, G22

1 Introduction

Financial groups are under constant development. Important factors affecting this development are globalization, deregulation but also competition. Financial services as well as financial institutions are constantly being integrated and new financial and insurance groups are emerging. Financial conglomerates are being formed. The way financial products are sold are being changed and new distribution channels appear. More competition forces financial institutions to search for new and more complex services as well as to create new products. Bancassurance is still a current and much discussed topic on the financial market. Some authors consider it a trend which is set to decline in the future saying that insurance companies will try to find different ways of distribution. Another group of authors see a great potential in this distribution channel. It is apparent that the development of bancassurance will be affected by the actual level of financial services in each particular country.

The theory of bancassurance is dealt with by many authors. When studying these theories it is necessary to distinguish between those approaching bancassurance from the product perspective and those doing so from the operation (product sales) perspective. Both approaches have something in common, however, and that is an internal integration from the perspective of the bank and insurance product and from the perspective of the bank and insurance operations. From the product perspective, bancassurance is often debated about with the term neither being unequivocally defined nor really accepted. Bancassurance from the operation perspective is related to how banks and insurance companies cooperate and how this cooperation develops; it is also related to the creation of variously integrated financial institutions. Authors offer different theoretical perspectives as well as different ways of sorting these kinds of integration.

For these reasons, it seems to be essential, before it is possible to proceed to conduct the research, to introduce a relevant theory of bancassurance and consequently set a theoretical base for the qualitative research evaluation of the financial practice. The crucial part of the qualitative research will be comparing theory and practice. The analysis of bancassurance functioning in practice requires that information and data is collected from the financial institutions which is extremely demanding and difficult. Neither banks nor insurance companies publish information about bancassurance, as a distribution channel, in an extent that might be anticipated supposing how much theory knows about this issue.

In this paper, it shall be determined whether similarities in how the financial group Erste Group Bank is organized also mean similarities in how bancassurance in the selected countries functions. This paper wants to discover more about the level of integration of financial institutions (bank and insurance company) and also financial products (bank and insurance product). The research will be conducted evaluating the financial group Erste Group Bank (hereinafter referred to as EG) which, in 2008, conducted a partnership agreement with the Vienna Insurance Group (hereinafter referred to as VIG). The research is primarily focused on the region of Central and Eastern Europe (CEE). The research will evaluate countries located in the CEE region in which the financial group EG operates: the Czech Republic (CZ), Slovakia (SK), Hungary (HU), Romania (RO), Croatia (HR) and Serbia (RS).

The bancassurance phenomenon that is unquestionably one of the most important trends in the evolution of the European financial services industry can be considered as a consequence of the progressive deregulation of the regulatory barriers to financial conglomerates (Clipici and Bolovan, 2012). Daňhel, Ducháčková a Radová (2008) consider creation of financial groups in the Czech Republic as a trend which shall not be a bank-insurance strategy in the pure form. Daňhel, Ducháčková and Radová (2007) point out that bancassurance is a significant factor stabilizing business risks of both sectors as well as the whole sector of financial services which may, as a consequence, bring more stability to economic systems and better security to clients. On the other hand, they also mention that bank-insurance is a very specific hinderer of further integration and further development of bancassurance products may be dependent on increasing number of wealthier clients who prefer more sophisticated "tailored" products.

Bancassurance is a relatively new type of services and operations which will probably further develop in the future. It is important to consider whether bancassurance has only advantages. From the clients' vantage point, a big development in bancassurance may be a step backwards. The main disadvantages may be found in simplifying and unification of insurance products. Bancassurance is present in every developed economy and it opens up an immense space for a non-price competition among banks. (Čejková, Martinovičová and Nečas, 2011)

Development of bancassurance in individual European countries depends on various factors; most importantly on each country's specifics. Such specifics are dealt with by Polouček (1999) who points out that the strategy of bancassurance is recommended, considered proven and applicable in other countries and regions on the international scale. It also seems to be important to mention that the development of bancassurance is affected by each country's specifics and particularities which has been proven by various researches on bancassurance (Polouček, 1999).

The common denominator of all available definitions of bancassurance is the structured sale of combined financial products to targeted groups of clients. A very high effectiveness can be found in internally interconnected bancassurance product which represents an additional utility value for the end user of such a product as it is tailored for him based on what this end user needs. (Daňhel, Ducháčková and Radová, 2007)

According to Řezáč (2009) bancassurance can be defined as "effective creation and distribution of bank and insurance products for the common group of clients". When selling bancassurance products, the more the insurance products is rooted into the pillar

product of a financial institution, the more it will become its organic part and the better sales it will achieve. (Lím, 2012)

When defining bancassurance, it is necessary to not confuse it with assurfinance. Bancassurance and assurfinance may seem similar because they both create collective sales of bank and insurance products. Approximation of the bank and insurance sectors can be seen as divided into a few stages. At first, concepts of bancassurance and assurfinance were developed. Bancassurance means selling insurance products at the counters in banks. Assurfinance, on the other hand, means selling bank products utilizing insurers which basically is a cooperation in the area of distribution. Financial groups try to gradually develop a concept of allfinance which integrates all financial services. (Ducháčková and Daňhel, 2010)

Illeško (2002) also warns that the term of bancassurance is often defined and understood incorrectly. According to him, bancassurance cannot be confused with what should be referred to as cross-selling. The sale channel of bancassurance can be understood as a channel of selling the financial product which is internally integrated with the financial product and it brings an addition utility value for the end client of the financial institution. The insurance product is sold as a collective policy. An insurance company and a financial institution conclude a collective policy agreement which directly specifies conditions of the policy including insurance conditions.

Banks tend to be the most sought-after partners for sales of insurance products. Banking and insurance sector are two dominant parts of the financial system and they complement each other. In general, there are not as many banks as there are insurance companies willing to cooperate. Around the world, there are many integrated groups and strategic partnerships which, on a national level, do not allow partners cooperate, at least not in a larger extent, with other subjects, no matter how better or more favorable. (Lím, 2012)

Integration of insurance and banking sector and also of other financial services takes place not only in the area of product sales but also in the area of approximation and property integration of financial institutions. For this reason, we sometimes talk about a creation of financial conglomerates which may have very various structures. Integration of financial institutions can be in the form of a total integration, a partial integration with a parent universal bank, an integration with a banking or insurance parent company or a holding structure. The total integration is the highest form of integration. It means an integration of various financial services within one company. All activities are then financed using one capital. This form of integration is more or less constructed by theory. A partial integration with a parent universal bank leads to an organization of financial conglomerates in which the universal bank covers commercial and also investment banking. Utilizing daughter companies, this conglomerates offer other financial services including insurance policies. Integration with a banking or insurance parent company is a type of organization in which the parent company owns, either completely or partially, its daughter companies and through these, it provides clients with financial services (investment banking, insurance policies, other financial services). Finally, a holding structure is a type of organization in which an independent parent company owns all or most shares in independent daughter companies and each of them offers independent financial services. (Ducháčková and Daňhel, 2010)

2 Methodology and Data

This paper aims at determining whether similarities in how the financial group Erste Group Bank is organized also mean similarities in how bancassurance in the selected countries functions. To be able to do this, a qualitative research will be performed and an effort will be made to answer the following research questions: What kind of integration can we find in each examined country? What kind of internal integration have the banking and insurance products achieved in examined countries? In these countries, is there a similarity between the kind of integration and the level of internal integration of the bank and insurance product?

In order to be able to evaluate the integration of the financial group, the sorting method created by Ducháčková and Daňhel (2010) shall be used. This paper will focus on and evaluate bancassurance (not assurfinance) from the perspective of internal integration as defined by Ileško (2002). The internal integration (Ileško, 2002) is evaluated based on these characteristics: Is there a general contract for the bancassurance contract? Does arranging an insurance policy depend on arranging of the insurance product? Are there discounts on insurance products granted for clients of the bank? To answer these questions the following will be performed:

Firstly, basic characteristics of EG in the selected countries will be evaluated, an analysis will be performed, then sorting and comparison. Banks will be specified and this paper shall also look into their ownership structure, market shares (detail deposits, detail loans), customers and branches. Data available on EG's website and also in annual reports of EG as of 2014 will be used.

In the second part, an analysis will be performed, then sorting and comparison of the insurance group VIG. VIG has cooperated with EG since 2008. The strategic partnership also means that these institutions create integrated financial products. Insurance companies belonging to VIG will be specified. Also this time this paper will look into their ownership structure, market share and premium volume. This paper will determine the kind of integration of the financial group. Data available on VIG's and individual insurers' websites and VIG's and insurers' annual reports as for 2014 will be used.

The third part of the research will analyze bancassurance products offered by EG. Their range and most importantly the level of their internal integration will be evaluated. Data available on each insurer's website will be used. There is no relevant data to be found in annual reports of these insurers. Finally, all ascertained results will be analyzed and the research questions will be answered.

3 Results and Discussion

Expansion timeline of Erste group bank AG

EG was founded in 1819 as the first Austrian savings bank. EG went public in 1997 with a strategy to expand its retail business into CEE. Since then EG has grown through numerous acquisitions and organically to become one of the largest financial services providers in the Eastern part of the EU in terms of clients and total assets. "DIE ERSTE österreichische Spar-Casse - Bank AG" merged with "GiroCredit Bank Aktiengesellschaft der Sparkassen" and changed its name in "Erste Bank der oesterreichischen Sparkassen AG" operating under the name "Erste Bank" in 1997. Customer base was 600.000. The new bank went public at the Vienna Stock Exchange in November 1997. The important changes were in 2008. The separation of the Holding and Erste Bank Oesterreich took legal effect. The registered company name of the Holding is "Erste Group Bank AG". Ever since, the registered company name of split-off Erste Bank Oesterreich is "Erste Bank der oesterreichischen Sparkassen AG". Customer base was 17.2 Million.

Table 1 summarizes main characteristics of EG present in selected countries. The summary was performed considering each selected country and when it joined EG. This table also shows shareholders. Shareholders owning less than 1% of shares were ignored. Based on the data (table 1) we can see that in CZ and SK, banks have the highest market share. In these countries, financial groups have been present for 15 years. Their operations have the longest tradition in these countries and their experience reflects that. Another significant country from the market share perspective is RO which joined EG in 2006. The fourth place is taken by HR. HU and RS have the smallest market share. In all these countries, the majority shareholder is EG which has the smallest share in HR (59%) and RS (74%).

Table 1 Timeline of Expansion Erste Group Bank to CEE and Main Characteristics of Bank

Country	Year of entry	Form of entry	Name of bank	Shareholder	Market share in 2015, %		Customer in 2015, million	Branch in 2015
					Retail deposit	Retail loan		
CZ	2000	EB acquired a majority stake in Česká spořitelna, the biggest retail bank.	Česká spořitelna, a.s. (CS CZ)	98.97% (EG)	25.4	22.8	4.8	626
SK	2001	EB became the majority shareholder of Slovenská sporiteľňa, the largest Slovak bank.	Slovenska sporiteľňa, a.s. (SS SK)	100.00% (EG)	26.3	27.5	2.3	289
HR	2003	EB created the 3rd largest banking group in Croatia through the merger of Erste&Steiermärkische Bank d.d. and Riječka banka d.d.	Erste & Steiermärkische Bank d.d. (EB HR)	59.00% (EG) 41.00% (Steiermärkische Bank and Sparkassen)	13.0	13.9	1.2	158
HU	2004	EB and Postabank completed the merger to form Hungary's second largest retail bank.	Erste Bank Hungary Zrt. (EB HU)	100.00% (EG)	6.5	14.2	0.8	128
RS	2005	EB acquired a majority stake in Novosadska banka a.d., Novi Sad from the Republic of Serbia.	Erste Bank a.s. Novi Sad (EB RS)	74.00% (EG) 26.00% (Steiermaerische Bank and Sparkassen)	3.2	4.2	0.4	68
RO	2006	EB finalised acquisition of Banca Comerciala Romana S.A., the biggest bank in Romania.	Banca Comerciala Romana, s.a. (BC RO)	93.58% (EG) 6.30% (SIF Oltenia)	16.6	17.8	2.9	508

Source: Own work based on annual report EG 2014 and EG's website

Expansion timeline of VIG and cooperation with EG

VIG was established by Georg Ritter von Högel Müller as the k.u.k. priv. wechselseitige Brandschaden Versicherung in 1824. During its existence, it has become the largest Austrian insurance group whose majority owner is Wiener Städtische Wechselseitige Versicherungsanstalt-Vermögensverwaltung. VIG expanded into CEE in 1990. The VIG was the first Western European insurance company to make a cautious, risk-conscious move into the CEE region. Acquisition of the insurance operations of the EG at the beginning of 2008, VIG acquired the entire insurance business of the EG in Austria, the Czech Republic, Slovakia, Hungary, Croatia and Romania. As a result of this acquisition, VIG has risen to the top position among insurers that are internationally active in the CEE region and is a leading provider of life insurance. VIG operated in 25 markets in 2014.

Table 2 summarizes main characteristics of the insurance company VIG. The summary shows selected countries and when they joined VIG. It also shows (majority, unless a bank or an insurance company is involved) shareholders. Table 2 also shows what an insurer specializes in and whether or not it also specializes in bancassurance.

Table 2 Timeline of Expansion VIG to CEE and Main Characteristics of Insurance Company

	Market share in 2014	Premium volume in 2014, million €	Insurance company belonging to VIG Life and non-life insurer Specialization	Year of entry to VIG	Shareholder	
CZ	33.6%	1,683.4	Kooperativa pojistovna, a. s., VIG (KOOP CZ)	Life and non-life	1990	96% (VIG)
			Česká podnikatelská pojišťovna, a. s., VIG (CPP CZ)	Life and non-life; motor vehicle	2005	100% (KOOP CZ)
			Pojišťovna České spořitelny, a.s., VIG (PCS CZ)	Life; bancassurance	2008	90% (VIG) 5% (KOOP CZ) 5% (CS CZ)
SK	33.7%	727.0	KOOPERATIVA poisťovňa, a.s. VIG (KOOP SK)	Life and non-life	1991	94% (VIG)
			KOMUNÁLNA poisťovňa, a.s. VIG (KOM SK)	Life and non-life; towns	2001	81% (KOOP SK) 19% (VIG)
			Poisťovňa Slovenskej sporiteľne, a.s. VIG (PSS SK)	Life, bancassurance	2008	90% (VIG) 5% (KOOP SK) 5% (SS SK)
HR	8.4%	90.9	Wiener osiguranje Vienna Insurance Group d.d. (WIENER HR)	Life and non-life	1999	99% (VIG)
			Erste osiguranje Vienna Insurance Group d.d. (ERSTE HR)	Life	2009	90% (VIG) 5% (WIENER HR) 5% (EB HR)
HU	7.4%	180.0	UNION Vienna Insurance Group Biztosító Zrt. (UNION HU)	Life and non-life	2000	100 % (VIG)
			ERSTE Vienna Insurance Group Biztosító Zrt. (ERSTE HU)	Life; bancassurance	2000	90 % (VIG) 5% (UNION HU) 5% (EB HU)
			Vienna Life Vienna Insurance Group Biztosító Zrt. (VIENNA HU)	Life	2014	100 % (VIG)
RS	9.7%	71.7	"WIENER STÄDTISCHE OSIGURANJE" akcionarsko društvo za osiguranje (WIENER RS)	Life and non-life	2003	100 % (VIG)
RO	18.2%	339.7	OMNIASIG VIENNA INSURANCE GROU S.A. (OMNIASIG RO)	Non-life	2005	99% (VIG)
			Asigurarea Romaneasca – ASIROM Vienna Insurance Group S.A. (ASIROM RO)	Life and non-life	2007	86% (VIG)
			BCR Asigurari de Viata (BCRA RO)	Life	2008	94% (VIG) 5.5% (BC RO)

Source: Own work based on annual report VIG 2014 and VIG's website

Having compared ownership structures (table 2) in individual countries, we can sum up that not even in one of the examined countries can we find an organization presented in the theoretical part of this paper as presented by Ducháčková and Daňhel (2010). Cooperation of EG and insurance companies belonging to VIG is based on the strategic partnership concluded in a partnership contract in 2008. It is also important to say that in each country except for RS, the Erste Bank has a market share larger than 5%. This market share is always present in one of the VIG insurance companies and that company specializes in life insurance and bancassurance.

It is important to point out (see table 2) that the biggest similarity in organization and property integration of the insurance group VIG is present in CZ and SK, followed by HU. In this country, VIG does not have an insurance company which is a daughter company of another insurance company. Such similarity cannot be found in any other selected country. Property integration in CZ and SK is connected with the development of EG and

VIG and most importantly, with similar historical development starting in Czechoslovakia. Another very similar country in VIG's organization is RO. Later this paper will evaluate similar countries (CZ, SK, HU, RO) and the level of integration of bancassurance products will be determined.

Integration of bancassurance products

Table 3 shows a comparison of countries which all have very similar organization within VIG. These countries are CZ, SK, HU and RO. The level of bancassurance product integration was also taken into consideration.

Table 3 Bancassurance Products Offered in CZ, SK, HU and RO

Insurance products			
Type of insurance product	Insurer	Level of integration	Note
Life Insurance	PCS CZ	Account kept for free	3 products
Travel Insurance	KOOP CZ	General contract; with a personal account or a card; also for businesses	3 products
Income Shortfall Insurance	PCS CZ	General contract; with a personal account, credits, cards; also for businesses	3 products
CZ Legal Expenses Insurance	KOOP CZ	General contract; optional part of account	
Card and Personal Belongings Insur.	KOOP CZ	General contract; also for businesses	
Motor Vehicle Insurance	KOOP CZ	With current account	2 products
Household and Real Estate Insur.	KOOP CZ	No clear connection with any bank product; discounts for clients of CS CZ	
Life Insurance	PSS SK	No clear integration	2 products
Injury Insurance	PSS SK	With children's bankbook	
Travel Insurance	KOOP SK	With payment cards	
SK <u>Insurance with Consumer Credit</u> <u>Insurance with Mortgage Credit</u> <u>Insurance with Housing Credit</u> Real Estate Insurance	PSS SK	General contract; within contract of credit	4 products; complex insurance
Life insurance	ERSTE HU	With credits	
Injury Insurance	ERSTE HU		
HU Income shortfall insurance	UNION HU	With credits, cards, accounts	2 products
Family House and Household Insurance	UNION HU	With mortgage credits	
Life Insurance	BCRA RO	Better conditions for bank clients; with credits	4 products
RO Real Estate Insurance	OMNIASIG RO	No clear internal integration of product; direct reference to insurer	
Damage Insurance	OMNIASIG RO		
Valuables Insurance	OMNIASIG RO		

Source: Own work based on websites of insurance companies

The comparison conducted in Table 3 makes it possible to state the following. CZ and SK offer the broadest range of products. The products in individual countries differ by their range and internal integration.

SS SK does not offer vehicle insurance and legal expenses insurance. The closely interconnected products are offered by SS SK. These are 4 products provided with credits of SS SK. A particular arrangement of an insurance policy is affected by a general contract. The insurer is SS SK, the other insurer is the company Cardif Slovakia, a.s. (hereinafter referred to as CARDIF SK) and KOOP SK. CARDIF SK is a specialized bank-insurer. It offers specialized bancassurance products and with an insurance product, it is possible to get a suitable bank product. With life insurance, internal integration does not seem to exist.

CS CZ also offers integrated bancassurance products. Unlike SS SK, its offer is more varied. CS CZ offers a broader range of products. Bancassurance products are offered through a general contract, in which CS CZ is the insurer. Individual clients (of insurance) need to apply for insurance. It is namely travel insurance, income shortfall

insurance, legal expenses insurance and payment card insurance and personal belongings insurance. Motor vehicle insurance, insurance of real estate and household is also offered online. Household insurance and insurance of real estate does not show any signs of integration. Clients of CS CZ can obtain a discount. Car insurance is available only for clients of CS CZ. Also life insurance shows no integration with a bank product. In case that life insurance is arranged, personal account is kept free of charge.

Banks in HU and RO offer bancassurance products but it is a different level of integration than in CZ and SK. Life insurance is integrated in both countries with credit. BC RO does not offer insurance of income shortfall unlike EB HU. Both countries offer insurance of real estate. EB HU offers insurance of real estate with a connection with mortgage credits. Property insurance offered by BC RO cannot be considered bancassurance. It is merely an offer of insurance on the bank’s website.

Table 4 shows a comparison of HR and RS which differ by organization within VIG. The level of bancassurance product integration was also taken into consideration.

Table 4 Bancassurance Products Offered in HR and RS

	Insurance products			Note
	Type of insurance product	Insurer	Level of integration	
HR	Life Insurance	ERSTE HR		3 products
	Life Insurance	WIENER RS	With credits	3 products
RS	Travel Insurance	WIENER RS	With credits	
	Property Insurance	WIENER RS	With credits	
	Motor Vehicle Insurance	WIENER RS	With credits	

Source: Own work based on websites of insurance companies

EB HR offers only products of life insurance and on its website it merely states general information about its cooperation with the insurance company ERSTE HR. Insurance can be arranged at the bank’s counters and it is recommended for securing credits. The products of life insurance cannot be considered bancassurance. Based on available information, it is not possible to conduct evaluation of the financial product integration.

EB RS offers, apart from life insurance, also four products of non-life insurance of the insurance company WIENER RS. Products are offered within EB RS’s credits. Information about the products are vague and not explained in detail. For this reason, it is not possible to conduct evaluation of the financial product integration.

Conclusions

This paper aimed at determining whether similarities in how the financial group Erste Group Bank is organized also mean similarities in how bancassurance in the selected countries functions. To be able to do this, a qualitative research was performed and the following research questions were answered: What kind of integration can we find in each examined country? What kind of internal integration have the banking and insurance products achieved in examined countries? In these countries, is there a similarity between the kind of integration and the level of internal integration of the bank and insurance product?

Six countries which are located in the Central and Eastern European region were selected: Czech Republic, Slovak Republic, Hungary, Romania, Croatia and Serbia. In this countries, a partnership agreement between VIG and EG was concluded in 2008. This partnership is the first common feature in the organization. The most significant similarity in organization of EG and VIG is visible in CZ and SK. We can also observe that in these countries, there is the most significant similarity between bancassurance functioning and in financial products integration. Other countries with similarities are HU and RO. Because information provided in Romania is too vague, it is not possible to analyze how bancassurance functions there in more detail.

What kind of integration can we observe in individual countries? Based on the research which was performed, it is possible to state that none of the selected countries shows

any form of integration as presented by Ducháčková and Daňhel (2010). Ownership integration is present in five of the selected countries, in form of ownership of more than 5% of the Erste Bank. EG and VIG cooperate in the form of a strategic partnership thanks to which bancassurance products are offered.

What kind of internal integration have the banking and insurance products achieved in examined countries? This research shows that the highest level of internal integration was reached in Slovakia followed by the Czech Republic's financial market. The next country is Hungary followed by Romania.

In the selected countries, is there a similarity between the kind of integration and the level of internal integration of the bank and insurance product? The kind of integration is identical in all selected countries and it is based on the strategic partnership. We cannot conclude that all countries show the same level of internal integration of the bancassurance product. The highest level is reached in SK and CZ which is probably caused by the fact that both groups, EG and VIG, have been operating in these countries for the longest time as compared with the other selected countries, and probably also by the fact that both countries started their operations at roughly the same time in what was then Czechoslovakia.

Acknowledgments

Research behind this paper was supported by the Czech Science Foundation within the project 16-17796S 'Affiliation with financial conglomerate as a determinant of performance and risk of banks'.

References

- Clipici, E., Bolovan, C. (2012). Bancassurance – main insurance distribution and sale channel in Europe. *Scientific Bulletin – Economic Sciences*, vol. 11 (special issue), pp. 54-62.
- Čejková, V., Martinovičová, D., Nečas, S. (2011). *Poistný trh*. Bratislava: Iura Edition.
- Daňhel, J., Ducháčková, E., Radová, J. (2007). *Analýza globálních trendů ve světovém a českém komerčním pojištění*. Praha: VŠE.
- Daňhel, J., Ducháčková, E., Radová, J. (2008). Hlavní závěry z analýzy globálních trendů ve světovém a českém komerčním pojištnictví. *Pojistné rozpravy*, vol. 22 (2008), pp. 114-118.
- Ducháčková, E., Daňhel, J. (2010). *Teorie pojistných trhů*. Praha: Professional Publishing.
- Erste Group Bank AG (2016), *Annual report 2014*. Retrieved from: <http://www.erstegroup.com/en/About-us>.
- Erste Group Bank AG (2016), *Fact Sheet 2005*. Retrieved from: <http://www.erstegroup.com/en/About-us/ErsteGroup>.
- Illeško, P. (2003). Bankopojištění, jeho výhody a perspektivy v ČR. *Pojistný obzor*, vol. 4, pp. 15.
- Lím, P. (2012). Bankopoištenie je nielen o spolupráci s bankami. *Pojistný obzor*, vol. 2, pp. 20-22.
- Polouček, S. (1999). *České bankovníctví na přelomu tisíciletí*. Ostrava: Ethics.
- Řezáč, F. (2009). *Marketingové řízení komerční pojišťovny*. Brno: MU.
- Vienna Insurance Group (2016). *Annual report 2014*. Retrieved from: <http://www.vig.com/en/investor-relations/downloads/annual-reports.html>.
- Vienna Insurance Group (2016). *Vienna Insurance Group in CEE*. Retrieved from: <http://www.vig.com/en/vig/group/vig-in-cee.html>.

Financial Performance of Czech Subsidiaries under Control of the EU Listed Companies

David Procházka¹

1 University of Economics, Prague
Faculty of Finance and Accounting, Department of Financial Accounting and Auditing
Nám. W. Churchilla 4, Praha 3, 130 67, the Czech Republic
E-mail: prochazd@vse.cz

Abstract: *Entities under foreign control play an important role in economy. In the Czech context, companies with foreign owners generate around 50% of industrial output (Ernest, 2014). Many of these subsidiaries are controlled by parents listed at regulated markets, for which consolidated financial statements in compliance with the IFRS shall be prepared. Czech subsidiaries might form a significant share of corresponding group's results, taking into evidence of Procházka (2016) that just 0.3% of Czech non-financial companies make 30% of aggregate output in non-financial sector (measured by share on total turnover). Furthermore, the analysis of individual corporate data and macroeconomic time series unveil a wide dispersion in the effective tax rates of these companies (Procházka, 2016). The finding implies a conjecture about two-way profit transfers both into and out of the Czech Republic. This paper aims at assessing empirically the financial performance of Czech subsidiaries under control of EU listed companies, including cross-sectional differences in terms of geographic affiliation of the parents. The results indicate relatively evenly distributed return on assets (ROA), but significant differences in return on equity (ROE). Furthermore, the values of ROA are on average higher than ROE, suggesting profit shifting in the groups.*

Keywords: IFRS adoption, financial performance, parent-subsidiary links

JEL codes: M41

1 Introduction

Entities under foreign control play an important role in economy. In the Czech context, companies with foreign owners generate around 50% of industrial output (Ernest, 2014). Many of these subsidiaries are controlled by parents traded at regulated markets, which require reasonable returns on investments and simultaneously pressure for discipline in terms of corporate governance. However, some capital markets (not only in emerging countries, but also in developed countries) are not functioning effectively and weak enforcement enables issuers to manage earnings and other indicators of financial performance in an opportunistic way. The different incentives driving behavior of listed parent can affect the performance of its subsidiaries unexpectedly. The previous research usually addresses environmental, strategic, and organizational factors influencing various measures of financial performance of companies (Capon, Farley, & Hoenig, 1990), (Orlitzky, Schmidt, & Rynes, 2003). Stakeholders' patterns of involvement in corporate strategic decision-making hit the performance decisively (Berman, Wicks, Kotha, & Jones, 1999). Regarding the influence of ownership structure, mixed evidence is available. If corporate control patterns are viewed as exogenous variables, than the concentration of ownership (up-to-certain level) brings positive benefits on shareholder value and profitability (Thomsen & Pedersen, 2000). However, treating the ownership as a multi-dimensional and an endogenous factor does not result in any systematic relation between ownership structure and firm performance, as agency problems elicited by diffuse ownership are compensated by market advantages (Demsetz & Villalonga, 2001).

Another dimension is brought to the issue, if a company is controlled by another firm. From the view of a subsidiary, the parent can execute its influence in positive (value-creation) or negative (value-exploitation) manner (Yang, Mudambi, & Meyer, 2008). Generally, research evidences positive impact of becoming a subsidiary on the subsidiary's performance (Birkinshaw & Hood, 1998), (Delios & Beamish, 2001), (Fang, Wade, Delios, & Beamish, 2007), (Gaur, Delios, & Singh, 2007), (Fang, Jiang, Makino, &

Beamish, 2010). The impact is more pronounced, if the parent comes from a developed country and the subsidiary is located in an emerging market. The transfers (know-how, staff, and technology) from the parent and its commands usually reshape the organizational structure of the subsidiary and improve its performance (Fey & Björkman, 2001), (Luo, 2003). In many cases, such subsidiaries are largest companies in the local economy (Albu, Lupu, & Sandu, 2014) generating a significant share of gross domestic product or tax revenue (Procházka, 2016).

The aim of the paper is to assess financial performance of Czech subsidiaries under control of the EU listed companies. All these Czech subsidiaries have to choose an appropriate strategy to the commands of parents, which face capital market pressures. On one side, the parents may force the subsidiaries to maximize value creation to meet or beat capital market expectations. On the other hand, an acquisition of a subsidiary can be motivated by the vision to exploit market in local territory, even at expense of destroying performance of the subsidiary. Finally, subsidiaries might be used as a tool in profit shifting in or out of the Czech Republic, depending on relative (un)favorableness of local taxation regime to other domiciles of companies within the group. The expected outcome of performance of subsidiaries under control of listed companies is thus unclear.

2 Methodology and Data

The assessment of financial performance will be performed by applying two standard metrics of financial analysis: Return on Assets (ROA) and Return on Equity (ROE).

$$ROE = EAT/Assets \quad (1)$$

$$ROA = EBIT/Equity \quad (2)$$

where EAT is Earnings after Taxation and EBIT is Earnings before Interest and Taxation.

The analysis will be made for years 2009-2013 and individual data will be checked for the existence of any heterogeneity in terms of the domicile of the parent. The domicile of the parent is used as a sorting variable for three reasons. Firstly, the quality of enforcement regimes differ across countries, which may strengthen/impair the parent's incentives to boost performance of the group (Berger, 2010). Secondly, taxation varies across countries as well and the parent's location is used as a proxy to control for this potentially different incentive to shift profits (Heckemeyer & Overesch, 2013). Thirdly, capital markets are distinct in their size and economic importance across the EU countries (Procházka & Pelák, 2015).

Regarding composition of the sample, several sources are utilized. The Amadeus Bureau Van Dijk database is searched for identification of the EU listed companies as well as their Czech subsidiaries. Incomplete and mismatched data on the subsidiaries were manually checked against the Business Register. The number of Czech companies under control of the EU listed companies is determined to be 1,347. The sample selection is presented in Table 1.

Table 1 Czech Subsidiaries under Control of the EU Listed Companies

Type on entity	Number
EU listed companies (non-financial, equities traded)	7,851
Czech subsidiaries of EU listed companies according to Amadeus	1,629
Czech subsidiaries of EU listed companies after manual correction	1,347

Source: Own analysis of records in Amadeus, Business Register

Individual corporate data are extracted from the Albertina database. Descriptive statistics distributed by years are presented in Table 2.

Table 2 Descriptive Statistics of Sample

Year 2009 (n=738)	min	median	max	mean	st. dev.
Assets, tCZK	737	209,186	138,464,258	1,673,416	7,480,203
Equity, tCZK	31	82,769	96,971,980	840,292	4,759,250
Sales, tCZK	2	201,751	177,547,000	2,041,983	9,710,945
EBIT, tCZK	(2,627,154)	9,666	18,692,916	123,844	879,054
EAT, tCZK	(3,261,836)	6,515	15,891,093	95,835	749,072
ROA, %	(161.34)	6.54	101.67	9.00	18.74
ROE, %	(8,879.19)	11.20	215.89	(19.16)	367.73

Year 2010 (n=919)	min	median	max	mean	st. dev.
Assets, tCZK	213	225,641	135,201,054	1,738,756	7,441,211
Equity, tCZK	2	84,525	76,959,460	847,838	4,240,908
Sales, tCZK	1	203,072	208,715,000	2,143,539	10,260,207
EBIT, tCZK	(7,383,528)	11,185	10,595,000	130,842	663,950
EAT, tCZK	(4,859,433)	7,151	9,404,000	107,770	565,267
ROA, %	(173.22)	6.82	104.12	9.50	18.22
ROE, %	(201,650)	11.89	1,410.46	(218.94)	6,656.38

Year 2011 (n=923)	min	median	max	mean	st. dev.
Assets, tCZK	6	223,054	135,571,000	1,800,142	8,736,742
Equity, tCZK	5	82,965	86,359,578	901,914	5,240,411
Sales, tCZK	3	205,600	240,089,000	2,167,108	11,124,923
EBIT, tCZK	(4,022,579)	10,996	14,288,000	141,233	784,401
EAT, tCZK	(4,137,611)	6,922	14,288,000	113,823	719,274
ROA, %	(161.03)	6.97	8,000.00	17.92	263.57
ROE, %	(7,125.00)	11.69	7,240.00	(1.45)	382.39

Year 2012 (n=941)	min	median	max	mean	st. dev.
Assets, tCZK	393	236,291	141,242,000	1,670,241	7,703,766
Equity, tCZK	25	83,385	88,302,000	810,140	4,608,359
Sales, tCZK	2	210,825	246,308,000	2,010,839	10,289,226
EBIT, tCZK	(1,946,592)	12,027	13,259,000	134,849	697,629
EAT, tCZK	(1,958,786)	7,845	13,259,000	106,315	618,199
ROA, %	(1,767.48)	6.98	109.50	5.88	65.18
ROE, %	(6,590.57)	11.88	435.00	(4.59)	254.54

Year 2013 (n=944)	min	median	max	mean	st. dev.
Assets, tCZK	160	238,954	152,001,000	1,948,189	9,272,024
Equity, tCZK	54	82,156	90,316,000	961,722	5,428,879
Sales, tCZK	3	204,554	249,648,000	2,190,499	11,805,188
EBIT, tCZK	(1,538,452)	11,373	30,197,187	183,336	1,259,933
EAT, tCZK	(1,538,452)	7,330	24,037,985	146,688	1,046,383
ROA, %	(272.23)	6.59	1,757.45	9.85	60.02
ROE, %	(8,791.53)	11.50	23,291.03	25.87	849.54

Source: Own calculation using Albertina database

The database contained in total 4,936 years' firm observations, out of which 409 were eliminated because of negative equity (which would make interpretability of ROE perplexed) and 17 observations were dropped out, as not having input on EAT. The final sample contains thus 4,511 observations, which exhibit a quite massive dispersion. As there are different companies listed on capital markets in terms of size, also the size of their subsidiaries varies. The sample of Czech subsidiaries of EU listed companies includes therefore small companies as well as the largest Czech company (Škoda Auto) and other big firms. Final remark to descriptive statistics, extreme values of minimum and maximum for ROA and ROE are result of denominators' values close to zero.

3 Results and Discussion

As the sample characteristics differ significantly, the financial performance indicators of subsidiaries are calculated as weighted, where the weight is calculated as the share of a particular subsidiary's assets on total assets of all subsidiaries with the parent from same country. By assigning size-based weights, bigger companies have a more substantial impact on the subtotals, which corresponds to their higher importance for Czech economy. Respective results are captured in Table 3 and Table 4. The minimum and maximum values (for the number of group-observations higher than 10) for each year are highlighted bold.

Table 3 Return on Assets (ROA)

	2009	2010	2011	2012	2013
AT	4.36%	4.80%	4.48%	3.66%	3.47%
BE	10.52%	8.67%	4.38%	5.60%	6.83%
CY	(0.30%)	1.62%	3.64%	2.49%	8.48%
CZ	3.42%	5.94%	4.53%	5.33%	6.86%
DE	10.97%	7.83%	10.50%	11.09%	12.55%
DK	(1.76%)	2.85%	0.68%	1.66%	2.92%
ES	8.72%	6.21%	6.14%	7.73%	7.88%
FI	7.47%	7.55%	7.80%	4.58%	11.49%
FR	3.32%	8.67%	6.98%	7.62%	6.99%
GB	5.95%	9.87%	6.29%	6.06%	6.16%
GR	4.93%	3.49%	6.19%	14.27%	6.79%
HR	5.09%	9.07%	4.51%	1.75%	3.20%
HU	3.45%	2.94%	0.42%	1.99%	0.37%
IE	4.95%	7.34%	6.57%	8.56%	5.02%
IT	23.26%	16.59%	11.73%	8.03%	6.53%
LU	3.97%	5.57%	3.37%	4.15%	3.07%
MT	(1.79%)	(1.57%)	(5.97%)	(1.32%)	---
NL	(2.71%)	1.12%	1.34%	3.91%	3.26%
PL	6.68%	14.75%	15.19%	10.81%	6.09%
PT	1.09%	2.17%	(0.63%)	(0.66%)	3.28%
SE	15.62%	16.08%	17.11%	18.19%	20.14%
SI	6.30%	5.60%	4.96%	5.15%	5.79%
SK	10.61%	14.04%	19.24%	19.14%	18.65%

Source: Own calculation using Albertina database

The analysis of results reveals several findings. Firstly, ROA is mostly positive for all "parent-subsidiary" links. Negative ROA is recorded just in 9 group-cases, out of which 4 belongs to the Czech subsidiaries of the Maltese parents; 2 to the subsidiaries of the Portuguese parents; and 1 to subsidiaries of Cypriot, Danish, and Dutch parents. However, only in case of Dutch and Danish parents, the number of Czech subsidiaries is greater than 10. In other instances, the count is one or maximum two subsidiaries. Secondly, the ROA group values are evenly distributed across individual "parent-subsidiary" links compared to ROE results. The lowest return on assets is reported by Czech subsidiaries of the Danish listed parents. On the other hand, the subsidiaries of the

Swedish parents reach the highest performance in three out of five years over the period analyzed. Thirdly, over 30 subgroups have negative average ROE for the subsidiaries of the parents from the respective capital markets. Furthermore, the range between maximum and minimum values in particular year is more striking compared to ROA. Fourthly, negative average ROE scores repeat consequently over several years for some country-groups (e.g. Luxemburg, the Netherlands, Malta, etc.). Fifthly, consecutive negative ROE values are usually reverse after several years. This suggests that interperiod transfers of profits are possible only for restricted time-spans.

Table 4 Return on Equity (ROE)

	2009	2010	2011	2012	2013
AT	(59.10%)	5.16%	(3.51%)	6.05%	(9.35%)
BE	16.00%	13.90%	5.56%	(177.54%)	(3.97%)
CY	(9.54%)	3.62%	8.69%	5.03%	27.56%
CZ	5.97%	16.17%	4.40%	9.76%	9.30%
DE	12.31%	13.76%	17.11%	15.45%	17.94%
DK	(14.38%)	5.05%	(20.81%)	(1.48%)	40.61%
ES	14.43%	11.20%	4.10%	13.91%	9.50%
FI	7.62%	8.20%	10.35%	(5.67%)	21.01%
FR	9.09%	8.70%	13.72%	13.08%	13.73%
GB	(3.64%)	(21.88%)	1.64%	13.25%	13.37%
GR	(21.91%)	(18.74%)	9.75%	68.46%	(42.69%)
HR	8.15%	21.10%	8.13%	2.38%	6.69%
HU	10.28%	11.22%	3.68%	5.32%	3.01%
IE	5.17%	33.33%	14.10%	15.64%	17.13%
IT	26.88%	21.54%	(5.10%)	(4.69%)	(21.77%)
LU	(7.10%)	(38.56%)	(112.99%)	(10.62%)	123.45%
MT	(17.88%)	(15.82%)	(86.15%)	(22.98%)	---
NL	(203.87%)	(16.02%)	(10.15%)	0.96%	2.73%
PL	5.31%	27.71%	25.75%	22.25%	10.59%
PT	3.15%	12.73%	(145.05%)	22.50%	10.90%
SE	24.69%	22.80%	24.47%	23.46%	22.26%
SI	9.93%	7.94%	6.89%	6.99%	9.25%
SK	(183.46%)	(14.52%)	21.49%	17.75%	(14.21%)

Source: Own calculation using Albertina database

With reference to results of (Procházka, 2016), demonstrating low effective tax rates of Czech subsidiaries under control of listed companies compared to other economy, the significant differences between (generally positive) ROA and (relatively frequently) negative ROE lead to a conjecture that certain Czech subsidiaries of EU listed companies are engaged in massive profit shifting, esp. through groups' debt financing and tax reliefs and other legal tools of tax avoidance. An exact conclusion could be made only with the knowledge of amount of interest expense/income to affiliated companies. A structure of income statement prepared in compliance with Czech GAAP does not contain this type of information until 2016. However, the information is required to be presented since 2016, which might provide with additional data source to further investigate the ways of profit shifting within multinational groups, incl. relevant amounts.

4 Conclusions

The paper investigates the financial performance of Czech subsidiaries under control of the EU listed companies. Following findings of general business research on "parent-subsidiary" links, the control of a foreign parent from developed country improves financial performance of a subsidiary in developing country. The subsidiaries of publicly listed companies were selected, as capital markets usually exercise higher pressures for conducting business under good corporate governance, which shall in turn have positive impact on the performance. Empirical data from financial statements over period 2009-

2013 indicate mostly positive results for return on assets (ROA). The same dataset indicates, although, that many country-subgroups operate with negative return on equity (ROE). Combined with findings of other studies on effective taxation (Procházka, 2016), this leads to conjecture that the subsidiaries of listed companies are engaged extensively in profit shifting. Future research shall explore the ways of profit transfers, e.g. through intra-group financing structures. The recent amendments in Czech accounting law, requiring separate presentation of transactions (including interest income and interest expense) with related parties, may be helpful in the analysis. Furthermore, firms individual characteristics (such as size, industry, leverage, etc.) shall be investigated as explanatory variables for the dispersion of financial performance of given companies.

Acknowledgments

This paper has been prepared within the research project „*Economic Impacts of the IFRS Adoption in Selected Transition Countries*” (supported by the Czech Science Foundation, No. 15-01280S).

References

- Albu, N., Lupu, I., Sandu, R. (2014). Multinationals as Vectors of Corporate Governance Improvement in Emerging Economies in Eastern Europe: A Case Study. In S. Boubaker & D. K. Nguyen (Eds.), *Corporate Governance in Emerging Markets*. Berlin, Heidelberg: Springer Berlin Heidelberg, pp. 331–349.
- Berger, A. (2010). The Development and Status of Enforcement in the European Union. *Accounting in Europe*, vol. 7(1), pp. 15–35.
- Berman, S. L., Wicks, A. C., Kotha, S., Jones, T. M. (1999). Does Stakeholder Orientation Matter? The Relationship Between Stakeholder Management Models and Firm Financial Performance. *Academy of Management Journal*, vol. 42(5), pp. 488–506. Retrieved from: <http://doi.org/10.2307/256972>.
- Birkinshaw, J., Hood, N. (1998). Multinational Subsidiary Evolution: Capability and Charter Change in Foreign-Owned Subsidiary Companies. *Academy of Management Review*, vol. 23(4), pp. 773–795. Retrieved from: <http://doi.org/10.5465/AMR.1998.1255638>.
- Capon, N., Farley, J. U., Hoenig, S. (1990). Determinants of Financial Performance: A Meta-Analysis. *Management Science*, vol. 36(10), pp. 1143–1159.
- Delios, A., Beamish, P. W. (2001). Survival and Profitability: The Roles of Experience and Intangible Assets in Foreign Subsidiary Performance. *Academy of Management Journal*, vol. 44(5), pp. 1028–1038. Retrieved from: <http://doi.org/10.2307/3069446>.
- Demsetz, H., Villalonga, B. (2001). Ownership Structure and Corporate Performance. *Journal of Corporate Finance*, vol. 7(3), pp. 209–233. Retrieved from: [http://doi.org/10.1016/S0929-1199\(01\)00020-7](http://doi.org/10.1016/S0929-1199(01)00020-7).
- Ernest, J. (2014). Český průmysl je „náš“ jen z poloviny (Only Half of the Czech Industry Is “Ours”). *Statistika&My*, vol. 4(10), pp. 18–19.
- Fang, Y., Jiang, G.-L. F., Makino, S., Beamish, P. W. (2010). Multinational Firm Knowledge, Use of Expatriates, and Foreign Subsidiary Performance. *Journal of Management Studies*, vol. 47(1), pp. 27–54. Retrieved from: <http://doi.org/10.1111/j.1467-6486.2009.00850.x>.
- Fang, Y., Wade, M., Delios, A., Beamish, P. W. (2007). International Diversification, Subsidiary Performance, and the Mobility of Knowledge Resources. *Strategic Management Journal*, vol. 28(10), pp. 1053–1064. Retrieved from: <http://doi.org/10.1002/smj.619>.

- Fey, C. F., Björkman, I. (2001). The Effect of Human Resource Management Practices on MNC Subsidiary Performance in Russia. *Journal of International Business Studies*, vol. 32(1), pp. 59–75. Retrieved from: <http://doi.org/10.1057/palgrave.jibs.8490938>.
- Gaur, A. S., Delios, A., Singh, K. (2007). Institutional Environments, Staffing Strategies, and Subsidiary Performance. *Journal of Management*, vol. 33(4), pp. 611–636. Retrieved from: <http://doi.org/10.1177/0149206307302551>.
- Heckemeyer, J. H., Overesch, M. (2013). Multinationals' Profit Response to Tax Differentials: Effect Size and Shifting Channels. *ZEW Discussion Papers*, vol. 13–045.
- Luo, Y. (2003). Market-seeking MNEs in an Emerging Market: How Parent Subsidiary Links Shape Overseas Success. *Journal of International Business Studies*, vol. 34(3), pp. 290–309.
- Orlitzky, M., Schmidt, F. L., Rynes, S. L. (2003). Corporate Social and Financial Performance: A Meta-Analysis. *Organization Studies*, vol. 24(3), pp. 403–441. Retrieved from: <http://doi.org/10.1177/0170840603024003910>.
- Procházka, D. (2016). Effective Tax Rates in the “Foreign Parent – Czech Subsidiary” Links. In L. Sedmihradská (Ed.), *Proceedings of the 21st International Conference: Theoretical and Practical Aspects of Public Finance 2016*. Prague: Oeconomica, Forthcoming.
- Procházka, D., Pelák, J. (2015). The Development of Capital Markets of New EU Countries in the IFRS Era. *Procedia Economics and Finance*, vol. 25, pp. 116–126. Retrieved from: [http://doi.org/10.1016/S2212-5671\(15\)00720-0](http://doi.org/10.1016/S2212-5671(15)00720-0).
- Thomsen, S., Pedersen, T. (2000). Ownership Structure and Economic Performance in the Largest European Companies. *Strategic Management Journal*, vol. 21(6), pp. 689–705. Retrieved from: [http://doi.org/10.1002/\(SICI\)1097-0266\(200006\)21:6<689::AID-SMJ115>3.0.CO;2-Y](http://doi.org/10.1002/(SICI)1097-0266(200006)21:6<689::AID-SMJ115>3.0.CO;2-Y).
- Yang, Q., Mudambi, R., Meyer, K. E. (2008). Conventional and Reverse Knowledge Flows in Multinational Corporations. *Journal of Management*, vol. 34(5), pp. 882–902. Retrieved from: <http://doi.org/10.1177/0149206308321546>.

Practical Application of Sentiment Indicators in Financial Analysis: Behavioral Finance Approach

Zuzana Rakovská¹, Martin Svoboda²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 60200 Brno, Czech Republic
E-mail: zuzana.rak@gmail.com

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 60200 Brno, Czech Republic
E-mail: Martin.Svoboda@econ.muni.cz

Abstract: Behavioral finance assumes that individual financial decisions are influenced by emotions and mood. A public sentiment and its effect on collective decision-making have been studied in a number of publications giving the vast variety of research design. This paper examines various techniques in measuring market sentiment and its applications in analysis of financial data. Using a qualitative, exploratory approach, the study identifies trends in sentiment indicators and also tries to analytically categorize heuristics and behavioral biases connected to public mood.

Keywords: sentiment indicator, behavioral finance, heuristics and biases

JEL codes: G02, G14

1 Introduction

In traditional market theory bounded with rationality and informational efficiency, sentiment and emotions should appear only as noise, if occurring at all. According to Efficient Market Hypothesis (Fama, 1970), any such noise is immediately corrected by actions of rational arbitragers and as a result, market prices are always at their fundamental values and could not be predicted. Empirical research of financial markets represents a challenge to this traditional theory through concepts of *limited arbitrage* (De Long et al., 1990), or *overreaction* and *underreaction* of market prices to private and public news (Barberis et al., 1998). Taking into account these concepts, irrational behavior of market participants captured by sentiment as well as its relation to market prices and returns, have been widely examined. Recent studies show that sentiment influences market prices and does play a role in formation of future returns (Brown and Cliff, 2005; Baker and Wurgler, 2006; Tetlock, 2007). The question now remains, how to measure sentiment and quantify its effects, and how to assess the best measure mirroring the market performance.

Using comparative and explanatory approach, this paper attempts to describe the wide array of sentiment measures available in literature. We establish a link to behavioral-finance theory in Section 3 in order to show how investor beliefs might be explained. Section 4, divides sentiment measures into three groups according to the method used in deriving the sentiment and provides a comparison of these three approaches. Finally, Section 5 delivers conclusion of this paper.

2 Methodology and Data

The aim of the paper is to comparatively assess and describe various research designs connected to sentiment measure and its application in analysis of financial data. The study evaluates these measures from behavioral-finance point of view and discusses several behavioral biases and heuristics to link them with the theory. We used qualitative and explanatory approach whose main part consists of literature review and documents study.

3 Result and Discussion

Before we move to discussion of various research designs connected to sentiment in financial analysis, we will first evaluate sentiment from behavioral-finance (BF) point of view. BF approach to sentiment might be considered as "bottom-up" approach while it employs behavioral concepts to explain how investors underreact or overreact to past fundamentals (Baker and Wurgler, 2006). Efficient market hypothesis, (Fama, 1970) assumes that market prices follow random walk and that markets are informationally efficient. This means that prices could not be predicted and that all the available information in the market is already incorporated in prices. Any potential mispricing would be immediately corrected by rational arbitragers who would drive the prices back to fundamentals. This concept has been challenged by many authors. De Long et al. (1990) introduced *limited arbitrage* in which rational arbitragers are risk averse and fails to beat *noise traders* (Black, 1986) in the market simply because it is too risky for them. Shleifer and Vishny (1997) emphasized that investor sentiment could not be systematically predicted and hence actions of rational arbitragers are limited. Based on this work, Barberis et al. (1998) discussed *overreaction* and *underreaction* of market prices to consistent patterns of good or bad news (De Bondt and Thaler (1985) and Chan et al. (1996), respectively) as a challenge to traditional theory of efficient market. They linked those anomalies with two behavioral concepts: (1) *representativeness* (Kahneman and Tversky, 1974), defined as a judgmental shortcut that leads to paying too much attention to similarity of events and hence to ignoring the law of probability in the process, and (2) *conservatism*, defined as relatively slow reaction to the new evidence. Authors created a model of how investors form sentiment and how these beliefs affect stock prices and returns. Daniel et al. (1998) followed the similar approach and assumed that stock prices overreact to private signals and underreact to public signals. They examined *overconfidence* (Camerer and Lovo, 1999) as an overestimation of private information and assumed that mistakes (noise) in stock market arise due to misinterpretation of new information by these overconfident traders. Another behavioral concept widely discussed in literature in connection to sentiment is *herding behavior* (Shiller, 2003; Brown and Cliff, 2005; Bormann, 2013). Authors propose a rationale based on the premise that an investor might be more optimistic in the market as a result of "following the herd" of other optimistic investors (Brown and Cliff, 2005).

Sentiment Indicators in Financial Analysis

There are three approaches in obtaining sentiment measures that are specified in the literature:

1. construction of a financial proxy measure,
2. conduction of a survey, and
3. use of sentiment analysis techniques.

Financial-based Measures of Sentiment - Proxy Measures

The first discussed method assumes sentiment to be exogenous and represents an alternative in which the sentiment is captured indirectly, using individual or several market variables as proxies. This approach has been widely established in literature. Lee et al. (1991) introduced closed-end funds discounts as a single market measure of investor sentiment (studied also by Neal and Wheatley, 1998). They found strong evidence that this proxy affects returns of stocks traded by investors. Several other papers discussed individual variable proxies of sentiment. Whaley (2000) examined volatility index (VIX) and its relation to stock market returns or Dennis and Mayhew (2002) used Put-Call Ratio (PCR) to explain volatility skew observed in the prices of stock options.

Alternatively, a combination of several market measures as a proxy for market sentiment has been utilized. Baker and Wurgler (2006) applied six sentiment proxies identified by literature (the closed-end fund discount, NYSE share turnover, the number and average first-day returns on IPOs, the equity share in new issues, and the dividend premium) and constructed the composite "sentiment index" as the first principal component by

employing Principal Component Analysis (PCA). Their study showed that composite sentiment index affects time-series of stock returns but it also assumes that age, size, volatility or profitability of stocks influence this relationship. The same set of sentiment proxies were applied in Baker et al. (2012) where the index for six local stock markets and a global market was constructed to assess effects on international market. Authors found that global as well as local sentiment index is significant predictor of stock returns, again taking into account attributes such as size or volatility. Bai (2014) applied eight sentiment proxies in construction of composite index for EU markets and found strong effects on stock returns and volatility.

Survey-base Measures of Sentiment

Compared to financial-based measures, sentiment extracted from surveys is assessed directly. Generally, sentiment as measured by surveys represents a periodic balance of comments to a selection of questions closely related to a reference variable they are tracking. The recent literature offers wide range of studies concerning sentiment data captured either by weekly, biweekly or monthly surveys conducted on registered set of participants. Brown and Cliff (2005) employed monthly data provided by *Investor Intelligence* (II). II tracks the number of newsletters that are positive (bullish), negative (bearish) or neutral based on the subjective evaluation of expectations about the market direction in the future. To aggregate such data into a sentiment index measure, Brown and Cliff (2005) constructed the *bull-bear spread* as a percentage of bullish (positive) newsletters minus bearish (negative) newsletters on a total set of newsletters. They studied the relation between the sentiment index and asset valuation and found significant evidence that market is overvalued in periods of optimism.

The *bull-bear spread* measure was further employed in Zwergel and Klein (2006), Schmeling (2007), Bormann (2013) or Lupu et al. (2016), who analyzed sentiment data captured by Global Investor Survey conducted by Sentix (www.sentix.de). Participants of this survey are either individual investors (75 %) or institutions (25 %) and from February 2001 when Sentix started, more than 5000 agents have registered. Each participant is weekly asked about their opinion on the market direction for the short (one month) and medium (six months) term for the number of major stock markets in Europe, USA and Japan. Three answers are possible: positive ("up"), neutral ("unchanged") and negative ("down"). Authors examined power of both, individual and institutional investor sentiment to predict stock prices. Both, Zwergel and Klein (2006) and Schmeling (2007) found strong evidence in favor of sentiment predictability of future stock returns in case of institutions and medium term of six months. Forecasting power of private investors sentiment in both terms was not proved. Bormann (2013) assumes that investors sentiment of a market is driven by forces similar across markets and hence he used factor analysis to decompose short term and long term sentiment indexes as calculated by *bull-bear spread* into two behavioral concepts: emotions and mood. Emotions then stand for short term sentiment and mood for long term sentiment and those measures might be used to test sentiment proxies whether they really represent sentiment and which kind of sentiment they belong to.

Sentiment Analysis

The development and rise of the World Wide Web changed the way how information is processed. Firstly, it allowed for transition of many journals into online form and introduced news-feeds. Secondly, it created a space for the user-generated content in form of discussing forums, blogs, posts in social media, etc. Those new means of information processing brought new possibilities to agents sharing their opinions and emotions about individuals, companies or market movements. Since there is an enormous quantity of such content each day, it is impossible to go through each journal article, blog or forum and extract sentiment direction out of it. Instead, a computational technique which detects author's attitude, opinions, emotions and sentiment stored in text called *sentiment analysis*, has been applied. Studies employing this technique are assessing sentiment classification to determine whether the text is objective or subjective

and in case of subjective parts, whether they contain positive, negative or neutral sentiment.

Recently, a number of studies have examined relationship between sentiment extracted through sentiment analysis and market movements. The first group of authors has employed "formal" sources such as financial press and financial live news (Tetlock, 2007; Schumaker et al., 2009). The other group examined sentiment in user-generated content, mainly in form of blogs or posts to social media, such as Twitter or LiveJournal (Gilbert and Karahalios, 2010; Bollen et al., 2011; Smailovic et al., 2014). There are also several studies examining both conventional and unconventional sources of news (Zhang and Skiena, 2010; Yu et al., 2013).

Tetlock (2007) used quantitative content analysis program, General Inquirer (GI), to process daily "Abreast of Market" column issued by Wall Street Journal. In each daily article, he counted words following 77 predetermined GI categories and constructed a *pessimistic factor* employing a principal component factor analysis of these categories. He then studied the influence of this factor on daily US stock market returns measured by DJIA index. Significant evidence of sentiment as a contrarian indicator of future stock returns was found, namely that high levels of media pessimism negatively affects market prices and that unusually high or low pessimism predicts high trading volumes. Conventional source of news was examined also in Schumaker et al. (2009) who employed sentiment analysis on set of financial news data from Yahoo! Finance and found evidence that subjective articles are capable of predicting future trading volumes.

User-generated content in form of LiveJournal feeds was studied in Gilbert and Karahalios (2010). Authors constructed the *Anxiety Index* as a measure of time change in aggregate anxiety and worry across all LiveJournal posts¹. The results showed that *anxiety index* predicts negative pressure on S&P500 returns up to 3-days lag. Bollen et al. (2011) and Smailovic et al. (2014) applied sentiment analysis on general Twitter posts and studied predictive power of derived sentiment towards market returns. While Bollen et al. (2011) employed two publicly available tools for sentiment analysis (OpinionFinder and GPOMS), Smailovic et al. (2014) developed Support Vector Machine (SVM) classifier. Both used Granger causality test to show that the model for stock returns prediction is significantly improved after the sentiment dimension is included.

Finally, Zhang and Skiena (2010) and Yu et al. (2013) in their studies processed both, conventional and unconventional news to deliver daily sentiment polarity towards multiple financial markets. They then studied its relation to stock market performance measured by stock returns. Zhang and Skiena (2010) showed significant correlation between sentiment polarity of both, formal news and Twitter posts, and stock market returns up to 3-day lag. Yu et al. (2013) attempted also to compare forecasting power of overall, conventional and social media. They found that overall media performs better in predicting stock returns than conventional media only.

Sentiment Indicators - Comparison

Following the literature review, **financial-based measures of sentiment** of both local and global markets, significantly affect stock returns and volatility. Their practical application is based mainly on their historical availability in financial data streams, such as Bloomberg, Thomson Reuters or Barron's (for example, sentiment proxies such as *put-call ratio* or VIX have been widely incorporated into those data streams). Although financial-based variables were employed not only in construction of market sentiment proxies but also in capturing individual investor sentiment (Kumar and Lee, 2006; Schmitz et al., 2007), this approach does not allow for controlling of factors like sophistication of investors (Schmeling, 2007). Furthermore, Sibley et al. (2016) argues that sentiment index constructed in Baker and Wurgler (2006) has a little significance in predicting stock returns because there is a business cycle component which biases the measure. Overall, financial-based measures of sentiment depend on initial assumptions about their feasibility to stand as a proxy for sentiment. This feature might cause problems with interpretation of model results in case the exogeneity of sentiment is not

correct. This risk might be overcome when direct measure of sentiment is in place, hence many studies have started to deal with endogenously given sentiment measures that might be captured by financial surveys.

Sentiment indexes obtained from survey data reflect direct measures of sentiment as an expectations of survey participants on future markets direction. Sentix as a one possible measure of sentiment is now directly available in digital news repositories as Bloomberg, CEIC or Thomson Reuters. Since financial-based measures takes sentiment as exogenous by use of market proxies, direct approach to sentiment might be considered more feasible in explaining the model results. Moreover the decomposition of *bull-bear spread* into emotions and mood (Bormann, 2013) might serve for testing purposes whether proxy measures as offered by Brown and Cliff (2005) or Bai (2014) really capture sentiment and whether they are short or long term indicators. However, the dispute on three questions is present, namely how representative the survey participants are, how large is the gap between how people respond versus how they behave in reality and whether weekly/monthly frequency of indexes is capable of predicting future stock returns in a sufficiently reliable way. The mitigation for the first two questions might be assessed by placing the mechanism for controlling reliability of investors (mainly those institutional) participating in the survey. The risk of the third one can be removed by incorporating higher frequency data on sentiment which might not be feasible in survey-based approach simply because of the incentives of respondents to participate in more-than-a-weekly surveys. The solution to data frequency might be offered by the recent concept of sentiment analysis.

Sentiment analysis represents a recent approach in delivering indirect measure of sentiment polarity and subjectivity by employing textual analysis of both formal (financial news and press) and informal (social media and user-generated content) news. Similarly to sentiment index offered by sentix, sentiment analysis is now being incorporated into financial news repositories including Bloomberg or Thomson Reuters. Sentiment analysis approach allows for daily observations which was not feasible in survey-based approach and hence might be used to create more sophisticated trading models. However, while this approach in context of financial analysis is still in its beginnings, the model results depends on how the textual data were processed and whether the analysis controlled for uniqueness of financial data and all its features affecting mainly subjectivity component of sentiment.

Table 1 summarizes this section.

Table 1 Comparison of Sentiment Indicators

	Financial-Based Measures	Survey-Based Measures	Sentiment Analysis
Nature of Sentiment	Indirect (Sentiment considered to be exogenous)	Direct	Indirect (Sentiment derived from the text)
Measure	- Individual sentiment proxies (Closed end-fund discounts, PCR, VIX, etc.) - Composite Sentiment Index (Baker and Wurgler (2006); Baker et al. (2012))	Bull-bear spread	- Polarity index, Subjectivity index - Pessimism factor (Tetlock, 2007), Anxiety Index (Gilbert and Karahalios, 2010)
Frequency	daily	weekly/monthly	daily
Features of Sentiment	- Individual/Institutional Sentiment - Local/Global market Sentiment	- Individual/Institutional Sentiment - Local/Global market Sentiment - Short/Long term Sentiment	- Individual/Institutional Sentiment - Local/Global market Sentiment

Application in Financial Data Stream	Bloomberg, Thomson Reuters, Barron's, MSN Money, Market Watch, Trading Markets, etc.	Bloomberg, Thomson Reuters, CEIC, Factset, Macrobond Financial	Bloomberg, Thomson Reuters
Positives	- wide application of indexes in financial data streams	<ul style="list-style-type: none"> - sentiment measured directly - immediate possibility to distinguish between individual/institutional sentiment, short/long term sentiment - through decomposition into emotions and mood -> possibility to test financial proxies whether they really measure sentiment (Bormann, 2013) 	<ul style="list-style-type: none"> - allows for high-frequency sentiment data - great potential due to rising importance of user-generated content - possibility to extract opinions on any company, individual, market, etc.
Negatives	<ul style="list-style-type: none"> - measure possibly biased due to business cycle component (Sibley at al., 2016) - difficult to distinguish between individual and institutional sentiment - proxy measure -> difficulties in interpreting the model results 	<ul style="list-style-type: none"> - data are weekly/biweekly/monthly -> models with daily prices is not possible - number of observations limited to the number of times the survey was conducted in a history - representativeness of survey participants - gap between how people respond to survey and how they behave in reality 	<ul style="list-style-type: none"> - sentiment data depends on techniques employed in sentiment analysis (how the subjectivity or polarity is evaluated) - application on financial news only recent

Source: Own, based on conducted analyzes

4 Conclusion

This paper used qualitative and explanatory approach in order to assess different research designs connected to sentiment measure. We discussed sentiment as it is seen by behavioral finance and identified four behavioral concepts connected to it, namely (1) *representativeness heuristic*, (2) *conservatism*, (3) *overconfidence*, and (4) *herding behavior*. Following the literature, sentiment measures were decomposed into three groups according to the method used to extract them from the data. In the first approach, sentiment indicators are taken as exogenous and are represented by individual or multiple financial-variable proxies. Sentiment indicators constructed in this way, such as *put-call ratio* or VIX are widely applied in financial data streams applications. However, the measures bear several limitations from which the potential difficulties in interpreting the model results are the most important. The second approach employs financial surveys that offer direct measure of sentiment data most commonly serving for construction of *bull-bear spread*. This approach provides direct measure of sentiment from which it is possible to immediately distinguish between individual and institutional sentiment. Nevertheless, survey-based indicators are being challenged due to their relatively low frequency of observations (weekly or even monthly) as well as due to their dependence on reliability of survey participants. The last approach examined, sentiment analysis, represents the novelty in financial literature. It uses computational techniques in order to extract sentiment from the both formal (financial press and news) and informal (blogs, forums, social media) sources of news. This method has wide potential due to the rise of user-generated content which allows for construction of high-frequency data on sentiment. The drawbacks of sentiment analysis lie in a method employed in evaluation of subjectivity and polarity of textual data which might be limited due the relative novelty of this approach in field of finance.

References

- Bai, Y. (2014). Cross-border sentiment: an empirical analysis on EU stock markets. *Applied Financial Economics*, vol. 24(4), pp. 259-290.
- Baker, M., Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. *Journal of Finance*, vol. 61(4), pp. 1645-1680.
- Baker, M., Wurgler, J., Yuan, Y. (2012). Global, Local, and Contagious Investor Sentiment. *Journal of Financial Economics*, vol. 104(2), pp. 272-287.
- Bandopadhyaya, A., Jones, A. L. (2008). Measures Of Investor Sentiment: A Compartaive Analysis Put-Call Ratio vs. Volatility Index. *Journal of Business*, vol. 6(8), pp. 27-34.
- Barberis, N., Shleifer, A., Vishny, R., Shefrin, H. (1998). A Model of Investor Sentiment. *Journal of Finacial Economics* vol. 49, pp. 344-380.
- Black, F. (1986). Noise. *Journal of Finance*, vol. 41(3), pp. 529-543.
- Bollen, J., Mao, G., Zeng, X. (2011). Twitter mood predicts the stock market. *Journal of Computational Science*, vol. 2(1), pp. 1-8.
- Bormann, S.-K. (2013). *Sentiment Indices on Financial Markets: What Do they Measure?*
- Brown, G. W., Cliff M. T. (2005). Investor Sentiment and Asset Valuation. *The Journal of Business*, vol. 78(2), pp. 405-440.
- Camerer, C., Lovallo, D. (1999). Overconfidence and Excess Entry: An Experimental Approach. *The American Economic Review*, vol. 89(1), pp. 306-318.
- Chan, L. K. C., Jegadeesh, N., Lakonishok, J. (1996). Momentum Strategies. *The Journal of Finance*, vol. 51(5). pp. 1681-1713.
- Daniel, K. D., Hirshleifer, D., Subrahmanyam, A. (1998). Investor Psychology and Security Market Under- and Overreactions. *Journal of Finance*, vol. 53(6), pp. 1839-1886.
- De Bondt, W. F. M., Thaler, R. (1985). Does the Stock Market Overreact? *Journal of Finance*, vol. 40(3), pp. 793-805.
- De Long, J. B., Shleifer, A., Summers, L. H., Waldmann, R. J. (1990). Noise Trader Risk in Financial Markets. *Journal of Political Economy*, vol. 98(4), pp. 703-738.
- Dennis, P., Mayhew, S. (2002) Risk-Neutral Skewness: Evidence from Stock Options. *Journal of Financial and Quantitative Analysis*, vol. 37(3), pp. 471-493.
- Fama, E. (1970). Efficient capital markets: a review of theory and empirical work. *The Journal of Finance*, vol. 25(2), pp. 383-417.
- Gilbert, E., Karahalios, K. (2010) Widespread Worry and the Stock Market. *In Proceedings of the 4th International AAAI Conference on Weblogs and Social Media*, pp. 58-65.
- Kahneman, D., Tversky, A. (1974) Judgment under Uncertainty: Heuristics and Biases. *Science (New York, N.Y.)* vol. 185(4157), pp. 1124-1131.
- Kumar, A., Lee, C. (2006) Comovements. *The Journal of Finance*, vol. 61(5), pp. 2452-2485.
- Lee, C., Shleifer, A., Thaler, R. (1991). Investor Sentiment and the Closed-End Fund Puzzle. *Journal of Finance*, vol. 46(1), pp. 75-109.
- Lupu, I., Hurduzeu, G., Nicolae, M. (2016) Connections between Sentiment Indices and Reduced Volatilities of Sustainability Stock Market Indices. *Economic Computation and Economic Cybernetics Studies and Research*, vol. 50(1), pp. 157-175.

- Neal, R., Wheatley, S. M. (1998). Do Measures of Investor Sentiment Predict Returns? *Journal of Financial and Quantitative Analysis*, vol. 33(4), pp. 523-547.
- Schmeling, M. (2007). Institutional and individual sentiment: Smart money and noise trader risk? *International Journal of Forecasting*, vol. 23(1), pp. 127-145.
- Schmitz, P., Glaser, M., Weber, M. (2007). *Individual Investor Sentiment and Stock Returns - What Do We Learn from Warrant Traders?*
- Schumaker, R. P., Zhang, Y., Huang, C.-N. (2009). Sentiment Analysis of Financial News Articles. In *Proceedings of 20th Annual Conference of International Information Management Association*, pp. 1-21.
- Shiller, R. J. (2003). From Efficient Markets Theory to Behavioral Finance. *The Journal of Economic Perspectives*, vol. 17(1), pp. 83-104.
- Shleifer, A., Vishny, R. W. (1997). The Limits of Arbitrage. *The Journal of Finance*, vol. 52(1), pp. 35-55.
- Sibley, S. E., Wang, Y., Xing, Y., Zhang, X. (2016). The information content of the sentiment index. *Journal of Banking and Finance*, vol. 62, pp. 164-179.
- Smailovic, J., Grcar, M., Lavrac, N., Znidarsic, M. (2014). Stream-based active learning for sentiment analysis in the financial domain. *Information Sciences*, vol. 285(1), pp. 181-203.
- Tetlock, P. C. (2007). Giving Content to Investor Sentiment: The Role of Media in the Stock Market. *The Journal of Finance*, vol. 62(3), pp. 1139-1168.
- Whaley, R. E. (2000). The investor fear gauge. *Journal of Portfolio Management*, vol. 26(26), pp. 12-17.
- Yu, Y., Duan, W., Cao, Q. (2013). The impact of social and conventional media on firm equity value: A sentiment analysis approach. *Decision Support Systems*, vol. 55(4), pp. 919-926.
- Zhang, W., Skiena, S (2010). Trading Strategies to Exploit Blog and News Sentiment. In *Proceedings of the Fourth International AAAI Conference on Weblogs and Social Media*, vol. 34, pp. 375-378.
- Zwergel, B., Klein, C. (2006). *On the Predictive Power of Sentiment: Why Institutional Investors are Worth Their Pay.*

The Impact of the Features of Healthcare Providers in Poland on their Costs in the Accounting System

Monika Raulinajtys-Grzybek¹, Katarzyna Frankowska², Wojciech Matuszewicz³

¹ Warsaw School of Economics
Department of Management Accounting
Al Niepodległości 162, 02-554 Warszawa, Poland
E-mail: mrauli@sgh.waw.pl

² Warsaw School of Life Sciences
Nowoursynowska 166, 02-787 Warszawa, Poland

³ The Agency for Health Technology Assessment and Tariff System
I. Krasickiego 26, 02-611 Warszawa, Poland
E-mail: sekretariat@aotm.gov.pl

Abstract: *The article presents the analysis how costs of healthcare providers are explained by their main characteristic features. Cost data was obtained from the accounting systems of several healthcare providers operating in Poland. The study involved the costs of hospital wards, which are the final cost centers providing inpatient services. Cost data for each ward was grouped into categories related to main resources used. The information from the accounting system has been prepared in an uniform manner by the hospitals for the purpose of regulatory pricing of health services. The analysis included the impact of features of healthcare providers on the level of costs as well as unit costs of key resources, such as doctors, nurses, or the ward's infrastructure. Explanatory variables were nonfinancial features describing the activity of the ward, including medical specialty, location, type of hospital, legal form (public or private), and number of mandays.*

Keywords: accounting system, cost data, healthcare providers

JEL codes: M41, I11

1 Introduction

Uniform reporting of detailed cost data by healthcare providers takes place in many countries, in particular where pricing of health services is regulated, carried out by an external regulatory body and performed on the basis of information on the cost of the implementation of individual services (Raulinajtys-Grzybek, 2014). Such action usually involves the collection of financial and non-financial data (including medical data), which is the basis for setting the price (Waters and Hussey, 2004). Countries use different data for pricing and perform it differently, but in most countries in the European Union cost data on level of hospital wards is gathered (Busse et al., 2006; Busse et al., 2011).

Actual information about costs of organizational units allows taking conclusions on the cost of individual health services and the factors affecting their level. In consequence, such an approach enables defining health services in a way that best captures the level of costs. Cost homogeneity is one of the basic assumptions of the DRG system, which is commonly used in Europe for reimbursing most of the hospital services (Busse et al., 2011). There are publications that take into consideration how factors related to the patient (such as age and co-morbidities, and even the place of origin) influence the level of costs (e.g. Wood and Thomas, 1986, Hughes et al., 1989, Evers et al., 2002). In some healthcare systems prices differ among geographical regions or the location of the healthcare providers (Raulinajtys-Grzybek, 2015). There is however lack of systematic research on the impact of the factors related to the healthcare provider.

In 2015 the implementation of a regulated pricing of health services has been initiated in Poland. It is performed by a public institution dependent on the Ministry of Health - The Agency for Health Technology Assessment and Tariff System. In the first year the prices of selected health services have been set based on gathered information: both medical

data and financial information on costs of selected resources, in particular human resources and infrastructure. The method of reporting such information was not subject to significant changes, which enabled to use them for conducting a comparative analysis of costs of selected hospital wards.

The aim of the article is to analyze the impact of selected non-financial factors characterizing the hospital ward on the level of certain cost categories and to examine what is the significance of this impact.

2 Methodology and Data

In order to indicate the effect of selected non-financial factors on the costs of hospital wards the data on 273 hospital wards has been collected. The data was collected by the Agency for Health Technology Assessment and Tariff System from the hospitals that voluntarily participated in the process of data reporting, and covered the years 2013 and 2014. The analyzed sample is therefore intentional and includes 53 cardiology wards (CARD), 104 wards of internal medicine (INTERNA), 54 intensive care units (ICU) and 62 surgical wards (SURGERY). Another feature was legal form - 241 wards were located in public entities (PUBL), while 32 in private entities (PRIV). Wards have also been characterized in terms of the size of the city according with the Act of 1998 - 133 of them were located in the provincial cities (BIG), 63 in the former provincial cities (MIDDLE), and 77 in small cities (SMALL). The last feature was the scope of activities of the ward and its specificity - 25 branches were in teaching hospitals (TEACHING), 55 in specialist ones (SPECIALIST), 104 in regional ones (REGIONAL), 65 in local ones (LOCAL), and 24 in single-specialty hospitals providing just one type of the services (MONO). In addition to the above features, each of the wards has been described by the following information:

- number of days of hospitalization provided (MANDAYS),
- number of working hours of doctor and nurses in full time equivalents (FTEs) (DOCTORS, NURSES).

For each of the ward the providers have been asked to fill the uniform form and determine the following numbers:

- total cost of the hospital ward (TOTAL_COST),
- cost of pharmaceutical and disposable medical devices (PHARMA),
- cost of medical procedures performed for patients by other cost centers or purchased outside the hospital (PROC),
- total payroll costs, as well as the salaries of doctors and nurses (WAGES, WAGES_DOCTORS, WAGES_NURSES).

For the purpose of analysis, the following transformations have been performed to get additional dependent variables:

- infrastructure costs (INFRA) is calculated using the following formula:
 $TOTAL_COST - PHARMA - PROC - WAGES$
- remuneration of doctors and nurses per FTE (UNIT_WAGE_DOCTORS, UNIT_WAGE_NURSES) is calculated using the following formulas:
 $WAGES_DOCTORS / DOCTORS$ and $WAGES_NURSES / Nurses$

In order to evaluate the influence of non-financial variables on the dependent variables linear regression has been applied. We have examined normality of the distribution of dependent variables and rejected outliers based on studentized residuals. Tests were carried out at random (RESET test), normality (Shapiro-Wilk test), autocorrelation (Durbin-Watson test) and homoscedasticity of residues (White and Breusch-Pagan test). Depending on the results of the tests we used the classical and generalized least squares method. The analysis has been carried out using the SPSS, SAS and Gretl software.

3 Results and Discussion

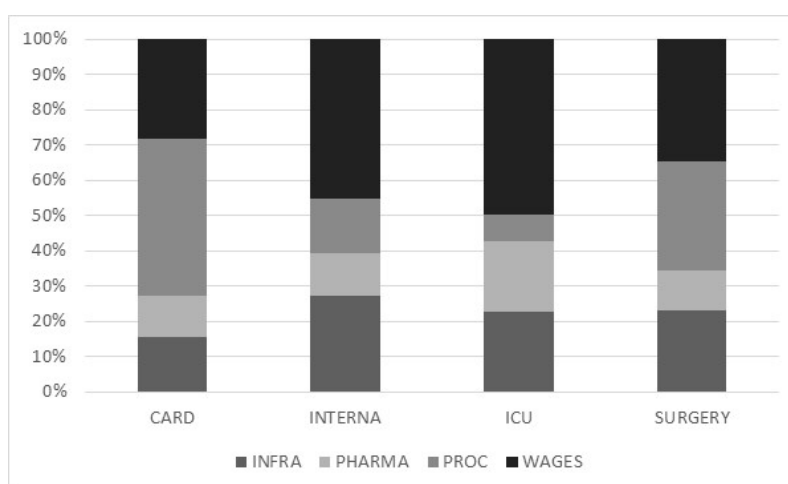
Files have been filled by the hospitals' accounting staff based on data registered in financial accounting systems. The employees received uniform instructions on what should be included under the various categories:

- TOTAL_COST should include the total costs of the center during the period, both direct and indirect allocated using the keys that guarantee a causal relationship in the allocation of costs,
- PHARMA should include all the costs of pharmaceuticals and disposable medical devices used in a given period for all patients; it should be noted that it is a common practice in hospitals to recognize the cost of these materials when they are issued from the central warehouse to hospital wards – it is caused by the lack of proper information systems for documenting the moment of using materials,
- PROC should include the costs of external medical procedures as well as medical procedures provided by other cost centers allocated using the keys that guarantee a causal relationship in the allocation of costs; it should be noted that hospitals could choose the allocation keys they used.
- WAGES should include the costs of salaries as well as fringe benefits, i.e. all costs associated with personnel working in the hospital ward, regardless of the form of contract.

Reasoning about the factors affecting the level of costs has been made with authors' awareness of the existing discrepancies in the reported data caused by different access to information and the lack of uniformity in the applied allocation keys.

The main factor influencing the level of costs is the medical specialty of the hospital ward. In surgical wards or wards conducting costly diagnosis higher costs of the procedures can be expected, while the non-surgical wards should have higher share of the internal resources of the ward – employees and infrastructure. Preliminary conclusions have been confirmed by the analysis of the cost structure in wards of different medical specialty (Figure 1).

Figure 1 Cost Structure by Medical Specialty



Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

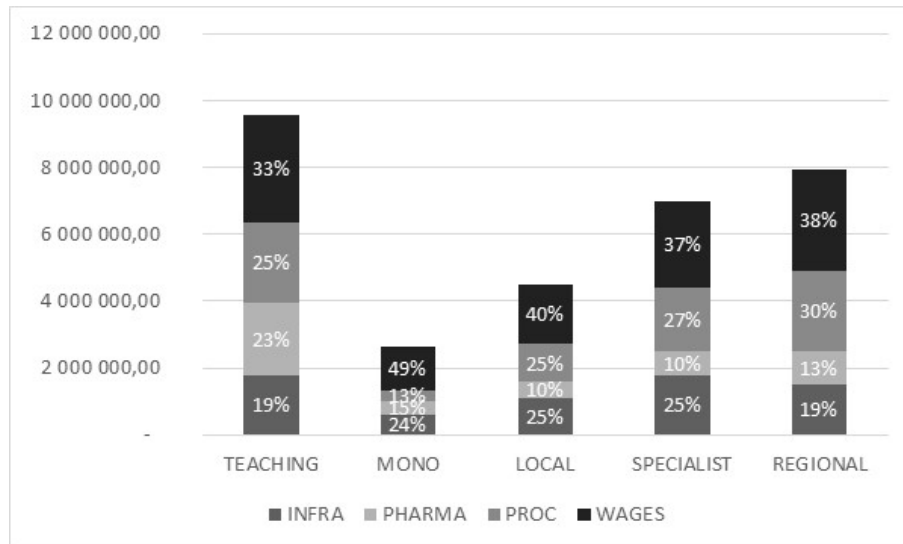
Wages have the highest share in the cost structure intensive care units. Low costs of procedures are also characteristic for this type of hospital ward as the treatment is performed mainly within the ward – and results in high costs of pharmaceuticals. Wards of internal medicine have a similar structure, although a share of procedure costs is higher with lower costs of pharmaceuticals.

In cardiology wards largest share have the cost of procedures – mainly due to high cost of hemodynamic procedures realized within a well-developed invasive cardiology. A

similar cost structure occurred in surgical wards, which primarily perform procedures in the operating theatre.

The impact of other non-financial characteristics is more difficult to predict. Figure 2 shows the cost structure in different types of hospitals. The figure shows the nominal values in order to illustrate the difference in total cost in different types of hospitals.

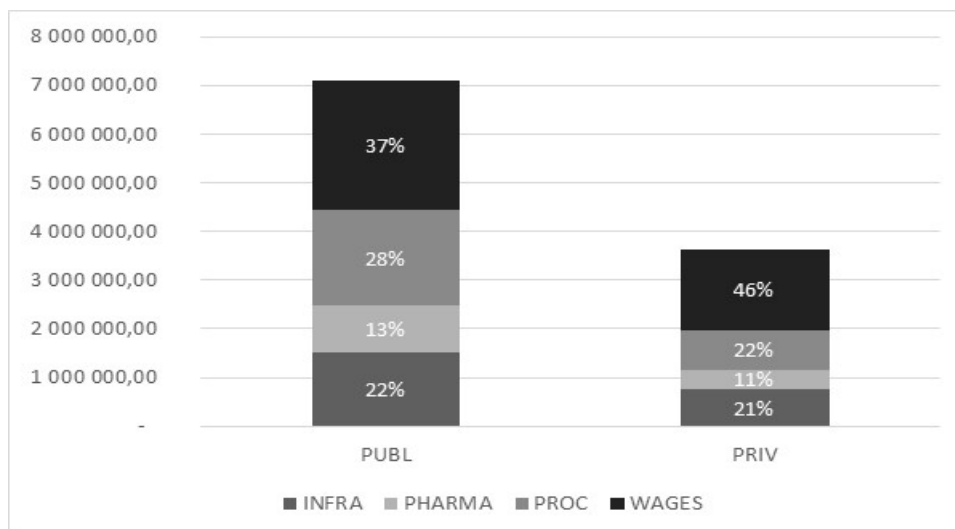
Figure 2 Cost Structure by Type of Hospital



Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

In single-specialty hospitals there is a high share of costs of wages and infrastructure. At the same time wards in these hospitals are characterized by the lowest level of total costs. Local, regional and specialist hospital have a similar cost structure, although attention is drawn by the lower costs of infrastructure in regional hospitals, as well as in teaching hospitals. The common opinion is that these hospitals in the DRG reimbursement system have a more difficult financial situation due to the fact that they treat the most difficult cases and do not receive proportionally higher payments. Moreover, teaching hospitals spend much more money on pharmaceuticals - the share of PHARMA costs in these wards is 23% with the average for the other wards at the level of 12%.

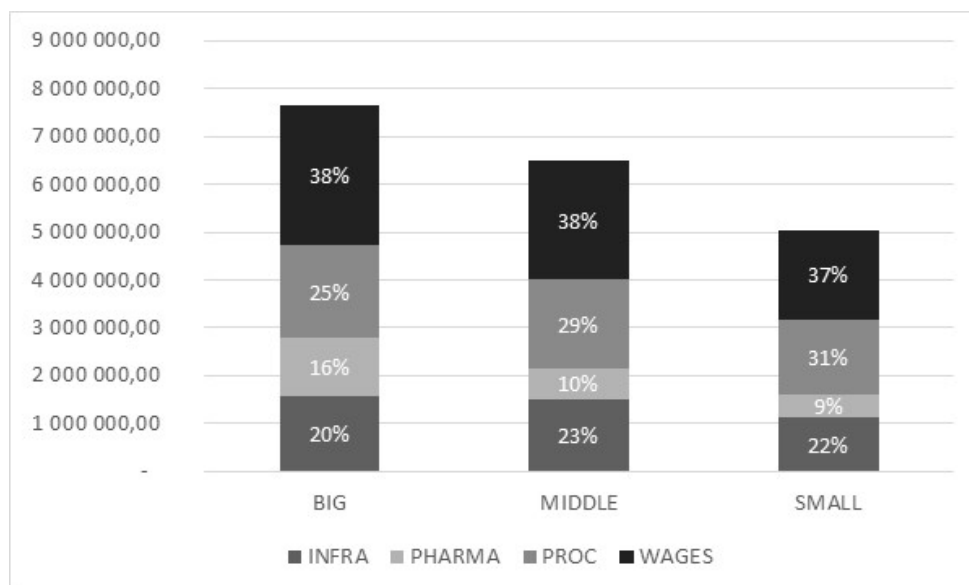
Figure 3 Cost Structure by Legal Form of the Hospital



Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

Figure 3 shows a comparison between the cost structure of private and public hospitals. Conclusions formulated for particular types of hospitals are consistent with a cost analysis among legal forms. Private hospitals are usually hospitals with one medical specialty, with relatively higher costs of wages and lower costs of pharmaceuticals. At the same time the average size of wards in these units is smaller than in the case of public hospitals.

Figure 4 Cost Structure by Location



Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

Figure 4 presents the cost structure in the wards located in cities of all sizes. The share of costs of wages and infrastructure is similar, but the share of procedure costs is higher in smaller cities and the share of pharmaceutical costs the opposite way – are higher in bigger cities. This may be caused by the fact that teaching hospitals with high costs of pharmaceuticals are located in the big cities.

In the next step, we tested the impact of non-financial factors in the value of each dependent variable. Table 1 shows the estimate of the infrastructure cost.

Table 1 Model of INFRA Costs

	Value	Standard error	T-test	p-value
Constans	249361	114563	2,177	0,0304
MANDAYS	107,517	6,32292	17	8,27E-45
PUBL	207351	96309,5	2,153	0,0322
CARD	343316	93213,3	3,683	0,0003
ICU	1,01E+06	98089,2	10,32	2,50E-21
SURGERY	454100	73407,9	6,186	2,23E-09
REGIONAL	-439454	76679,1	-5,731	2,62E-08
LOCAL	-494147	82759,7	-5,971	7,27E-09
MONO	-594432	125197	-4,748	3,31E-06

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

The coefficient of determination (R^2) for this model is 61%, which means that the variables included in the model explained 61% of the variation of infrastructure costs. Its cost depends primarily on the number of mandays realized, or in other words – the size of the ward. It is higher for public hospitals than private ones. At the same time it is lower for regional, local, and single-specialty hospitals compared to teaching and

specialist hospitals, among which the cost does not differ significantly. Nominally, the lowest infrastructure costs were registered in internal wards (despite their relatively high share in the cost structure), while the highest were registered in the intensive care units. The size of the city where the hospital is located, is significantly correlated with the type of hospital - often local hospitals are located in small and teaching hospitals in large cities.

Table 2 Model of PHARMA Costs

	Value	Standard error	T-test	p-value
Constans	-138657	38389,4	-3,612	4,00E-04
MANDAYS	59,9416	3,86434	15,51	1,74E-39
CARD	107757	78550,2	1,372	1,71E-01
ICU	982286	96024,3	10,23	4,80E-21
SURGERY	149433	36906,4	4,049	6,68E-05

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

Table 2 shows the estimation of the cost of pharmaceuticals. The coefficient of determination (R^2) for this model is 52%. The cost of pharmaceuticals depends on the number of mandays. The highest pharmaceutical costs occurred in ICU wards, lower in cardiology and surgery, and the lowest in internal medicine wards. Despite the fact that the analysis of the cost structure for teaching hospitals showed a significantly higher share of the costs of pharmaceuticals, this variable was not included in the model as important.

Table 3 Model of PROC Costs

	Value	Standard error	T-test	p-value
Constans	-416245	183213	-2,272	2,39E-02
MANDAYS	32288,1	4195,55	7,696	2,84E-13
CARD	2,00E+06	513046	3,89	1,00E-04
ICU	660480	149189	4,427	1,40E-05
SURGERY	1,47E+06	183803	8,002	3,93E-14
LOCAL	-339014	68821,3	-4,926	1,49E-06

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

Table 3 shows the estimation of the cost of the procedures. The coefficient of determination (R^2) for this model is 42%. The cost of the procedures depends on the size of the wards reflected with the amount of mandays. It is highest in cardiology and surgery, lower in intensive care, and nominally the lowest in internal medicine wards. In addition, the cost of the procedures is significantly lower in wards located in local hospitals.

Table 4 shows the estimation of total costs of wages. The coefficient of determination (R^2) for this model is 67%. The cost of wages depends on the size of the ward reflected with the amount of mandays. It is highest in the intensive care units, slightly lower and comparable in cardiology and surgery, and the lowest in internal medicine wards. In addition, the cost of wages is significantly lower in local and single-specialty hospitals, and the highest in teaching hospitals, which is mainly due to large differences in the total cost level of these hospitals.

Table 4 Model of WAGES Costs

	Value	Standard error	T-test	p-value
Constans	432670	123849	3,494	0,0006
MANDAYS	59,9416	3,86434	15,51	1,74E-39
CARD	688731	125182	5,502	8,65E-08
ICU	1894650	131286	14,43	1,79E-35
SURGERY	696773	95006,2	7,334	2,55E-12
LOCAL	-582670	80535,6	-7,235	4,72E-12
TEACHING	277044	139724	1,983	0,0484
MONO	-688298	149809	-4,595	0,00000663

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

In order to obtain comparable data about wages across wards, for two main personnel groups - doctors and nurses - we calculated wages per hour. Table 5 and 6 show the estimation of the costs of wages of doctors and nurses calculated per one hour. The coefficients of determination (R^2) for these models are low and are respectively 16% and 6%.

Table 5 Model of UNIT_WAGE_DOCTORS Costs

	Value	Standard error	T-test	p-value
Constans	48,3876	1,35131	35,81	1,98E-113
ICU	21,808	3,26517	6,679	1,08E-10
SURGERY	8,8913	2,32405	3,826	2,00E-04
REGIONAL	7,5809	1,95466	3,878	1,00E-04

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

Unit wages of doctors are higher in ICU wards, and surgical wards. Interestingly, the highest wages are in wards located in regional hospitals. It should be noted, however, that the coefficient of determination for this model is very low. It shows that the cost of salaries of doctors are largely explained by variables not included in the model. This may be the level of expertise or competence of personnel, and other factors.

Table 6 Model of UNIT_WAGE_NURSES Costs

	Value	Standard error	T-test	p-value
Constans	25,0748	0,369001	67,95	1,17E-186
REGIONAL	2,39462	0,562982	4,253	2,80E-05
TEACHING	3,18259	0,899145	3,54	5,00E-04

Source: Authors according to data from Agency for Health Technology Assessment and Tariff System

The coefficient of determination for the model describing the remuneration of nurses is even lower. Unit wages of nurses are the highest in teaching hospitals, and secondly - as salaries of doctors - in regional hospitals.

The last two models indicate that non-financial factors characterizing hospital wards only to minimal extent affect the salaries of both doctors and nurses.

4 Conclusions

The article analyzed the relationship between non-financial factors describing the hospital wards and the level of selected cost categories. Financial data is one of the most important sources of information used for pricing health services. Knowledge about the

factors influencing the level of costs may be used in determining the prices of services taking into consideration the specifics of the hospital wards, as well as be useful for comparative analyzes.

We have taken into consideration the following non-financial factors: the medical specialty of the hospital ward, the legal form of the healthcare provider, location of the hospital, as well as the hospital type. Dependent variables included the cost of infrastructure, pharmaceuticals and disposable medical devices, procedures, wages, and unit costs of wares of doctors and nurses per hour.

The results showed that the total costs depend mainly on the size of the ward measured by the number of mandays, as well as its specifics. The same service provided in different departments - for example, internal medicine and surgical - will engage resources with significantly different costs. For most variables the type of hospital turned out to be important. This variable is significantly correlated with the size of the city, which therefore was not included in any model as important. Legal entity of the healthcare provider proved to be significant only in relation to the cost of infrastructure.

Included variables are not the only ones that affect the costs, although for most dependent variables the models created describe well their variability. The exception were the unit costs of wages of doctors and nurses, which only slightly depend on the factors included in the model. A limitation of the model is also a fact that the analysis used the cost statements prepared by various healthcare providers using different allocation keys. This introduces limitation to this analysis and creates a field for further research.

References

- Act 1998.96.603. Ustawa z dnia 24 lipca 1998 r. o wprowadzeniu zasadniczego trójstopniowego podziału terytorialnego państwa.
- Agency for Health Technology Assessment and Tariff System. Financial and non-financial information on costs of hospital wards. Unpublished report.
- Busse, R., Geissler, A., Quentin, W., Wiley, M. (eds.) (2011). *Diagnosis-related groups in Europe: moving towards transparency, efficiency and quality in hospitals*. McGraw-Hill/Open University Press, Maidenhead.
- Busse, R., Schreyögg, J., Smith, P. C. (2006). Editorial: hospital case payment systems in Europe. *Health Care Management Science*, vol. 9(3), pp. 211-213.
- Evers, S., Voss, G., Nieman, F., Ament, A., Groot, T., Lodder, J., Boreas, A., Blaauw, G. (2002). Predicting the cost of hospital stay for stroke patients: the use of diagnosis related groups. *Health Policy*, vol. 61(1), pp. 21-42.
- Hughes, J. S., Lichtenstein, J., Magno, L., Fetter, R. B. (1989). Improving DRGs. Use of procedure codes for assisted respiration to adjust for complexity of illness. *Medical Care*, vol. 27, pp. 750-757.
- Raulinajtys-Grzybek, M. (2014). Cost accounting models used for price-setting of health services: An international review. *Health Policy*, vol. 118(3), pp. 341-353.
- Raulinajtys-Grzybek, M. (2015). *Pricing health services: Transaction cost approach*. Anchor Academic Publishing, Hamburg.
- Waters, H. R., Hussey, P. (2004). Pricing health services for purchasers – a review of methods and experiences. *Health Policy*, vol. 70(2), pp. 175-184.
- Wood T. J., Thomas S. E. (1986). Severity of illness and diagnosis related groups. *Medical Journal of Australia*, vol. 145, pp. 79-81.

Prediction of Future Development of the World Economy under Conditions of Negative Interest Rates

Oldřich Rejnuš

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 601 00 Brno, Czech Republic
E-mail: rejnus@econ.muni.cz

Abstract: *The paper deals with the problems of contemporary way of using interest rates within the framework of monetary regulation, with special focus on cases when extremely low, or even negative rates are applied. The first part is focused on theoretic definition of the meaning and function of interest rates in financial and economic system in the sense of „standard“ economic theory, or in accordance with individual economic approaches. Subsequently, the influence of contemporary extremely low or even negative interest rates of central banks are analyzed, as well as their influence on the activities of economic subjects, with special attention to individual sorts of financial institutions, namely its influences on their economic results and on fulfilment of their mission. And, subsequently, it defines and characterizes the impacts of contemporary monetary policy of the world most important central banks on functioning of economy of individual the most important states or multinational economic units, as well as world global economy. Based on achieved results, future development is predicted, both from the point of view of economic development and from the standpoint of future impacts on contemporary human society.*

Keywords: economy, financial system, interest rates, monetary policy, household wealth

JEL codes: E43, E44, E47, G01, G17

1 Introduction

Recently, non standard ways of management of individual countries' economies can be observed worldwide. It is a result of the fact that financial crisis, which started in the year 2008, has not been satisfactorily solved; it has not only been overcome, it has been gradually deepening; at present, it endangers both financial systems of the most important countries of the world and the whole global economy.

Monetary policy plays a significant role in contemporary management of national or supranational economies, respectively. It is because contemporary crisis factors are not of the same type as those that emerged in the past, within "traditional" depressions that appeared within economic cycle. At the moment, we speak about financial crisis; it exists despite of the fact that economies of most states have been slowly growing. It is a result of the fact that crisis phenomena are under process in financial systems of individual states (in case of the Eurozone within the whole supranational community), as well as in world financial system. Since the financial system is an integral part of related economic system, it is obvious that its potential collapse must inevitably affect real economy. It means, in other words, that unless we manage to solve contemporary financial crisis, collapse of real economy on all levels can be reckoned.

2 Methodology and Data

Contemporary problems of world economy did not originate all by itself; it is a result of a number of reasons that arose from erroneous, or possibly intentional destructive operation of people. It is obvious that in order to get a chance to solve it, it is necessary to analyze current situation both in financial systems and economies of individual countries, as well as in global world financial system and global economy. Nevertheless, it is necessary not only to deal with economy, including finances, but with a number of related factors.

Used methodology represents a combination of qualitative and quantitative analysis. Qualitative component of performed research is represented by findings of economic theory that are subsequently compared with contemporary way of management of the most important world economies. As for economy, following theoretical approaches are applied: „*Classical theory of interest rates*“, „*Liquidity preference theory of interest rates*“, „*The loanable funds theory*“, and „*The rational expectations theory of interest rates*“, where monetary economy is represented, namely „*Fischer’s quantity theory of money*“. With regard to quantitative constituent, it is based on economic data which have been taken from Eurostat database, US Department of the Treasury and Trading economics.

3 Results and Discussion

Theoretically–economic conception of the importance of interest rates

Interest rates can be considered to be one of the most significant factors of market operations of financial markets. Classical economists allege that: “the level of interest rates, or mere expectation of their changes, significantly determine behaviours of all subjects that make business at financial markets. With regard to the fact that both borrowers and investors can pass between its individual segments, interest rates are factors that mutually interconnect the whole financial market and help keep it balanced”. As financial market can be perceived as an inseparable part of related financial system, which is an inseparable part of related economy, its exceptional importance both in national economies and global world economy is obvious.

Following most important functions are guaranteed by interest rates in financial system and by means of it in economy (Giddy, 1994; Rose, Marquis, 2009):

Regulate the flow of common savings into investments, which supports economic growth.

Allocate distribution of disposable financial resources into the most profitable investments with the shortest period of return.

Bring offer and demand of money into balance.

Taking into account its influence on the amount of savings and investments, they represent exceptionally important regulation tool kept by the state.

Above mentioned facts show that interest rates are an extraordinarily important factor that influences the operations of economy and keep it balanced, which means effectively functioning condition. It means that their correct height and high flexibility are inevitable for the economy to be able to perform its unique function, which means satisfying (gradually growing) final consumption of the population and increasing general welfare and quality of human life.

How do individual economic attitudes (theories) face economic importance of interest rates? „*Classical theory of interest rates*“ considers interest rate to be a bonus, paid to creditors for “sacrifice” their current consumption for a promise of higher consumption in the future. Or, by other words, for providing their disposable monetary funds to realize investments that should increase abilities of the economy to produce, and subsequently, it should meet the needs of their citizens. To the contrary, „*Liquidity preference theory of interest rates*“ considers interest rate to be a reward for providing liquidity, which the owner of the money gave up and received less liquid securities (or in given case bonds), where the interest rate depends on the length of this period. „*The loanable funds theory*“ considers interest rate to be the main factor, influencing exchange rates in following way – the higher the interest rates in one state, compared with foreign countries, the higher demand for its bonds; this results in growth of local currency. As far as the theory „*The rational expectations theory of interest rates*“, is concerned, it delineates the importance of information regarding future development of interest rates (in the same way as in case of inflation). Broadly speaking, the principle of “inertial inflation” is transferred into the principle of “inertial development of interest rates”, which means that if public opinion on future development of interest rates is created, it will subsequently influence future development of nominal interest rates.

All four mentioned interest rate theories show that the importance of interest rates in the economy is undisputable. Nevertheless, it is undisputable that all of them "work" solely with positive interest rates; it follows that negative interest rates are, from the point of view of theory of economy, unimaginable.

Currency regulation has, apart from absolute value of exchange rate, another related tool, which is goal-directed influencing of amount of money in money circulation. In this area, too, there is a number of economic attitudes that use different ways to work with so called quantitative theory of money, which is based on statement that the offer of money (monetary supply) directly influences price level. There is a number of individual theoretical attitudes, before all Fisher transaction equation; it is based on David Ricardo's opinion that: "the value of money changes in inverse proportion to its amount in circulation". Irving Fisher introduced his commonly known "Equation of Exchange" in his book "The Purchasing Power of Money" (Fisher 1922):

$$M \cdot V = P \cdot T \quad (1)$$

Where: M – money supply, V – velocity of circulation, P – average price level, T – volume of physical transactions of goods and services.

The left side of the equation expresses cash flow within certain period of time, the right side expresses monetary value of transactions, realized within this time period. In other words, this is "macroeconomic condition of balance"; unless it is met, mechanisms are activated that establish equilibrium by means of price-level change.

Analysis of economic impacts, incurred as a result of extremely low, or even negative interest rates

Extremely low interest rates signalize serious macroeconomic problems, where negative interest rates evidence extreme problems. It implies that purpose-built use of negative interest rates mean non-standard (and insufficiently verified) non-conventional ways of monetary regulation that might, beside usually only partial immediate remedy, significantly and on long-term basis breach operation of economics in the future. There is even a threat of significant and irremovable negative impacts.

At present, more and more central banks worldwide are announcing negative interest rates. European Central Bank, Bank of Japan and Swiss National Bank belong to the most important ones, but Central Bank of Denmark and Central Bank of Sweden joined the trend.

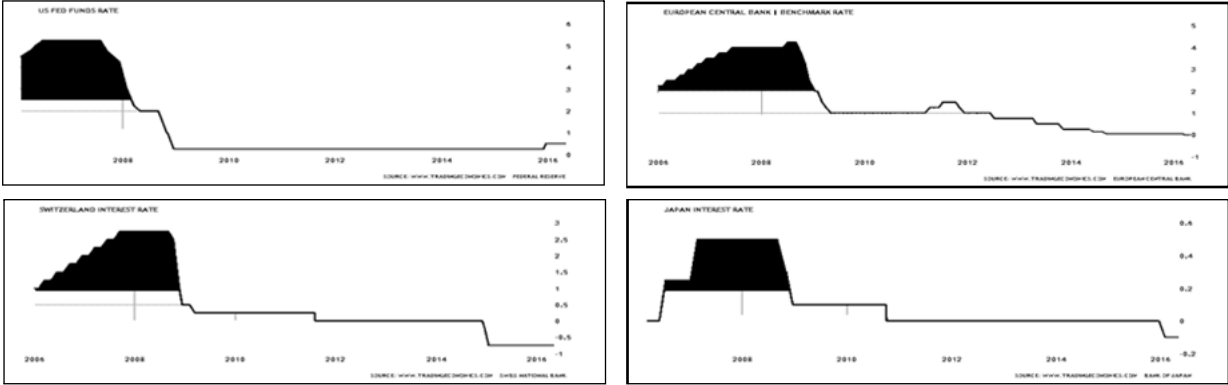
At the moment, only deposit rates are concerned, which are short-term interest rates applied by central banks to commercial banks deposits. The purpose is to make commercial banks to activate lending of non-banking economic entities and support economic growth. On the other hand, there is a question, what would happen if negative interest rates affected non-financial economic entities, too, or what are the dark sides of using negative interest rates and what sort of risks they bring into financial system and into economy?

This topic has been discussed on professional level for a number of years; it is obvious that contemporary policy of extremely low interest rates of central banks cannot be analysed separately, but as an inseparable part of expansive monetary policy. This is being applied by central banks of overwhelming majority of countries, attempting to boost economy. Nevertheless, with regard to extreme indebtedness of households, companies and states, implementation of classical tools is less and less effective, which leads to searching for non-standard tools and their implementation. Extremely low or even negative interest rates, often and intensively used, together with "printing money" is partly a result of central banks policies to depreciate domestic currencies to support export, domestic consumption and investment, but, at the same time, it is an attempt to decrease the impacts of extremely high indebtedness of states, corporations and growing number of households.

This form of monetary policy is far from being only positive; it can cause a number of both unpredictable and predictable consequences. For example analytics of American Goldman Sachs warned central banks that: “non-conventional stimulation measures have their limits and in the end, they can harm economies as well as help them” (Urbánek 2015). They gave the opinion that: “excessive and non-conventional activity of central banks can result in consequences that governments and companies “become lazy”; they should, before all, struggle to boost economic growth. In this respect, it can even bring inverse effect and it might be extremely hard to cancel these stimulation measures.” Opinions of other economists are very similar. For example, the governor of the Czech National Bank Singer (2006) mentioned, when he came back from the meeting of the International Monetary Fund that “negative interest rates do not bring, from the point of view of demand support, any relief for central banks. At the same time, he presented an opinion that “monetary policy itself can hardly return world economies to long-term path of growth”, which is in agreement with economic theory that “the role of monetary policy is not to influence long-term economic trends, but to absorb oscillation of economic cycle” (Mishkin 2016).

Figure 1 shows that contemporary interest rates of central banks are extremely low on a long-term basis and they have been still dropping; ten-year development of main interest rates FEDu, ECB, and central banks of Switzerland and Japan (four so called “majors”).

Figure 1 The Development of Main Interest Rates of Central Banks for Four Main World Currencies



Source: Trading Economics

What are (or will be) the most important impacts of negative interest rates as a tool of monetary policy of central banks? Following areas of problems have been discussed the most often:

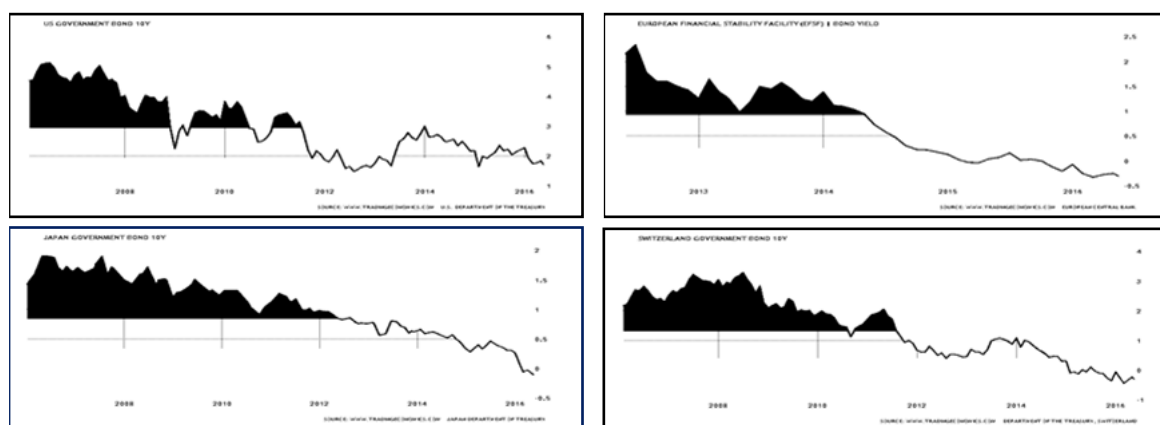
Suppression of the function of market allocation mechanism of monetary funds into the most effective investment projects: This means denial of the importance of interest rates in the sense of “Classical theory of interest rates” in the sense that unless there is interest, paid by debtors for borrowing money, efficacy of their investing cannot exist, either. These days, the validity of this theory can be proved for example by current bankruptcies of oil companies and shale gas companies that would never had been opened if “normal” interest costs would have been applied.

Suppressing of interest to invest into debt instruments: When the interest rates are low, the interest to save or invest into debt instruments decreases; in case of negative interest rates, it is nonsense to save money in banks, or to change them for any classical debt investment tools.

Following Figure 2 shows ten years period of decrease of profitability of long-term (ten year) bonds of the US, Switzerland, Japan and Eurozone (EFSF bonds were used in this particular case). It proves the fact that the trend is on long-term basis in all mentioned cases; it started in 2008 as a result of financial crisis development. Furthermore,

profitability of long-term bonds starts getting negative in some countries and there are no signs of return to normal status.

Figure 2 Example of a Decade of Decrease of Ten-year Bonds Issued by the US, Eurozone (EFSF bonds), Japan and Switzerland.



Source: Trading Economics

The following chart shows contemporary distortion of bond markets in a number of significant countries from the point of view of profitability of their long term bonds, depending on actual size of their public debt, related to gross domestic product.

Table 1 Indebtedness of Selected States and Profitability of Their Ten-year Bonds

State	Debt to GDP [%] (December 2015)	Government bonds 10Y [% p.a.] (May 2016)
United States	104.2	1.71
China	43.9	2.90
Japan	229.2	- 0.11
Russia	17.9	8.79
United Kingdom	89.2	1.38
India	66.4	7.45
Brazil	66.2	12.25
Australia	33.9	2.25
Eurozone/*	90.7	*/EFSF - 0.31
Germany	71.2	0.13
France	95.8	0.47
Italy	132.7	1.48
Spain	99.2	1.61
Portugal	129.0	3.18
Belgium	106.0	0.52
Greece	176.9	7.42

Source: Trading Economics*/EFSF-The European Financial Stability Facility

The chart shows that Eurozone countries and Japan are the most distorted; their central banks have been using the tool of negative interest rates.

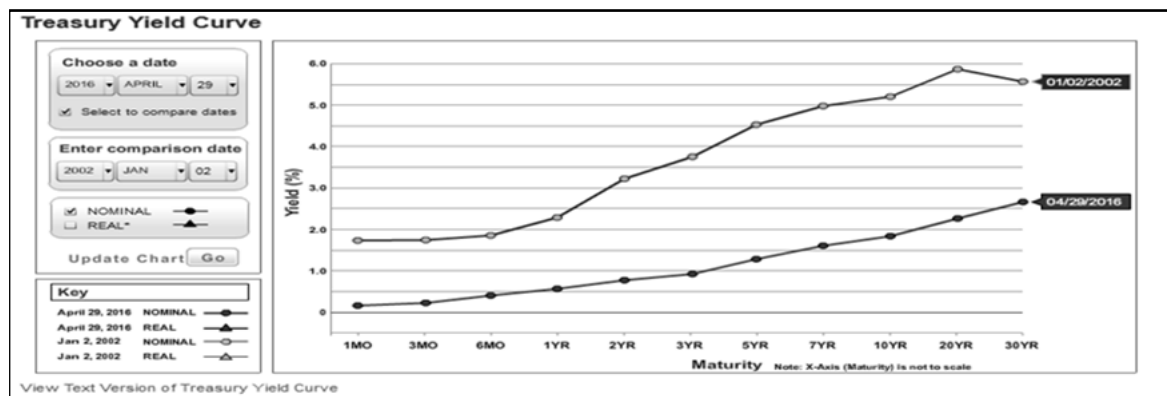
Support of investments into shares: Extremely low or even negative interest rates decrease revenues of debt tools, which results in demand for alternative investment instruments, before all shares. In connection with it, their rates are growing; in a number of countries, this led to formation of speculative share bubble (especially in case that commercial banks and central banks take part in the business).

Support of investments into real assets, especially into real estate: Extremely low (or negative) interest rates result in inflation expectations, which means increased

demand for active assets. In view of the fact that the interest rates are almost zero, demand for mortgage loans and subsequently for real estate has been growing; subsequently, prices of real estate are growing too, which leads to speculative bubble in the real estate market.

Negative impact on economic activities of commercial banks: There is a rule that bank assets are usually on long-term basis, but they are financed by short-term liabilities. This shows that banks gain Net Interest Margin from the difference between short term and long term interest rates. In case of extremely low interest rates, the yield curve is malformed in a way that its standard, "roughly logarithmic" shape is "getting flattened", as we can see in figure 3.

Figure 3 Comparison of Historical Yield Curve of American Government Debentures, Issued in January 2002 (after Speculative Bubble Burst in 2001) and Similar Contemporary Curve (after the First Increase of Interest Rates by FED in December 2015).



Source: US Department of the treasury

The above mentioned figure shows that in the US, the differences in profitability of short-term and long-term assets are currently significantly lower than usually, compared with the year 2002; further decrease of interest rates would result in further reduction.

Negative impact on economic activities of pension companies or pension funds: This is very important risk factor related to the fact that liabilities of the funds are calculated by the method of discounting of future liabilities. It is important to say that, as Ender says (2016), there are so called "Defined contribution funds" that pay the sum the person saved, increased by the sum of revaluation, but there are "Defined benefit funds" that made commitment to pay pre-agreed sums. These funds are deeply endangered by decreasing of interest rates; the lower the interest rates, the higher the liabilities and the more assets they need that would have to, in case of negative interest rates, exceed the nominal value of liabilities. This makes the owners of such funds enter risky business, and sometimes even to technical insolvency.

Change of standard properties of financial investment assets and liabilities: Financial investment instruments represent property that bring revenue to its owners (or it is supposed to bring it in the future); on the contrary, (financial) liabilities can be, in this case, defined as obligations. But what will happen with investment assets and liabilities that are in balance sheets (balances) of financial institutions in case of negative interest rates? In such cases, it might result in turning their properties, which would mean assets would bring negative (nominal) revenue, while liabilities would bring positive (nominal) revenue. This would mean complete change of behaviours of business participants at financial markets with disastrous consequences. In such a case, bonds would be bought, due to negative revenues, solely by speculators for the purpose of short-term possession, moreover only in cases that even deeper decrease of interest rates was expected.

Unpredictable development in derivative markets: It is estimated that the total value of derivative instruments, or futures, and structured products, amount to one quadrillion (one thousand trillion) US dollars (Snyder 2014) worldwide. Many of them are subject of interest, monetary or credit instruments that might show unexpected price development in case of change of valuation or change of interest, or (in case of credit derivatives) they might "activate". Such risks can be considered to be highly extreme.

Dependence of commercial banks and other financial institutions and potential investors on central banks: Riskiness of this factor is based on the fact that central banks are more and more influential and they are more and more involved in economy management. It means that, although their representatives are not elected bodies, they more and more decide on economic courses of states. Currently, the situation is very serious; the principle that the development of market prices is decided by market outcomes of their issuers is not valid anymore; the rule "the worse the better" is slowly becoming valid. This is a consequence of expectations that every new problem will result in further easing of monetary policy.

Support of further indebtedness of all economic subjects: extremely low or even negative interest rates result to further indebtedness of states, companies and households. As the statement "stimulation causes further stimulation" is considered to be proven, it is obvious that the longer the period of this monetary policy is, the more difficult it would be to change it. At present, we are worried, before all, that the extent of indebtedness exceeded "point of irreversibility" and the way back is impossible.

Creating conditions for future galloping inflation or hyperinflation, or alternatively monetary reforms: These issues are theoretically dealt with by monetary economy. Despite the fact that there are several partly different theoretical attitudes, there is one thing they all have in common: they turn attention to the fact that in case central banks start "printing money" it would lead to inflation. In this case, Irving Fisher's equation of exchange can be used; it suggests that under condition of contemporary "printing" money the circulation of money speeds up, it would result at least in galloping inflation; the later it happens, the higher the inflation will be in future.

Prediction of future economic development in case of long-term use of negative interest rates and "printing" money

When analyzing impacts of negative interest rates, the factor of time must be considered. In such a case factor of time means the period of time in which central banks would purposefully announce negative interest rates. The length of the period when they are used plays an important role as far as their impacts and consequences are concerned.

Short-term, or operative use of negative interest rates can be analyzed on national levels. It follows that central banks of individual countries (except for Eurozone countries) pursue monetary policy independently, or at their own discretion and in various periods. This is why these negative interest rates, usually not very drastic, are before all psychological.

In case that negative interest rates are used on long-term basis, moreover in cooperation with further printing money, following development can be predicted: in the beginning, the economy will be "pseudo-stabilized", but it will be redeemed by further indebting (which has been happening right now); one day, critical limit will be exceeded. Further expansion, including printing further money and further decreasing interest rates will be enforced (it means even more negative values). Commercial banks will not be able to bear it anymore and they will introduce negative interest rates of bank deposits; it will result in complete lack of interest in deposits and bonds, panic withdrawing money and unsatisfiable panic demand for liquidity. This will be followed by restricting and gradual cancellation of cash money and forced changeover to electronic money. It will cause the end of both economic and personal freedom and will result in mass riots and collapse of economic systems on all levels.

In case that the critical level of indebtedness is exceeded (the point of irreversibility, which cannot be exactly defined, but it is believed it has already been exceeded in a

number of countries) and central banks tried to stop the process of further growth of indebtedness and increased interest rates, market interest rates would grow, too. It would cause bankruptcies of many economic entities, including a number of states, this would result in domino effect; bankruptcies would spread worldwide by means of banking and financial systems. There is a reason to assume that bankruptcies of states will start (due to common currency) in the most indebted countries of southern wing of Eurozone (Sulík 2012; Robejšek 2015; Rejnuš, 2015), followed by disintegration of the Eurozone and subsequently of the whole European Union (at the same time, there are other important states where bankruptcy is not excluded). This will cause serious disruption of the whole global economy and will cause the same catastrophic result as the previous case.

4 Conclusions

The analysis shows that negative (for now mostly deposit) interest rates of central banks can be currently considered to be a tool of psychology, to put pressure on commercial banks to be more willing to provide loans to non-financial subjects and to depreciation of domestic currencies within ongoing monetary wars. Nevertheless, in case they move into more negative values, and subsequently were transferred to clients of banks, they would become extremely dangerous for economy. The longer is this non-standard tool used, the more serious consequences would be brought; at the same time, it cannot be separated from other non-conventional tools of monetary regulation, especially from printing money.

References

- Ender, V. (2016). *Záporné úrokové sazby: Centrální banky by měly nechat experimentů*. Retrieved from: <http://finmag.penize.cz/ekonomika/309339-zaporne-urokove-sazby-centralni-banky-by-mely-nechat-experimentu>.
- Fischer, I. (1922). *Die Kaufkraft des Geldes: ihre Bestimmung und ihre Beziehung zu Kredit, Zins und Krisen*. 2. Aufl. Berlin: W. de Gruyter & Co.
- Giddy, I. H. (1994). *Global financial markets*. Lexington: D.C. Heath.
- Mishkin, F. S. (2016). *The economics of money, banking, and financial markets*. 11.th. global edition. Boston: Pearson.
- Rejnuš, O. (2014). *Finanční trhy*, 4.th ed. Praha: Grada.
- Rejnuš, O. (2015). Contemporary Development of the European Monetary Union and its Risk Factors. *European Financial Systems 2015*, Proceedings of the 12th International Scientific Conference. Brno: Masaryk University, pp. 498-506.
- Rose, P. S. a Marquis, M. H. (2009). *Money and capital markets: financial institutions and instruments in a global marketplace*. 10th ed. Boston: McGrawHill.
- Singer, G. (2016). *MMF jaro 2016 – důraz na dopady reforem, riziko propadu poptávky a zkušenosti se zápornými sazbami*. Retrieved from: http://www.cnb.cz/cs/o_cnb/blog_cnb/prispevky/singer_20160421.html.
- Sojka, M. (2010). *Dějiny ekonomických teorií*. Praha: Havlíček Brain Team.
- Sulík, R. (2012). *Euro nejvíc poškozuj ECB*. Retrieved from: http://neviditelnypes.lidovky.cz/evropa-euro-nejvic-poskozujecb-d4l-/pekonomika.aspx?c=A120911_112902_p_ekonomika_wag.
- Snyder, M. (2013). *Why Is The World Economy Doomed? The Global Financial Pyramid Scheme By The Numbers*. Retrieved from: <http://theeconomiccollapseblog.com/archives/why-is-the-world-economy-the-global-financial-pyramid-scheme-by-the-numbers>.
- Urbánek, V. (2015). *Goldmani varují centrální banky: Neortodoxní opatření mají své limity a rizika*. Retrieved from: <http://www.kurzy.cz/zpravy/386884-goldmani-varuji-centralni-banky-neortodoxni-opatreni-maji-sve-limity-a-rizika/>.

Economic Condition of the European Union countries and Level of Rating

Tomasz Rólczyński¹, Tomasz Kopyściański²

¹WSB University in Wrocław
Fabryczna street 29-31
53-609 Wrocław
Poland
tomasz.rolczynski@wsb.wroclaw.pl

²WSB University in Wrocław
Fabryczna street 29-31
53-609 Wrocław
Poland
tomasz.kopyscianski@wsb.wroclaw.pl

Abstract: *Credit rating agencies have a significant impact on the securities market facilitating investment decisions on the basis of ready-made benchmarks. In this way they contribute to reducing the asymmetries and costs of obtaining information necessary to make decisions regarding buying or selling financial instruments, taking into account the debtor's estimated risk of default. The increased significance of the assessments made by the rating agencies refers closely to the rapid development of the debt security market and thus emerging demand on the part of the buyers of those securities for an independent analysis which would determine the issuer's financial standing. The assessments which are published using special symbols reflects country's ability to raise capital and its cost. The purpose of the article is to evaluate the relationship between the economic condition of the European Union countries and the assessment issued by the rating agencies such as Standard & Poor's, Fitch, Moody's. The economic condition of country will be described using a synthetic variable, and ratings will be transferred to the ordinal scale, hence to assess the relationship with the use of Spearman's rank correlation coefficient.*

Keywords: ratings and ratings agencies, economic outlook, synthetic measure, Spearman's rank correlation coefficient

JEL codes: G240, E660, C18

1 Introduction

In literature rating agencies are likely to be defined as investment advice firms, performing the quality classification of debt securities and other debt instruments based on the issuer's financial standing through rating the debtor with a certain level of financial trust, expressed in the form of letter designators (Dziawgo, 1998). The increased significance of rating agencies, in particular, for the financial viability assessment of countries has been noted at many levels in recent years. The market success of public debt securities issuance depends greatly on the ratings. Further to that, rating is considered to be an important requirement while seeking external sources of financing in the securities market, which refers particularly to issuers whose position has not yet been well established on the market. Moreover, the issuer credit assessment affects significantly the interest rates on public debts securities and consequently, the public debt servicing costs. On top of that, rating agencies are being increasingly more engaged in the risk assessment of assets held by financial institutions, as they are necessary for meeting capital adequacy requirements. The role played by the rating agencies on the markets has basically a positive impact on investors as well as on issuers. The agencies provide investors with information on risk assessment for a particular security. Also, they help to reduce the costs of raising capital for issuers, or at least for those with a good rating (McClintock and Calabria, 2012).

Ratings also affect considerably the financial market participants. There are a few reasons for this. Firstly, although the assessments provided by the rating agencies are based on complex estimation methods, yet, investors can use them immediately and in a very simple way, regardless of their profile and level of expert knowledge (Levich et al., 2002). Secondly, the rating should be an independent and objective credit risk assessment of an entity running up debt on the financial market, that is, an opinion based on an objective analysis of the ability of a particular entity to service its debt (Frost, 2007). While giving assessments, rating agencies must therefore face a number of requirements. They should be objective, treat all entities which they investigate equally and should not allow themselves to be influenced by those who may consider the rating to be a way of publicly confirming their worth and gaining publicity; and by those who expect the agencies to give them high rating, e.g. referring to its voluntary nature and that it costs money. Furthermore, rating agencies should be independent, i.e. their economic and legal position should be such as to guarantee their ability to fend off the influence on the part of entities under consideration, and in particular of state authorities.

However, in practice theoretical presumptions about the essence of rating encounter numerous doubts as to to what extent the assessment corresponds to the current economic situation of the country and to what extent it is the result of a subjective analysis carried out by rating agencies. In order to address this issue, this paper makes an attempt to compare, within the research framework, the level of ratings of the countries under study with their economic condition between 2012 and 2014.

The purpose of the article is to evaluate the relationship between the economic condition of the European Union countries and the assessment issued by rating agencies such as Standard & Poor's, Fitch, Moody's.

2 Methodology and Data

The economic condition may be understood as the country's state in terms of its finances, price stability, labour market and the pace of economic development. It is a collective phenomenon requiring suitable variables for its description. Comparing and assessing the values of variables between objects brings about difficulties with respect to the assessment of the investigated phenomenon (Rólczyński, 2009).

Countries aspiring to accession to the Economic and Monetary Union, and thus to participate in the so called Eurozone, should meet the criteria, also named convergence criteria, which were set out in the Maastricht Treaty. The criteria refer to the required level of economic indicators (variables from 1 to 4, listed below), which the economy of a given country should have if intending to adopt the Euro as a common currency for its national economy (Rólczyński, 2013).

We can therefore assume that the countries which fulfil the convergence criteria enjoy good economic condition. For this reason, the indicators which result from the convergence criteria will be taken into account while performing the analysis of economic condition. In addition, the following indicators will also be examined: dynamics of the gross domestic product, unemployment rate, as the analysis of these indicators allows for providing the answer to the question whether the country has achieved economic stability and an "adequate" economic growth. These variables make up the so called "macroeconomic stabilization pentagon", in other words, such "characteristics" describing the economic condition which, if "at the right level", ensure economic stabilization and economic growth (Kołodko, 1993).

The method of standardized sums

The methods of linear ordering allow for ranking the analysed objects from "the best" to "the worst", while the ranking criterion represents the level of the collective phenomenon. The selection of the variables used to describe the phenomenon is mostly of substantive nature. While constructing a synthetic measure which describes the phenomenon, the degree of the variables correlation is of no importance (Appenzeller, 2008). In the paper a patternless method for linear ordering was applied, such as the

method using standardized sums (Econometrics with elements of mathematical programming, 1992).

The variables which form the basis for the construction of the synthetic measure are characterized by different measurement units and orders of magnitude, and therefore standardization is performed before using the method of standardized sums. Afterwards all the variables values become dimensionless and arithmetic means equal 0, while the variances and standard deviations equal 1.

The standardization is most frequently performed according to the following formula:

$$z_{ij} = \frac{x_{ij} - \bar{x}_j}{s_j} \quad (i=1,2,..n \quad j = 1,2,.. m) \quad (1)$$

where:

z_{ij} – standardized value of the j-th variable for the i-th observation

\bar{x}_j – arithmetic mean of the variable x_j

s_j – standard deviation of the variable x_j .

The construction of the synthetic measure and the application of the method for linear ordering is possible when all the variables describing the collective phenomenon are in their nature either a stimulant or destimulant. The destimulant can be converted into a stimulant by multiplying its standardized values by 1. The neutral variable can be converted into a stimulant, according to the following formula:

$$z_{ij} = \begin{cases} 1 & \text{for, } x_{ij} = N_j \\ \frac{-1}{x_{ij} - N_j - 1} & \text{for, } x_{ij} < N_j \\ \frac{1}{x_{ij} - N_j + 1} & \text{for } x_{ij} > N_j \end{cases} \quad (2)$$

where N_j is a nominal value for the j-th variable.

The method of standardized sums involves the following stages:

The calculation of the sum of the standardized values follows according to the formula below:

$$p_i = \sum_{j=1}^m z_{ij} \cdot w_j \quad (3)$$

where:

z_{ij} – standardized value of the j-th variable for the i-th observation

w_j – weight of the j-th variable

$$w_j = \frac{1}{m} \quad \text{for } j = 1, 2, \dots, m \quad (4)$$

Calculating the development measure for each of the objects under consideration:

$$m_i = \frac{p_i - p_{-0}}{p_0 - p_{-0}} \quad \text{for } i = 1, 2, \dots, n \quad (5)$$

$$p_0 = \sum_{j=1}^m z_{0j} \cdot w_j \quad (6)$$

$$p_{-0} = \sum_{j=1}^m z_{-0j} \cdot w_j \quad (7)$$

$$z_{0j} = \max_i z_{ij} \quad (8)$$

$$z_{-0j} = \min_i z_{ij} \quad (9)$$

The objective of constructing the development measure m_i is to obtain standardized values on the interval [0:1], whereby, the closer the value m_i is to 1, the better it shows the extent of the collective phenomenon in the object concerned.

Spearman's rank correlation coefficient and significance test

In order to achieve the objective of the paper, it is necessary to assess the interdependency between the level of the credit rating and the economic condition of the countries for which the synthetic variable has been constructed.

For the dependency assessment the Spearman's rank correlation coefficient was calculated based on the following equation:

$$r_s = 1 - \frac{6 \sum_{i=1}^n d_i^2}{n(n^2 - 1)}, \text{ where:} \quad (10)$$

d_i - the differences between the ranks of the corresponding values of the x_i characteristics and the y_i characteristics ($i=1, 2, \dots, n$).

n - number of observations

The Spearman's rank correlation coefficient (r_s) is given in the range [-1; 1], i.e. when r_s value is closer to -1 or 1, then the statistical dependence is stronger. Compared to Pearson's correlation coefficient, the Spearman's rank correlation coefficient can be used to measure the nonlinear dependencies and also, more importantly, it can be applied to any kind of distribution of the variables to be compared (it also refers to the significance test of the rank correlation coefficient) (Spearman, 1904).

To determine the significance of the Spearman's rank correlation coefficient, a nonparametric test was used. Given the null hypothesis stating that the X and Y random variables are independent, and that the pairs (x_i, y_i) are independent of each other, the statistic distribution:

$$t = r_s \sqrt{\frac{n-2}{1-r_s^2}} \quad (11)$$

of the rank correlation approaches (together with the increased sample size) Student's distribution with $n-2$ degrees of freedom, where n is the sample size (Kendall, 1948). The test was carried out with the significance level $\alpha=0.05$. *If the null hypothesis is rejected,*

then the alternative hypothesis is adopted which says that random variables are dependent.

Data

The assessment of the economic condition and the construction of the synthetic indicator will be performed based on the following variables:

Table 1 Variables Used for the Synthetic Variable Construction, Their Characteristics and Weights

symbol	Variables	Variable characteristics	weight
X1	Harmonised index of consumer prices (HICP)	neutral	0,2
X2	Budget outturn as % of GDP	neutral	0,1
X3	Public debt as % of GDP	destimulant	0,1
X4	the yield of 10-year-government bonds	destimulant	0,2
X5	real change in GDP compared to last year, as %	stimulant	0,2
X6	Unemployment rate, as %	destimulant	0,2

Source: Authors' own study

With respect to the characteristics of the variables it should be noted that, for the neutral variables, the mean value of the variable for the three countries with the greatest price stability was taken as the nominal level of HICP, in line with the guidelines of the Maastricht Treaty. Therefore the nominal value changes during the subsequent years of the study. The nominal value of the country's budget outturn was set out as zero because the state in which the country generates neither budget surplus nor deficit is considered to be the optimum condition.

The weights were distributed among the variables under consideration, so that each of the investigated areas that influences the economic condition could have the same weight. This leads to the weights of the X2 and X3 variables, which equal 0,1 and which describe the country's finances area.

The data used for the calculation and assessment of the economic condition of the EU countries were provided by Eurostat.

With the view to determine the relationship between the rating level and the economic condition of the countries, the ratings of the three rating agencies have been replaced with a point scale (Kopyściański and Rólczyński, 2015).

3 Results and Discussion

The data which formed the basis for the calculation and assessment of the economic condition of the EU countries were derived from Eurostat. The calculations were carried out using the Statistica 12 and Excel software.

Based on the data collected, calculations were carried out to determine the level of the synthetic variable describing the economic condition of the EU countries (m_i). The results are illustrated in Table 2.

Table 2. The Values of the Synthetic Variable m_i for the EU Countries in 2012-2014

	2012	2013	2014
Austria	0,743	0,684	0,612
Belgium	0,676	0,668	0,684
Bulgaria	0,715	0,782	0,552
Cyprus	0,516	0,435	0,278
Czech Republic	0,647	0,701	0,816
Denmark	0,742	0,808	0,812
Finland	0,651	0,634	0,603
France	0,723	0,678	0,633
Germany	0,820	0,732	0,750
Greece	0,149	0,094	0,125
Hungary	0,460	0,577	0,699
Ireland	0,657	0,643	0,806
Italy	0,497	0,504	0,574
Lithuania	0,678	0,721	0,797
Luxembourg	0,756	0,789	0,800
Latvia	0,773	0,838	0,703
Malta	0,706	0,765	0,755
Poland	0,631	0,711	0,765
Portugal	0,395	0,512	0,498
Romania	0,645	0,658	0,623
Slovakia	0,597	0,636	0,699
Slovenia	0,594	0,509	0,706
Spain	0,471	0,385	0,471
Sweden	0,753	0,855	0,827
The Netherlands	0,678	0,635	0,770
The UK	0,692	0,673	0,668

Source: Authors' own study

Next, the values of the synthetic variable m_i were compared with the rating level recorded for the EU countries at the end of each year (replaced with the point scale), and the calculation of the Spearman's rank correlation coefficient was performed. The results are illustrated in Table 3.

Table 4. The Values of the Spearman's Rank Correlation Coefficients between the Synthetic Variable m_i and the Level of Rating in 2012-2014

rating agency	The value of the synthetic variable in year:		
	2012	2013	2014
S&P	0,623	0,675	0,506
Moody's	0,659	0,710	0,595
Fitch	0,795	0,764	0,650

Source: Authors' own study

As can be seen from the table, all the coefficients have a positive value, which implies that the higher the value of the synthetic variable, the higher the rating. Moreover, based on the calculations prepared with the support of Statistica 12 all the coefficients are statistically significant having the significance level at $\alpha = 0.05$. The study leads to two conclusions. Firstly, the rating agencies assess the countries' creditworthiness fairly, following the countries' economic condition. Assuming that the above conclusion holds true, another conclusion suggests itself: it is possible to assess the economic condition using the synthetic variable. Furthermore, the construction of the synthetic variable itself is sound while employing the method illustrated in the paper and the variables set.

4 Conclusions

On the basis of the analysis carried out in 2012-2014 it can be concluded that the ratings provided by the rating agencies are linked to the countries' economic condition in the period under study. One should draw attention to the fact that, within the study's framework, the influence of numerous other factors which were not taken into account and yet may have affected the examined issues, was disregarded. The considerations presented in this paper are mainly based on the comparisons of the rating levels with the economic condition measured using the most common macroeconomic measurements. In order to decide this question in a greater detail, what would be required are in-depth quantitative studies based on the data gathered over a longer period of time, while taking into account a broader scope of factors affecting the rating of a particular country's creditworthiness. Nevertheless, the findings allow for a clear conclusion that the assessments carried out by the rating agencies are not formulated in isolation from the country's current economic condition.

References

- Appenzeller, D. (2008). Metodologiczne problemy opisu i prognozowania kondycji finansowej. *Prognozowanie w zarządzaniu firmą*, Indygo Media, Wrocław, pp. 127-134.
- Bartosiewicz, S. (1992). *Ekonometria z elementami programowania matematycznego i analizy porównawczej*, Akademia Ekonomiczna, wyd. III. Wrocław.
- Dziawgo, E. (1998). *Kredyt-rating. Ryzyko i obligacje na międzynarodowym rynku finansowym*. Wydawnictwo Naukowe PWN, Warszawa.
- Frost, C. A. (2007). Credit rating agencies in capital markets: A review of research evidence on selected criticisms of the agencies. *Journal of Accounting*, 22, pp. 469-492.
- Kołodko, G. W (1993). Kwadratura pięciokąta. Od załamania gospodarczego do trwałego wzrostu. Poltext, Warszawa.
- Kopyściański, T., Rólczyński, T. (2015). The Impact Of The Ratings On The Cost Of Financing Public Debt In The European Union Countries. *International Journal of Arts & Sciences*, 08(04), pp. 155-164.
- Levich, R. M., Majnoni, G., Reinhart, C. M., (2002). *Rating Agencies and the Global Financial System*, Boston.
- McClintock Ekins, E., Calabria, M. A. (2012). Regulation, Market Structure, and Role of the Credit Rating Agencies. *Policy Analysis*, nr 704, pp. 31-36.
- Rólczyński, T. (2009). Zastosowanie metod porządkowania liniowego do oceny zmian sytuacji ekonomicznej państw Unii Europejskiej. *Prace Naukowe, Akademia Ekonomiczna w Katowicach*, 2009, pp. 433-449.
- Rólczyński, T. (2013). Comparative analysis of economic condition of the European Union countries in the years 2002-2011. *Єдина Європа: Погляд у майбутнє, Національний Гірничий Університет*, Дніпропетровськ, pp. 18-29.
- Spearman, C. (1904). The proof and measurement of association between two things. *American Journal of Psychology*, 15, pp. 72-101.

Using of Venture and Equity Capital in Financing of SMEs in the Slovak Republic

Katarína Rentková¹, Monika Roštárová²

¹ Comenius University in Bratislava
Faculty of Management FM CU
Odbojárov 10, P. O. Box 95, 820 05 Bratislava, Slovakia
E-mail: katarina.rentkova@fm.uniba.sk

² Comenius University in Bratislava
Faculty of Management FM CU
Odbojárov 10, P. O. Box 95, 820 05 Bratislava, Slovakia
E-mail: monika.rostarova@fm.uniba.sk

Abstract: *The economy of the Slovak republic is integrated within the frame of the global world economy. The companies are functioning in the highly competitive environment. SMEs dominate the Slovak economy, covering 99.5% of the enterprise population. The vast majority of SMEs were micro enterprises, employing up to 9 employees. Self-entrepreneurs are an important component of the enterprise population in the Slovak Republic. Available financial resources are a key factor for the development of SMEs, also in the Slovak Republic. SMEs may be funded from various sources. Venture capital funds are oriented towards financing establishment and growth of small innovative businesses. In this paper, we will define SMEs, the venture and equity capital and we will analyze the role of venture and equity capital in financing of SMEs in the Slovak Republic. The use of private equity capital and venture capital in Slovakia reached the peak in 2009. Since then, the only decline is noticeable or the stability of the compared period. The most important problem can be the lack of knowledge of entrepreneurs about the possibilities of funding for their projects by venture capital. It is clear that Slovakia has a high innovation potential and significant development begins in the area of start-ups.*

Keywords: equity capital, investment, venture capital, Slovak Republic, SMEs

JEL codes: G24, O16

1 Introduction

Small and medium-sized enterprises (hereinafter SMEs) represent one of the “driving engines” and determinants of the economy because SMEs are a major source of business ideas aimed at the development, growth, and innovation. SMEs also provide employment, they create a competitive environment contribute to growth in the overall economy of the state. SMEs often operate only on a local or national level so they encourage and increase the attractiveness of a region; they contribute to the growth of competitiveness of a region and lower the regional unemployment. Another strength of SMEs is their attachment to the region (e.g. in the sector of tourism or specialized enterprises). According to numerous statistics the SMEs represent the agent of stability in the region.

The general subjects of this paper are SMEs; and the main problem is to analyse the using of venture and private equity capital as a resource of financing of SMEs. Currently, the issue of SMEs devoted considerable attention in the academic circles, but mainly is based at the political level (the European Commission).

The support of innovative ideas, the development and the innovation in general, these form the base of development for the state economy. The financial resources needed for the development represent problem for SMEs. SMEs can be funded from various sources. SMEs can use internal or external sources of funding. Internal sources of funding can be, e.g. the own savings of entrepreneur, the retained profits or profit from the sale of

assets. External sources of funding can be informal (e.g. family, friends, and business angels) or formal (e.g. bank loans, microloans, factoring or using of equity).

2 Methodology and Data

The paper is processed by using a wide scale of the scientific methods and procedures. The specific range of methods was based on the research needs of the individual parts. The intention is to follow the logical continuity of this paper, the correctness and the adequacy of information and data. This paper represents more theoretical research because we are dealing with the definitions of key terms. One of the research parts is focused on the definition and the determination of the key terms. We define the venture capital, the equity capital and small and medium-sized enterprises. This section is prepared by using the analytical method and the synthesis. These two chapters are based on literature review; it is based on available literature and studies. But in the second part of this paper, we analyze the situation of financing small and medium sized enterprises the Slovak Republic. Second part represents empirical part. On the basis of the information, we analyze the role of venture and equity capital in financing of SMEs in the Slovak Republic.

3 Results and Discussion

Definition of Venture and Equity Capital

Risk capital is provided to the businesses for their support, development, and innovation. Risk capital is directed especially to businesses that are unable to obtain financing to start and develop by conventional external resources (e.g. by bank loans). Risk capital is defined by two terms – by the private equity capital and venture capital. Some authors consider private equity capital and venture capital as synonymous. We will distinguish them, in this paper.

Venture capital is defined as a source of financing for new businesses. Venture capital funds pool investors' cash and loan it to start-up firms and small businesses with perceived, long-term growth potential. Venture capital is the most important way of funding start-ups that do not have access to their own capital. Described capital entails high risk and potentially high returns for the investor. There are several types of venture capital and they differ in start-up's stage and amount of investment. Individual investors usually invest mainly one type of capital. (Rentková, K. and Roštárová, M., 2016) There are several types of venture capital. We will briefly summarise the classification of venture capital according to the stage of life cycle of investee.

Pre- seed capital is used for financing of ideas and research project with the goal of building a successful company around it in later stages. Pre- seed start-up are working on the business model and description of value creation for future customers.

Seed capital represents sources used for a market research and all activities before company's establishment. Investor finances the testing of investee's entrepreneurship with seed capital. Seed financings may be directed toward product development, market research, building a management team and developing a business plan (Papík, M., 2015). A genuine seed-stage company has usually not yet established commercial operations - a cash infusion to fund continued research and product development is essential. These early companies are typically quite difficult business opportunities to finance.

Start- up capital is applied to overlap initial costs including purchase of new machinery and equipment, purchasing of technologies, development of technologies, initial costs for marketing etc. Start- up capital is used for financing of start-up for first two years of operation. (Rentková, K. and Roštárová, M., 2016)

Growth capital represents a funding to the initial growth of company. The phase of financing starts when the final product is created and a testing stage is finished and

validated by customers in comparison to start-up capital. Money from growth capital cover marketing costs and expansion. (Blank, S., 2010).

Expansion capital represents the amount of money intended for expansion. It is difficult to support expansion just by using own resources. The term expansion is linked to opening new foreign markets with selling the same product or a new product development. Expansion capital is used for mentioned purposes (Komorník, J., 2006).

Private equity capital is a private developing capital. Private equity is a medium-term or long-term funding which is provided as consideration for the obtaining of shares in the capital of the company. Shares of the company are not traded on a stock exchange but have potential of growth. The investor decided to use its finances especially in existing and already established businesses that need capital for further development or for further possibilities of innovations. The investor receives a share in the ownership structure of the company and become co-owners.

Definition of Small and Medium-sized enterprises

In the EU, the SMEs represent more than 99% of European enterprises and two thirds of private sector jobs and contribute to more than half of the total added value created by businesses in the EU. The SMEs represent the important element of the EU economy, the important "driving engine" of the European economical growth and the opportunity to create maintainable jobs. About 85% of all new jobs in the EU (from 2002 to 2010) were created by the SME. Nine out of ten SMEs are actually micro enterprises with fewer than 10 employees. Various action programmes have been adopted to support SMEs, such as the Small Business Act, which encompasses all of these programmes and aims to create a comprehensive policy framework. The Horizon 2020 and COSME programmes have also been adopted with the aim of increasing the competitiveness of SMEs through research and innovation, and providing better access to finance for SMEs. (Gouardères, 2016)

Supporting the creation and growth of businesses, in particular SMEs are key ways by which cohesion policy helps to boost regional economies. For these reasons, many European institutions deal with the issue of SMEs. SME is defined in EU law (EU recommendation 2003/361). The European Commission has adopted Commission Recommendation of 6 May 2003 concerning the definition of enterprise (Article 1 of Annex, appointed Recommendation). The definition of micro, small and medium-sized enterprises is analysed in Article 2 of Annex, appointed Recommendation. The definition of an enterprise is: "An enterprise is considered to be any entity engaged in an economic activity, irrespective of its legal form. This includes, in particular, self-employed persons and family businesses engaged in craft or other activities, and partnerships or associations regularly engaged in an economic activity." (Article 1) The second definition is very precise and detailed: "The category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. Within the SME category, a microenterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million." We can conclude that SME is the company which is defined by 2 main factors:

- number of employees;
- either turnover or balance sheet total.

A firm which is part of larger grouping may need to include employee/ turnover/ balance sheet data. Table 1 shows the characteristics of micro; small and medium-sized enterprises. The difference between a start-up and a small company is visible in the character of companies'goals. Small companies focus on profitability and a stable long-term value. Start-ups are based on a growth potential and incomes. Both of them want to be profitable in the end, but start-ups need to attract investors. The profitable

company doesn't need any investor when we don't think about the stage of expansion. (Rentková, K. and Roštárová, M., 2016)

Table 1: Business Support by the Objectives of Cohesion Policy

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ EUR 50 million		≤ EUR 43 million
Small	< 50 persons	≤ EUR 10 million		≤ EUR 10 million
Micro	< 10 persons	≤ EUR 2 million		≤ EUR 2 million

Source: By authors using data of EU recommendation 2003/361 (2003)

Small Business Act is a framework for measures to support SMEs. This act is based on ten principles to guide the conception and implementation of policies both at EU and Member State level. These pillars are: business, a second chance, Think Small First principle, sensitive administration, state aid and public procurement, access to finance, the single market, skills and innovation and internationalization. However, the Commission regularly evaluates its application in the Member States. Supporting entrepreneurs, attracting investors and enhancing the productive capacity of regions are vital to improving their economic performances and helping those that are lagging behind to catch up. Review of Small Business Act was adopted in 2011 which noted the slow progress in the adoption of measures to support SMEs in priority areas. Entrepreneurship 2020 Action Plan represents the EU long-term strategy. This strategy aims to improve the business environment by strengthening the entrepreneurial culture and increasing the EU's entrepreneurial potential. The plan is based on three pillars: an entrepreneurship education and training, an appropriate business environment, greater involvement in the business of selected groups of people (elderly, women.) (Jeck, T., 2015)

Financing of SMEs in Slovakia

The definition of the small and medium-sized enterprises in the Slovak Republic is similar to their definition in the other EU countries. The independent Slovak Republic came into existence on the 1st January 1993 as the sovereign democratic state with the parliamentary form of the governance. With the expanse of 49035 m² and with 5 404 322 inhabitants (reported on the 31.12.2011), 48.6% of which are men and 51.4% women, the Slovak Republic constitutes one of the smaller European states. In regard to its advantageous position (geographically in the middle of the Europe), the Slovak Republic is described as the bridge of the European Union to the east. The Slovak republic represents the important transit point for the market of non-European Union countries.

The economy of the Slovak republic is integrated within the frame of the global world economy. The conditions for business activities are strongly influenced by the economy, however from the macroeconomic point of view it can be stated that the Slovak republic belongs among the countries which are interesting for investments possibilities. On one hand, the investors could be afraid of the impact and the outcome of the ongoing debt crisis in the Eurozone. (Nováčková and Bajžíková, 2016) On the other hand, the perspective macroeconomic development of the Slovak republic would have the positive impact on the investors, based on the data of the Statistical Office of the Slovak republic and the Ministry of Finance of the Slovak republic.

The companies are functioning in the highly competitive environment. It is improbable that the free trade or the market mechanism could have any influence on balancing out the regional disparities which means that the poor regions could have been even poorer. For this reason, the planning and programming of the regional development seems important also in relation to the support for the small and middle enterprises. The regional support on enterprises should be oriented towards the development and improvement of the economical structure and creation, stabilization of endangered jobs in regions by using the State or other structural aid. The Slovak republic as the EU

Member State is involved in many SMEs support programs but also in the regional development program.

SMEs dominate the Slovak economy, covering 99.5% of the enterprise population as of 2012. The vast majority of SMEs (86.6%) were micro enterprises, employing up to 9 employees. Self-entrepreneurs are an important component of the enterprise population in the Slovak Republic, a significant part of which are employing firms. In 2013, there were altogether 39 531 self-entrepreneurs with at least 1 employee, with the exception of 2 all of them are part of the SMEs population. (OECD, 2015) Table 2 shows an overview of the status of small and medium enterprises in Slovakia in 2014.

Available financial resources are a key factor for the development of SMEs, also in the Slovak Republic. SMEs may be funded from various sources (**own resources and external resources**). In recent years we can observe the decline of funding for SMEs in developed countries, as a result of the global crisis. The decline in profitability of SMEs has resulted in a reduction in the development of their own resources.

Table 2: SMEs – Basic Figure in the Slovak Republic, 2014

	Number of enterprises			Number of persons employed			Value added		
	Slovakia		EU-28	Slovakia		EU-28	Slovakia		EU-28
	Number	Share	Share	Number	Share	Share	Billion EUR	Share	Share
Micro	377379	96,4 %	92,7%	552381	39,0%	29,2%	9	27,1 %	21,1%
Small	11474	2,9%	6,1%	224291	15,8%	20,4%	6	17,7 %	18,2%
Medium	2083	0,5%	1,0%	224798	15,9%	17,3%	6	16,5 %	18,5%
SMEs	390936	99,9 %	99,8%	1001470	70,7%	66,9%	20	61,2 %	57,8%
Large	469	0,1%	0,2%	415365	29,3%	33,1%	13	38,8 %	42,2%
Total	391405	100,0 %	100,0 %	1416835	100,0 %	100,0 %	33	100,0 %	100,0 %

These are estimates for 2014 produced by DIW Econ, based on 2008-2012 figures from the Structural Business Statistics Database (Eurostat). The data cover the non-financial business economy, which includes industry, construction, trade and services (NACE Rev. 2 sections B to J, L, M and N), but not enterprises in agriculture, forestry and fisheries and the largely non-market service sectors such as education and health. The advantage of using Eurostat data is that the statistics are harmonised and comparable across countries. The disadvantage is that for some countries the data may be different from those published by national authorities.

Source: European Commission (2015b).

SMEs may use external forms of financing. However, SMEs have limited access to external financing. Bank loans represent the possibility of financing from external sources. SMEs may also benefit from bank loans and alternative forms of financing (e.g. the venture capital or the equity capital). Venture capital funds are oriented towards financing establishment and growth of small innovative businesses. Venture capital funds pool investors' cash and loan it to small businesses with perceived, long-term growth potential. Venture capital and equity capital still represent a marginal source of development capital in the Slovak Republic. Reasons for this situation may be: lack of knowledge about venture capital, weak experiences, fears, slowly starters environment focused on innovative entrepreneurship and innovative enterprises.

Government support represents another way of financing SMEs (e.g. direct government funding and government guarantees for loans to SMEs). "There are government SME loan and guarantee programmes operated by specialised state banks and the Slovak Business Agency (hereinafter SBA). During the financial crisis government loan

guarantees increased by 20.1% to EUR 99 million (2008), similarly SME government direct loans increased by 37% between 2007 and 2008 to EUR 160 million. Between 2008 and 2010, loan guarantees declined to EUR 70 million and rose again to 87 million in 2012. In 2013, however, government loan guarantees more than halved and stood at EUR 38 million." (OECD, 2015)

Financial support and development of SMEs in Slovakia is carried out in particular:

- in the form of loans,
- through microloans,
- by using the venture capital,
- by the use of guarantees (e.g. for bank loans);
- through non-repayable financial assistance,
- by using some options for financing selected activities from national funds,
- by using some options for financing selected activities of multinational trusts and the like. (National Holding Fund)

It is important to note that there exists a policy of state support to SMEs in Slovak republic. The most important institutional actors to support SMEs is Ministry of Economy of Slovak republic which acts as sponsor and coordinator of many activities in that area. State support is implemented through the Ministry in several areas:

- Area of strategy and development of SMEs
- The field of institutional environment to support SMEs
- Area of cooperation with international institutions
- Area of legislation and regulatory measures to support the business environment as a whole
- Area of securing financial resources for SMEs
- Area of support and development of SMEs at regional level of Slovak republic

Last, but very important sources of funding for SMEs (especially micro) are family members, friends, and so called business angels. Family and friends is important people who support the biggest risk, because they invest to a new business concept. They do not belong to typical investors because they offer a financial support for the realisation of entrepreneurship concept. (Šlahor and Majrečáková, 2013) Business angel investors usually put their resources into the innovative, scalable and repeatable business model to first versions of product, which are suitable for beta testing and market validation.

SBA deals with the analysis, but especially the support of SMEs in Slovakia. Promoting the use of risk capital is one of the priority areas. SBA is the founder of National Holding Fund Ltd. (hereinafter NHF, Ltd.). NHF Ltd.:

- Manages three venture capital funds without legal personality:
 - The Seed Capital Fund - the amount of single investment from this Fund is determined by the interval from 6,600 EUR to 663,878 EUR. The resources of the Fund may be invested in three basic stages of the life cycle of the company (i.e. seed, start-up and development) in the form of equity or its combination with a credit.
 - The Regional Seed Capital Fund - the amount of single investment from this Fund is determined by the interval from 6,600 EUR to 165,959 EUR. The resources of the Fund may be invested in three basic stages of the life cycle of the company (i.e. seed, start-up and development) in the form of equity or its combination with a credit.
 - The Fund SISME - The maximum amount of investment may reach 165 969 EUR. The resources of the Fund may be invested in two stages of the life cycle of the company (i.e. seed, start-up) in the form of equity or its combination with a credit.
- Manages four venture capital funds with separate legal subjectivity:
 - The Seed Capital Fund, LP - The permissible amount of financial investment in one company reaches an average of 663,878 EUR. It is intended for start-up or innovative projects.

- The Slovak development funds, Inc. - It focuses on investments in equity in the small and medium-sized enterprises. The companies in which the Fund invests must have a mature management team that has the necessary management skills and entrepreneurial approach. They should produce products or provide services with high added value and should have high growth potential.
- The Slovak Growth Capital Fund, Inc. - The maximum average amount of investments in one calendar year shall not exceed 3,319,392 EUR. The Fund mostly invests in portfolio investments generally exceeding 25% of the registered capital of the target company or equity instruments that will guarantee adequate impact on the activities of Target Company. The investments are indented to companies in various stages of their development.
- The Innovation and technology Fund, Inc. - The mission of the Fund is to use venture capital to support entrepreneurial initiative and promote the development of entrepreneurship, employment and business towards an innovative economy.

Table 3: The Number and Volume of Approved Investment Proposals in Funds in 2014

Fund name	The number of approved proposals in 2014	The volume (EUR) in 2014	The number of approved proposals since the beginning of Funds	The volume of approved proposals since the beginning of Funds (EUR)
The Seed Capital Fund	0	0	71	21,465,463
The Regional Seed Capital Fund	0	0	37	3,715,004
SISME Fund	0	0	10	1,490,330
The Innovation and technology Fund, Inc.	4	1,415,000	4	1,415,000
The Seed Capital Fund, LP	0	0	34	11,336,408
The Slovak development funds, Inc.	1	29,549	25	24,225,422
The Slovak Growth Capital Fund, Inc.	1	3,000,000	23	49,302,074
Total	6	4,444,549	204	112,949,701

Source: SBA (2015).

Table 3 shows the number and volume of approved investment proposals in funds in 2014. Table 3 shows that venture capital investment in the Slovak Republic is still significantly low. We can conclude from the above information that venture capital, as an alternative source of external financing of SMEs, in Slovakia is still low developed. This statement is confirmed by the OECD report. Venture capital investments in 2014 remained equal comparing to the previous year. Total funding over the period was very marginal (OECD, 2015b).

4 Conclusions

The Slovak Republic ensures competitive position of its regions against regions of other Member States and ensures the harmonious development of its territory by the implementation of cohesion policy. Regional gross domestic product (GDP) is used for the assessment of the economic situation of individual higher territorial units. The big difference between Slovak regions is noticeable, especially between the rich Bratislava region and the rest of the Slovak Republic. Through support to SMEs (e.g. promoting employment and business support), it is possible to reduce disparities between regions.

The use of private equity capital and venture capital for SMEs is very important. Investors bring to companies not only the support in the form of finances but also strategically significant support, often in form of their knowledge, skills and experiences. These important factors can help the company to achieve a significant position in the market because the risk capital represents a particular partnership. The partnership formed between entrepreneurs and investors. Venture capital and equity capital do not constitute a single financial assistance to start a business, but it is a process that takes several years.

The use of private equity capital and venture capital in Slovakia reached, according to the OECD, the peak in 2009. Since then, the only decline is noticeable or the stability of the compared period. Reasons for this situation could be many. The most important problem can be the lack of knowledge of entrepreneurs about the possibilities of funding for their projects by risk capital. It is clear that Slovakia has a high innovation potential and significant development begins in the area of start-ups. We can expect that as the use of business angels at start-up, the use of venture capital will improve in Slovakia over time.

References

- Blank, S. (2010). *A Startup is Not a Smaller Version of / Large Company*. Retrieved from: <http://steveblank.com/2010/01/14/startup-is-not-a-smaller-version-of-a-large-company>.
- European Commission (2015a). Business support. Retrieved from: http://ec.europa.eu/regional_policy/activity/business/index_en.cfm.
- European Commission (2015b). SBA Fact Sheet. Retrieved from http://ec.europa.eu/growth/smes/business-friendly-environment/performance-review/files/countries-sheets/2015/slovakia_en.pdf.
- Jeck, T. (2014). *Malé a stredné podniky na Slovensku a v Európskej únii: bariéry, financovanie a inovačné správanie*. Retrieved from: http://www.ekonom.sav.sk/uploads/journals/268_wp67jeck.pdf.
- Gouardères, F. (2016). Small and medium-sized enterprises. Retrieved from: http://www.europarl.europa.eu/ftu/pdf/en/FTU_5.9.2.pdf.
- National Holding Fund. What is risk capital? Retrieved from: <http://nhfond.sk/Podpora-MSP/podpora-msp-na-slovensku/>.
- Nováčková, D., Bajzíkova, Ľ. (2016). Fundamental changes in the state aid policy in the Slovak republic. *Hradec economic days 2016*. Hradec Králové: Gaudeamus.
- OECD (2015). *Financing SMEs and Entrepreneurs 2015: An OECD Scoreboard*. OECD Publishing, Paris. Retrieved from: http://dx.doi.org/10.1787/fin_sme_ent-2015-en.
- Papík, M. (2015) Comparison of asset structure of insurance companies and pension funds, In *Globalization and its socio-economic consequences: part 2*. pp. 551-558.
- Rentková, K. – Roštárová, M. (2016). Analysis of start-up investments in European region. In: *Innovation management and education excellence vision 2020: from regional development sustainability to global growth*. Norristown, PA: IBIMA, pp. 1946-1956.
- SLOVAK BUSINESS AGENCY. *Rizikový kapitál*. Retrieved from: <http://www.sbagency.sk/rizikovy-kapital-0#.VfltmxHtmko>.
- SLOVAK BUSINESS AGENCY. (2015) Report on the state of Small and Medium Enterprises in the Slovak Republic in 2014. Retrieved from: http://www.sbagency.sk/sites/default/files/sprava_o_stave_msp2014.pdf.
- Šlahor, Ľ. – Majerčáková, D. (2013). Leadership and management development in social service organizations. In: *Theory and practice in management*, pp. 60-65.
- ŠÚSR (2016). *Regional statistical yearbook of Slovakia 2015*. Bratislava: Štatistický úrad Slovenskej republiky.

Testing the Weak Form of Efficiency on Chinese Stock Market

Petr Sed'a¹, Juan Antonio Jimber del Río²

¹ VSB-Technical University of Ostrava
Faculty of Economics, Department of Mathematical Methods in Economics
Sokolská třída 33, 701 21 Ostrava 1, Czech Republic
E-mail: petr.seda@vsb.cz.cz

² University of Córdoba
Faculty of Law and Business and Economic Sciences, Department of Statistics, Econometrics,
Operational Research and Applied Economics
Puerta Nueva S/N, 14071-Córdoba, Spain
E-mail: jjimber@uco.es

Abstract: *Efficient market hypothesis is one of possible analytical approaches to analyse a behavior of equities on financial markets. The basic idea of the efficient market hypothesis is based on determination of asset prices by relevant information. Thus, it is assumed that efficient market fully and accurately reflects all relevant information. The efficient market hypothesis has been a subject of many investigations that applied different approaches and methods. In this paper, we focused on testing the efficient market hypothesis in its weak form using data from Chinese stock market. Since China belongs to the world's largest economies the special aim of this paper is also to analyze empirically a potential influence of the global financial crisis of 2007-2009 years on the weak form of efficiency of the Chinese stock market. For the purpose of this paper there will be compared efficiency of Shanghai and Hong Kong stock markets in the form of random walk model using both linear and nonlinear statistical tests. These statistical tests delivered different results for both Hang Seng and Shanghai Composite indexes in all sub-periods. Hong Kong stock market became inefficient during the global financial crisis. Contrary to that, efficiency of Shanghai stock market in the crisis period cannot be explained by rational economic arguments.*

Keywords: China, information, efficiency, statistical tests, stock market

JEL codes: C12, G14, G18

1 Introduction

Efficient market hypothesis is one of basic analytical approaches that may explain movements of prices in financial markets. The basic idea of the efficient market hypothesis is a determination of equity prices by interaction of interested rational market agents. Information efficiency therefore depends on the fact if and how the market prices reflect all accessible relevant information (Campbell et al, 1997). The efficient market hypothesis means that security prices fully reflect all available information at any given time.

The behavior of stock prices has been a subject of many scientific investigations. Most theories claim that stock markets are efficient and therefore can't be forecasted. However, practitioners have never believed in it, and logically tried to maximize profit on stock market using forecasting methods. The efficient market hypothesis is almost certainly the right place to start when thinking about asset price formation. Empirical evidence suggested, however, that this hypothesis cannot explain some important and worrying features of asset market behavior.

In this paper, we will focus on testing the efficient market hypothesis in its weak form using data from Chinese stock market since China belongs to the largest economies in the world. Over past decades, many empirical studies have focused on the weak form of efficiency using data samples from Chinese stock market. For instance, Song and Jin (1995) concluded in their empirical study that Shanghai Stock Exchange has already been weakly efficient or came close to the weak form of efficiency. However, Zhang and Zhou (2001) showed that Chinese stock market has not achieved the weak-form of

efficiency so far. Cooray (2003) tested the random walk hypothesis in Hong Kong market by unit root tests. This study utilized monthly data and achieved results confirmed that returns followed the random walk process. Worthington and Higgs (2006) examined for random walk models using daily returns of Chinese stock market. They applied several kinds of runs tests and the variance ratio test. The results from variance ratio tests indicated that China didn't follow the weak form of efficiency. However, Hong Kong stock market was consistent with the random walk model.

Our paper follows results of recent works in this field and contributes to discussion on efficiency of developed and newly emerged stock markets. The aim of this paper is to investigate the weak-form of the efficient market hypothesis in the form of random walk model using daily data from Chinese stock market in the period of 2003-2015 years.

It has been empirically confirmed that crashes and or crisis are not devoted to developed markets only. Emerging markets including China are not excluded from this rule and may face such instability sometimes, Hančlová (2012). Thus, a special aim of our paper is to investigate and compare an impact of the global financial crisis of 2007-2009 years on the weak form of efficiency of Chinese stock market.

This paper is organized as follows. First, it will be discussed a theoretical basis for the efficient market hypothesis. In the next step, selected linear and nonlinear methods of testing will be described. Then, efficiency of Chinese stock market, represented by Hong Kong stock market and Shanghai stock market, will be tested by both linear and nonlinear statistical tests (Tran, 2007). Finally, based on results of these tests it will be verified and discussed a validity of the efficient market hypothesis of Chinese stock market, and indicated further steps of analysis.

2 Methodology and Data

Market efficiency is defined within a hierarchy of three nested information sets. If we come out of this hierarchy of information we can define efficiency with respect to increasing amounts of information (Fama, 1970):

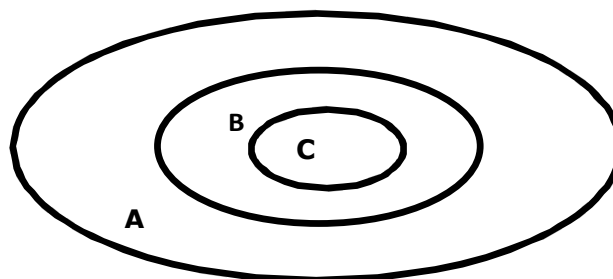
Weak-form of efficiency: No investor can earn excess returns by developing trading rules based on historical prices or return information.

Semi-strong form of efficiency: It is impossible to make above average profit from trading based on any publicly available information.

Strong-form of efficiency: No investor can earn above average returns using any information, whether public or private.

Figure 1 describes the above mentioned sets of information:

Figure 1 Information Sets



Source: Own elaboration

- A – All available information,
- B – Publicly available information,
- C – Historical price information.

It is obvious that the following implications hold: $C \subset B \subset A$. (1)

Since Shanghai stock market belongs to emerging stock markets, we will test just the weak form of the efficient market hypothesis on Chinese stock market. The weak form of the efficient market hypothesis says that market prices include all available historical information. Thus, an effort to obtain and analyze historical information does not bring any significant results for analytics. In the case of the weak form of efficiency a technical analysis can't help us to achieve above-average returns since they are based on analyses of publicly accessible historical information which are already included in share prices. In this paper, we will not take into account information and transaction costs and risk premium as well.

If the rate of return from holding the shares is to move in a reasonable interval that is not too high, and in most cases are indeed behaving like that, we can replace the percentage rate of return by a logarithmic rate of return:

$$R_{t+1} = \ln P_{t+1} - \ln P_t, \quad (2)$$

where R_{t+1} is a logarithmic rate of return at time $t+1$ and P_t denotes a price of asset at time t . Then, we will test so calculated rate of return by both linear and nonlinear tests as further described in this section.

In general, there can be defined three different types of random walk models (Campbell et al, 1997). The random walk 1 model (RW1) assumes independently and identically distributed (IID) increments, while the random walk 2 model (RW2) expects just independent increments. In the case of the random walk 3 model (RW3) are assumed uncorrelated increments.

In the RW1 model with IID increments, P_t is given by following equation:

$$P_t = \mu + P_{t-1} + \varepsilon_t, \quad \varepsilon_t \sim IID(0, \sigma^2), \quad (3)$$

where μ is expected change of price, and $IID(0, \sigma^2)$ indicates that errors ε_t are independently and identically distributed with zero mean and a variance of σ^2 . Independence of increments ε_t shows that the random walk is also a fair game. The fact that independence shows not only that the increments are uncorrelated, but also that any nonlinear functions of increments are also uncorrelated, is important as well. If we know the initial value P_0 at time 0, the conditional mean and variance at time t are as follows:

$$E[P_t / P_0] = P_0 + \mu t, \quad (4)$$

$$Var[P_t / P_0] = \sigma^2 t. \quad (5)$$

Equations (4) and (5) show that the random walk is a nonstationary process. At the same time, the conditional mean and variance are both linear. It also holds for the RW2 and RW3 models.

In the RW2 model, we can extend the assumptions of the RW1 model to include processes with independent but not identically distributed increments, since this assumption is not reasonable for stock prices over the long term. For example, in the New York Stock Exchange, there were many changes in social, technological, economic and other factors over the last two hundred years. Hence, it is not reasonable that the daily stock returns have kept the same properties over two hundred years. Therefore, the RW2 model is weaker than the RW1 model. However, any transformation of future price increments is unpredictable using any past price increments. For the purpose of this paper, we will test the weak form of efficient market hypothesis in the form of RW2 model.

Properties of R_t will be tested by linear and nonlinear statistical tests. These tests can verify properties of return series in the form of RW2 model only. First, the weak form of

efficiency will be investigated by linear variance ratio (VR) test (Campbell et al, 1997). Let's define R_t as the daily logarithmic rate of return according to (2) and R_t^k as k -day logarithmic rate of return. If the rates of return are independent, then the variance of their sum must be a linear function of time, namely:

$$\text{Var}(R_t^k) = k\text{Var}(R_t), \quad (6)$$

assuming that R_t has a constant variance.

The k -th order variance ratio $VR(k)$ can be written as follows:

$$VR(k) = \frac{\sum_{j=1}^k \text{Var}(R_{t,j}) + 2\sum_{i>j} \text{cov}(R_{t,i}, R_{t,j})}{k\text{Var}(R_t)}. \quad (7)$$

The VR is a linear combination of first $k-1$ autocorrelation coefficients with linearly declining weights of corresponding autocorrelation coefficients.

Since linear statistical tests cannot detect nonlinear relationships generated by returns in time, a validity of the weak form of efficiency should be tested not only by linear methods but by nonlinear tests as well. Economic and other social systems are usually nonlinear, and linear approximation is possible only in the case of existence of weak nonlinearities in these systems. When testing a behavior of returns by nonlinear methods, it is actually validating the results of testing by linear methods (Hinich and Mendes, 2005). When testing efficiency by nonlinear methods we examine whether it is possible to express the rate of return as follows:

$$R_t = g_t(r_1) + \varepsilon_t h_t(r_2), \quad (8)$$

where ε_t is a random noise which has an unspecified distribution F . Functions g_t and h_t are nonlinear ones containing historical information in itself, r_1 and r_2 are vectors of independent variables. It is obvious that:

$$E_{t-1}(R_t) = g_t(r_1), \quad (9)$$

$$E_{t-1}(R_t - E_{t-1}(R_t))^2 = h_t^2(r_2). \quad (10)$$

If we find functions g_t or h_t , or both functions simultaneously, we can say that returns are nonlinear in the first moment, or are nonlinear in the second moment, or are nonlinear in both the first and second moments. It is also possible to test a presence of nonlinearities in higher moments. It has been developed a wide range of tests to detect nonlinearities in returns. In this paper, the Engle's test will be applied. This test can also verify properties of return series in the form of RW2 model.

Engle (1982) constructed a test that explicitly examines non-linearity in the second moment. This test was proposed in relation to autoregressive conditional heteroskedasticity (ARCH) model.

Let's define the return from investments in shares by following equation:

$$R_t = f(R_{t-i}) + \varepsilon_t, \quad (11)$$

where ε_t is a conditional heteroskedastic process with conditional mean $E(\varepsilon_{t+1} | \Omega_t) = 0$ and conditional variance $E(\varepsilon_{t+1}^2 | \Omega_t) = h_{t+1}$, and Ω_t is information set available at time t . These requirements meet the following model $\varepsilon_t = v_t \sqrt{h_t}$, where v_t has unspecified probability distribution.

Hence, it is clear that ε_t and consequently R_t are nonlinear in the second moment. Engle assumed that $h_t = \sigma_t^2$ and follows AR process being expressed by following equation:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_p \varepsilon_{t-p}^2. \quad (12)$$

The null hypothesis for testing the nonlinearity in the second moment assumes that there is no correlation between σ_t^2 and ε_{t-j}^2 for $j=1,2,\dots,p$, thus $H_0: \alpha_1 = \alpha_2 = \dots = \alpha_p = 0$ compared to H_1 : it exist at least one $\alpha_j \neq 0$ for $j=1,2,\dots,p$.

Empirical analysis will be completed on daily returns of Chinese indexes Shanghai Composite (mainland China) and Hang Seng (Hong Kong) in the period from January 2003 to October 2015. It includes in total 4688 trading days. This period was chosen intentionally to investigate changes of Chinese equity market efficiency of respective indexes in the time before, during and after global financial crisis of 2007-2009 years. We have more than 12 years long time series of the closing rates of both indexes. Both series were obtained from <http://finance.yahoo.com> website.

Basic testing period was divided into three sub-periods. No financial authority indicated exactly the duration of the global financial crisis. That is why we decided to define all testing sub-periods on the basis of development of S&P 500 index that is a proxy of the US stock market that can be considered a representative of events on global stock markets. The development of S&P 500 index can be seen in Figure 2. First sub-period was defined from 01/01/2003 to 10/05/2007. It includes 1739 observations, and we called it the pre-crisis sub-period. Then the second sub-period started 10/05/2007 when S&P 500 index reached maximum value and ended 03/09/2009 when this index achieved its minimum. This sub-period is significantly affected by the global financial crisis. There are 522 observations in total. The third sub-period will start from 03/09/2009 and ends 10/30/2015. It includes 2427 observations. This time interval is called the post-crisis period.

Figure 2 Development of S&P 500 Index



3 Results and Discussion

In this section, empirical testing the weak form of efficiency of both analysed indexes (Shanghai Composite and Hang Seng) in all investigated periods using linear (variance ratio test) and nonlinear (Engle's ARCH test) methods will be carried out. All statistical tests will be calculated with a help of Eviews software.

The basic aim of this paper can be expressed in the form of following hypotheses:

H_0 : Stock market is efficient in its weak form.

H_1 : Stock market is not efficient in its weak form.

Empirical analysis will start by the variance ratio test. This test evaluates the efficient market hypothesis in the form of RW2 model as described in section 2. When applying the variance ratio test, we assumed homoskedasticity but not identical distribution in residual component. This assumption is less restrictive than in the case of RW1 model.

Table 1 and Table 2 show variance ratios, estimated values of z-statistics and corresponding p-values for both respective time series and all three testing sub-periods. It is assumed that z-statistic has normal distribution. The critical value at 5% significance level is ± 1.96 . If the z-statistic lies within the interval $(-1.96; 1.96)$, we cannot reject the null hypothesis that daily returns are independent, and thus follow random walk process. Otherwise, the null hypothesis that daily returns are independent can be rejected.

The fact that a proportion of variance is not equal to 1 at any time delay is sufficiently significant for rejecting the null hypothesis of random walk. The results of variance ratio test in Table 1 are very clear and show that the null hypothesis can be rejected just in the crisis period for Hang Seng index. On the other hand, in the pre-crisis and post-crisis periods, we cannot reject null hypothesis that daily returns are independent.

Table 1 Results of Variance Ratio Tests (VR) for Hang-Seng Index

Hang-Seng Index									
	Pre-crisis Period			Crisis Period			Post-crisis Period		
Period	VR	z-stat.	Prob.	VR	z-stat.	Prob.	VR	z-stat.	Prob.
2	0.995	-0.190	0.849	0.886*	-2.599	0.009	0.987	-0.666	0.506
4	0.989	-0.235	0.814	0.848	-1.858	0.063	0.998	-0.056	0.955
8	0.997	-0.047	0.962	0.728*	-2.098	0.036	0.989	-0.060	0.858
16	0.951	-0.469	0.639	0.635	-1.895	0.058	0.999	-0.089	0.988

Source: Own calculations in Eviews

Achieved results presented in Table 2 are completely different. There can be seen that the null hypothesis of RW2 model cannot be surprisingly rejected in the crisis period only. Contrary to that, in the pre-crisis and post-crisis periods the null hypothesis can be rejected since some values of z-statistic exceeded the value of ± 1.96 , and therefore lies in the critical interval.

Table 2 Results of Variance Ratio Tests (VR) for Shanghai Composite Index

Shanghai Composite Index									
	Pre-crisis Period			Crisis Period			Post-crisis Period		
Period	VR	z-stat.	Prob.	VR	z-stat.	Prob.	VR	z-stat.	Prob.
2	0.951*	-2.055	0.039	0.926	-1.694	0.090	1.002	0.105	0.916
4	0.962	-0.854	0.393	0.908	-1.116	0.265	0.999	-0.003	0.998
8	1.015	0.217	0.828	0.983	-0.132	0.895	1.107	1.785	0.074
16	1.046	0.439	0.661	0.955	-0.235	0.814	1.204*	0.279	0.023

Source: Own calculations in Eviews

As a next step of our analysis we verified potential nonlinear dependencies in returns using Engle's ARCH test. The Engle's ARCH test was carried out for both investigated

indexes and all three sub-periods. The values of z-statistics for lags from -1 to -5 and corresponding p -values on which we can reject the null hypothesis are shown in Table 3 and Table 4.

The null hypothesis that returns are independent in second moment can be clearly rejected in the case of Hang Seng returns for all investigated periods. It seems that dependency is strongest in the crisis period. In the case of Shanghai Composite index, achieved results are completely different. The non-linearity in the second moment is evident surprisingly just in the pre-crisis and post crisis periods.

Table 3 Results of Engle's ARCH Tests for Hang-Seng Index

Hang-Seng Index									
	Pre-crisis Period			Crisis Period			Post-crisis Period		
Lag	Coeff.	z-stat.	Prob.	Coeff.	z-stat.	Prob.	Coeff.	z-stat.	Prob.
-1	0.018	0.760	0.447	0.144*	3.266	0.001	0.075*	3.683	0.000
-2	0.042	1.752	0.080	0.151*	3.385	0.001	0.005	0.248	0.804
-3	0.044	1.814	0.069	0.278*	6.386	0.000	0.127*	6.313	0.000
-4	0.070*	2.892	0.004	-0.024	-0.543	0.588	0.037*	1.834	0.067
-5	0.137*	5.616	0.000	-0.054	-1.227	0.220	0.041*	2.026	0.043

Source: Own calculations in Eviews

Table 4 Results of Engle's ARCH Tests for Shanghai Composite Index

Shanghai Composite Index									
	Pre-crisis Period			Crisis Period			Post-crisis Period		
Lag	Coeff.	z-stat.	Prob.	Coeff.	z-stat.	Prob.	Coeff.	z-stat.	Prob.
-1	0.050*	2.903	0.037	0.018	0.416	0.677	0.143*	7.034	0.000
-2	0.043	1.785	0.075	-0.051	-1.145	0.253	0.053*	2.566	0.010
-3	0.047	1.939	0.053	0.049	1.130	0.259	0.123*	6.044	0.000
-4	0.010	0.427	0.669	-0.075	-1.704	0.089	0.063*	3.093	0.002
-5	0.056*	2.328	0.020	-0.026	-0.592	0.554	0.020	0.996	0.319

Source: Own calculations in Eviews

The results of testing the efficiency of the Chinese stock market has shown that if we test the weak form of efficient market hypothesis by both linear and nonlinear methods, the null hypothesis of efficiency cannot be rejected surprisingly in the case of Shanghai Composite index in the crisis period, while in the pre-crisis and post-crisis periods the opposite is true. Shanghai returns are not independent, and therefore do not follow the RW2 model in those periods. On the other hand, results of testing RW2 model for Hang Seng index are logical and expectable. Linear variance ratio test didn't reject the null hypothesis in the pre-crisis and post-crisis periods, while nonlinear Engle's test detected statistically significant dependency in all sub-periods.

If we consider potential influence of the global financial crisis on market efficiency, empirical findings are quite divergent. In the case of Hang Seng stock index, statistical tests delivered expectable results, Hong Kong stock market became inefficient during the global financial crisis period. Contrary to that, efficiency of Shanghai stock market in the crisis period cannot be explained by rational economic arguments. It seems that specific institutional trading rules and regulations by Chinese authorities may play significant role. For instance, in Shanghai stock market, there exists a price limit for stock trading and so on. However, a deeper analysis of institutional arrangements of Shanghai stock market exceeds the length of this paper and it is not in accordance with defined aim of this paper.

When comparing results achieved in this paper with other papers that are focused on testing the weak form of efficiency of Chinese stock market, unfortunately, there cannot be provided serious comparison. This is because there has not been published any serious paper that investigate the weak form of efficiency of Chinese stock market using

data from the period of the global financial crisis. There have been found just some manuscripts or thesis. However, our results are in a harmony with thesis of Hang and Grochevaia (2015). They also didn't reject the null hypothesis of efficiency for Shanghai Composite index using data from 2007-2012 years. In this thesis, they also applied several variance ratio tests.

When assessing the overall efficiency of stock markets, it is necessary to keep in mind that our conclusions are statistically significant. However, it is also necessary to examine economic significance of achieved results since provided tests didn't take into account information and transaction costs, and risk premium as well. Nevertheless, empirical findings imply that in the case of inefficiency it is theoretically possible to build a predictive model whose predictions can be more accurate than RW model.

4 Conclusions

Efficient market hypothesis is usually associated with the idea of random walk which is used in financial literature as a tool to describe the phenomenon when a future price changes represent random deviations from past prices. If a flow of information is immediately reflected in stock prices, future price changes are independent on updates of current prices. Since information is by its nature unpredictable, then price changes will also be unpredictable and random. As a consequence, prices fully and immediately reflect price-fixing information. It means that no investor can make above average profit without taking himself on more risk. This paper was focused on a statistical evaluation of daily returns of the Chinese stock indexes Hang Seng and Shanghai Composite from the point of view of efficiency. Our investigations concerned the weak form of efficiency in the form of RW2 model only. For the purpose of this paper we utilized daily data from Chinese stock market in the period from 2003 to 2015. The null hypothesis of market efficiency was verified by linear variance ratio test and nonlinear Engle's test. Data sample was divided into three testing sub-periods. A special emphasis was given on potential influence of the global financial crises of 2007-2009 years on markets efficiency. Completed statistical tests delivered different results for Hang Seng and Shanghai composite indexes in all sub-periods.

Acknowledgments

This paper was supported by the Czech Science Foundation through project No. 13-13142S and the European Social Fund within the project CZ.1.07/2.3.00/20.0296.

References

- Campbell, J. Y., Lo, A. W., MacKinlay, A. C. (1997). *The Econometrics of Financial Markets*. 1st ed. New York: Princeton University Press.
- Cooray, A. (2003). *The Random Walk Behaviour of Stok Prices: A comparative Study*. 1st ed. Hobart School of Economics: University of Tasmania.
- Engle, R. F. (1982). Autoregressive Conditional Heteroskedasticity with Estimates of the Variance of United Kingdom Inflation. *Econometrica*, vol. 50(2), pp. 987-1007.
- Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. *Journal of Finance*, vol. 25(2), pp. 383-417.
- Hanclova, J. (2012). The Effects of Domestic and External Shocks on a Small Open Country: the evidence from the Czech Economy. *International Journal of Mathematical Models and Methods in Applied Sciences*, vol. 6(2), pp. 366-375.
- Hang, J., Grochevaia, N. (2015). *Study of the Weak-Form Efficient Market Hypothesis: Evidence from the Chinese Stock Market*. 1st ed. Gothenburg: University of Gothenburg. Retrieved from: https://gupea.ub.gu.se/bitstream/2077/42474/1/gupea_2077_42474_1.pdf.

- Hinich, M. J., Mendes, E. M. (2005). *A comparison between standard bootstrap and Theiler's surrogate methods*. 1st ed. Austin: University of Texas at Austin.
- Song, S., Jin, W. (1995). An empirical study on the efficiency of Shanghai stock market, *Jingji Xuejia (The Economists)*, vol. 4, pp. 56-64.
- Tran, V. Q. (2007). Testing the Weak Form of Efficiency on Czech Stock Market. *Politická ekonomie*, vol. 6(6), pp. 751-772.
- Worthington, A. C., Higgs, H. (2006). Weak-Form Market Efficiency in Asian Emerging and Developed Equity Markets: Comparative Tests of Random Walk Behaviour. *Accounting Research Journal*, vol. 19(1), pp. 54-63.
- Zhang, Y., Zhou, Y. (2001). Are China's stock market weak-form efficient? *Jinrong Yanjiu (Journal of Financial Research)*, vol. 24(3), pp. 15-26.

Financial Statements in the Financial Decision Making

Jaroslav Sedláček

Masaryk University
Faculty of Economics and Administration, Department Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: sedl@econ.muni.cz

Abstract: *The paper is devoted to the comparison of financial statements according to International accounting standards and Czech accounting legislation and impact assessment of identified differences on the decisions of investors and owners of corporations. The first objective is to identify accounting methods and practices that lead to differences in reporting of financial position and performance of corporations, analyze their causes and examine their impact on the statements. The second objective is to assess the impact of these differences using methods of financial analysis on data specific company. For this purpose is created parallel system of ratio indicators. Calculations of indicators and their development in time make it possible to assess the significance of these differences and the degree of influence on the decisions of users of financial statements. Research has proven that despite the ongoing harmonization efforts, there are still significant differences in both approaches and should be taken into account when making decisions.*

Keywords: *financial statements, financial decision, models of valuation, recognition, differences*

JEL codes: *M21, M41, G32*

1 Introduction

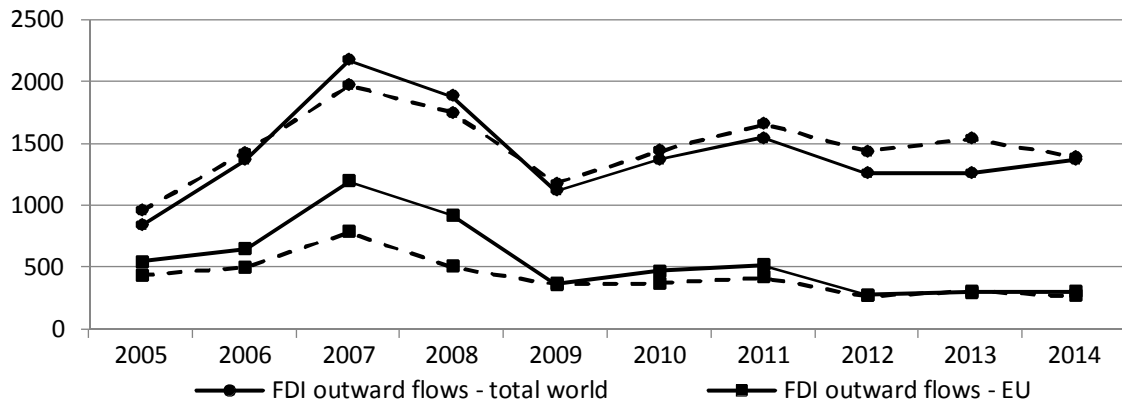
Accounting is generally considered a reliable instrument of financial management, which accurately shows assets and liabilities of trade corporations and their net income. It is based on principles and rules which are universally recognised and accepted all over the world. And it is the understanding of these principles and their implementation at international and national levels which causes the differences in valuation, ultimately leading to different reporting of performance of businesses (Brealey, Myers and Allen, 2006), which is usually measured by the profitability of paid-in capital, EVA (Economic Value Added) indicators, MVA (Market Value Added) indicators, or by SVA (Shareholder Value Added) indicators. The environment in which accounting develops and functions plays a key role (Sedláček, 2007). It is therefore logical that accounting is influenced by the economic, legal, social, political and cultural environment in a given jurisdiction. Also the application of accounting principles in national rules (particularly for valuation) is different in each country. This occurs despite the ongoing efforts to harmonise accounting globally in the form of the International Accounting Standards (IAS) and the International Financial Reporting Standards (IFRS), including the interpretations of SIC (the Standing Interpretations Committee) and IFRIC (the International Financial Reporting Interpretations Committee).

Furthermore, a problem arises from the fact that the individual principles contradict each other and it is up to the will of businesses to decide which principle is more important when valuing their assets and liabilities. The selected method of valuation then directly affects the amount of reported assets and liabilities of a trade corporation, it has an impact on the amount of costs (as asset consumption expressed in monetary terms) and revenues (as accrued assets expressed in monetary terms) as well as on the amount of reported net income of a trade corporation (Bruneckiene and Pekarskiene, 2015).

The international standards have gradually become globally applied accounting standards and they successfully respond to the current needs of globalisation of economy and, in particular, to the development of world financial markets, which is under way without any limits (Pacter, 2015). Companies seek capital at the best price wherever it is

available. Investors and lenders seek investment opportunities wherever they can get the best returns commensurate with the risks involved. To assess the risks and returns of their various investment opportunities, investors and lenders need financial information that is relevant, reliable and comparable across borders. The amounts of cross-border investment are enormous. To illustrate (see Fig. 1): the Organisation for Economic Co-operation and Development (OECD) estimates that worldwide Foreign Direct Investment (FDI) outflows in 2014 were USD 1.372 trillion. The historically highest level was in 2007 (USD 2.170 trillion).

Figure 1 The Development of the Worldwide Foreign Direct Investment (Trillion USD)



Source: OECD statistics 2015

The use of one set of high quality standards by companies throughout the world improves the comparability and transparency of financial information and reduces financial statement preparation costs. When the standards are applied rigorously and consistently, capital market participants receive higher quality information and can make better decisions. Thus, markets allocate funds more efficiently and firms can achieve a lower cost of capital. A comprehensive review of nearly 100 academic studies of the benefits of IFRS concluded that most of the studies provide evidence that IFRS has improved efficiency of capital market operations and promoted cross-border investment.

According to Pacter from the IFRS Foundation 130 countries have publicly pledged to adopt the IFRS as a single set of global accounting standards, 114 countries require their use in all or most public companies and their use in other countries is possible. The ongoing convergence of the US GAAP, which are oriented to the needs of corporations financed through financial markets (Bohušová, 2011), also contributes to the global nature of the IFRS. Accounting is thus becoming more and more international and national accounting is more and more pushed to the sphere of small and medium-sized trade corporations, in which it plays the role of recording for the tax purposes or commercial law. The International Accounting Standards Board (IASB) seeks to establish a coherent global system of accounting standards, but the way of their implementation in individual countries is still within the authority of national governments or economic groups. In the Czech Republic, being a member country of the EU, only those trade corporations which are traded on the public capital markets are obliged to submit financial statements according to the IFRS from 1st January 2005 onwards. Other corporations follow the Czech accounting standards, which leads to inconsistent reporting of their financial and revenue situations on an international scale. On the basis of the amendment to the Accounting Act valid from 1st January 2011 onwards, the IFRS may also be used for the purpose of preparing individual financial statements by those trade corporations which are a part of a consolidated unit preparing a consolidated financial statement in accordance with the IFRS.

It is clear that the differences in reporting according to the international and national accounting standards will be particularly affected by the economic and legal environment of individual countries (Malíková and Černíková, 2014; Oxelheim, 2003). They will depend on how each country modifies the relationship between these two systems and

how it will accept changes arising from the IFRS updates. The IASB permanently modifies and extends the IFRS depending on the evolving needs of the users of financial statements.

The Czech national accounting system is primarily based on rules which are codified in legislation. As a member country, it is a subject to the legislation of the European Union and therefore it has to carry out its obligations. The main pillar of the Czech accounting legislation in its broader concept is the Accounting Act, which is a basic, generally valid legislative norm with state-wide force, containing adjustment of accounting methods and reporting for all business units in the country ranging from the smallest to the largest (also multinational) ones, whose scope of business and purpose of foundation are fundamentally different. The form and content of the act are determined not only by the rules and the content of the European legislation, but also by the Czech legislative rules and the requirement for full compliance (both factual and terminological) with the other regulations of the Czech legal order. Considering the fact that the act is also designed for very small business units, e.g. the self-employed who cannot be expected to have broad theoretical knowledge in accounting and related fields, it is necessary to make the text as much comprehensible and clear as possible. The national accounting system is also influenced by the tax requirements, because the accounting net income is at the same time the basis for the assessment of corporate income tax. As a result, in practice the management makes a lot of estimates when preparing accounting statements with regard to the potential tax implications of the particular accounting procedure. This may lead to adoption of an accounting stance based on tax counts and not on considerations about how it is to be expressed in fair and true view of a transaction in its essence. Although the Czech accounting legislation (below CAL) has gradually taken over a wide range of procedures from the IFRS and it is continuously updated in the form of amendments, there are still differences resulting from the different priorities and principles. Identification of the differences between the two accounting systems and examination of their causes is the subject of many research studies, see e.g. papers by audit companies Ernst and Young (EaY, 2013) and PricewaterhouseCoopers (PwC, 2013). The IASB projects, whose aim is to meet the needs of users resulting from the dynamically developing financial markets, are currently discussed. The solution lies in simplification and clarification of reporting of financial instruments (IFRS 9).

2 Methodology and Data

The aims of our research are to compare the accounting methods and procedures for the preparation of financial statements in compliance with the IFRS and the Czech accounting legislation (CAL) and to identify the main differences of both approaches which affect the reporting of the financial position and performance of corporations; to assess the degree of the influence, or the significance, of these differences using the method of financial analysis. We use a parallel system of ratio indicators, which are applied to a specific corporation.

The identification of the main differences will arise from the comparison of the two approaches as regards the recognition of the basic items of financial statements, their measurement methods, and the procedures used for their booking.

The recognition of the basic items of financial statements

Asset – the IFRS characterize an asset as a future economic benefit, which will very likely occur and is controlled by the corporation (i.e., it can only use the benefits following from the asset in its own favour). Unlike in the case of the CAL, the ownership is not important for the recognition of the asset. This affects the reporting of the balance sheet total if, e.g., the corporation uses financial leasing.

Liabilities and other debts - represent the obligation of the corporation to settle a liability (debt), which occurred in consequence of past situations, and its settlement will result in reduced economic benefit (reduced assets or increased liabilities). CAL does not provide a definition of liabilities or other debts or criteria for their recognition.

Equity – is defined as the remaining proportion of the corporation's assets after deducting the liabilities. The definition is the same in the case of the CAL; however, due to the different definition of costs and incomes and other liabilities, the equity will be reported with a different value.

Costs – reduce the economic benefit of the corporation during the accounting period by using assets or creating liabilities, which leads to reduced equity in a different way than allocation to owners. The IFRS distinguish two types of costs: expenses (i.e., costs related to common activities of the corporation) and losses (the opposite of gains).

Incomes – represent an increase in the corporation's economic benefit by increasing the value of assets or reducing liabilities. They increase the equity in a different way than owners' deposits. Unlike the CAL, the IFRS distinguish two types of incomes - revenues (i.e., the income from the common corporation's activities) and gains (i.e., the income from other than common activities, which are reported in compensation with the related costs - losses).

The measurement methods for assets, liabilities and other debits

Valuation in accounting should generally be derived from the benefit which an asset or liability will bring to the owners. It is basically the right choice between two extreme approaches based on the one hand on historical costs, and on the other hand on fair prices. Both approaches have their pros and cons and that is why the choice of an appropriate valuation variant is always problematic and ambiguous. The measurement method used will naturally affect the value of the reported assets and liabilities, equity and the amount of the costs, which are reflected in the activation and the profit or loss account for the period given (Brabec and Hasprová, 2014). To identify the measurement differences between the IFRS and the CAL we analyze measurement models and the conditions of their use.

The IFRS list as the basic models:

- the historical cost,
- the current cost,
- the realisable value,
- the present value,
- the fair value,
- and the nominal value.

The standards also allow using other measurement models and techniques that provide useful information for economic decisions. They are gradually turning away from an accounting model based on displaying the ability of the corporation to reproduce historically expressed costs or retain nominally expressed financial capital towards models responding to the behaviour of markets (Christensen and Nikolaev, 2013). Within production, measurement relates to the market in the form of purchase prices (costs) of the assets which have been consumed during the production. The factor of time is reflected in the measurement of assets and liabilities by the method of the effective interest rate. When testing the assets as regards the value depreciation, the recoverable amount is determined together with the value in use (Ding et al, 2007).

The models presented in the CAL are basically consistent with the IFRS, with the exception of the measurement by equivalence, which is applied for long-term financial assets. The key factor for determining the differences resulting from measurement are the different approaches used at the stages of the acquisition (creation) of the assets and liabilities, in the course of holding the assets and the existence of liabilities, and after the disposal of assets or settlement of liabilities. The issues related to measurement are not only choosing the right model, but also differently defined requirements as regards the level of the data entering the model.

Accounting procedures and reporting

The differences in this area originate in the concept of accounting methods and procedures, which are based on defined principles in the IFRS, while in the CAL they mainly take the form of detailed rules (Epstein and Jermakovicz, 2010). Out of the many differences that may significantly affect financial statements, we mention: the liabilities following from financial leasing, the cost of the disposal of fixed assets and restoration of the original state, methods of depreciation of fixed assets, spare parts, results of research and development, intangible assets with indeterminate period of use, exceptional items, corrections of significant errors, building contracts, employee benefits, real estate investments, reserves, etc. The possible alternative solutions do not contribute to comparability, and neither do the problems which are not addressed at all in the Czech legislation in contrast to the IFRS (Bohušová and Svoboda, 2013).

An increased risk of errors and inaccuracies in the course of a financial statement creation may occur in the case where a corporation creates statements in accordance with the IFRS, but they need to know the result in compliance with the Czech legislation in order to determine the tax base. It is ideal to do dual accounting, which is more expensive, however, especially during the preparation and implementation of the two systems. Therefore, it is more popular in practice to create statements in compliance with the CAL and then transform them into statements in compliance with the IFRS using transformation rules (Hýblová, 2014). This procedure is always inaccurate, and the result is in proportion to the cost the corporation considers acceptable.

Parallel system of ratio indicators

A system of indicators is chosen to cover four basic areas of the financial analysis: liquidity, debt ratios, equity, and profitability of corporations (Valouch, Sedláček and Králová, 2015). In total, seven ratio indicators are selected: Current Ratio, Quick Ratio, Debt Equity Ratio, Interest Coverage Ratio, Proprietary Ratio, Return on Sales, and Return on Equity. The calculations of the indicators are performed using data of a real international company, which operates in the building industry and is categorized as a large accounting unit by the Act on accounting (Act no. 563, 1991). The development of the differences between the indicators in compliance with the IFRS and the CAL is measured by interannual indexes expressed in percentage points. The time interval covers six immediately preceding years.

The size of the difference and its direction are the basis for the interpretation of the causes of the development of the individual variables entering the indicator.

3 Results and discussion

Data for the calculation of ratio indicators are taken from the financial statements (balance sheet and profit and loss account) of the company drawn up in compliance with the IFRS and concurrently the CAL in individual years of the researched period. Independent variables are described by the equations below:

$$\text{Current Ratio: Current Assets} / \text{Current Liabilities} \quad (1)$$

$$\text{Quick Ratio: Current Assets} - (\text{Inventory} + \text{Prepaid Expenses}) / \text{Current Liabilities} \quad (2)$$

$$\text{Debt Equity Ratio: Total Liabilities} / \text{Stockholders Equity} \quad (3)$$

$$\text{Interest Coverage Ratio: EBIT} / \text{Interest Expense} \quad (4)$$

$$\text{Proprietary Ratio: Stockholders Equity} / (\text{Total Assets} - \text{Intangibles}) \quad (5)$$

$$\text{Return on Sales: Earnings after Tax} / \text{Net Sales} \quad (6)$$

$$\text{Return on Equity: Net Income} / \text{Stockholders Equity} \quad (7)$$

The resulting values of the financial indicators calculated using the data reported by the corporation compliant to the IFRS and the CAL are listed in Table 1. The closest relationship between the two systems was observed in the time series of Interest

Coverage Ratio Return on Sales $r_y = 0.9997$ as measured by the Pearson correlation coefficient; followed by Return on Equity and Return on Sales. On the contrary, the lowest of the measured correlations were found in the time series Proprietary Ratio ($r_y = 0,8095$). No negative correlation was found.

Table 1 Development of Financial Ratios under CAL and IFRS in the Period 2009-2014

Ratios	System	2009	2010	2011	2012	2013	2014
Current Ratio	CAL	1.62	1.58	1.77	1.93	1.75	1.89
	IFRS	1.59	1.57	1.78	1.90	1.70	1.88
Quick Ratio	CAL	1.58	1.57	1.75	1.89	1.60	1.82
	IFRS	1.53	1.52	1.65	1.76	1.51	1.76
Debt Equity Ratio	CAL	1.76	1.98	1.63	1.62	1.90	1.49
	IFRS	1.78	2.04	1.68	1.70	2.02	1.59
Interest Coverage Ratio	CAL	26.83	34.11	28.67	33.70	25.80	18.12
	IFRS	27.78	35.60	29.41	35.00	26.60	18.54
Proprietary Ratio	CAL	0.32	0.29	0.32	0.33	0.30	0.33
	IFRS	0.31	0.29	0.33	0.35	0.31	0.33
Return on Sales	CAL	0.03	0.03	0.04	0.04	0.01	0.02
	IFRS	0.03	0.03	0.03	0.04	0.01	0.02
Return on Equity	CAL	0.14	0.13	0.14	0.14	0.05	0.07
	IFRS	0.15	0.13	0.14	0.14	0.05	0.08

Source: Own elaboration

The size of the difference (Dt) between the indicators compliant to the IFRS (RI) and the CAL (RC), expressed in percentage is calculated for the individual years (t) according to the equation:

$$Dt = [(RI - RC)/RC] \times 100 \quad (8)$$

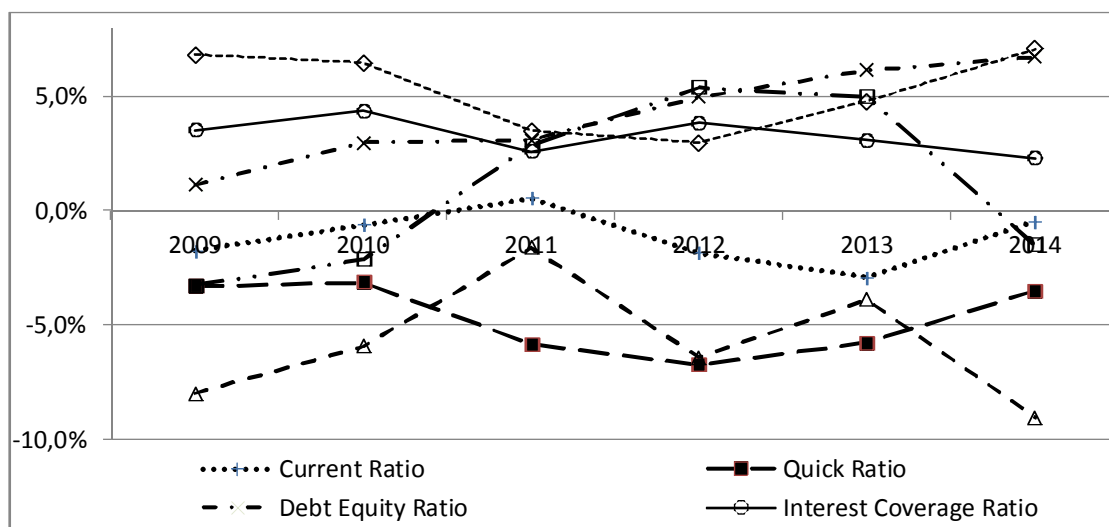
The calculated values of the differences are entered in the graph in Fig. 2, which also shows the development in the period 2009–2014. As regards the differences that have a negative progress throughout the observed period, higher values of ratio indicators were calculated compliant to the CAL than the IFRS. This concerns indicator Return on Sales, which is interannually influenced in particular by the efficiency of the production and the costs. The difference ranges around 6.4% and the causes lie in a different approach to the recognition of revenues. Additionally, liquidity measured using the data reported in compliance with the IFRS achieves lower values than when reported compliant with the CAL. It is a consequence of the different recognition and measurement of current assets and short-term debts. Spare parts are always included in reserves in compliance with the Czech legislation, including reserves from the company's own activities and all related costs enter the measurement. The curve of the indicator Quick Ratio difference values is under the curve of Current Ratio, i.e. the differences for Quick Ratio are larger. This is caused by the different structure of short-term debts, which are reported in a lower value compliant to the CAL compared to the IFRS. Although the corporation achieves a relatively high level of liquidity and there are no large fluctuations in between the years, the distortion of the reported value may reach up to 6.7%, as occurred in 2012. The lowest volatility in the course of the observed period was measured for the Current Ratio difference, which ranged from – 2.9% to + 0.6%.

The corporation has a relatively low Debt Equity Ratio, which even declined during the period observed. It is a good signal for investors. The corporation manifests higher values in compliance with the IFRS compared to the CAL, as confirmed by the positive progress of the differences. The difference reached its peak in 2014. The cause can be particularly found in the different accounting concerning leasing. Interest Coverage Ratio difference curve suggests a very low distortion between the two approaches to reporting, which reached a maximum of 4.4%. The ability of the corporation to pay the interests exceeds the recommended values several times. However, in reality, the indicator declined due to the declining values of EBIT.

Completely unprecedented development of the differences was observed in the Proprietary Ratio, which reflects the corporation's endowment with equity. The difference increased from negative values to positive ones in the years 2011 to 2013, and then again returned to a minimum value of - 1.5%. A greater degree of influence can be attributed to the item intangible assets, which are reported with a substantially lower value by the CAL than by the IFRS.

The corporation did not reach a very high value of profitability, which had a downward trend throughout the observed period. The volatility of Return on Equity differences ranged between 3% and 7.1%. The higher values of the indicators reported under the IFRS were most likely influenced by the accounting methods for deferred taxes, depreciation, and valuation by fair value, which were reflected in the reported higher net profit.

Figure 2 Development of the Differences between the Financial Ratios under IFRS and CAL



Source: Own elaboration

4 Conclusions

The world economy globalization requires that adequate information are provided for users' economic decisions. This requirement is met by the IFRS, which are developed by an independent institution; due to their qualities, they are gradually adopted (completely or partially) by economic groups and individual jurisdictions across the continents. The Czech Republic has adopted the IFRS for selected corporations; the others are bound by the national accounting legislation. In spite of the amendments to the CAL, which follow the IFRS updates and in fact absorb their new amendments, some differences remain, which in effect reduce the mutual comparability of the reported data.

The results of the research conducted have confirmed the differences in reporting, which are mainly caused by different approaches to the recognition of assets and liabilities, their measurement and depreciation, which results in increased volumes of long-term assets and debts, equity and profit/loss in the statements prepared under the IFRS. Financial statements then show a different balance sheet total or other profit or loss of the corporation, depending on whether they are created in compliance with the IFRS or CAL. The size of the differences measured by ratio indicators changed interannually in the range from -9% to + 7.1%. The lowest distortion was observed for the Current Ratio (0.6%), while the largest has been measured for the Return on Sales (9%).

The introduction of uniform standards will facilitate a better comparison of the economic position and performance of corporations, regardless of national borders, encourage the free flow of transnational capital, and increase the credibility of financial statements. Permanent innovation of global accounting standards with respect to user needs will

increase the reliability and facilitate use of the financial statements, which will be reflected in the quality of the decisions based on them. However, as demonstrated by our research, in the conditions of the Czech economy, investors, lenders, managers, and other users when making their decisions should take into account the correction factor arising from the differences between the existing national and multinational financial reporting systems.

References

- Bohušová, H. (2011). General Approach to the IFRS and US GAAP Convergence. *Acta univ. agric. Et silvic. Mendel. Brun.*, 54(4), pp. 27–36.
- Bohušová, H., Svoboda, P. (2013). The evaluation of new methodological approaches to lease reporting on the side of lessor. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*. 61(4), pp. 881-891.
- Brabec, Z., Hasprová, O. (2014). The Importance of Intangible Assets in a Company Engaged in the Development of Advanced Technologies. In *International Multidisciplinary Scientific Conferences on Social Sciences and Arts*, pp. 769-776
- Brealey, R. A., Myers, S. C., Allen, F. (2006). *Principles of Corporate Finance*. Boston: McGraw-Hill.
- Bruneckiene, J., Pekarskiene, I. (2015). Economic Efficiency of Fines Imposed on Cartels. *Inžinerine Ekonomika-Engineering Economics*, 26(1), pp. 49-60.
- Hýblová, E. (2014). Analysis of mergers in Czech agricultural companies. *Agricultural Economics*, vol. 60(10), pp. 441-448.
- Christensen, H. B., Nikolaev, V. V. (2013). Does fair value accounting for non-financial assets pass the market test? *Review of Accounting Studies*, 18(3), pp. 734–775.
- Ding, Y., Hope, O-K, Jeanjean, T., Stolow, H. (2007), Differences between domestic accounting standards and IAS: Measurement, determinants and implications. *Journal of Accounting and Public Policy*, 26(1), pp. 1-38.
- EaY (2013). *EaY publikace*. Retrieved from: <http://www.ey.com/CZ/cs/home/library>.
- Epstein, B. J., Jermakovicz, E. K. (2010). *Interpretation and Application of International Financial Reporting Standards*. New Jersey: John Wiley & sons.
- OECD Data, Analysis and Forecasts (2015). Foreign Direct Investment (FDI) Statistics. <http://www.oecd.org/corporate/mne/statistics.htm>
- Malíková, O., Černíková, M. (2014), Financial Management-Accounting and Tax Aspects of Debt Capital Decision Making. Political Sciences, Law, Finance, Economics and Tourism, Vol II, Book Series: *International Multidisciplinary Scientific Conferences on Social Sciences and Arts*, pp. 19-26.
- Oxelheim, L. (2003). Macroeconomic Variables and Corporate Performance. *Financial Analysts Journal*, 59(4), pp. 36-50.
- Pacter, P. (2015). *IFRS as global standards: a pocket guide*.
- PwC (2012). IFRS publikace. Retrieved from: <http://www.pwc.com/cz/cs/ucetnictvi/ifrs-publikace.html>.
- Sedláček, J. (2007). Analysis of the development of financial efficiency of enterprises in the Czech Republic. *Journal of Economics*, 55(1), pp. 3-18.
- Sedláček, J. (2010). The methods of valuation in agricultural accounting. *Agricultural Economics*, 56(2), pp. 59-66.
- Valouch, P., Sedláček, J., Králová, M. (2015). Impact of Mergers of Czech Companies on their Profitability and Returns, *Journal of Economics*, 63(4), pp. 410-430.
- Act no. 563/1991 Coll., on accounting, as amended.

Financial Literacy of Elementary School Pupils in Pardubice

Kateřina Seinerová¹

¹ University of Pardubice
Faculty of Economics and Administration, Institute of Mathematics and Quantitative Methods
Studentská 95, 53210 Pardubice, Czech Republic
E-mail: Katerina.Seinerova@upce.cz

Abstract: *This paper analyses results of the comparative study, related to the financial literacy, conducted among the pupils of the 8th and 9th year of the basic education. The data were collected by the survey questionnaire covering topics of personal budgeting, currency, payment methods, price literacy and future financial visions of the respondents. This study compares the results obtained from the survey realized in three elementary schools of different types. In particular, common type of elementary school, elementary school with advanced courses of mathematics and eight-year type of elementary school.*

Keywords: financial literacy, financial education, personal budget

JEL codes: A21, I20, C83

1 Introduction

Financial literacy is a core life skill for participating in modern society. Children are growing up in an increasingly complex world where they will eventually need to take charge of their own financial future. The OECD's Principles and Good Practices for Financial Education and Awareness recommend that financial education start as early as possible and be taught in schools. Including financial education as part of the school curriculum is a fair and efficient policy tool. Financial education is a long-term process. Building it into curriculums from an early age allows children to acquire the knowledge and skills to build responsible financial behaviour throughout each stage of their education. This is especially important as parents may be ill-equipped to teach their children about money and levels of financial literacy are generally low around the world. (OECD, 2012)

Ministry of Finance defined the financial literacy in the National Strategy for Financial Education. It is a comprehensive and systematic approach to reinforcing the financial literacy of citizens of the Czech Republic. The objective of the strategy is to create a financial education system aimed at increasing the level of financial literacy in the Czech Republic. The strategy defines the main issues as well as consequential priority tasks in the area, including specific tasks of the key players, with an emphasis on the public administration entities. According to Ministry of Finance, financial education is a key element in consumer protection in the financial market and represents one of the objectives stipulated in the Framework Policy of the Ministry of Finance on Consumer Protection in the Financial Market. (MFČR, 2010)

Ministry of Education, Youth and Sports in the Czech Republic in cooperation with experts for financial literacy prepared a collection of materials focusing on the development of financial literacy. These materials are supposed to use by elementary school teachers and should satisfy subsequent criteria: appropriateness with primary and secondary education, compliance with the curricular reform and Financial Literacy Standards, quality, up-to-datedness, availability and good references. (MŠMT, 2014)

Another source used in elementary schools is a project called "Financial literacy into schools". It has been designed as a compact tool for elementary and high-school teachers and also for parents and students who want to understand better the financial topics and effectively use this knowledge in everyday life. This project is a reaction to increasing indebtedness of Czech families. That prevention focused on young people can be a way how to change it because low financial literacy is one of the reasons why people are not economical with their money and why they often take out many loans. There are

lessons and workshops including many important topics from the field of financial literacy organized for students. In 2016 the first annual contest “*Cost out it yourself!*” has held. It is an interactive financial literacy event for elementary school pupils and their parents or teachers (Yourchance, 2011).

Another useful source of information about financial literacy is highly appreciated book *Finanční gramotnost* by Škvára (2011). Covering main topics of financial literacy, it could be used for education at all school levels.

2 Methodology and Data

During spring 2016, a survey focusing on financial literacy took place in three elementary schools in Pardubice. This survey covered topics of personal budgeting, currency, payment methods, taxes, inflation, and insurance.

There were several questions on respondents in the questionnaire. These identifying questions inquired not only respondents' gender or school grade, but also their experiences with personal budget or future plans.

The part of the survey focusing on students' knowledge was arranged in a form of knowledge test. Some of the questions proposed several possibilities of answers, others were designed as open questions. Several questions were in the form of short numerical problems.

The questionnaire was filled in by the 8th and the 9th grade elementary school pupils. Three types of school took part in this survey. Participating schools were chosen on the basis of their popularity. All of these schools were highly evaluated and they refused many applicants every year.

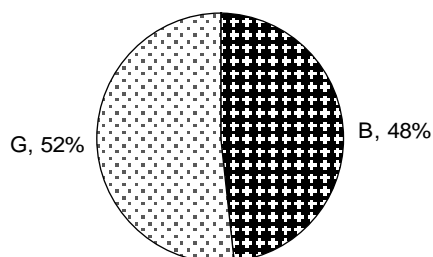
Type A was a common type of elementary school. This school provided 122 respondents, 67 were boys and 55 were girls. 43 of these respondents were studying their 8th grade and 79 the 9th grade. Students of the 8th grade attended 4 lessons of mathematics a week, students of the 9th grade had 5 lessons of mathematics a week. Financial literacy was not taught on a regular base, no additional courses specialised on financial literacy were provided.

Type B was the elementary school with advanced courses of mathematics. Due to the demographical evolution and strictly selective admissions to the mathematical class, the number of responses was quite low. Only 53 respondents from this school took part in our survey, from which 25 were boys and 28 girls. 35 of these pupils were studying their 8th grade and only 18 the 9th grade. Students of 8th as well as 9th grade attended 5 lessons of mathematics a week. Numerical problems focused on financial literacy were solved during mathematical lessons.

C stood for the eight-year type of the grammar school. From this school participated 108 respondents, 45 were boys and 63 girls. 56 of these participants were studying the 8th grade, 52 were studying the 9th grade. Students of both the 8th and the 9th grade attended 4 lessons of mathematics a week. Voluntary course focused on financial literacy was provided for students of grammar school.

Figure 1 presents distribution of respondents from all participating schools by gender, where G means girls and B means boys. The numbers of responding girls (146) and boys (137) were very similar. Figure 2 presents distribution of respondents by their grade. The number of 8th grade pupils was 134, while the number of 9th grade pupils, participating the survey, was 149.

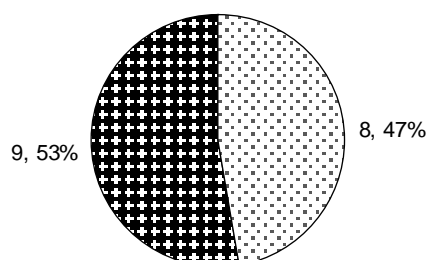
Figure 1 Gender



Source: Own results based on questionnaire survey

The questionnaire was distributed in a paper form. The advantage of this form of distribution was that pupils had a chance to write down their own remarks to particular questions. This opportunity was used by about 25 % of respondents and it provided additional information.

Figure 2 Grade



Source: Own results based on questionnaire survey

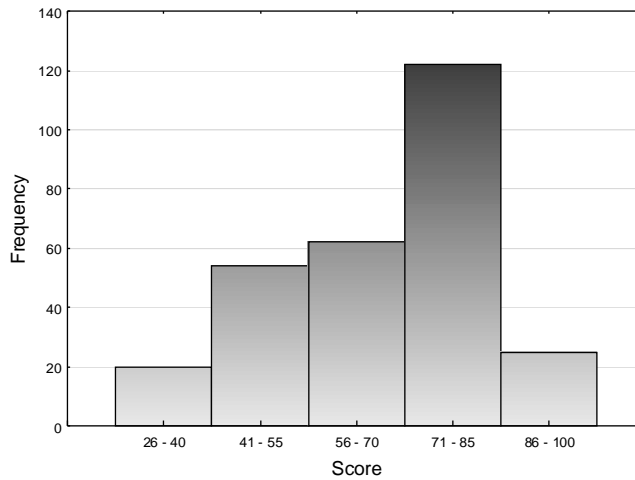
The questionnaire used for this research was designed and evaluated according to Presser (2004) and Saris and Gallhofer (2007). Questions were designed in compliance with MŠMT (2014).

3 Results and Discussion

Figure 3 presents the distribution of score achieved by the respondents. Only 8.8 % of respondents achieved the top range of score, i.e. more than 86 %, but a decent number of respondents (43.1 %) achieved the score range of 71 – 85 %. Almost 7.1 % of pupils did not responded more than 40 % of questions correctly. Average score achieved in the survey was 65.2 %, modus and median were both 71 %.

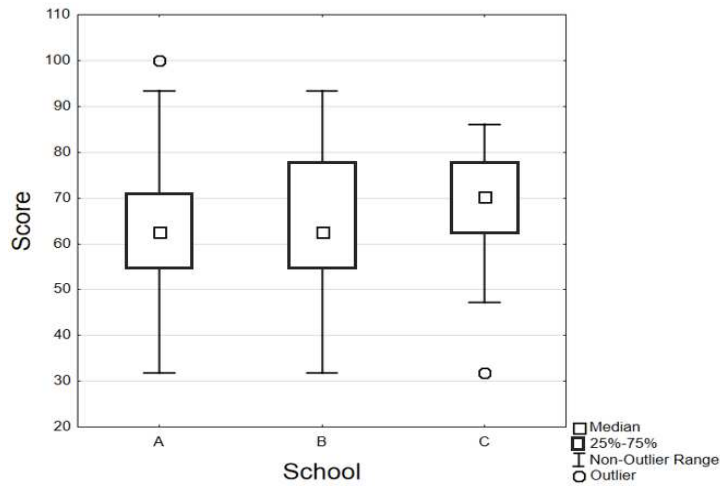
Figure 4 presents box plots showing different score results achieved by pupils of particular analysed schools. From this figure, it is obvious that the highest possible score 100 % was achieved only by a pupil attending common type of elementary school. It was a girl studying the 9th grade.

Figure 3 Overall Score (in %)



Source: Own results based on survey

Figure 4 Box Plots



Source: Own results based on survey

Table 1 presents score distribution by the school type. Average score for school of type A is 62.221 %, for type B 63.849 and for type C 69.259. The eight-year type of the grammar school achieved significantly higher score than the others types of schools.

Table 1 Score Distribution

Score	26 - 40	41 - 55	56 - 70	71 - 85	86 - 100
Type A	13	35	22	43	9
Type B	6	10	12	21	4
Type C	1	9	28	58	12

Source: own results based on survey

Although scores of both elementary schools (type A and B) can be considered as identical ($p = 0.38327$ using Mann-Whitney test), scores of all the participating schools cannot ($p = 0.0001$ using Kruskal-Wallis test). These results were based on rough data (not shown).

Table 2 presents p-values of the chi-square tests and corresponding values of Cramer V. These tests tried to discover possible dependences.

Dependence between the score and the school type is significant, since the p -value 0.0003 is very small. Value of $V = 0.227$ refers to weak dependence between the score and the school type.

Dependence between gender and score achieved by the respondent was not discovered on the significance level 0.05, but is significant on level 0.01.

Weak dependence between grade and achieved score is significant on level 0.05.

The last analysed situation concerned the relationship between the score and the property of an own bank account. This test was not significant on any usual significant level.

Table 2 Chi-square Tests

	p-value	V
School type	0.0003	0.227
Gender	0.0591	0.179
Grade	0.0211	0.220
Own account	0.3323	-

Source: Own results based on survey

Table 3 presents results of participating schools in different topics of survey. Average scores of personal budgeting were similar for schools of type A and B, but obviously higher for school of type C, whereas results related to currency were quite good and comparable, exceeding 80 % for all participating schools. Other topics, including for example payment methods, taxes, inflation, and insurance showed lower average scores between 50 and 60 %.

Table 3 Average Scores

	Personal budgeting	Currency	Other topics
Type A	57.58	81.76	50.14
Type B	55.19	84.43	54.09
Type C	65.74	84.26	59.88

Source: Own results based on survey

Table 4 presents results of various types of questions. Average scores achieved by respondents in short numerical problems showed obvious differences among participating schools. Students of the elementary school with advanced courses of mathematics showed better results than pupils of common elementary school, but scores of eight-year type grammar-school students were even higher exceeding 95 %. Most problematic questions were definitions of basic terms of financial literacy (credit card, inflation, interest), no school exceeded average score of 40 %. Questions related to awareness of prices again showed obvious difference among students of particular types of schools.

Table 4 Average Scores

	Numerical problems	Definitions	Prices
Type A	79.92	37.21	54.92
Type B	86.79	34.72	58.49
Type C	95.83	39.26	64.81

Source: Own results based on survey

Another results obtained from the survey showed an example of future visions of the respondents. One pupil did not respond this question. As presented in table 5, salary expected by the eight-year type of the grammar school pupils were higher than by the others.

Table 5 Expected Salary (in CZK)

Salary	< 20 000	20 - 30 000	30 - 40 000	> 40 000
Type A	7	45	40	30
Type B	4	17	22	10
Type C	0	20	35	52

Source: Own results based on survey

4 Conclusions

Results of the survey showed significantly higher level of financial literacy for pupils of the eight-year type of the grammar school. These students were enabled to attend voluntary courses of financial literacy. The level of the financial literacy on the common elementary school and the school with advanced courses of mathematics was almost the same.

Distinct difference was observed in levels of solving the numerical problems. Comprehensibly, students of elementary school with advanced courses of mathematics achieved better scores than students of common elementary school, as their mathematical education is concerned to solving it. Even better results were observed at grammar school.

Dependence between the survey score and the school type as well as between the score and the grade of the respondent was proved. The grammar school pupils showed higher expectations concerning to their future salaries. Remarks made by respondents on the questionnaire papers showed that the grammar school students analysed the questions deeply, showing the knowledges, those were not expected by the author of the survey.

Acknowledgments

This paper was supported by the project No.SGS_2016_023 ekonomický a sociální rozvoj v soukromém a veřejném sektoru (Economical and social development in private and public sector), financed from the Czech Republic funds.

References

MFČR (2010). *Financial education – National Strategy for National Education*. Retrieved from: <http://www.mfcr.cz/en/about-ministry/financial-education>.

MŠMT (2014). *Katalog materiálů pro rozvoj finanční gramotnosti*. Retrieved from: <http://www.msmt.cz/vzdelavani/zakladni-vzdelavani/katalog-materialu-pro-rozvoj-financni-gramotnosti>.

OECD (2012). *Financial Education in Schools*. Retrieved from: <http://www.oecd.org/finance/financial-education/financialeducationinschools.htm>.

Presser, S. (2004). *Methods for Testing and Evaluating Survey Questionnaires*. Hoboken: Wiley.

Saris, W. E., Gallhofer, I. N. (2007). *Design, Evaluating, and Analysis of Questionnaires for Survey Research*. Hoboken: Wiley.

Škvára, Miroslav. (2011) *Finanční gramotnost*. Praha: Miroslav Škvára.

Yourchance (2011). *Finanční gramotnost do škol*. Retrieved from: <http://www.financnigramotnostdoskol.cz/en/>.

Stress-testing Model for Structural Liquidity Risk

Eugenia Schmitt¹

¹University of Applied Management
Faculty of Business Administration
Lange Zeile 10, 85435 Erding, Germany
E-mail: eugenia.schmitt@fham.de

Abstract: *The financial crisis of past decades has shown the need to take into account liquidity risk in stress-testing frameworks in an explicit way. The stress-testing model presented in this paper provides an answer to the fundamental question of the risk management: What hypothetical costs a bank should expect for liquidity provision in a particular point of time by the negative development of future financing conditions? Its key components are the cash flow scenarios under consideration the counterbalancing capacity (CBC) and the liquidity spread scenarios developed by historical simulation approach. This enables the view on to the realistic risk, after exhaustion of compensation capacity. Multiple dimensions of liquidity risk are combined with two quantitative risk measures, Value-at-Risk (VaR) and Expected Shortfall (ES). The analytical components of liquidity risk management that are needed to address the new Basel III are taken into account. Additionally to calculation of liquidity costs, detailed analyses of liquidity needs are possible. An application on a typical middle sized bank in a case study illustrates how sensitive VaR and ES are to the shocks.*

Keywords: liquidity risk, banking, stress-tests, value at risk, regulatory requirements

JEL Codes: C14, C81, G28, G17, G18

1 Introduction

The main role of banks in the financial system is to provide liquidity through the financial intermediation. This transformation function makes them fragile, especially at their heart – the funding liquidity risks.

The traditional point of view to a bank liquidity is to ensure bank's ability to pay its claims at any time. This is a strong condition to be kept for achieving its profit-earning capacity. (Zeranski, 2010, p. 207; Bartetzky, 2008, p. 8.). To fulfil this condition, the bank has to hold enough funds in every point of time t . Compared to the other risks as market or credit risk, liquidity risk has a special issue to consider: The path dependence. Even when a bank can obtain enough liquidity at the point of time $t+1$, its liquidity in any point of time $T > t$ doesn't guarantee its liquidity at t . (Skoglund, Chen, 2012, p. 37). For a comprehensive liquidity management, risk manager has to focus on cash flows. (Matz, 2011, Chapter 6.).

Stress scenarios help to understand and to evaluate if a bank has enough cash at the right time and derive realistic opportunities for responding to a funding problem rapidly, if needed, in advance. (Matz, 2007, p. 41, 42.) Stress testing is a key risk management technique, a range of analysis methods for assessing resilience to extreme events. (Čihák, 03/2007, p. 4.).

The aim of the present stress-testing model is to calculate the risks caused by the increase of liquidity costs due the change of funding conditions in consequence of a market shock. The long-term funding structure will be focused. (Neu, 2007, p. 27.). The quantification of risks using probabilistic methods is necessary.

Review on related Literature

This study draws on the literature that relates to Matz and Neu (2007) who view the liquidity risk as a consequential risk, because it increases following one or more spikes in other financial risks (i.e. market liquidity risk). Neu et al. (2007) posts two basic principles for understanding liquidity costs. First, they are depending on scenario, market

conditions, bank balance sheet and the positioning of the bank in the market. Second, liquidity reserve reduces liquidity risks, but increases liquidity costs.

Bartetzky (2008) defines the liquidity risks in two dimensions: As an inability to pay risks and as a liquidity transformation risks. For the measure of the second one, he suggested the VaR-measure framework. There is not a closed valuation model on this topic yet. Thus, the present study fills the gap and extends these proposals in a stress-testing framework. For the selection of risk measure, the present paper leans on the work of Acerbi (2004) who shows the boundaries of VaR and underlines possibilities and problems for using the risk measure ES, among others for liquidity risk measurement.

Berkowitz (1999) investigates the possibility to integrate stress testing into a basis risk model of a bank, so his definition of stress test will be used for the further liquidity risk measurement. Thus, the present model makes it possible to combine the distribution function for normal and stress circumstances and to refer to the respective probability of risks.

The present paper addresses two issues: It shows that 1. the assumptions and the choice of scenario matters, 2. ES is more responsive to stress situation than LVaR (liquidity VaR). It contributes to the literature in incorporating of probabilistic measure of liquidity costs in a stress-testing framework.

The remaining part of the paper is organised as follows: The quantitative stress-testing framework is outlined in the following section. Section 3 discusses the data, specifications of the stress scenarios and risk measures and presents the case study results. The section 4 concludes.

2 Methodology and Data

The present stress-testing model consists of following two main components:

Scenario specifications for calculating liquidity-funding costs

Interest and spread curves can take a completely different shape under strain market conditions or in a crisis compared to business as usual circumstances. Shifts in liquidity spreads in a banking practice should be determined for three kinds of scenarios:

The Base scenario, where the interest and liquidity spreads development follows the business as usual circumstances. The calculation of risk in the base scenario enables the risk manager to compare the risk development when market conditions worsen.

The Sensitivity scenario as a parallel shift, where the institute's own bounds relating to the effect of different interest and liquidity spread widenings can be investigated.

The Market scenario as a structure changing shifts on the base of empirical, historical crisis, data. In the present study an emulation of the past crisis will be shown.

Components for quantification liquidity risks under extremal conditions

A risk measure, for risks arising in consequence of the increase in liquidity costs, LVaR or ES, will be calculated on the basis of two dimensions: The volume changes of the funding portfolio and the spread changes of the institution's own liquidity spreads.

Risk measures VaR and ES as a base for the costs calculation

Value-at-Risk (VaR)

Today, the VaR is a standard tool in risk management for banks. VaR can be applied to any financial instrument and portfolio of any type, the result can be expressed in a single number in the same unit of measure – the lost money. (Klimiková et al., 2012) That makes it possible, to directly compare the relative riskiness between different portfolios. (Acerbi et al., 2001, p. 2, Acerbi, 2004, p. 151.).

In order to compute VaR, a specified level of confidence $\alpha \in]0, 1[$, which selects the set of „worst cases“, and a time horizon over which the future loss should be estimated have

to be chosen. With no loss of generality, by considering the probability of 1% and the time horizon of 10 days, the definition of VaR is often used as follows: "VaR is the maximum of potential loss, that a portfolio can suffer in the 99% best cases in 10 days." Or, which means the same: "VaR is the minimum potential loss that a portfolio can suffer in the 1% worst cases in 10 days." (Acerbi et al., 2001, p. 4, 5, Szegö, 2002, p. 1257, 1258.). This definition shows, that VaR systematically underestimates the potential losses associated with the specified probability level.

VaR doesn't answer the question how serious and how high are the risks behind the selected quantile. (For more details on criticism see f. e. Acerbi et al., 2001; Acerbi, 2004.). For this purpose, another risk measure has to be introduced, the expected shortfall (ES). (Artzner et al., 1997, Acerbi, 2004.).

Expected Shortfall (ES)

ES measures the expected value of portfolio returns given that some threshold, here the VaR, has been exceeded. (Acerbi, 2004; Uryasev, 2004.). Formally, the ES is defined as follows (Yamai, Yoshida, 01/2002, p. 88.):

$$ES_{\alpha}(X) = L VaR_{\alpha}(X) + E(X - L VaR_{\alpha}(X) \mid X > L VaR_{\alpha}(X)) \quad (1)$$

where X is a random variable denoting loss and

$VaR_{\alpha}(X)$ is the VaR at the $100(1-\alpha)\%$ confidence level.

Using the language of the example above, the ES is the expected value of the portfolio's loss in the 1% worst cases in 10 days.

There are different methods for computing risk in a VaR-approach. The present model follows the three steps structure:

- Cash flow mapping and determination of liquidity gap report,
- Estimation of the institute's own liquidity spread distribution,
- Risk Calculation: Calculation of VaR as a quantil of the distribution of present values of liquidity costs, calculation of ES on the base of the above formula (1).

Historical simulation

In the present study, the historical simulation approach will be used in the second step. This method is adopted to generate market-wide stress scenarios to examine the costs of liquidity risk of banks. Instead of making distributional assumptions it assumes, that the historical crisis will repeat in the future in the same manner. (Berkowitz, 07/1999, p. 6; Meyer, 1999, p. 191, 192.) The main source of stress derives from disruptions in financing conditions on the capital market. The presence of sufficient amount of high quality data is essential for an appropriate calculation.

Risk measurement in the present stress-testing model

Step 1: cash flow mapping and determination of liquidity gap report

The base for the calculating liquidity risks is the cash flow mapping and modelling, where broad product knowledge and market experience are important. (The cash flow modelling is not the topic of the present study. For more details see f. e. Neu, 2007, pp. 28-33, Matz 2011, Chapter 6.).

Liquidity gaps must be determined as a base to gain an insight into the liquidity situation. The expected liquidity „marginal“ gap is an algebraic difference of predicted cash flows from open amounts of expected liabilities and claims in a given time bucket (Castagna, Fede, 2013, pp. 118-119; Neu, 2007, pp. 25-26.):

$$NCF_t = CF_t^+ - CF_t^- \text{ („marginal gap“ = „cash in“ - „cash out“)} \quad (2)$$

The negative gap indicates liquidity needs, the positive gap liquidity overhang. In the sense of the cash flow oriented definition of liquidity, the bank liquidity is assured, if at

every point of time the "cash outs" are smaller than "cash ins" inclusively the *CBC*. (Skoglund, Chen, 2012, p. 37.): $CF_t^+ + CBC_t \geq CF_t^-$

For assessing the expected liquidity situation in a given time bucket, the total amount of liquidity needed is necessary to know. For this reason, the projection of liquidity progression will be calculated as a sum of marginal gaps:

$$CF_{kum,t}^+ = \sum_{m+1}^M CF_{m,t}^+ ; CF_{kum,t}^- = \sum_{n+1}^N CF_{n,t}^-$$

$$NCF_{kum,t} = CF_{kum,t}^+ - CF_{kum,t}^- \text{ for } t = 1, \dots, T \quad (3)$$

The cumulative *CBC* will be calculated separately, but in the same way as the cumulative *NCF*. It is a limit for the liquidity deficit. (CEBS, 12/2009.). The cumulative total gaps Gap_{kum} ($NCF_{kum,t}$ including cumulative *CBC*, $CBC_{kum,t}$) are the base for the further analyses.

In all time buckets where negative cumulative gaps, $Gap_{kum,t} < 0$ occur, these gaps will be closed prospective by using hypothetical opposite money and capital market transactions. (Schmielewski, 04/2010.). A financing gap FL_t originates. This is the amount of liquidity in the respective time bucket, the bank will need to obtain on the capital market. Thus, the liquidity costs will be calculated for cases, when *CBC* depleted.

Step 2: Estimation of the institute's own liquidity spread distribution

The empirical liquidity spread changes, delta spreads, ΔLS , are simulated by the historical simulation method in a given time bucket. For every time bucket t , x scenarios of liquidity spread changes are determined. By addition of every $\Delta LS(x)$ to the liquidity spread LS_{t0} at the observation time point $t0$, the projection of the past crisis to the future will be constructed.

Step 3: Risk Calculation

For each liquidity spread scenario x in the time bucket t , the financing gap FL_t will be discounted by the discount factor $DF_{t,x}$ of the refinancing interest rate of the scenario x : $BW_{t,x} = FL_t \cdot DF_{t,x}$. The result is the present value of the liquidity costs for a respective scenario in the time bucket t . For the calculation of the scenario impact to the circumstances at the observation point of time, differences of liquidity costs present values from x liquidity spread changes-scenarios in the respective time bucket t are calculated as follows:

$$\Delta BW_{t,x} = BW_{t,x} - BW_{t,0} \text{ for } t = 1, \dots, T \text{ and } x = 1, \dots, X \text{ scenarios.} \quad (4)$$

$BW_{t,0}$ is the present value at the observation time point 0 in the time bucket t .

The empirical historical distribution function of the present value differences in a given time bucket will be constructed. The results are sorted in ascending order. The corresponding present value will be assigned to the chosen confidence level. This is the risk measure LVaR, i.e. the maximum amount of liquidity costs for a modelled scenario in a given time bucket, that will not be exceeded with the selected probability. ES includes the values behind LVaR by addition their mean to LVaR, as the formula (1) shows.

3 Results and Discussion

The target of the case study is to show the suitability of the risk estimation by using the risk measure LVaR and ES for the statement of the problem.

Choice of an example bank

A hypothetical bank, with the balance sheet total amounts to 30 billion € will be suggested. Its structure is oriented on a middle sized German bank (Koetter, 11/2013, p. 14-20.). The refinancing takes place on capital markets, the bank issues bonds and is active in both retail and wholesale businesses. Such banks are for example real-estate credit institutions, private mortgage banks and some saving banks. (Kuck, 2013, p. 34.).

Market data and the liquidity gap report for the example bank

The values of interest rate curves for the case study are anonymised values of a German bank in the time period from 31.1.2000 to 30.6.2013 on the monthly base. For a risk free reference interest rate, the swap curve is chosen. For the determination of institute's own liquidity spreads, the mortgage covered bond curve were used, because the target banks of this study usually issue such bonds. (Schmitt, 2014, pp. 157.) The currency used is Euro.

The basement for the construction of cash flow progression under extremal market conditions represent expected cash flows under business as usual conditions, which have to be constructed as accurately as possible. For the present stress-test, the funding view to the transactions is crucial. The base scenario only will be taken into account. The respective values are collected in the following table 1.

Table 1 Market Data, Swap & Liquidity-spread Curve, Cumulative Gap for Base Scenario

Term Structure	6M	1Y	2Y	5Y	8Y	10Y
Swap %	0,12	0,43	0,60	1,22	1,75	2,01
Liq Spreads (BP)	20	6	8	15	25	34
Gap _{kum}	200	-150	-350	-1750	-1800	-1150

Source: Own processing on the base: Schmitt, 2014, p. 157-159.

Scenario parameter

The structure changing shifts in the liquidity spread curve in an appropriate time period of two market wide historical crises will be calculated (Rudolph, 2011.):

Crisis 1: 30.4.2008 – 30.6.2013

During this time period, the highest spread movements occurred. The reason were the subprime crisis and her expansion to an international finance crisis, which in 2008 led to a liquidity crisis, the widening of spreads in the EU zone in 2009 as well as the economic crisis in spring 2009. The worries about the Euro Currency because of starting of financial turmoil in Greece are also included in this time period.

Crisis 2: 29.2.2000-31.12.2003

This crisis shows a high frequency and spread widening. The main feature are terror attacks on 11th of September 2001 in New York and the following market turmoil. Further events in this time period are: Crisis in Argentina during 1998-2002, breaking down of New Economy, Enron bankruptcy and the financial crisis in Brasilia. In Germany, the main event was the Commerzbank crisis.

Results

For the calculation of LVaR and ES, the confidence level of 95% is chosen. In the table 2 selected results for the two crisis are shown (Schmitt, 2014, pp. 169-172.):

Table 2 Results of the Risk Measurement

	6M	1Y	2Y	5Y	8Y	10Y
Base Case						
LVaR	0	-0,12	-0,35	-4,53	-4,95	-1,74
ES	0	-0,31	-0,89	-12,43	-13,02	-3,72
Crisis 1 (30. 4. 2008 – 30. 6. 2013)						
LVaR	0	-0,21	-0,80	-9,03	-8,52	-2,39
ES	0	-0,77	-1,73	-22,71	-20,61	-5,11

Crisis 2 (29. 2. 2000 – 31. 12. 2003)

LVaR	0	-0,36	-1,04	-12,31	-9,16	-2,10
ES	0	-0,76	-2,13	-29,96	-23,45	-4,91

Source: Own processing on the base: Schmitt, 2014, p. 168.

Risks of increased liquidity costs in the example bank appear in the 1y time bucket. The CBC is sufficient to cover negative gaps until one year. Both crises show different pictures: The circumstances of the crisis 2 are more threatening compared to the crisis 1. Across all time buckets LVaR and ES values are higher in the crisis 2. The value of ES in the 1Y time bucket is very similar in both crises, because the deviation in the level of extreme values in this time bucket was not strong enough, so that extreme outlier was not present in the data. Different pattern display the following time buckets, where LVaR and ES show higher values for the crisis 2.

The values of LVaR and ES in both crises compared to the base case are different in their amount. For example in the crisis 1, the bank can expect, that costs of 90 thousand € (increase from -120 thousand € in base case to -210 thousand € in crisis 1) with a probability of 95% would not be exceeded, when measured by LVaR. In the crisis 2, it would be approximately 240 thousand €. Analogously, for every time bucket can be shown, how much costs would the bank envisage after consumption of its CBC. Thus, the risk manager see how much liquidity at minimum will be needed and can plan actions which at least have to be taken for the relevant time bucket.

At this point, the meaning of ES is apparent. This risk measure shows the additional value, which the risk manager has to count with in average for the case when in a given scenario the liquidity costs arise more than the estimated LVaR value. The amount of ES can serve as an insurance against extreme events. Hence, f. e. in the given crisis 1 and 2 in the time bucket 1Y, the amount of an average liquidity costs would be 770 and 760 thousand € respectively, which are about twice as high as LVaR values. This potential loss should be funded, if the scenario occurs. Compared to LVaR an additional amount of 560 and 400 thousand € would be needed. The risks, which are sorted out by LVaR, are involved in the ES measurement. ES catches risks behind LVaR, hence the risk precaution under ES is more conservative.

The difference of the risk amounts of the two scenarios can be explained by the structure of liquidity spreads. In the crisis 1, the total magnitude of the range of liquidity spreads is high. But it follows through various consecutives spread widenings. In contrast, the crisis 2 involves some much larger spontaneous spread widenings. This result illustrates the fact, that no general estimates for the extent of risk on the basis of standardised scenarios can be made. Rather, to reveal the most threatening but realistic scenario in a timely manner, more scenarios of different kind should be analysed.

4 Conclusions

The goal of this model is to present deeper insights to the risk analysis of an increase in liquidity costs. By using LVaR and ES as a risk measure, it is possible to compare the liquidity risk with other bank risks, such as market or credit risk. Historical simulation methodology is understandable and easy to implement, no assumption for extreme value distribution is needed. Thus, there is no model risk in this calculation. There is still a problem in the assumption that past crisis will repeat in the future. It is time to rethink assurance in the governance process – from being intuitive to being conscious. (Klimikova, Muchova, 2016.) To build hybrid scenarios is one of the possibilities to handle this problem. Expert knowledge is necessary for setting appropriate parameters.

The case study showed remarkably high distinction of the values LVaR and ES under stressed conditions. Even when holding of sufficient liquidity amount for the case of crisis is not possible, the ES should be reflected for planning purposes. In order to compute ES, high quality data with enough extremal values should be available. If the calculation is

based on few data, ES values can be distorted. Even in such cases, ES gives a rough orientation for risks beyond LVaR.

This model links a scenario based and quantitative approach by using modern quantitative methods. It contributes to a structured building up of bank-wide stress-testing. There are areas for further research too, as to integrate scenario modelling for cash flows and CBC, or modifying the simulation method as well as an appropriate modelling of extremal values, the tail part of the distribution.

References

- Acerbi, C. (2004). Coherent Representations of Subjective Risk-Aversion. In: Szegö, G. (2004). *Risk Measures for the 21st Century*, John Wiley & Sons, pp. 147-209.
- Acerbi, C., Nordio, C., Sirtori, C. (02/2001). *Expected Shortfall as a Tool for Financial Risk Management*. Retrieved from: <http://www.gloriamundi.org/picsresources/ncs.pdf>.
- Artzner, P., Delbaen, F., Eber J. M., Heath, D. (1997). Thinking coherently, *Risk 10(11)*, pp. 68-71.
- Bartetzky, P. (2008). Liquidität im Fokus - Wiederentdeckung eines Kernrisikos. In: *Handbuch Liquiditätsrisiko*, Schäffer-Poeschel, Stuttgart, pp. 2-27.
- Berkowitz, J. (07/1999). *A coherent Framework for Stress-Testing*. Retrieved from: <http://www.ssrn.com>, ssrn id=181931.
- Castagna, A., Fede, F. (2013). *Measuring and Managing Liquidity Risk*, John Wiley & Sons.
- CEBS (12/2009). *Guidelines on Liquidity Buffers & Survival Periods*. Retrieved from: <https://www.eba.europa.eu/documents/10180/16094/Guidelines-on-Liquidity-Buffers.pdf>.
- Čihák, M. (03/2007). Introduction to Applied Stress Testing, *IMF Working Paper*, WP/07/59. Retrieved from: <http://www.imf.org/external/pubs/ft/wp/2007/wp0759.pdf>.
- Koetter, M. (11/2013). Market structure and competition in German banking - Modules I and IV, *German Council of Economic Experts*. Retrieved from: http://www.sachverstaendigenrat-wirtschaft.de/fileadmin/dateiablage/download/publikationen/arbeitspapier_06_2013.pdf.
- Klimiková, M., Schwarzová, M., Vovk, M., Tašková, J., Sabolová, A. (2012). *Bankový manažment a marketing I.*, Bratislava: IRIS. ISBN 978-80-89238-63-7, pp. 314-334.
- Klimiková, M., Muchová, M. (May20, 2016). Assurance – a vital tool of guiding the internal audit, in conference: *Evropsky fiskální dialog*, NEWTON College, a.s..
- Kuck, H. (2013). Die 100 größten Deutschen Kreditinstitute. Retrieved from: www.diebank.de/fileadmin/images/top100/diebank_Top100_2013.pdf.
- Matz, L. (2011). *Liquidity Risk Measurement and Management*, Xlibris Corp., USA.
- Matz, L. (2007). Scenario Analysis and Stress Testing. In: Matz, L., Neu, P. (2007). *Liquidity Risk Measurement and Management*, John Wiley & Sons, pp. 37-64.
- Meyer, Ch. (1999). *Value at Risk für Kreditinstitute*, Deutscher Universitätsverlag, Wiesbaden.
- Neu, P. (2007). Liquidity Risk Measurement. In: Matz, L., Neu, P. (Hrsg.) (2007). *Liquidity Risk Measurement and Management*, John Wiley & Sons, pp. 15-36.
- Neu, P., Leistenschneider, A., Wondrak, B., Knippschild, M. (2007). Market Developments in Banks' Funding Markets. In: *Liquidity Risk Measurement and Management*, John Wiley & Sons.
- Rudolph, B. (2011). Hintergründe und Verlauf der internationalen Finanzkrise 2008. In: *1931 Finanzkrisen 2008*, Piper, München, pp. 145 - 241.

Schmielewski, F. (04/2010). Quantitative Messung der Liquiditätsrisiken eines Kreditinstitutes mittels eines stochastischen Modellansatzes. In: *Frühwarnindikatoren und Risikomanagement*, pp. 144-178. Retrieved from: http://www.leuphana.de/fileadmin/user_upload/Forschungseinrichtungen/ics/files/FinAL/2010/FINAL-04-2010-3.pdf.

Schmitt, E. (2014), *Stochastisches Stresstesting des Liquiditätstransformationsrisikos im Rahmen der strukturellen Liquiditätsrisikosteuerung*, Inaugural-Dissertation an der Ludwig-Maximilians-Universität München. Head of the dissertation: Prof. Dr. Rudolph, Bernd, Prof. Dr. Elsas, Ralf.

Skoglund, J., Chen, W. (2012). Cash Liquidity at Risk. In: *International Review of Applied Financial Issues and Economics*, vol. 4, No. 1, 2012, pp. 36-45.

Szegö, G. (2002). Measures of risk, *Journal of Banking and Finance* 26, pp. 1253 – 1272.

Uryasev, S. (2004). Conditional Value-at-Risk, Methodology and Applications: Overview, Risk Management and Financial Engineering Lab, *University of Florida*. Retrieved from: <http://www.ise.ufl.edu/uryasev/publications/>.

Yamai, Y., Yoshida, T. (01/2002). On the Validity of Value-at-Risk: Comparative Analyses with Expected Shortfall. *Monetary and Economic Studies* 01/2002; 20(1): pp. 57-85.

Factors Influencing Clients in Selection of Insurance Company

Elena Širá¹, Katarína Radvanská², Zuzana Grančaiová¹

¹ University of Prešov
Faculty of Management, Department of Economic Sciences and Economy
Konštantínova 16, 080 01 Prešov, Slovak Republic
E-mail: elena.sira@unipo.sk, elena.sira1@gmail.com

² International School of Management ISM Slovakia
Duchnovičovo námestie 1, 080 01 Prešov, Slovak Republic
E-mail: radvanska@ismpo.sk

Abstract: *The aim of the article is to show, if clients have changed their preferences in selection of insurance company during 5 years. This article compares how the scheme of client's behaviour has been changed. Our research compares the data from the years 2010 and the years 2015, which show factors influencing clients in selection of insurance company in Slovakia. We have also analysed and compared the factors with the biggest influence on clients in the year 2010 and 2015. In addition to analysis of client's behaviour, we have also analysed and compared insurance market environment via selected indicators. We have analysed the volume of written premium, density, penetration and others. The level of economic development of the country may also affect clients in their preferences of the insurance company. We have analysed the unemployment, average monthly wage and other factors in the years 2010 and 2015 to gain the adequate findings.*

Keywords: insurance market, importance of selection the insurance company

JEL codes: G22, D12, D53

1 Introduction

Competitiveness is the basic requirement for an enterprise in a constantly changing market environment. In most industries some firms are more profitable than the others. (Bharadwaj, Varadarajan & Fahy, 1993) The most successful is a company which manages to secure competitive advantage, to succeed in the market among other companies and gain a better market position. Thus, an enterprise that wants to be successful in the long term on the market should discover, monitor and continually improve their competitive advantage.

The issue of competitiveness is a very complex area with no strict definition of immutable factors. The in-house factors and external factors included in a common concept of business environment have an impact on increase of competitiveness of market operators. A significant factor has become the changing external environment due to the effects of globalization.

Porter, Goold & Luchs (1996) understand value chain as the basis for the selection of corporate competitiveness factors. This is an approach based on the recognition that the company is to be understood as a set of sub-activities, which contribute to the total amount produced. We distinguish primary wealth generating activities related to product creation, marketing, delivery to customers and supporting activities.

In a broader sense, competitiveness is a mixture of the following factors:

- Product and portfolio deals should the most overlap with the needs and expectations of customers;
- Communication skills with respect to customers inform them not only about our offer, but through active communication their needs are identified or uncovered and then satisfied;

- The cumulative effect of the company, which is partly determined by the relative fixed fundamentals of business entity and partly by the image of that enterprise (Porter 1993);
- Business processes as a way of firm's competitive potential (Ray, Barney and Muhanna 2004);
- The staff reflects the quality of services provided. Quality staff brings a comparative advantage and is characterized by well-qualified workers, politeness and good behaviour, trustworthiness, reliability, responsiveness and communicativeness. They address the requirements of the client professionally and flexibly. (Medved' 2012, p. 535)

The insurance sector plays a very important role in the development of any economy. It is necessary for the economic and overall development of any country. In today's competitive economy, the Banking, Finance and Insurance sector plays a very important role. (Khurana 2008) The financial system is a collection of financial institutions, financial markets and elements of the financial system infrastructure. (Pukala & Adamišín 2015) The insurance market is a component of financial system. (Grmanová 2015)

The insurance market is a place which brings together supply and demand for insurance. This includes all relationships between sellers and buyers, who use insurance as their object of exchange. Insurance services - insurance protection or cover are specific goods performed by the insurance market. The insurance market is long dominated by offering insurance products over demand. The insurance market is a buyer's market, which is generally a precondition for increased competition through price and supply.

In last years, the intensification of competitive pressures can be found in European insurance market. (Hardwick & Dou 1998) Increased competitions among insurance markets resulted in improvements in overall efficiency. (Carr, Cummins & Regan 1999)

Research made by Siddiqui & Sharma (2010) has shown that the quality of services and the achievement of customer satisfaction and loyalty are fundamental for the survival of insurers. The quality of after sales services can lead to very positive results through customer loyalty, repetitive sales and cross-selling (Taylor, 2001).

2 Methodology and Data

The main aim of this paper was to determine the factors that affected client most when choosing an insurance company. Which factors are involved in decision making: product, recommendation from friends, information gained from mass-media, attitude of sellers, image?

Hypothesis: *We assume that product offering will have a statistically more significant level of importance for the selection of insurance company compared to other factors.*

- Independent variables - factors (product, recommendation from friends, information gained from mass-media, attitude of sellers, image) - nominal variable;
- Dependent variable - the importance of the factors for choosing an insurance company - ordinal variable (7 levels of importance).

To verify the hypothesis, we used non-parametric statistical test for more than 3 variables / factors of Kruskal-Wallis test. To verify the hypothesis we used survey data from 2010 and from 2015. In both years, we have surveyed responses from a sample of more than 100 respondents of our questionnaire.

Both questionnaires were distributed to the residents of Slovakia. We applied them to the selected sample. This was determined by random choice. In 2010, we worked with a sample of 105 respondents and in 2015 there were 104 respondents.

Factors by which we divided the population were age. We focused on the age group 19-59 years that was further divided into sub-groups. The age group 19-29 years is a key

category for insurance companies, so it is also devoted an increased attention. It is a group of young people just entering the labour market, beginning to arrange their own livings and acquiring material things of higher value, establishing a family. This age group is most suitable for the purchase of life insurance policy with regard to the appropriate duration, as well as other insurance contracts, as they have already had their own income and gained certain assets and tangible things of higher value like cars, apartments, real estate, etc. The age group 30-59 years is a group of people of working age, this means that the majority of the population is working, or has had work experience, having some revenues and a certain property. In this age group, we assume that most insurance policies have already been closed and if residents plan to take out a new insurance policy they largely decide according to the insurance company, which they have already purchased some insurance policies, and have also received some experience.

On the background to the situation in the insurance market of Slovakia, we used the characteristics of this market through selected indicators. We got the last published data from 2014. The economic situation in the country was analyzed for the years 2010, 2014, 2015.

3 Results and Discussion

Insurance market in the Slovak Republic

Despite the fact that the Slovak Republic is a country with a low population it falls within Europe to the states with developed insurance market. As one of the richest economies in the region it has a high level of disposable income. Stronger demand felled by increasing levels of consumer spending should support the steady growth of life and non-life insurance (Slovakia Insurance Report 2015).

The situation in the insurance market of the Slovak Republic corresponds to the state of the Slovak economy. On the market there is a sufficient number of insurance companies (22 in 2015), offering insurance products from both life and non-life insurance. Slovak insurance market is operated by commercial insurance companies that offer products from the life and general insurance. In addition to these companies operating in the insurance market there are also universal insurance companies offering both types of products.

Table 1 Development of Selected Insurance Indicators in Slovakia

	Written Premium in Life insurance (thousands €)	Written Premium in Non-Life insurance (thousands €)	Written Premium Total (thousands €)	Life insurance / non-life insurance	Density (€)
2010	1,126,405	940,269	2,066,674	55/45	380.23
2014	1,215,548	965,351	2,180,899	56/44	402.28

Source: Own processing

Total premiums written in 2014 increased compared to 2010. Also, even in different types of premiums written, we can talk about the increase in 2014. In the European area, the majority of life insurance business is concentrated in the Western European countries, where the life insurance has a long tradition among the population. (Brokešová, Ondruška & Pastoráková 2015)

The ratio of life and general insurance is the share of life insurance written premiums versus the share of non-life insurance written premiums. In 2010 the ratio was 55/45, and in 2014, the ratio of written premiums in life insurance to written premiums in the non-life insurance was 56:44. Thus, the volume of written premiums in Slovakia is

increasing. Written premium per capita (density) is shown in €. Almost this indicator has grown during the examined period.

Table 2 Penetration in Slovakia

	Written Premium Total (thousands €)	GDP (thousands €)	Penetration (%)
2010	2,066,674	67,387,140	3.07
2014	2,180,899	75,560,460	2.89

Source: Own processing

When we calculate written premiums to GDP, we gain penetration in %. This value was in 2010 in amount of 3.07 % and in the year 2014 in amount of 2.89 %. This indicator varies about the level of 3 % during last few years.

Selected macroeconomic indicators of the Slovak Republic

Table 3 shows macroeconomic indicators affecting insurance market development in the Slovak Republic. We can see that GDP is growing from the amount of € 67,387m. in the year 2010 to € 76,521m. in the year 2015. The economy of this country has grown too. Inflation is very low and stable. Unemployment is high, but it has decreased in last 2 years. Average wage is growing too. Compared to year 2010 average wage has grown more than 11 % in the year 2015.

Table 3 Selected Macroeconomic Indicators of the Slovak Republic

	GDP (thousands €)	Inflation (%)	Unemployment (%)	Average wage (€)
2010	67,387,140	0.7	14.5	769
2014	75,560,460	-0.1	13.2	837
2015	76,521,000	1	11.5	853.7

Source: Own processing

From the above characteristics, it is clear that the insurance market is growing in Slovakia. It follows the trend of Western European countries, where is the prevalence of non-life to life insurance. Favourable economic environment has also a considerable impact on the development of the insurance market. The country's economy is stable. The volume of written premiums from year to year increases, so there is constant demand for insurance products on the Slovak insurance market. We are interested, therefore, in what the most affects customers in selecting the insurance company and the subsequent signing the insurance contracts.

Research about customer preferences

In our researches, we analysed what affect clients to choose insurance companies. Stated factors were: range of products, recommendation from friends, information gained from mass-media, attitude of sellers and image of insurance company. Analysed factors can obtain the values from the range from 1 (unimportant) to 7 (very important). The results are shown in table 4.

Table 4 Research from the Year 2010

	1	2	3	4	5	6	7	Answers
Range of products	0	0	2	13	12	37	41	105
Recommendation from friends	4	7	12	14	21	19	28	105
Information gained from mass-media	21	12	7	9	10	19	27	105
Attitude of sellers	2	13	13	28	19	18	12	105
Image	4	14	31	25	18	10	3	105

Source: Own processing

We then calculated the basic descriptive statistics for each selection factor of the insurance company from the perspective of their importance which are shown in Table 5.

Table 5 Statistical Characteristics of the Research 2010

105 answers	Average	SE	SD	Median	Skewness	Slope
Range of products	5,97142 9	1,181868	1,087138	6	-0,903742	-0,10685
Recommendation from friends	5,00000 0	3,076923	1,754116	5	-0,566628	-0,65258
Information gained from mass-media	4,33333 3	5,397436	2,323238	5	-0,269077	-1,52048
Attitude of sellers	4,43809 5	2,517766	1,586747	4	-0,090711	-0,80447
Image	3,77142 9	1,947253	1,395440	4	0,245734	-0,40606

Source: Own processing

Since the data were ordinal nature, more important is median figure. According to median figure, the most important factor for selecting insurance company in the year 2010 was "range of products". Because median for "attitude of sellers" and "image" was the same, we compare values of average. So the factor with lowest importance was "image".

Table 6 Research from the Year 2015

	1	2	3	4	5	6	7	Answers
Range of products	5	5	12	5	23	13	41	104
Recommendation from friends	21	10	11	14	14	11	23	104
Information gained from mass-media	29	13	15	19	11	3	14	104
Attitude of sellers	16	11	9	11	12	14	31	104
Image	11	6	10	16	16	14	31	104

Source: Own processing

Table 7 Statistical Characteristics of the Research 2015

104 answers	Average	SE	SD	Median	Skewness	Slope
Range of products	5.298077	0.1796602	1.832182	6	-0.82380596	-0.4451600
Recommendation from friends	4.105769	0.2168750	2.211700	4	-0.08442779	-1.4201917
Information gained from mass-media	3.336538	0.2006387	2.046121	3	0.44861344	-0.9885637
Attitude of sellers	4.519231	0.2194691	2.238154	5	-0.33127217	-1.3952027
Image	4.788462	0.1978568	2.017752	5	-0.50669086	-0.9645158

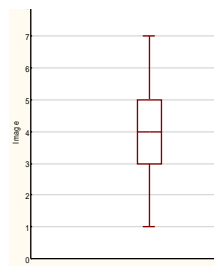
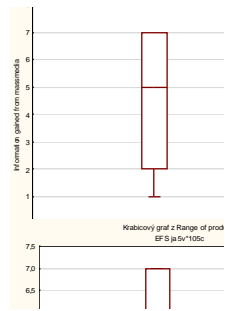
Source: Own processing

Utmost importance for the selection of insurance company has the factor "range of products", and the lowest was the factor "information media", both in terms of average and median. Since the data were ordinal nature, more important is median figure.

Graphical analysis of data distribution according to importance of the various factors to select the insurance company indicates that the data do not have a normal (Gaussian) distribution. This assumption is confirmed by the statistical analysis, which showed that the various layouts had statistically significantly different distribution from normality (the significance level of $\alpha = 0.05$). This finding is important for subsequent comparison of relevance factor for choosing an insurance company when there is a need to use non-parametric statistical tests, and also due to the ordinal nature of the dependent variable (i.e. importance of the factors for choosing an insurance company).

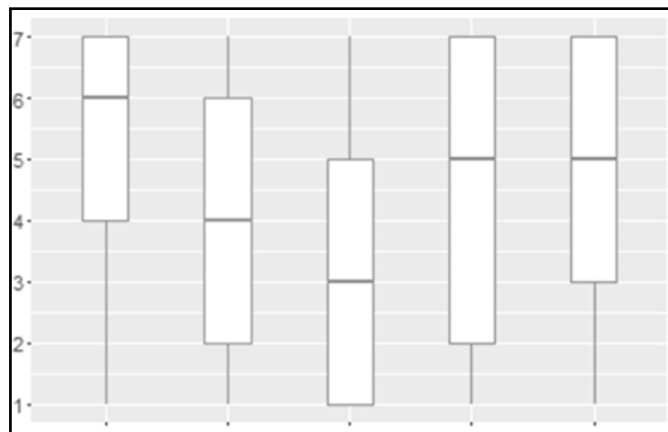
We then statistically verified whether the factor "range of products" would have a statistically significantly higher rating of the importance than other factors. Graphically is depicted distribution with a median importance factor for choosing an insurance company through box-plot charts that allows comparison of the tendency of respondents to assess the magnitude of the factors for choosing an insurance company - Figures 1, 2. Again it appears that the factor "range of products" was rated as the most important. The least important factors seem to be the in research 2010 "image" and "attitude of sellers" and in 2015's research "recommendation from friends" and "information from the media".

Figure 1 Box-plot Graph – Research 2010



Source: Own processing

Figure 2 Box-plot Graph – Research 2015



Range of products

Reccomendation from friends

Information gained from media

Attitude of sellers

Image

Source: Own processing

4 Conclusions

The situation in the insurance market of the Slovak Republic corresponds to the state of the Slovak economy. The insurance market is stable, follow the trend of other European countries in majority of life insurance business to non-life. Economy situation is stable, with growing tendencies of GDP and average wage.

In case of our researches in 2010 and 2015, the highest importance for the selection of insurance company has the factor "range of products" in both analysed years. The factors

with lowest importance vary according to researches. According to economy situation in the country and development of mentioned insurance market, the clients have better conditions for life, spend more money for insurance, but the offer of products is steadily the most important factor for choosing insurance company.

Acknowledgments

This paper is an output of the project **KEGA- 035PU-4/2016**.

References

- Bharadwaj, S. G., Varadarajan, P. R., Fahy, J. (1993). Sustainable competitive advantage in service industries: a conceptual model and research propositions. *The Journal of Marketing*, pp. 83-99.
- Brokešová, Z., Ondruška, T., Pastoráková, E. (2015). Economic and Demographic Determinants of Life Insurance Industry Development. *European Financial Systems 2015*.
- Carr, R. M., Cummins, J. D., Regan, L. (1999). Efficiency and competitiveness in the US life insurance industry: Corporate, product, and distribution strategies. In *Changes in the Life Insurance Industry: Efficiency, Technology and Risk Management*, pp. 117-157.
- Grmanová, E. (2015). Efficiency of National Life Insurance Markets in Europe. *European Financial Systems 2015*.
- Hardwick, P., Dou, W. (1998). The competitiveness of EU insurance industries. *Service Industries Journal*, 18(1), pp. 39-53.
- Khurana, S. (2008). Customer Preferences in Life Insurance Industry in India. *ICFAI Journal of Services Marketing*, vol. 6(3).
- Medved', J. (2012). *Banks: theory and practice*. Bratislava: Sprint, 2012.
- Porter, M. E. (1993). *Competitive advantage*. Victoria Publishing.
- Porter, M. E., Goold, M., Luchs, K. (1996). From competitive advantage to corporate strategy. *Managing the multibusiness company: Strategic issues for diversified groups*, pp. 285-314.
- Pukala, R., Adamišín, P. (2015). Unit-linked Insurances as an Element that Shapes the Savings Portfolio of Households in Poland after the Accession to the European Union. *European Financial Systems 2015*.
- Ray, G., Barney, J. B., Muhanna, W. A. (2004). Capabilities, business processes, and competitive advantage: choosing the dependent variable in empirical tests of the resource based view. *Strategic management journal*, vol. 25(1), pp. 23-37.
- Siddiqui, M. H., Sharma, T. G. (2010). Measuring the customer perceived service quality for life insurance services: An empirical investigation. *International Business Research*, vol. 3(3).
- Slovakia insurance report, 2015. *Slovakia insurance report – Q4 2015*, pp. 1-79.
- Taylor, S. A. (2001). Assessing the use of regression analysis in examining service recovery in the insurance industry: relating service quality, customer satisfaction and customer trust. *Journal of Insurance Issues*, vol. 24 (1/2), pp. 30-57.

The Optimized Indicators of Technical Analysis by Anticyclic Assets

Martin Širůček¹, Karel Šíma²

¹Mendel University in Brno
Faculty of Business and Economics, Department of Finance
Zemědělská 1, 613 00 Brno, Czech Republic
E-Mail: sirucek@gmail.com

²Mendel University in Brno
Faculty of Business and Economics
Zemědělská 1, 613 00 Brno, Czech Republic
E-Mail: sima.karel@gmail.com

Abstract: *The paper is focused on using the technical analysis and its indicators. It deals with the evaluation of investment strategies based on the optimized parameters of technical analysis indicators. The analysis focuses on using selected indicators of the technical analysis in the period from 11/1/2013 to 10/31/2014. The empirical analysis includes a back-test of optimized indicators, the results of which are compared with the recommended setting of these indicators, held in the period from 11/1/2014 to 10/31/2015. The optimization and the back-test were realized on anticyclical stocks, represented by the index S&P 500 Consumer Staples. The main aim of the paper is to bring to the speculators a higher investment return based on the change of the recommended (default) setting of these indicators.*

Keywords: technical analysis, optimization, relative strength, moving average, Bollinger bands

JEL codes: G11, G17

1 Introduction

Technical analysis has its permanent place among investors, especially since the information from charts have been increasingly used in IT technologies and analyses of financial assets prices. Thanks to the great development in the information technologies, it is possible to say, that the technical analysis is increasingly used, because today it is enough to have a computer with a special programme. Any person, even a person with no professional education, may try to create his or her own business strategy that may be based on formations, which appear in charts or in signals generated by indices, which are calculated and shown in a chart by a given computer programme. Just because of computers, indices of technical analysis are today easy to process. Computers help with not only the determination of indicator's value, but also with the calculation of the change of various parameters of some indicators (indices) and with finding the most suitable setting or optimization.

This paper is focused exactly on the analysis and especially on the optimization of technical analysis indicators. Thanks to the optimization of indices, which was carried out against the recommended setting, it is possible to answer the question, whether the implementation of optimization is beneficial and whether it is possible to achieve higher revenue therewith. Optimization is carried out in order to make a given indicator reacting better in a new trend at a given volatility. It is based on the assumption that volatility does not change too much, unless there is a sudden shock. Thanks to optimization, the influence of volatility should be reduced, because at the time of high volatility, a lower number of signals is generated thanks to the optimization while the standard setting may generate more signals of which some may be false and thus harming the investor.

The technical analysis is widely used among traders and financial professionals, and is very often used by active day traders, market makers, and pit traders. In the 1960s and 1970s, it was widely dismissed by academics. In a recent review, Irwin and Park (2007) reported that 56 of 95 modern studies found it to produce positive results.

According to Kirckpatrick, Dahlquist (2011), the technical analysis monitors prices at freely tradable markets with the intention to create profit or investment decisions. The technical analysis is based on basic economic theories. According to Víšková (1997), all fundamental, economic, political, psychological and other information are included in prices. Therefore, it is completely useless to study financial statements of companies and to compare a market price of a share with its intrinsic value, as it is done by fundamental analysts. According to Kohout (1998), the historically oldest idea of how to forecast the trends of rates of securities and commodities is the recognition of various patterns, images and signals, which appear in the course of historical prices.

Stanković, Marković and Stojanović (2015) mention, that the technical analysis had its ups and downs over the past few decades, depending on the extent of the prevalence of the Efficient Market Hypothesis in academic circles. On the other hand, studies such as those by Fama, Blume (1966), Van Horne, Parker (1968), Jensen, Benington (1970) or Irwin, Park (2007) show that the technical trading strategies have not always provided acceptable level of profitability. Thus, there is a space for the creation of alternative strategies for the setting of indicators using the technical analysis, which bring higher revenues to the speculators. According to Taylor (2014), the success in technical trading depends on conditions on the financial market, its (non)liquidity and macroeconomic (in)stability. Erić, Andjelić and Redzepagić (2009) state that the profitability of trading strategies based on MACD and RVI indicators depends on the optimization of these indicators.

Share quotations or movements of their prices are very volatile up to random. One of the techniques to deal with this phenomenon is, according to Pring (2002), the usage of moving averages, which tries to ease the fluctuation of price cycles into a smooth trend, by which disfigurement is smoothed to a minimum. A moving average is, according to Murphy (1999), the most universal and widely used among all indicators of technical analysis. Based on Droke (2001) or Veselá (2011), in business practice, it is possible to encounter with various types of moving averages: simple moving average (SMA), triangular moving average (TMA), weighted moving average (WMA), exponential moving average (EMA), variable moving average (VMA), or time series forecast (TSF).

According to Veselá (2011), the MACD indicator is formed by a combination of several moving averages, and it shows typical features of an oscillator. Based on Murphy (1999), what makes this indicator so successful is the fact that it combines something from the principles of oscillators with the approach of crossing the dual moving averages. According to Appel (2005), one of its strongest features is the ability to detect a key moment for entering the market after a series of sequential moderate market declines.

Another frequently used indicator is Bollinger Bands. According to Kirckpatrick, Dahlquist (2011), it is first necessary to calculate a simple moving average for the construction of Bollinger Bands. Bollinger uses the SMA, because a majority of calculations of standard deviation uses the SMA. Further, a band with the exact number of standard deviations is drawn.

In June 1978, J. Welles Wilder introduced the Relative Strength Index (RSI), which measures the strength of historical price movements by comparing "positive" and "negative" days. Thus, the RSI compares the magnitude of the recent gain of the stock with the magnitude of its recent losses and turns the information into a number that ranges from 0 to 100. According to Wilder (1978), the RSI is a tool that may add a new dimension to the interpretation of a chart, when it is drawn in connection with a chart of a daily course.

Wilder (1978) recommends to use 14 periods. The shorter period set, the more sensitive oscillator and the wider amplitude. The RSI works best if the fluctuation reaches top and bottom extremes. Therefore, when an investor trades in very short time intervals and he/she wants to have a more significant oscillation, it is possible to shorten time periods. A period is extended in order to have an oscillator smoother and narrower in amplitude. The amplitude of 9-period RSI is therefore greater than the one of the recommended 14-

period. Even though 9 and 14 is the most frequent setting, analysts experiment also with other values. As stated by Murphy (1999), some analysts use a shorter interval, such as 5 and 7, in order to increase volatility of the RSI line.

According to Turek (2008), the RSI is a momentum indicator and although its main use is to show overbought and oversold values, these values can stay irrational for a very long time. Simply said, once you use the RSI in a strong uptrend; you should expect the indicator to stay in overbought values for a considerable part of the entire increasing movement.

2 Methodology and Data

The main objective of this paper is to evaluate the technical analysis for chosen index instruments of the New York Stock Exchange (NYSE) during the period from 1 January 2014 to 31 October 2015.

Partial objective is optimization of the parameters of technical analysis indicators and a subsequent comparison of the profitability of business strategies, based on the optimized parameters of indicators. The optimization of technical analysis indicators is carried out so that investment strategy based on a given index maximizes its profitability; thus, optimal values of parameters will be those, during the use of which the given business strategy achieves the highest valorisation. Indicators for optimization and subsequent testing were selected with respect to their frequent application, which is due to their relatively easy construction and interpretation. Using these indicators recommended e.g. Taylor, Allen (1992), Lui, Mole (1998), Appel (2005), Stanković, Marković and Stojanović (2015) or Larsen (2010).

- Simple Moving Average (SMA),
- Moving Average Convergence/Divergence (MACD),
- Relative Strength Index (RSI),
- Bollinger Bands (BB).

Profitability of optimized indicators will be tested on an index instrument representing the anticyclical sector, which reacts in the opposite direction than the economic cycle. The selected instrument is anticyclical Index S&P 500 Consumer Staples.

The optimally set parameters of indicators (see Table I) were tested within the respective business strategies and compared with the stated indexed instruments. The used input data were acquired at a daily period (daily closing prices of indices). The RSI indicator setting was calculated in a 14-day period, the bottom and upper borders being 30 and 70, respectively. Wilder (1978) recommends the same setting too. Appel (2005) established the boundaries 12/26/9 by using the MACD indicator.

Table 1 Recommended Settings by Selected Indicators

	SMA	BB	RSI	MACD
recommended settings	20-day	20-day, 2x st. dev.	14/30/70	12/26/9

Source: Own work

The time period intended for the optimization of technical analysis indicators is from 1 November 2013 to 31 October 2014. For the subsequent back testing a period from 1 November 2014 to 31 October 2015 was chosen.

For each indicator, there are selected boundaries of limits (top and bottom boundaries), in which individual parameters can be set, selected with respect to recommended values and also to usage in practice.

For the SMA, the selected limits are 1 to 200 days. For the BB, the bottom and top moving average boundaries are selected as 1 and 200, resp. At the same time, the boundaries for standard deviation are 1 and 8. For the RSI, a range, in which the testing

is done, is set so that the length of RSI is optimized for the values from 1 to 100, the bottom boundary for the values from 10 to 40 and the top boundary for the values from 60 to 90. In the case of MACD, a range of values from 1 to 50 is selected for the faster SMA, from 10 to 100 for the slower SMA, and from 1 to 50 for the trigger.

3 Results and Discussion

For the evaluation of the performance (back-test of optimized indicators with the comparison of recommended setting), the following methods are used: realized profit, total quantity of trades (one trade contains opening and closing of a position) and average profit/loss per one trade, and quantity of profitable trades.

Other information is also stated, but it will only support the evaluation. These include the quantity of profitable and losing trades (expressed in absolute values), average profit in profitable trades, average loss in losing trades, profit in the most profitable trade and loss in the most losing trade.

Table 2 Back Test of Optimized SMA

	Optimized SMA	Recommended SMA
Total profit	-0.70 %	-1.26 %
Total quantity of trades	48	16
Percentage of profitable trades	43.75 %	31.25 %
Quantity of profitable trades	21	5
Quantity of losing trades	27	11
Average profit/loss	-0.01 %	-0.06 %
Average profit in profitable trades	0.86 %	2.18 %
Average loss in losing trades	-0.68 %	-1.08 %
Profit in the most profitable trade	3.21 %	5.84 %
Loss in the most losing trade	-3.02 %	-2.17 %
St. deviation (risk of average profit)	1.03 p.p.	2.09 p.p.

Source: Own work

By using both strategies (default setting and optimized settings of SMA), the investor suffered a loss. The strategy based on the optimized indicator was set very aggressively and made many deals, but more than a half of them were unprofitable. This lack of success was the reason for the average loss being 0.01 %, which is better than by the default settings; on the other hand however, the more deals the higher fees the investor needs to pay. A lower loss brings to the investor also a lower level of risk, in this example 1.03 p.p. As to the risk-revenue ratio, it was in this case -0.0097 by the optimization and somewhat worse (-0.028) by the recommended setting.

Table 3 Back Test of Optimized Bollinger Bands

	Optimized BB	Recommended BB
Total profit	0.00 %	10.66 %
Total quantity of trades	0	5
Percentage of profitable trades	0.00 %	100.00 %
Quantity of profitable trades	0	5
Quantity of losing trades	0	0
Average profit/loss	0.00 %	2.05 %
Average profit in profitable trades	0.00 %	2.05 %
Average loss in losing trades	0.00 %	0.00 %
Profit in the most profitable trade	0.00 %	2.89 %
Loss in the most losing trade	0.00 %	0.00 %
St. deviation (risk of average profit)	0.00 p.p.	0.68 p.p.

Source: Own work

The optimized setting of the Bollinger Bands indicator did not generate any deal, while the recommended setting of the same indicator generated 5 deals - all of them profitable. The strategy benefited from the volatility and market falls and avoided the August slump because the penult deal was closed on 10 July and the last buy signal came as late as on 28 August, i.e. after the market crash. Thanks to that, the average profit per one deal was ca. 2 %. The average profit was reached with the lowest volatility level (only 0.68 p.p.) thanks to which, in terms of profit, this strategy brought to the investor the highest risk-revenue ratio of 3.014, i.e. an additional unit of risk brings to the investor more than 3 p.p. of profit.

Table 4 Back Test of Optimized RSI

	Optimized RSI	Recommended RSI
Total profit	5.38 %	6.53 %
Total quantity of trades	1	1
Percentage of profitable trades	100.00 %	100.00 %
Quantity of profitable trades	1	1
Quantity of losing trades	0	0
Average profit/loss	5.38 %	6.53 %
Average profit in profitable trades	5.38 %	6.53 %
Average loss in losing trades	0.00 %	0.00 %
Profit in the most profitable trade	5.38 %	6.53 %
Loss in the most losing trade	0.00 %	0.00 %
St. deviation (risk of average profit)	NA	NA

Source: Own work

Both strategies based on the RSI indicator made a profit and both of them made only one deal. The strategy based on the default setting of the RSI indicator produced a higher profit, but only because the optimized strategy dictated to sell underlying assets due to the end of the observed time period. In this case, the buying price was lower than by the default setting and the position was opened (buy signal) after the market correction in August. Since both strategies generated only one deal, standard deviation could not be measured.

Table 5 Back Test of Optimized MACD

	Optimized MACD	Recommended MACD
Total profit	3.98%	5.90%
Total quantity of trades	35	9
Percentage of profitable trades	45.71%	44.44%
Quantity of profitable trades	16	5
Quantity of losing trades	19	5
Average profit/loss	0.12%	0.68%
Average profit in profitable trades	1.06%	2.94%
Average loss in losing trades	-0.68%	-1.13%
Profit in the most profitable trade	3.21%	7.29%
Loss in the most losing trade	-1.67%	3.04%
St. deviation (risk of average profit)	1.08 p.p.	2.77 p.p.

Source: Own work

Also in this case, the two strategies were profitable; however, the strategy based on the default MACD indicator setting brought a higher profit (over 2 p.p.). It is also interesting that both strategies did not reach the level of 50 % success, although they generated profits. The strategy based on the optimized indicators made more deals, but the average profit was only 0.12 % as compared to the average profit of 0.68 % provided by the default setting. As to the risk level, the strategy of default setting recorded a

somewhat greater success, where the risk-revenue ratio was 0.24, compared with the alternative setting (0.11).

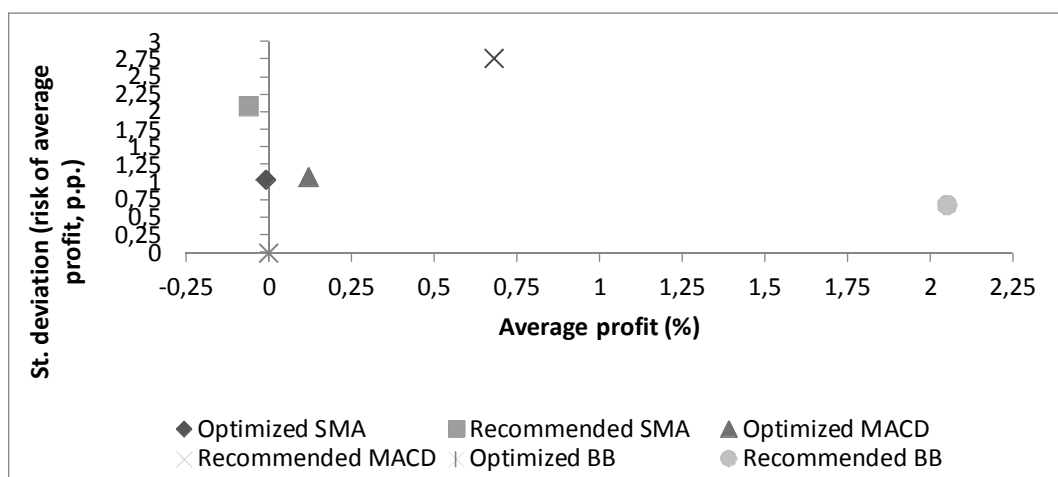
4 Conclusions

In our empirical analysis, the optimized SMA indicator could not make a profit neither with the stock of anticyclical corporations nor with the cyclical stocks (our previous research). In the case of anticyclical index S&P 500 Consumer Staples, the optimized SMA indicator created a huge number of deals, but only 43 % of them were profitable. The reason could be probably changes in the selected index. If the trend was changed to a sidelong trend, optimized indicators (in general) provided higher losses. Also, if the trend lost the power, consequences were negative by optimized indicators. In the case of optimized Bollinger Bands, no deal was created. The reason was that the setting by this optimized indicator was very conservative. The optimized setting was not so sensitive than the recommended setting and reacted even to the market movement at the end of the observed period; a deal was however not made.

The optimized RSI indicator provided the same amount of deals as the default setting, but the default strategy was more successful, measured by profit. The RSI indicator optimization brings the worse profit to the speculator and this result corresponds well with the findings of Stanković, Marković and Stojanović (2015). The same situation was by optimizing the MACD indicator, where the share of profitable trades was a little higher than the default setting, but the total average profit was lower. The higher number of deals by the optimized strategy (35 as compared with 9 by the default setting) also decreases the profit due to increasing transaction costs.

Our research results show that the strategy based on the optimized indicators gives slightly worse results than the strategy based on the recommended setting of these indicators. Thus, we can conclude that for the speculation with the anticyclical stock traded on the NYSE, the speculator should prefer the recommended setting of selected technical analysis indicators (SMA, BB, RSI, MACD). Indicators based on the default setting provided a higher profit in the case of profitable deals and a lower loss in the case of unprofitable deals, but generally with the lower number of deals (except for Bollinger Bands and RSI) and hence with the lower transaction costs. The default setting of the Bollinger Band indicator brought to the speculator the third highest average profit (the first was the RSI, but this indicator provided only one deal, the second best average profit was by the SMA indicator with 2.18 %). When we extended our research to the level of risk, the default Bollinger Bands indicator brought the best result with the risk-revenue ratio of 3.014, because the standard deviation by this strategy was the lowest one. Figure 1 shows the risk-revenue ratio (profile) of each strategy (not optimized and default setting by RSI, where only one deal was made).

Figure 1 Risk-Revenue Ratio



Source: Own work

References

- Appel, G. (2005). *Technical analysis: Power tools for active investors*. Harlow: Pearson Professional Education.
- Droke, C. (2001). *Moving averages simplified*. Columbia, MD: Marketplace Books.
- Erić, D., Andjelić, G., Redzepagić, S. (2009). Application of MACD and RVI Indicators as Functions of Investment Strategy Optimization on the Financial market. In Working Papers of the Faculty of Economics in Rijeka, Vo. 27, Issue 1, pp. 171-196.
- Fama, E. F., Blume, M. E. (1966). Filter Rules and Stock-Market Trading. *Journal of Business*, pp. 226-241.
- Irwin, S. H., Park, CH. (2007). What Do We Know About the Profitability of Technical Analysis? *Journal of Economic Surveys*, Vol. 21, No. 4, pp. 786-826.
- Jensen, M. C., Benington, G. A. (1970). Random Walks and Technical Theorie: Some Additional Evidence. *The Journal of Finance*, Vol. 25, Issue 2, pages 469-482.
- Kirkpatrick, CH. D., Dahlquist, J. R. (2011). *Technical analysis: the complete resource for financial market technicians*. 2nd ed. UpperSaddle River, N.J.: FT Press.
- Kohout, P. (1998). *Peníze, výnosy a rizika: příručka investiční strategie*. Vyd. 1. Praha: Ekopress, 190 s.
- Larsen, J., I. (2010). Predicting stock prices using technical analyses and machine learning. *Norwegian University of Science and Technology*. Retrieved from: <http://www.diva-portal.org/smash/get/diva2:354463/FULLTEXT01.pdf>.
- Lui, Y., Mole, D. (1998). The use of fundamental and technical analyses by foreign exchange dealers: Hong Kong evidence. *Journal of International Money and Finance*, Elsevier, vol. 17, issue 3, pp. 535-545.
- Murphy, J. J. (1999). *Technical analysis of the financial markets: a comprehensive guide to trading methods and applications*. New York: New York Institute of Finance.
- Pring, M. J. (2002). *Technical analysis explained: the successful investor's guide to spotting investment trends and turning points*. 4th ed. New York: McGraw-Hill.
- Stanković, J., Marković, I., Stojanović, M. (2015). Investment Strategy Optimization Using Technical Analysis and Predictive Modeling in Emerging Markets. *Procedia Economics and Finance*, Vol. 19, pp. 51-62.
- Taylor, M. P., Allen, H. (1992). The use of technical analysis in the foreign exchange market. *Journal of International Money and Finance*, Elsevier, vol. 11(3), pp. 304-314.
- Taylor, N. (2014). The Rise and Fall of Technical Trading Rule Success. *Journal of Banking and Finance*, vol. 40, pp. 286-302.
- Turek, L. (2008). *Jak se stát traderem*. Retrieved from: <http://www.czechwealth.cz/blog/temata/materialy-zdarma>.
- Van Horne, J. C., Parker, G. G. (1968). Technical Trading rules: A Comment. *Financial Analyst Journal*, pp. 128-132.
- Veselá, J. (2011). *Investování na kapitálových trzích*. 2., aktualiz. vyd. Praha: Wolters Kluwer Česká republika.
- Víšková, H. (1997). *Technická analýza akcií*. Vyd. 1. Praha: HZ.
- Wilder, J. (1978). *New concepts in technical trading systems*. Greensboro, N.C.: Trend Research.

Budgetary Gaming Behavior and its Determinants

Ladislav Šiška¹

¹ Masaryk University
Faculty of Economics and Administration, Department of Corporate Economy
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: ladislav.siska@econ.muni.cz

Abstract: *Budgetary gaming behavior (such as spending money at year end to avoid losing it, deferring necessary expenditures, accelerating sales near year end to meet the budget, negotiating easier targets) belongs among arguments against using budgets for company management. Especially proponents of Beyond Budgeting movement propose to abandon budgets for this reason. The paper presents results of the survey among 214 companies domiciled in the Czech Republic and Slovakia dealing with budgeting gaming and its context. Descriptive statistics and formal statistical test (Kruskal-Wallis, Mann-Whitney) revealed that the problem of budgetary gaming is more prevalent in larger companies that are subsidiaries. On the contrary, in the small enterprises it is less present problem, but more correspondents with the use of budgets for management purposes. Albeit the occurrence of budgetary gaming behavior, the companies in the sample did not intend to abandon budgeting at all.*

Keywords: management accounting, budgeting, budgeting gaming, contingency factors

JEL codes: M21

1 Introduction

Budgetary control has formed an inseparable part of the corporate management since 1970s (Bititci et al., 2012, Otley, 2016). No surprise that every modern textbook of Management accounting devotes at least one chapter to budgeting (see e.g. Drury, 2012 or Atkinson et al., 2012 for comparison). However, around the turn of the 20th and 21st centuries, the strong critique of budgeting evolved. Hope and Fraser (2003) belong to the most influential authors of such critique and their book *Beyond Budgeting* gave name to the whole movement of Beyond Budgeting Roundtable (BBRT).

The proponents of Beyond Budgeting argue that using budgets for management purposes represents "an unnecessary evil" as Jan Wallander, the former CEO of successful budget-free Svenska Handelsbanken, put it. Budgeting consumes large amounts of management time and impedes firm from being flexible and adaptive because employees' ingenuity is directed to non-productive budgetary games like devising how to meet the budgeted numbers instead of outperforming competitors, how to achieve budget slack instead of setting ambitious goals, or how to get the same allocation of resources as in the last year. These are the reasons why the most radical members of BBRT think budgets should be completely abandoned. The less radical wing of BBRT does not declare war to the budgets themselves but to their universal use for many purposes at the same time, e.g. for setting targets plus for rewarding and, in addition, for allocation of resources.

Beyond Budgeting was studied in many studies done by either proponents like Bourmistrov and Kaarbøe (2013) or more traditionally viewing authors Libby and Lindsay (2010). Popesko et al. (2015) carried out similar survey to the latter one in Czechia and found that Czech companies are satisfied with traditional budgets and plan to improve them instead of moving away from them. The reasons were found in relatively short time needed for preparing budgets and alignment between budgets and strategy. The budgetary gaming was not investigated.

Aim of the article

There was no research in Czechia dealing with budgetary gaming although Libby and Lindsay (2010) proved that increases in gaming are perceived to negatively impact long-run performance (the observed correlation .28 for 133 Canadian companies and .56 for

78 US companies). That is why the purpose of this paper is to answer the following research questions:

- RQ1: To which extent is budgetary gaming present in the companies domiciled in Czechia and Slovakia?
- RQ2: Which company characteristics (context variables) have significant impact on budgetary gaming presence?

The remainder of the paper is organized as follows. In the next section, the methodology of empirical survey and characteristics of respondents' sample are described. The next part presents our findings, which are discussed in the final part of the article.

2 Methodology and Data

Main concepts

The central concept of *budgetary gaming* was operationalized through four typical gaming behaviors named by Libby and Lindsay (2010, p. 65-66):

- spending money at the year end to avoid obtaining reduced budget in the next year (variable *YearEndSpending*);
- deferring necessary expenditures to meet the budgeted expenses for this year (variable *ExpenditureDeferring*);
- accelerating sales near year end to meet the budget otherwise the sales would be realized in the next year (variable *SalesAccelerating*);
- negotiating easier targets (variable *Sandbagging*).

Respondents were asked to use the previous two years as a point of reference. Their task was to indicate on the Likert's scale to which extent they agree that the named gaming behavior pertains to their company (*1=not at all ... 7=totally agree*). Based on the answers, the summated *BdgtGaming* variable was constructed.

The size of the company, a standalone status of the company, purpose of budgeting and willingness to abandon budgets were selected as the context variables important for answering RQ2.

Size was measured by the counts of full-time employees (FTEs). Companies with more than 10 and less than 50 FTEs were classified as small, companies employing from 50 to 250 FTEs were considered medium and finally large companies had more than 250 FTEs.

Whether a company is standalone business or not was tested by the question: Does your company belong to the group of enterprises? The variable *GroupofComp* is dichotomous and equals to 1 for subsidiaries and parent companies otherwise 0 denotes standalone business.

To assess the purpose of budgeting, respondents were offered the following purposes and their task was to quantify to which extent (ranging from *0=not at all to 10=dominant tool*) budgets fulfill the particular purpose in their company:

- Forecasting (*Forecasting*);
- Resource Allocation (*Allocation*);
- Coordination of activities/centres (*Coordination*);
- Setting of managers' targets (*TargetSetting*);
- Setting standards for activities/centres performance control (*PerformanceControl*);
- Compensation and rewards tied to the meeting of budgeted figures (*Rewarding*).

The question concerning future of budgets asked how likely (*1=impossible ... 7=certainly*) it is that the respondent's company within next 2 years

- abandons budgets (*Abandoning*);
- radically simplifies budgets (*Simplifying*) or
- automates the budgetary processes (*Automating*).

Data collection and sample statistics

A web-based questionnaire using GoogleDocs technology served as the tool for data collection. Each questionnaire started with a covering letter explaining the study's purpose and a glossary of terms used. Students of Masaryk University helped with distribution of the questionnaire and randomly contacted managers from the profit seeking companies. The preferred targeted recipients were top managers, especially financial managers.

The total of 214 answers was gathered within the period from December 2013 to February 2014. The sample of respondents consisted of 53 general managers (CEOs) or owners, 103 people from finance departments, 15 from marketing and selling department, 17 from technical or operations department, 3 from procurement and 23 from other departments of profit seeking companies.

Regarding the size of the companies in the sample, 60 of them were classified as "Large" with more than 250 full-time employees (FTE), 64 as "Medium" with FTEs in interval from 50 to 250, and finally 90 companies were "Small" businesses with FTEs ranging from 10 to 50.

From territorial point of view, the respondents were from companies domiciled in the Czechia (the majority of 82 %) and Slovakia (the rest). The number of standalone companies was 153 (71%), the remainder reported to be part of the group of companies.

Data processing

All data processing was done in IBM SPSS version 23. Since the majority of data had ordinal character and non-normal distributions, the Kruskal-Wallis test was applied - in order to compare the medians among groups - and Mann-Whitney's U test in case dichotomous grouping variable was used.

The non-parametric Spearman's rank correlation coefficient assessed the association among variables in situation when both correlated variables were latent. The strength of association was interpreted based on De Vaus (2002, p. 259) as "low to moderate" for correlation coefficients 0.10–0.29, as "moderate to substantial" for 0.30–0.49 correlations, as "substantial to very strong" for correlations within 0.50–0.69 and finally as "very strong to very large" for correlations 0.70 and higher.

The cases with missing data were excluded pairwise. That is why some correlation analyses were conducted on less than 214 observations.

3 Results and Discussion

Table 1 summarizes the descriptive statistics. Measures of central tendency (median and mean) indicate accelerating sales near year end to be the most prevalent budgetary game, followed by expenditures deferring and negotiating easier targets by sandbagging. The last row of Table 1 shows the summated variable of Budgetary Gaming.

Table 1 Descriptive Statistics of Budgetary Gaming

	Median	Mean	Std.Dev.	Skewness	Kurtosis	Min.	Max.
YearEndSpending	1.00	2.20	1.78	1.41	0.74	1.00	7.00
ExpenditureDeferring	2.00	2.91	1.95	0.70	-0.78	1.00	7.00
SalesAccelerating	2.50	3.04	1.99	0.46	-1.24	1.00	7.00
Sandbagging	2.00	2.57	1.86	1.03	-0.11	1.00	7.00
BdgtGaming	11.00	10.72	5.43	0.50	-0.32	4.00	28.00

Source: Author

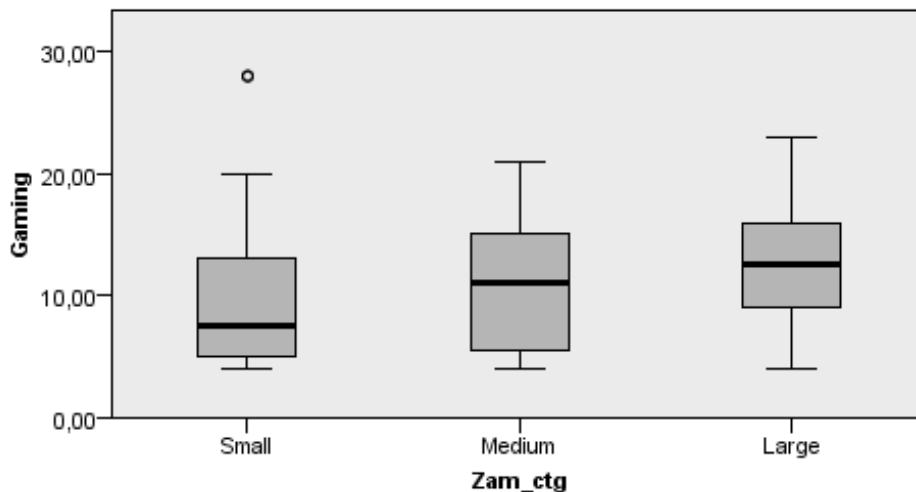
To get comparable results to Libby and Lindsay (2010, p. 65) who report in percentages of their samples where the budget gaming occurs at least occasionally, the similar

proportions of the answers ranging from 2 to 7 were calculated for each type of budgetary game:

- spending money at the year-end (*YearEndSpending*) occurs in 43.9% companies (Libby and Lindsay, 2010 report 42 % in Canada, 80 % in USA);
- deferring necessary expenditures (*ExpenditureDeferring*) was reported by 65.4 % respondents (Libby and Lindsay, 2010 report 80 % in Canada, 91 % in USA);
- accelerating sales near year-end to meet the budget (*SalesAccelerating*) occurs in 64.5 % (Libby and Lindsay, 2010 report 43 % in Canada, 60 % in USA);
- negotiating easier targets (*Sandbagging*) is somehow present in 57 % companies (Libby and Lindsay, 2010 report 77 % in Canada, 86 % in USA);
- at least one of budgetary games (*BdgtGaming*) reported 81.8 % respondents (Libby and Lindsay, 2010 report 95 % in Canada, 99 % in USA).

To explore the impact of context variables (RQ2), the differences in medians across the groups formed based on particular context variable were tested through Kruskal-Wallis tests. The test revealed that the *Size* of the company is significant contextual factor. Each type of budgetary games was more prevalent in the large companies as Figure 1 documents for the summated *BdgtGaming* variable in the boxplot diagram.

Figure 1 Budgetary Gaming in Differently Large Organizations



Source: Author

Affiliation with some group of companies (*GroupofComp*) was the next tested context variable. Mann-Whitney's U test identified statistically significant differences between the standalone businesses, where the budgetary gaming scores were lower, and the affiliations of the group of companies with higher scores of budgetary gaming.

Table 2 depicts correlations between budgetary gaming and the purpose of deploying budgets. There are low to moderate associations especially among budgetary games and using of budgets for rewarding, and using budgets for target setting respectively.

Table 2 Spearman's Rhos between Budgetary Gaming and Purpose of Budgeting

	Forecast	Allocation	Coordination	TargetSet.	PerfControl	Rewarding
YearEndSpending	0.009	0.203**	0.155*	0.069	0.048	0.105
ExpenditureDeferring	0.094	0.132*	-0.015	0.179**	0.097	0.205**
SalesAccelerating	0.055	0.123	0.138*	0.201**	0.186**	0.192**
Sandbagging	0.043	0.242**	0.140*	0.221**	0.186**	0.238**
BdgtGaming	0.068	0.256**	0.124	0.219**	0.200**	0.285**

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Author

Finally, the associations between budgetary gaming and intended changes in budgeting are depicted in Table 3. The highlighted significant correlations show only three and low associations.

Table 3 Spearman's Rhos between Budgetary Gaming and Future of Budgeting

	Abandoning	Simplifying	Automating
YearEndSpending	0.005	.137*	0.096
ExpenditureDeferring	-0.046	-0.009	0.082
SalesAccelerating	-0.022	0.035	.152*
Sandbagging	-0.077	0.054	0.129
BdgtGaming	-0.064	0.056	.153*

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Author

4 Conclusions

The analysis presented above documents that some sort of budgetary games was present in 81.8 % responding companies residing in Czechia and Slovakia. Such results are comparable to the situation abroad, although the presented comparison with findings of the study done by Libby and Lindsay (2010) might be biased due to higher proportion of large companies in their sample.

The second consequent research question focused on contextual variables with significant impact on budgetary gaming presence. Size and affiliation to the group of companies were found to be one of them. The problem of budgetary gaming is more prevalent in larger companies that are subsidiaries. On the contrary, in the small enterprises it is less present problem.

Concerning the relationship between the use of budgets for management purposes and budgetary gaming, low to moderate associations were found. Predictably, the problem of budgetary gaming is more present in companies where budgets play more significant role, i.e. they are used for compensation (Rewarding), setting of managers' target (TargetSetting) and resource allocation (Allocation).

Finally, budgetary gaming behavior was not found to be associated with the intentions of abandoning budgets. More or less random and low associations were found between budgetary gaming and intended simplification and automating.

To summarize, the presented outcomes confirm that the budgetary gaming is present in the companies domiciled in Czechia and Slovakia similarly to the companies abroad. On the other hand, the budgetary gaming presence does not seem to be sufficient reason to abandon budgets and to follow the lead of BBRT proclaiming management without budgets. Although the proponents of BBRT seem to be right in emphasizing that the usage of the same budget for three conflicting purposes - target setting, forecasting and resource allocation – poses the central problem (Bogsnes, 2009, p. 121) and encourages budgetary gaming behavior. With the exception of forecasting, the above outlined correlations between budgetary gaming presence and target setting, or resource allocation respectively were significant and higher.

The presented research faces many limitations. Firstly, the sample was not the miniature of the population and that is why the findings are not generalizable. Secondly, the research relies on single informant from each company and so offers great space for subjectivity.

References

Atkinson, A. A. (2012). *Management accounting: information for decision-making and strategy execution*. 6th ed. Boston: Pearson.

- Bititci, U., Garengo, P., Dörfler, V., Nudurupati, S. (2012). Performance Measurement: Challenges for Tomorrow. *International Journal of Management Reviews*, vol. 14(3), pp. 305-327.
- Bogsnes, B. (2009). *Implementing beyond budgeting: unlocking the performance potential*. Hoboken : John Wiley&Sons.
- Bourmistrov, A., Kaarbøe, K. (2013). From comfort to stretch zones: A field study of two multinational companies applying "beyond budgeting" ideas. *Management Accounting Research*, vol. 24, pp. 196-211.
- De Vaus, D. A. (2002). *Surveys in Social Research*. Allen & Unwin, Crows Nest (Australia).
- Drury, C. (2012). *Management and Cost Accounting*. 8th ed. Andover (Hampshire): Cengage Learning EMEA.
- Hope, J., Fraser, R. (2003). *Beyond Budgeting: How Managers Can Break Free from the Annual Performance Trap*. Harvard Business School Press, Boston.
- Otley, D. (2016). The contingency theory of management accounting and control: 1980-2014. *Management Accounting Research*, vol. 31 (2016), pp. 45-62.
- Popesko, B., Novak, P., Papadaki, S., Hrabec, D. (2015). Are the Traditional Budgets still Prevalent: the Survey of the Czech Firms Budgeting Practices. *Transformations in Business & Economics*, vol. 14(3C), pp. 373-388.
- Libby, T., Lindsay, R. M. (2010). Beyond budgeting or budgeting reconsidered? A survey of North-American budgeting practice. *Management Accounting Research*, vol. 21(1), pp. 56-75.

Implications of Low/Negative Interest Rates for Banks' Asset and Liability Management – An Example

Ľudomír Šlahor¹, Daniela Majerčáková², Mária Barteková³

¹ Comenius University in Bratislava
Faculty of Management, Department of Economics and Finance
Odbojárov 10, 820 05 Bratislava, Slovakia
E-mail: ludomir.slahor@fm.uniba.sk

² Comenius University in Bratislava
Faculty of Management, Department of Economics and Finance
Odbojárov 10, 820 05 Bratislava, Slovakia
E-mail: daniela.majercakova@fm.uniba.sk

³ Comenius University in Bratislava
Faculty of Management, Department of Economics and Finance
Odbojárov 10, 820 05 Bratislava, Slovakia
E-mail: maria.bartekova@st.fm.uniba.sk

Abstract: *Asset and liability management (ALM) in the current low/negative interest rate environment is a major concern for all banks. ALM is defined as the simultaneous planning of all asset and liability positions on the bank's balance sheet under consideration of the different bank management objectives and legal, managerial and market constraints, for the purpose of mitigating interest rate risk, providing liquidity and enhancing the value of the bank. ALM is heavily dependent on the movement of interest rates in the market. The history of ALM suggests that it is very important for a financial institution to measure, manage and control interest rate risk. The aim of this paper is to show how a sample bank's balance sheet might have looked like before and after the advent of the persistently low/negative interest rates environment. Further, we will show a duration structure of the example-bank's balance sheet before the period of low and further falling rates sets in. Also in this paper we will present most important implications for ALM after the period of persistently low interest rates. To attain this goal, we analysed the 2008 and 2015 balance sheets of a medium commercial bank facing conflicting goals such as returns, liquidity, solvency, and expansion of deposits and loans under uncertainty.*

Keywords: asset and liability management, ultra-low interest rates, bank balance sheet, duration

JEL codes: E49, G12, G21

1 Introduction

Interest rates are currently extremely low by historical standards. As of May 25, 2016, the annual yield of 10-year government bonds was 1.87 percent in the United States, 0.15 percent in Germany, -0.10 percent in Japan and -0.32 percent in Switzerland. Many central banks (BIS, 2016) lowered key interest rates to around zero (in some cases below zero) and additionally pursued different forms of unconventional monetary policy, e. g. massive purchases of various types of bonds. Interest rates in the Eurozone are currently lower than in other major monetary areas and the euro area yield curve has come to be quite flat in the first five months of 2016. In a low interest rate environment changes in interest rates as well as changes in future expected cash-flows of assets have a more pronounced impact on asset prices because the future is less heavily discounted compared to a high-interest rate environment. In other words, low/negative interest rates are a source of volatility.

In economies like the euro area and Japan, central banks (the European Central Bank and most recently the Bank of Japan) have implemented negative interest rates as a way to provide additional monetary stimulus at the "zero lower bound". In that sense,

negative interest rates are another of the unconventional monetary policy tools that central banks around the world (FRB, 2016) have used in the aftermath of the financial crisis (Vincencio, 2016). Since January 2015, over 20 independent central banks have eased their policy with Egypt, Turkey, Botswana, Israel, China, India, Australia, Singapore, Pakistan, Indonesia, Canada and Peru being amongst them.

The purpose of negative rates is to encourage spending and discourage saving. The central banks of Denmark (Danmarks Nationalbank), Sweden (Sveriges Riksbank), and Switzerland (the Swiss National Bank), in contrast, have implemented negative rates primarily to reduce upward pressure on their exchange rates. Their economies are closely interconnected with the Eurozone, and their government bonds (Bohdalová and Proksová, 2015) are very strongly correlated with the Eurozone government bonds. If their interest rates are higher than in the euro area, it would attract huge capital flows into their economies, thus putting upward pressure on the value of their currencies.

Interest rates play an important role in shaping banks' business strategies. A shift from conventional to unconventional interest rate policies would undoubtedly have a notable impact. The attractiveness of a product has a direct correlation with its interest rate; this means its market uptake will significantly vary when the interest rate changes. Banks must relook at their product portfolios in the light of this changed environment. How a bank handles the shift will be reflected in its market share, earnings, profitability, reputation, and other characteristics of business performance.

In this paper, we analyse how ultra-low interest rates affect a financial institution – a dynamically developing medium-sized commercial bank – and its ALM. The bank was founded in 1993, operates in 30 branches, its main products are mortgages and consumer loans. The bank's strategy is focused on the retail sector (Rentková and Roštárová, 2016) and lending to small and medium-sized enterprises (Bajžíková et al., 2014, Kajanová, 2015). To better manage the balance sheet, the bank has decided to start developing a sound ALM system (IFC, 2008).

The rest of the paper is structured as follows. Section two provides a brief review of the market environment, section three presents the methodology used and results, while the last section concludes the paper.

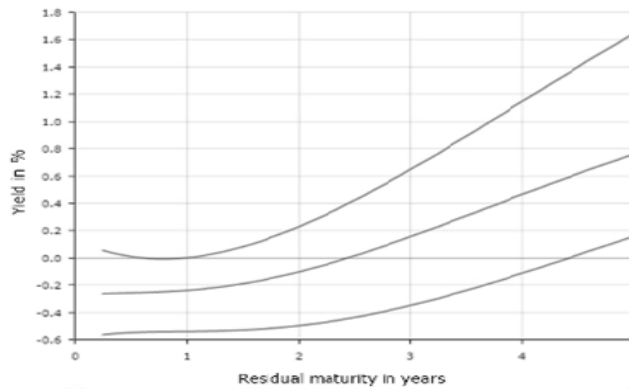
2 Methodology and Data

The primary business of a bank is managing the spread between deposits (liabilities, loans and assets). Basically, when the interest that a bank earns from loans is greater than the interest it must pay on deposits, it generates a positive interest spread or net interest income. The size of this spread is a major determinant of the profit generated by a bank. This interest rate risk is primarily determined by the shape of the yield curve.

A yield curve is a representation of the relationship between market remuneration and the remaining time to maturity of debt securities. A yield curve can also be described as the term structure of interest rates. The forward curve shows the short-term (instantaneous) interest rate for future periods implied in the yield curve.

Between 2014 and 2016 fixed income markets saw a huge yield curve flattening. This one can observe in forward curves showing low outright yields, e. g., the 5-year, 5-year EUR forward curve dropped from 1.65% in May 2014 to 0.18% in May 2016.

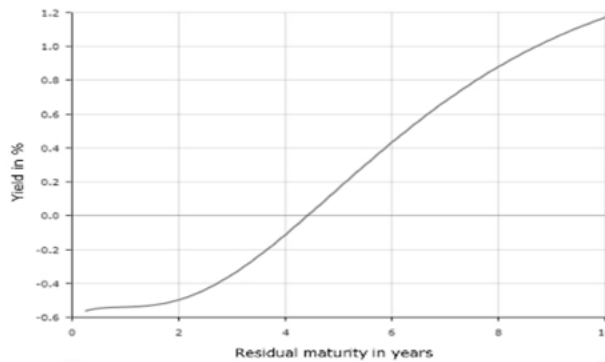
Figure 1 Forward Curve (May 2014, May 2015, May 2016)



Source: European Central Bank

Poor forecasting has been a feature of the post-financial crisis years. Economists have largely failed to grasp the vast headwinds facing euro area economies and stood by forecasts that a base rate rise was around the corner. The harsh reality of the Eurozone’s economic situation – high unemployment, huge state and consumer debts and the end of an economic expansion driven by baby boomers who are now retiring – could mean many more years of low rates (even if those low rates may be damaging in other ways). The global situation could also contribute further deflationary pressure.

Figure 2 Euro Yield Curve in 5 Years according to Current Forward Rates



Source: European Central Bank

The price of fixed-rate mortgages could be about to fall, however. This is because “swap rates”, the rates at which lenders borrow for fixed periods on money markets, have tumbled again in recent months (Figure 3). These markets reflect the expectation of the interest rate in the future.

Figure 3 5Y EUR Swap Rate and 3M EURIBOR



Source: European Central Bank

This environment poses challenges for bank’s asset-liability and risk management as well as earnings. Banks facing yield pressure may resort to riskier strategies, established forms of investment strategies may no longer be viable. In the current environment of protracted low/negative interest rates, the original focus on interest rate risk is of immediate relevance for financial institutions.

Because of greater uncertainty in the economic environment, ALM becomes a very difficult task. Interest rates have become much more volatile, resulting in substantial fluctuations in profits and in the value of assets and liabilities held by financial institutions. Initially, lower interest rates may even benefit banks as they lower funding costs and trigger a reappraisal of assets. However, in a protracted period of negative interest rates, it is quite likely that the yield curve becomes flatter. The flattening is supported by the zero floor on interest rates on deposits as long, as it is not appropriate to charge negative interest rates on deposits.

3 Methodology and Results

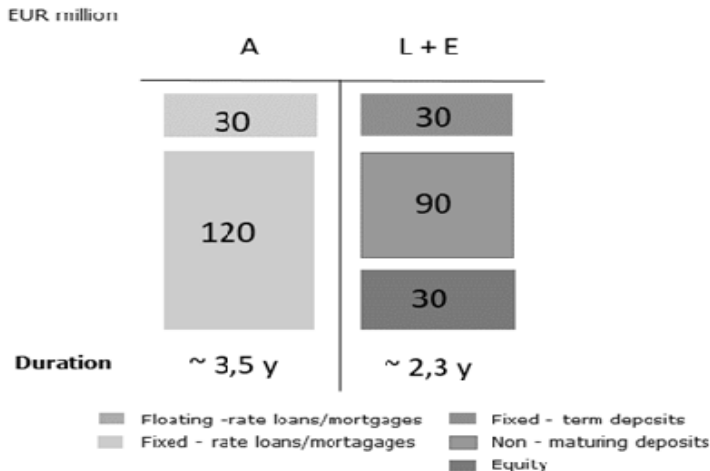
Since the financial crisis, there has been renewed interest in documenting the balance sheet positions of financial institutions (The Riksbank, 2016). Banks, in the normal course of business, assume financial risk by making loans at interest rates that differ from rates paid on deposits. Deposits often have shorter maturities than loans and adjust to current market rates faster than loans. The result is a balance sheet mismatch (duration) between assets (loans and mortgages) and liabilities (fixed-term deposits and non-maturity deposits).

Duration analysis aims at maximizing market value of equity. Duration is computed taking weighted average of cash flows of an instrument discounted to present time. Duration gap is computed subtracting weighted liabilities duration from asset duration. The weights are computed by dividing total liabilities by total assets. Duration analysis assumes precise knowledge of duration of assets and liabilities, market value of assets, a flat interest rate structure, no impact of convexity on valuation and a parallel shift in the change of interest rates.

Our approach is similar in spirit to the stress tests performed recently by different authors (see, for example, Moser et al., 2015). The typical stress test posits a set of scenarios, and banks are asked to report gains or losses anticipated under each scenario.

Below (Figure 4) an illustrative example is shown of how a sample bank’s balance sheet might have looked like before the advent of the persistently low rates environment.

Figure 4 Sample Bank’s Balance Sheet before the Advent of the Low Rates Environment

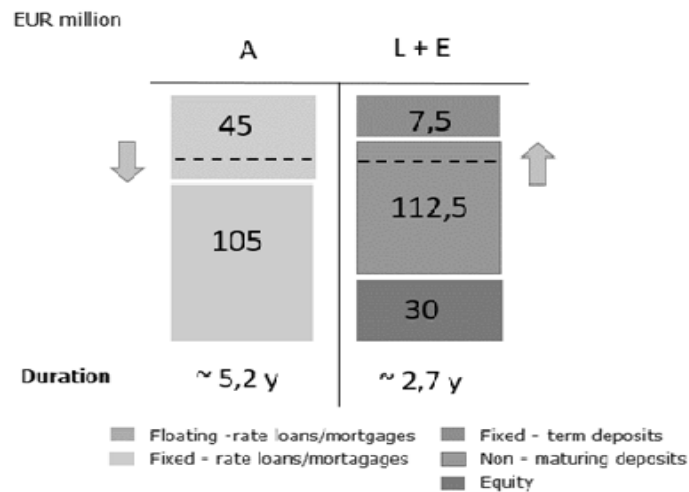


Source: Authors' calculations

As we can see, on the asset side, a mixture of floating rate and fixed rate loans and mortgages is present with the duration of 3.5 years. On the liability side, fixed term

deposits (EUR 30 million) and non-maturity deposits (EUR 90 million) - saving accounts, current accounts, and money-market accounts - are assumed. Our sample bank has EUR 30 million of equity on the balance sheet.

Figure 5 Sample Bank's Balance Sheet after the Advent of the Low Rates Environment

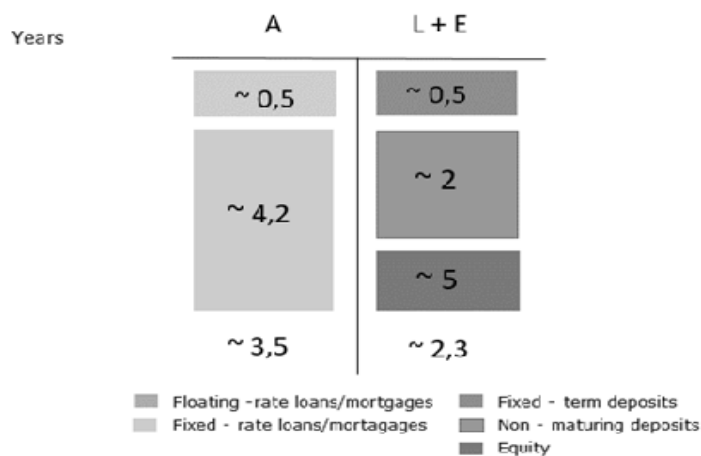


Source: Authors' calculations

After the low interest environment started in 2009, more bank's clients have decided to move from fixed term into non-maturity deposits and from mid-term into longer term mortgages. As a consequence, the interest rate risk structure of the balance sheet was significantly changed. On the asset side, increased demand for floating rate mortgages is identifiable. Going into the more details into the portfolio of fixed rate mortgages, clients are assumed to have an increased preference to lock in longer tenors once longer term interest rates have fallen sufficiently. On the liability side, less clients are ready to lock their money in term deposits at low rates and would begin to invest their cash into non-maturity deposits to last out the periods of low interest rates.

Figure 6 displays a likely duration structure of the sample bank's balance sheet before the period of low/negative interest rates. The duration of the fixed rate mortgages would be, say, around four years on average. Our calculations show that the floating rate/short time loans or mortgages have an average interest rate duration of around six months and that is close to the same average duration for the fixed term deposits.

Figure 6 Duration Structure before the Extended Period of Low Rates

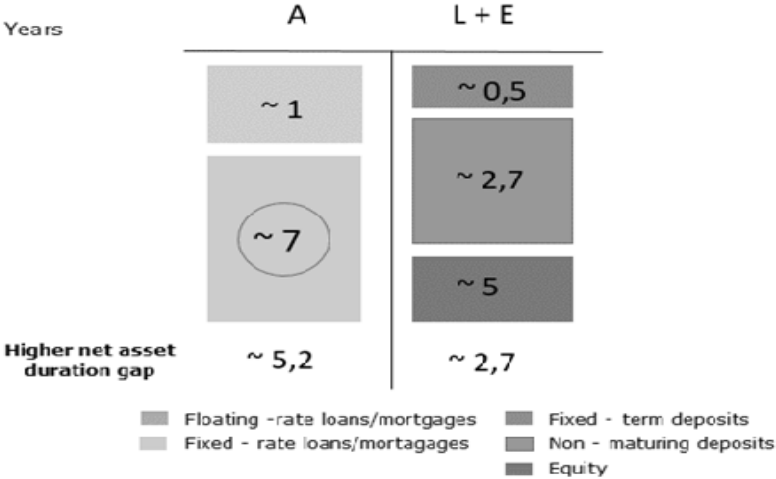


Source: Authors' calculations

The next chart shows the implications for ALM after the extended period of persistently low/negative interest rates. As one can see, the duration of the fixed rate mortgages was

increased to seven years from approximately four years on the initial balance sheet of our sample bank. Although the volume of fixed rate mortgages was reduced due to the shifts into floating rate mortgages, the average duration of the asset side was increased to approximately five years compared to around 3.5 years initially. Although the volume of the non-maturity deposits was increased in the low/negative interest rates environment, our calculations show that their effective interest rate duration has remained the same, around three years.

Figure 7 Duration Structure after the Extended Period of Low Rates



Source: Authors' calculations

Our sample bank’s asset/liability structure is liability sensitive (this is a bankers’ jargon which means that the liabilities are re-priced faster than the assets) because the duration (it means the term-to-maturity here) of its deposits is shorter than the duration of its loans. This creates a mismatch between its assets and liabilities. In order to balance this mismatch, our sample bank can do two things: (1) extend its liability duration by offering only longer-term deposits or shorten its asset duration by making only shorter-term loans or floating rate loans; and/or (2) utilize risk management tools (financial derivatives) to modify its asset/liability structure. It is not practical to actually change a bank’s asset or liability duration by intentionally lending short or borrowing long. This may prove to be costlier. The practical way to extend its liability duration or shorten its asset duration is to utilize risk management tools, such as financial derivatives to accomplish this task.

4 Conclusions

ALM uses various methods to identify risks. One of the traditional approaches is duration analysis to identify duration gaps, the idea behind that knowledge of the impact of interest changes on both the asset and the liability side will help banks immunize balance sheets against the adverse consequences of interest rate changes.

When a bank has a positive gap a possible management action at times of rising interest rates would be to increase rate sensitive assets or reduce rate sensitive liabilities. Another possible action is to extend liability maturity or shorten asset maturities. If on the other hand interest rates are falling, a reverse action will be initiated. But in reality it is not easy to later the bank’s balance sheet because it can be very costly in the short run, impact the financial policy of the bank towards its customers and lenders and also impact the bank’s market value of stockholders’ equity.

The impact on ALM (Oesterreichische Nationalbank, 2015) is supposed to be the deepest, as the shift can not only lower returns to banks in the longer run, but also increase their risk exposure. To manage this shift smoothly, banks and financial services firms will need

to strengthen their stress testing programs, and establish robust mechanisms for model validation as well as risk appetite and ALM.

References

Bajžíková, L., Šajgalíková, H., Wojčák, E., Poláková, M. (2014). Dynamics of changes towards knowledge – based economy in Slovak SMEs. *Procedia – Social and Behavioral Sciences* Vol. 150 (2014), pp. 637-647.

BIS (2016). *How have central banks implemented negative policy rates?* Retrieved from: http://www.bis.org/publ/qtrpdf/r_qt1603e.pdf.

Bohdalová, M., Proksová, D. (2015). Bond yield spreads in the Eurozone. *Sectiunea Stiinte Economice* Vol. 62 (2), pp. 221-239.

FRB (2016). "Low-for-long" interest rates and net interest margins of banks in *Advanced Foreign Economies*. Retrieved from: <https://www.federalreserve.gov/econresdata/notes/ifdp-notes/2016/low-for-long-interest-rates-and-net-interest-margins-of-banks-in-advanced-foreign-economies-20160411.html>.

IFC (2008). *How Can a Medium-Sized Bank Develop Its Own Asset/Liability Risk Management System?* Retrieved from: <http://www.ifc.org/wps/wcm/connect/5b72ae8048fc613db4f7bc849537832d/ECA-CR-ALM-Toolkit-EN.pdf?MOD=AJPERES>.

Kajanová, J. (2015). Performance analysis in SMEs through the usage of accounting information systems. In: *Proceedings from IX. international conference on applied business research ICABR 2014*. Brno: Mendel University in Brno, pp. 372-380.

Moser, C., Lake, C. S., Forrest, B. M., Waterstraat, S., Wilson, D. (2015). Asset and liability management with ultra-low/negative interest rates: The perspective of a Swiss bank – an illustrative example. *USB AG Workshop*, no. 20.

Oesterreichische Nationalbank (2015). *Implications of ultra-low interest rates for financial institutions' asset liability management – a policy-oriented overview*. Retrieved from: https://www.oenb.at/dam/jcr:1ddbf409-4b76-4eff-bbcb-7621069fc5db/mop_2015_q2_analyses03.pdf.

Rentková, K., Roštárová, M. (2016). Analysis of start-up investments in European region. In: *Innovation management and education excellence vision 2020: from regional development sustainability to global growth*. Norristown, PA: IBIMA, pp. 1946-1956.

The Riksbank (2016). *How do low and negative interest rates affect banks' profitability?* Retrieved from: http://www.riksbank.se/Documents/Rapporter/PPR/2016/160421/rap_ppr_ruta1_160421_eng.pdf.

Vincencio, E. R. (2016). Monetary conformation of the corporate governmentality III: Description of the monetary system. *Eurasian Journal of Economics and Finance*, vol. 4(2), pp.18-41.

The Recommendation of Safe Haven Interest Rates in the BEPS Context

Veronika Solilová¹, Danuše Nerudová², Hana Bohušová³, Patrik Svoboda⁴

Mendel University in Brno
Faculty of Business and Economics, Department of Accounting and Taxes
Zemědělská 1, 613 00 Brno, Czech Republic

¹ E-mail: veronika.solilova@mendelu.cz

² E-mail: d.nerudova@seznam.cz

³ E-mail: uchana@mendelu.cz

⁴ E-mail: patrik.svoboda@mendelu.cz

Abstract: *Intercompany financial transactions are subjected to scrutiny by tax authorities as they represent very popular tax planning instrument with results of a significant reduction of the group's effective tax rate. Tax authorities have limited the use of intercompany debt or the tax-deductibility of interest by the arm's length principle, thin capitalization rules or/and safe harbour for taxpayers. Moreover, the recent work of the European Union, OECD and G20 members as regards the BEPS project is also scrutinized with a focus on the elimination of profit shifting through intra-group debt financing. The aim of the paper is to recommend transfer pricing approaches for intra-group loans in EU, based on the analysis of experiences from the USA and recommendations of the BEPS project and the proposal of the EU Anti-Tax Avoidance Directive. We recommend to introducing safe haven rates for different compounding periods and amount of loan denominated in EUR altogether with the application of thin capitalization rules in the form of EBITDA ratio with the threshold of 30% or within a corridor of 10% to 30%. Based on it, the transfer pricing simplified measurements for loan can be ensured.*

Keywords: *loans, safe harbours, arm's length principle, Base Erosion and Profit Shifting project, thin capitalization rules*

JEL codes: *H26, G38, F38, K34*

1 Introduction

Intercompany financial transactions have been subjected to scrutiny by tax authorities in recent years. This phenomenon is affected by two factors, namely by the increased importance and materiality of financial transactions inside of the multinational group; and by the solution of the complex issue relating with the pricing of financial transactions by tax authorities as state (Russo & Moerer, 2012). Moreover, considering the high mobility of capital, intra-group financing have become very popular tax planning instrument. It is mainly due to the treatment of interest as a deductible item under the tax laws of most countries. Further, intercompany financial transactions offer the optimization if a group financing company is set up in a favorable tax jurisdiction (or applying a special regime for group financing activities) and provides loans to other group companies with results of a significant reduction of the group's effective tax rate (Offermanns & Baldewising, 2015), (Solilová & Nerudová, 2013). This kind of base erosion have been also subjected to scrutiny by the Base Erosion and Profit Shifting project (hereinafter BEPS), which was launched by the OECD altogether with G20 in February 2013 with the aim to fight against tax fraud and tax evasion.

Currently, many tax authorities have limited the use of intercompany debt or the tax-deductibility of interest by a variety of thin capitalization rules and by introducing a safe harbour for taxpayers. Generally, those rules can be divided into six broad groups, particularly on (i) arm's length tests, (ii) withholding tax on interest payments, (iii) rules which disallow a specified percentage of the interest expense of an entity, (iv) rules which limit the level of interest expense or debt in an entity with reference to a fixed ratio, (v) rules which limit the level of interest expense or debt in an entity with reference to the group's overall position, and (vi) targeted anti-avoidance rules which

disallow interest expense on specific transactions. Moreover, a number of tax authorities applied a combined approach that includes the arm's length test altogether with thin capitalization rules to provide restrictions to the deductibility of interests.

The application of the arm's length test represents the cornerstone of the transfer pricing rules, under which the effect of special conditions on the levels of profits and profit base erosion should be eliminated through the arm's length principle. The definition of the arm's length principle is stated in the Art. 9 of the OECD Model Tax Convention on Income and on Capital (OECD Model Tax Convention), and in the UN Model Tax Convention between Developed and Developing Nations. As a guideline for the practical application of this principle the Transfer Pricing Guidelines for Multinational Enterprises and Tax Authorities (hereinafter OECD TP Guidelines) was published by the OECD in 1995.

Generally, the (OECD, 2010) recommend to take into consideration, when assessing the arm's length interest rate, the various factors in the context of related party debt, such as the rate of interest on the loan, the term and conditions of the loan, the capital amount of the loan, the currency and the credit worthiness of the borrower (i.e. credit risk associated with the loan). It requires many analysis, mainly whether the overall terms and conditions of the loan are market conform and finally a benchmarking analysis. As state (Russo & Moerer, 2012) these analyses represent the screening process applied by commercial banks.

With regard to the process performed by tax authorities, they have to consider whether a third party would charge the rate of interest set between the related parties or whether that rate is too high or low. It is related with the fact whether a third party would have been willing to lend the funds at all and whether the transaction of intra-group loans is commercially rational. In this respect, the debt-to-equity ratio of the borrower and consequently to the thin capitalization rules shall be analyzed.

The outcome of the transfer pricing assessment of financing arrangements by the tax authority should not be underestimated. The increased likelihood of tax disputes in this area reinforces taxpayers' need to establish an intra-group policy which is built on the simplicity and transparency. Further, as mentions (Bakker, 2015) if the interest rate charged between associated entities is considered too low, the tax authorities in the lender's country may require additional interest income and tax this notional income accordingly. Otherwise, if the interest rate is considered too high then (i) the tax deductions for interest accrued or paid may be denied resulting in the increased local tax burden, and (ii) interest paid may be recharacterised as dividends resulting in additional withholding taxes. Moreover, a risk of thin capitalization of the borrower can arise. Therefore, it is crucial to review whether interest charged or paid between associated entities complies with the arm's length principle and thin capitalization rules applicable in the relevant countries before international financing structures are established.

However, the procedure implemented by the tax authorities in each country and the application of the above mentioned principles by each country's courts varies significantly. Moreover, almost countries do not have guidance on inter-group loans. It can be affected by the fact, that based on the general principle the interest rate charged between related parties should be the market rate of interest that would be charged at the time the indebtedness arose between unrelated parties, assuming similar facts and circumstances. Although, its practical application may create significant difficulties with identifying suitable comparables, because it is difficult or almost impossible to obtain overall terms and conditions of the loan of the unrelated entities from the commercial banks. Therefore this process is usually resulting into a resource-intensive process and too burdensome for taxpayers. Moreover, such compliance costs may be disproportionate to the size of the taxpayer, its functions performed, and the transfer pricing risks assumed in its controlled transactions as state (Nerudová, Bohušová, Svoboda & Široký, 2009 and Cressy, 2000). Hence, re-evaluation of transfer pricing rules in the area of intra-group loans should be considered to obtain greater simplicity in transfer pricing

administration and improving the efficiency and effectiveness of transfer pricing enforcement.

In this respect, in 2013, the OECD introduced the revision of the Section E on Safe Harbours in Chapter IV of the OECD TP Guidelines as a partial result of the project on the administrative aspects of transfer pricing. The revision brought important change in the view on the safe harbours, as a possible simplified transfer pricing measurement. Based on it a safe harbour is newly defined as a provision that applies to a defined category of taxpayers or transactions and that relieves eligible taxpayers from certain obligations otherwise imposed by a country's general transfer pricing rules as states (OECD, 2013).

Currently a lot of countries introduced safe harbours in the area of transfer pricing in their legislations to obtain greater simplicity and reduce the compliance burden of taxpayers, namely the USA, Australia, Brazil, India, Japan, Mexico, Poland, Spain, Thailand, United Kingdom, Switzerland and others. Usually, safe harbours are aimed to low-value added services, loans, royalties and special industries (Soo, Glaize, 2015). In European Union, this kind of simplified measurements is only available for low value adding services and loans in a few countries (Solilová, Nerudová, 2015). For instance, in Switzerland and in the U.S.A., the tax authorities have issued required minimum and maximum rates based on the domestic market.

The aim of the paper is to recommend transfer pricing approaches for intra-group loans in EU, based on the experiences from the USA in this area, recommendations of the BEPS project and the proposal of the EU Anti-Tax Avoidance Directive.

2 Methodology and Data

To fulfill the aim of the paper, firstly the U.S. experience and approaches for intra-group loans in the respect of transfer pricing issue were researched. Secondly, the recommendations of the BEPS project and EU based on the Anti-Tax Avoidance Directive were analyzed. Thirdly, the interest deductibility rules or thin capitalization rules in each EU Member States were researched. Then, results of the analysis were considered for a recommendation of transfer pricing approaches for loans in EU. As a data source was used mainly the U.S. legal framework with respect to transfer pricing issues of intra-group loans, the proposal of Anti-Tax Avoidance Directive and the Action Plan 4 "Limiting Base Erosion Involving Interest Deductions and Other Financial Payments" of the BEPS project.

Within the paper, the analysis, description and synthesis as scientific methods were used for the summarization of the U.S. transfer pricing approaches for intra-group loans and the BEPS and EU recommendations for this area. In addition, the others methods, namely induction and deduction were applied in the process of the recommendation of transfer pricing approaches for intra-group loans in EU.

The U.S. Approach for Intra-group Loans

The US transfer pricing law in section 482 of the Internal Revenue Code (hereinafter IRC) is the cradle of transfer pricing rules. With regard to intra-group loans, the US Internal Revenue Service (hereinafter IRS) also published the transfer pricing guidelines containing a clause for determination of taxable income in the case of loans or advances, particularly in section 1.482-2 of the IRC. Further, the IRS has been using the safe haven interest rates since 1986.

Based on the guidelines, interest on bona fide indebtedness must be charged where one member of a group of controlled entities makes a loan or advance directly or indirectly to, or otherwise becomes a creditor of, another member of such group. Further, bona fide indebtedness must be considered according to the section 1.482-2(a)(1)(ii)(A), under which bona fide indebtedness may include both loans or advances of money or other consideration (whether or not evidenced by a written instrument); or indebtedness arising in the ordinary course of business from sales, leases, or the rendition of services by or between members of the group, or any other similar extensions of credit.

In the respect of bona fide debt, the IRC summarizes the key court decisions in section 385 as following:

- the name and presence of a written agreement demonstrating indebtedness;
- the presence of a fixed maturity date;
- the source of payments and the right to enforce payment;
- thinness of the capital structure in relation to debt;
- the identity of interest between creditor and stockholder;
- the source of interest payments;
- the ability of the corporation to obtain credit from outside sources; and
- the failure of the debtor to repay.

In addition, the case law focuses on debt-equity ratios, when thin capitalization is a critical element to consider in the structuring of bona fide internal debt, and other financial ratios such as profitability, coverage, leverage and cash flow ratios.

Further, based on the section 1.482-2(a)(2)(i) of the IRC the arm's length interest rate is defined as "a rate of interest which was charged, or would have been charged, at the time the indebtedness arose, in independent transaction with or between unrelated parties under similar circumstances". Further, in determining the arm's length range of interest charged, all relevant factor have to be considered, such as principal amount, duration of the loan, credit standing of the borrower and interest rates charged on comparable loans between unrelated parties. In addition, the situs of the borrower rule (mentioned in section 1.482-2(a)(2)(ii)) has to be considered.

Moreover, the section 1.482-2(a)(2)(iii) states safe haven interest rates for certain loans and advances made after May 8, 1986, which are expressed in the U.S. dollars. Safe haven interest rate is defined as at least 100% of the lower limit of the Applicable Federal Rate (hereinafter AFR) and not greater than 130% of its upper limit. Each month, the IRS published various prescribed AFRs for federal income tax purposes in the form of revenue rulings. These various AFRs are set as (i) federal short-term rate if the loan is not over 3 years, (ii) federal mid-term rate if the loan is more than 3 but less than 9 years, and (iii) federal long-term rate if it is over 9 years. Current published revenue rulings including AFRs can be seen in Table 1 above.

Table 1 Revenue Rulling 2015-25, Applicable Federal Rates

	Period for Compounding				
	Annual	Semiannual	Quarterly	Monthly	
AFR	.56%	.56%	.56%	.56%	Short-term
110% AFR	.62%	.62%	.62%	.62%	
120% AFR	.67%	.67%	.67%	.67%	
130% AFR	.73%	.73%	.73%	.73%	
AFR	1.68%	1.67%	1.67%	1.66%	Mid-term
110% AFR	1.85%	1.84%	1.84%	1.83%	
120% AFR	2.01%	2.00%	2.00%	1.99%	
130% AFR	2.18%	2.17%	2.16%	2.16%	
150% AFR	2.53%	2.51%	2.50%	2.50%	
175% AFR	2.94%	2.92%	2.91%	2.90%	Long-term
AFR	2.61%	2.59%	2.58%	2.58%	
110% AFR	2.87%	2.85%	2.84%	2.83%	
120% AFR	3.13%	3.11%	3.10%	3.09%	
130% AFR	3.40%	3.37%	3.36%	3.35%	

Source: <https://www.irs.gov/pub/irs-drop/rr-15-25.pdf>.

If either no interest is charged or if the rate of interest charged is less than the lower limit of the AFR, then an arm's length rate of interest shall be equal to the lower limit, compounded semiannually. Similarly, if the rate of interest charged is greater than the

upper limit of the AFR, then an arm's length rate of interest shall be equal to the upper limit, compounded semiannually.

BEPS recommendations

The aim of the BEPS Action 4 was to identify coherent and consistent solutions to address base erosion and profit shifting using interest and payments economically equivalent to interest, i.e. to provide an effective solution to the risks countries face and which is robust against aggressive tax planning in the area of financing. As a solution, the BEPS Action 4 offers a few best practice approaches which limit an entity's net deductions for interest and payments economically equivalent to interest.

The best practice approach is based around a fixed ratio rule, group ratio rule, the use of carry forward, targeted rules, specific rules for the banking and insurance sectors and "de minimis" monetary threshold to remove low risk entities. The recommended approach is based mainly on a fixed ratio rule which limits an entity's net interest deductions to a fixed 30% of its earnings before interest, taxes, depreciation and amortization (hereinafter EBITDA). This approach can ensure the direct link of interest deductions to economic activity of entity and makes the rule reasonably robust against aggressive tax planning. Further, the BEPS Action 4 offers the possibility to introduce rules based on the earnings before interest and taxes (hereinafter EBIT). Moreover, the countries can set the benchmark ratio for a fixed ratio rule within a corridor of 10% to 30%.

However, the fixed ratio rule can lead to double taxation as it does not take into account the fact that entities operating in different sectors may require different amounts of leverage. Therefore, the groups can face double taxation if they are leveraged above the set level of benchmark fixed ratio. The solution of this issue is in the combination of the fixed ratio rule with the group ratio rule. This approach should provide an effective framework to tackle most base erosion and profit shifting involving interest and payments economically equivalent to interest.

In the end, the amount of intragroup interest and payments economically equivalent to interest is also affected by transfer pricing rules, in respect of BEPS project namely by Action 8-10 "Aligning Transfer Pricing Outcomes with Value Creation, which highlights substance of transaction and group synergies.

EU recommendations

The BEPS recommended approaches should be implemented urgently into national laws of the OECD Members so that the base erosion and profit shifting will be eliminated. In the respect of the internal market of the EU, there is a great risk of fragmentation and distortion of the internal market due to uncoordinated unilateral actions by EU Member States. Therefore the European Commission issued the proposal of the Anti-Tax Avoidance Directive proposing the minimum solutions for implementation of the BEPS recommendations with aim to receive a common minimum level of protection against tax avoidance. Particularly, the Directive lays down anti-tax avoidance rules in six specific fields: deductibility of interest; exit taxation; a switch-over clause; a general anti-abuse rule; controlled foreign company rules; and a framework to tackle hybrid mismatches.

In respect of the deductibility of interest based on the BEPS Action Plan 4, the Directive is limiting the amount of interest that the taxpayer is entitled to deduct in a tax year. For this purpose, net interest expenses will only be deductible up to 30% of a fixed ratio based on the taxpayer's gross operating profit (i.e. EBITDA) or up to an amount of EUR 1 million, whichever is higher. Further, the Directive also proposes the corridor of the ratio from 10% to 30% as is recommended by the OECD.

Further, it is necessary to clarify that the implementation of the interest limitation rules should not affect the taxpayers' obligation to comply with the arm's length principle.

3 Results and Discussion

The transfer pricing assessment of financing arrangements by the entity can be very difficult and a resource-intensive process resulting into a higher compliance cost of taxation. Based on the experience from the U.S.A. which introduced transfer pricing guidelines for loans, we can summarize the main aspects which shall be considered during transfer pricing analysis, namely situs of the borrower, principal amount, duration of the loan, credit standing of the borrower and interest rates charged on comparable loans between unrelated parties. Moreover, the interest-limitation rules should be considered so that the base erosion and profit shifting can be eliminated.

As can be seen in the table 2, there are only three countries which do not have any interest-limitation rules or thin capitalization rules in EU, namely Estonia, Cyprus and Malta, comparing with the rest of EU Member States. It should be highlighted that aggressive tax planning i.e., erosion of tax base and profit shifting, through those countries is possible to perform based on the flow-through of dividends and financing. Further, some EU Member States have a general interest-limitation rule instead of the thin capitalization rule, namely Finland, Ireland, Italy, Luxembourg, Netherlands, Austria, Spain and Sweden.

Table 2 Overview of Interest-limitation Rules or Thin Capitalization Rules in EU

Country	Current rules	New one based on the BEPS	Country	Current rules	New one based on the BEPS
Austria	Yes	No	Italy	Yes	Yes
Belgium	Yes	No	Latvia	Yes	No
Bulgaria	Yes	No	Lithuania	Yes	No
Croatia	Yes	No	Luxembourg	Yes	No
Cyprus	No thin-capitalization rules and no interest-limitation rules	No	Malta	No thin-capitalization rules and no interest-limitation rules	No
Czech Republic	Yes	No	Netherlands	Yes	No
Denmark	Yes	No	Poland	Yes	No
Estonia	No thin-capitalization rules and no interest-limitation rules)	No	Portugal	Yes	Yes
Finland	Yes	Yes	Romania	Yes	No
France	Yes	No	Slovak Republic	Yes	Yes
Germany	Yes	Yes	Slovenia	Yes	No
Greece	Yes	Yes	Spain	Yes	Yes
Hungary	Yes	No	Sweden	Yes	No
Ireland	Yes	No	United Kingdom	Yes	No

Yes - means the application of thin capitalization rules or interest limitation rules.

No - means no thin capitalization rules or interest limitation rules applied in the country.

Source: (European Commission, 2015), own processing.

In respect of the BEPS Action 4, if we compare current applied rules with the BEPS recommended approach, it can be concluded that only seven EU Member States apply

rules following the BEPS approach, namely Finland, Germany, Greece, Italy, Portugal, Slovak Republic and Spain. However, their implementation varies in each country.

In case of Italy, Germany and Spain the threshold of 30% of EBITDA is applied, which corresponds with the BEPS approach. Moreover, Italy combines the interest-limitation rule with the transfer pricing rule. In case of Finland and Slovak Republic the threshold is set in the amount of 25% of EBITDA. Further, there is used a safe harbour rule, under which interest expense up to EUR 500,000 is fully deductible in Finland. In case of Portugal and Greece a gradual reduction of the threshold is introduced, in 2015 it is set in the amount of 50% of EBITDA, in 2016 in the amount of 40% of EBITDA and in 2017 the threshold is set in the amount of 30% of EBITDA as it is recommended by the BEPS. Moreover, Greece provides a safe harbour, under which interest expense up to EUR 5 million (until 31 December 2015) and up to EUR 3 million (from 1 January 2016) is fully tax deductible.

Further, it should be noted that four above mentioned countries, namely Italy, Spain, Portugal and Greece, were faced the European sovereign-debt crisis. However, it is questioned, whether the introduction of interest-limitation rules in the form of a fixed ratio based on EBITDA is a result of the increased efforts to protect domestic taxable income during the sovereign-debt crisis or the beginning of the fight against the base erosion and profit shifting.

When implementing a fixed ratio based on EBITDA, on one hand, each country should take into account the specific features of its overall tax system, any obligations under its constitution and the fact that the implementation has to be in accordance with EU treaty freedoms, directives (namely with EU Parent Subsidiary Directive and Interest and Royalty Directive) and State aid regulations. On the other hand, an elimination of fragmentation and distortion of the internal market due to uncoordinated unilateral actions by EU Member States should also be taken into account. Moreover, the simplicity can be ensured through a unilateral implementation of rules.

When all above mentioned aspects are considered, then the following recommendations for transfer pricing assessment of loans can be made for the EU: the determination of predetermined rates in the form of safe haven interest rates for all period such as annual, semi-annual, quarterly and monthly compounding periods using EURIBOR rates; loans denominated in EUR and thin capitalization rule. Further, the safe haven rates shall be presented as the range of the 25 and 75 percentiles of rates known as interquartile range. In addition, thin capitalization rules or interest-limitation rules shall also be considered altogether with transfer pricing analysis of loans. In this respect it is recommended to introduce a fixed ratio based on the EBITDA with the threshold of 30% or within a corridor of 10% to 30% in the EU. Based on it, the transfer pricing simplified measurements for loan can be ensured.

In the end it should be highlighted, that the safe harbours have the potential to significantly reduce the compliance burden of taxpayers and the resource dedication of tax authorities provided that they are well-designed in line with the arm's length principle and applied based on a careful evaluation of the facts and circumstances.

4 Conclusions

The aim of the paper was to recommend transfer pricing approaches for intra-group loans in EU, based on the experiences from the USA in this area, recommendations of the BEPS project and the proposal of the EU Anti-Tax Avoidance Directive.

The U.S. transfer pricing for intra-group loans is mainly introduced in the section 1.482-2 and 385 of the IRC and can be summarized into a few approaches, namely situs of the borrower, safe haven rates, bona fide indebtedness and others. Each month, the IRS published various prescribed AFRs, which are known as safe haven rates, for all period such as annual, semi-annual, quarterly and monthly compounding periods. The application of safe haven rates is limited to loans denominated in the US dollars.

Based on the analyses of recommendations of the BEPS Action 4 and EU Anti-Tax Avoidance Directive can be concluded the recommended approach in the form of a fixed ratio based on the EBITDA with the threshold of 30% or within a corridor of 10% to 30% or interest deductibility up to an amount of EUR 1 million, whichever is higher. This approach can ensure the direct link of interest deductions to economic activity of entity and makes the rule reasonably robust against aggressive tax planning. Moreover, its coordinated implementation through all EU Member States prevents the fragmentation and distortion of the internal market due to uncoordinated unilateral actions by EU Member States and ensures the minimum level of protection against base erosion and profit shifting.

Therefore as a transfer pricing simplified measurement for loans taking into account simplicity, BEPS, a coordinated unilateral implementation in EU, we recommend the determination of the predetermined rates in the form of safe haven interest rates for different compounding periods and amount of loan using EURIBOR rates and thin capitalization rules or interest-limitation rules in the form of a fixed ratio based on the EBITDA with the threshold of 30% or within a corridor of 10% to 30%. The safe haven rates shall be presented as the range of the 25 and 75 percentiles of rates known as an interquartile range and applied only for loans denominated in EUR.

Acknowledgments

The paper presents the results of the research in the project GA CR No. 15-24867S „Small and medium size enterprises in global competition: Development of specific transfer pricing methodology reflecting their specificities“.

References

- Bakker, A. (2015). Transfer Pricing from the Perspective of Substance and Transparency: Is the OECD on the Right Track? In: Cotrut, M., ed. *International Tax Structures in the BEPS Era: An Analysis of Anti-Abuse Measures*, IBFD: Amsterdam, pp. 69-100.
- Cressy, R. (2000). *Tax, Assistance, Compliance and the Performance of the Smaller Business*. A Research Report to the Federation of Small Business.
- European Commission (2016). *Proposal for a Council Directive laying down rules against tax avoidance practices that directly affect the functioning of the internal market*, COM(2016) 26 final – Anti-Tax Avoidance Directive. Retrieved from: <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52016PC0026&from=EN>.
- European Commission (2015). *Study on Structures of Aggressive Tax Planning and Indicators - Final Report*. Taxation Papers – Working paper N. 61 – 2015. Retrieved from: http://ec.europa.eu/taxation_customs/common/publications/services_papers/working_papers/index_en.htm.
- Nerudová, D., Bohušová, H., Svoboda, P., Široký, J. (2009). *Harmonizace účetních standardů pro malé a střední podniky*. Praha: Wolters Kluwer.
- OECD. (2010). *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations*. OECD Publishing: Paris.
- OECD. (2013). *Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations*. Update Chapter IV., part E – Safe harbours. OECD Publishing: Paris.
- OECD. (2015), *Limiting Base Erosion Involving Interest Deductions and Other Financial Payments, Action 4 - 2015 Final Report*, OECD/G20 Base Erosion and Profit Shifting Project, OECD Publishing, Paris.
- Offermanns, R., Baldewing, B. (2015). Anti-Base-Erosion Measures for Intra-Group Debt Financing. In: Cotrut, M., ed., *International Tax Structures in the BEPS Era: An Analysis of Anti-Abuse Measures*, IBFD: Amsterdam, pp. 101-126.

Russo, A., Moerer, O. (2012). Introduction. In: Bakker, A. & M. M. Levey, eds., *Transfer Pricing and Intra-Group Financing*, IBFD: Amsterdam, pp. 1-56.

Solilová, V., Nerudová, D. (2015). Transfer Pricing Rules in the Context of SMEs. In: Teoretické a praktické aspekty veřejných finance. Vysoká škola ekonomická v Praze, Oeconomica – Praha.

Solilová, V., Nerudová, D. (2013), Transfer pricing: general model for tax planning. *Ekonomický Časopis*, vol. 61, no. 6, pp. 597-617.

Soo Mei-June, Glaize, M. (2015). *Transfer Pricing Features of Selected Countries 2015*. IBFD: Amsterdam.

US Internal Revenue Service: *The Internal Revenue Code*. Retrieved from: <https://www.law.cornell.edu/cfr/text/26/1.482-2>.

US Internal Revenue Service: *Applicable Federal Rates*. Retrieved from: <https://www.irs.gov/pub/irs-drop/rr-15-25.pdf>.

Foreign Exchange Intervention by the Czech National Bank and its Consequences

Miroslav Sponer¹, Martina Sponerová¹

¹Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno, Czech Republic
E-mail: sponer@econ.muni.cz
136615@mail.muni.cz

Abstract: *The article generally analyses the causes leading up to the foreign exchange intervention by the Czech National Bank in November 2013 and its consequences. The article examines the use of exchange rate by the Czech National Bank as a monetary policy instrument at the zero lower bound on interest rates. It explains the reasons for further easing monetary policy and for choosing the exchange rate instrument and its specific level, and discusses its expected benefits in the case of the Czech Republic.*

Keywords: deflation, exchange rate, foreign exchange interventions, monetary policy, zero lower bound

JEL codes: E31, E52, E58, F31

1 Introduction

The global financial and economic crisis and the ensuing economic contraction and decline in inflation forced many central banks to start using unconventional monetary policy instruments. The Federal Reserve and the European Central Bank purchased securities and injected massive amounts of liquidity into the economy in 2007–2015. In September 2011 the Swiss National Bank announced a minimum exchange rate of the franc against the euro backed by interventions in the foreign exchange market.

The Czech National Bank in the second half of 2008 entered an unprecedented period of cutting interest rates, which reached a record low (technical zero) level in November 2012. The monetary policy easing was also strongly aided by a spontaneous depreciation of the Czech koruna in response to a contraction in both external demand and the domestic economy. The exchange rate at that time proved its ability to act as an automatic adjustment mechanism, a mechanism available to the Czech economy thanks to its independent monetary policy.

In November 2013 the Czech National Bank (CNB) started to use the exchange rate as an instrument within its inflation targeting regime in the form of a publicly declared, one-sided exchange rate commitment. The CNB took this step after its monetary policy rates had hit the zero lower bound in autumn 2012 and the need to ease the monetary conditions further had gradually increased, with observed and forecasted inflation both heading well below the central bank's two per cent target and the Czech economy experiencing the longest recession in its history. The CNB's analyses were indicating that inflation would turn negative in early 2014 and there was a danger that this would turn into long-term deflation with all its adverse impacts on the economy. (Franta et al., 2014)

The CNB Bank Board decided to start using the exchange rate as an additional instrument for easing the monetary conditions by adopting an explicit and publicly communicated exchange rate commitment. The CNB will intervene in the foreign exchange market to weaken the Czech koruna so as to maintain the exchange rate of the koruna against the euro close to CZK 27 to the euro. The CNB made it clear that it was resolved to intervene in such amounts and for as long as needed to achieve the desired exchange rate level with the aim of smoothly fulfilling its inflation target in the future.

The public reaction to the CNB's decision was very strong and mostly critical. The criticism came from practically all sides, including from those economic agents that would

benefit relatively rapidly from a weakening of the koruna. The central bank's decision was, for the most part, not expected by financial market analysts and other domestic economic agents, despite the fact that the possibility of weakening the exchange rate had been signaled with increasing intensity for more than a year. Those arguing against the CNB's measure questioned the risk of deflation. Some representatives of exporting firms regarded the exchange rate weakening purely as an element of uncertainty causing financial losses on existing exchange rate risk hedging and increasing prices of imported inputs without offering a sufficiently long-term increase in the price competitiveness of domestic production. Corporate sector perceptions did not start to shift until the exchange rate commitment had earned sufficient credibility, the CNB had succeeded in communicating the medium-term nature of the commitment, and the positive effects on operating profits had started to be felt.

In this situation, the CNB was forced to start communicating intensively even on monetary policy issues that are usually regarded as axiomatic. The most important of them was the existence of the CNB's 2% target and the fact that this target, and not zero inflation or even negative inflation, embodies the central bank's statutory mandate to maintain price stability. It was also necessary to explain the functioning of the exchange rate transmission channels and that deflation caused by insufficient demand is not a positive phenomenon increasing the real wealth of society, but rather is a threat to the country's economic development and financial stability.

2 Methodology and Data

The Czech National Bank's interest rate cuts were aimed at delivering the desired positive monetary impulse mainly by influencing commercial banks' interest rates on loans and deposits. These rates are pivotal for households' and firms' consumption, saving, and investment decisions.

Thus, as the economic crisis deepened, it was legitimate to ask whether monetary policy transmission in the Czech Republic was still functioning properly or whether it had weakened compared to what we used to know about it based on our pre-crisis experience.

The primary transmission channels include the interest rate channel, the exchange rate channel, the credit channel, and the asset price channel. The importance of particular channels in a particular economy depends on the openness of the economy, its financial system development, as well as the role of the banking sector.

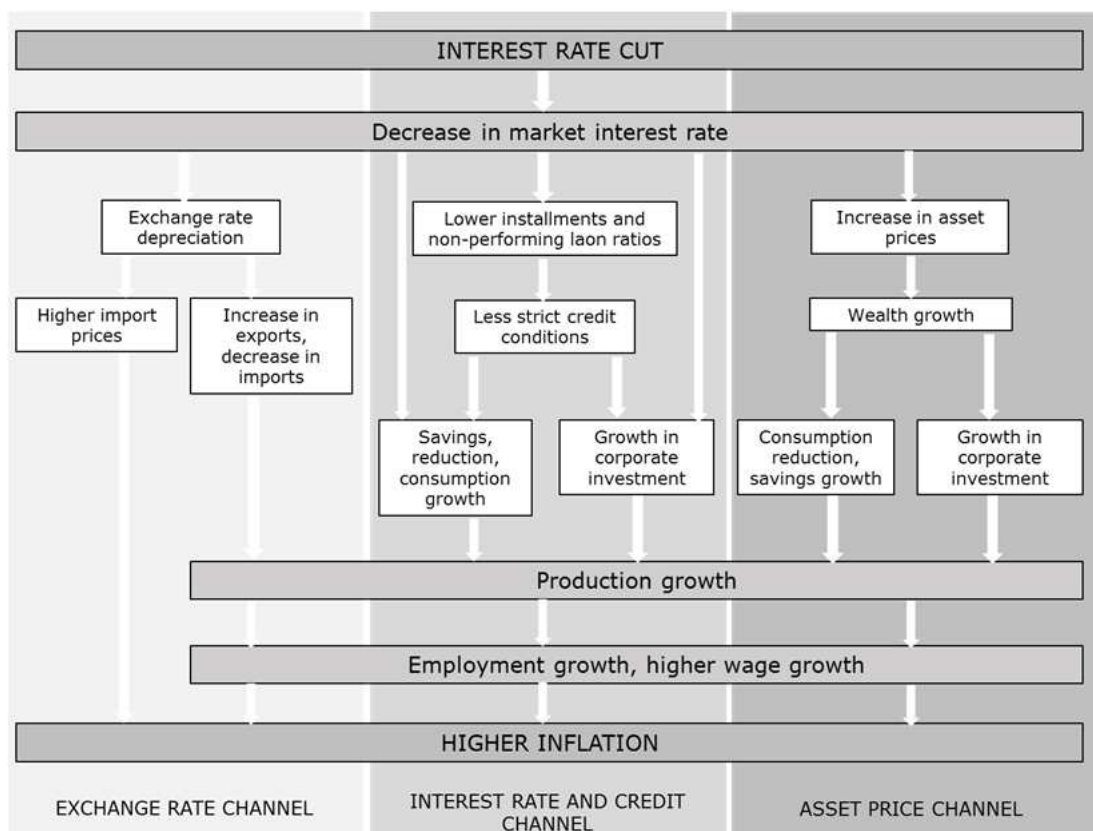
Through the interest rate channel, monetary policy influences the real economy by changing key interest rates. As consumption, saving, and investment decisions are typically based on long-term interest rates, the first necessary condition for effective monetary policy is a functioning channel of transmission of monetary policy interest rates to financial market interest rates. The changes in financial market interest rates influence the costs of interbank borrowing, to which banks subsequently react by adjusting their deposit interest rates. At the same time, the changes in the cost of bank financing influence the interest rates on loans provided by banks. In the end, client interest rates on deposits and loans enter the optimization process of economic agents in terms of intertemporal substitution or valuation of economic projects.

The effect of the exchange rate on inflation is especially substantial for very open economies. An exchange rate shock has a direct effect on consumer inflation through prices of imported consumer goods. Indirect effects include the price effects of substitution between domestic and foreign goods, changes in the domestic prices of raw materials and intermediate goods, and changes in the monetary policy stance.

The asset price channel can cause asset price adjustments induced by interest rate changes to influence the value of households' and firms' balance sheets, which is reflected in their confidence in the economy. The effectiveness of this channel for households is conditional on their perceptions about whether growth in real estate prices and financial asset prices increases wealth and is a source of consumption spending. In

the case of firms, growth in a firm's stock market value makes investment capital relatively cheaper. The basic scheme of transmission from policy interest rates to inflation is depicted in Chart 1.

Chart 1 Primary Transmission Channels



Source: Babecká–Kucharčuková et al., 2013

Empirical studies of monetary policy transmission in the Czech Republic employ a wide range of approaches. Bayesian VAR with time-varying parameters was used to evaluate changes in monetary policy transmission in the Czech Republic in Franta et al. (2013). The authors found the exchange rate pass through to be relatively stable, while the responsiveness of prices to monetary policy shocks increased. A comparison of the results obtained using four estimation techniques (VAR, structural VAR, Bayesian VAR, and factor-augmented VAR) is provided in Borys et al. (2009). The authors find both prices and output to decline after a monetary policy tightening, with the maximum response occurring after about one year.

Estimations using VAR, Bayesian VAR, and time-varying parameter VAR show that the fall in prices after an unexpected interest rate hike reaches its maximum after about 5–6 quarters. The response of prices to an exchange rate shock reaches its maximum after one year according to both the VAR and Bayesian VAR estimates. The impact of the crisis is estimated in two ways – using the time-varying parameter VAR and estimating the Bayesian VAR on the full sample as well as the pre-crisis subsample. Both approaches suggest that the transmission of monetary policy shocks was not substantially affected by the crisis in the Czech Republic. (Babecká–Kucharčuková et al., 2013)

Finally, regarding the significance of the wealth channel, the presented analysis did not confirm the presence of a wealth channel in the transmission mechanism in the Czech economy.

3 Results and Diskussion

Monetary Policy Tools at the Zero Lower Bound

A significant number of central banks have lowered their rates in response to the crisis in order to mitigate its consequences and meet their monetary goals and have announced that they expect rates to be at low levels for a significant period of time.

Depending on the particular situation of their economy and financial sector, central banks have turned their attention to various unconventional monetary policy measures, such as negative interest rates on deposits, various forms of quantitative or qualitative easing, and foreign exchange interventions. (Borio and Disyatat, 2010)

Experience with negative deposit interest rates is very limited and their economic consequences are in general very unclear. Moreover, in some pieces of legislation in the Czech Republic, penalty interest is bound in a multiplicative manner to the discount rate. This may lead to severe legal complications if the rate is lowered beyond zero. In addition, the general legislation forbids negative interest rates in certain types of contracts. (Lízal and Schwarz, 2013)

Quantitative easing is activity undertaken by the central bank that leads to intentional and significant growth in the size of its balance sheet. The central bank buys long-term government bonds (or other high-quality assets). In such operations, liquidity in the financial system increases. The central bank simultaneously sends out a signal to the economy that it intends sooner or later to achieve price growth by issuing money. The main channel of effect is therefore an effort to reduce long-term nominal interest rates and increase inflation expectations, thereby stimulating investment and demand through lower long-term real interest rates. Quantitative easing also usually fosters a weakening of the domestic currency, hence acting through the exchange rate transmission channel.

Qualitative easing involves the central bank conducting operations intended to change the composition of its balance sheet away from government debt securities towards riskier and less liquid assets, holding constant size of its balance sheet. The financial sector can transfer risky and illiquid assets to the central bank and thereby obtain more liquid and less risky instruments to cover its needs. This results in a decline in the risk premium, which in turn boosts investment in riskier projects. The final result is a rise in economic activity and inflation.

Credit easing represents a mixture of the above two approaches. The central bank expands its balance sheet so that average liquidity decreases and/or the riskiness of its assets increases. This activity is aimed at affecting the cost and availability of loans, and such measures are usually targeted at a specific, non-functional market segment.

Foreign exchange interventions or exchange rate are among the tools available to an open economy for ending deflation and escaping the zero lower bound (ZLB). Their use as an extraordinary monetary policy instrument was proposed by McCallum (2000) and Svensson (2001). These authors pointed out numerous advantages of using the exchange rate as an unconventional monetary policy tool. Using a small macroeconomic model, McCallum (2000) showed that at the ZLB a central bank in an economy open to foreign trade can successfully apply a policy rule that adjusts the rate of depreciation of the domestic currency to stabilize inflation and the real economy. In his approach, the exchange rate is an operating target of monetary policy and the exchange rate path corresponding to the policy rule is secured by central bank interventions in the foreign exchange market. The author concluded that this instrument can be very effective in achieving monetary policy objectives.

From a terminological perspective, the use of foreign exchange interventions as a monetary policy instrument is defined as an approach where the size of foreign currency purchases in the market is specified but the impact on the exchange rate is uncertain and depends on market conditions. The direction in which the central bank is trying to shift the exchange rate is thus clear, but the size of the shift is not. Many central banks use such policy even away from the ZLB. By contrast, the use of the exchange rate as an

instrument at the ZLB is defined as an approach where the central bank chooses and possibly also publicly declares the specific exchange rate level it wants to attain and is prepared to intervene in the foreign exchange market in unspecified and potentially unlimited amounts to attain that level. The CNB's choice in the form of the declaration of an asymmetric exchange rate commitment falls into the latter category and therefore differs fundamentally from the use of conventional foreign exchange interventions.

As a consequence, foreign exchange interventions have been selected as the most appropriate monetary policy tool when interest rates hit the zero bound and cannot be lowered any further. Moreover, given that the Czech economy is very open, it seems only logical to choose them over the alternatives.

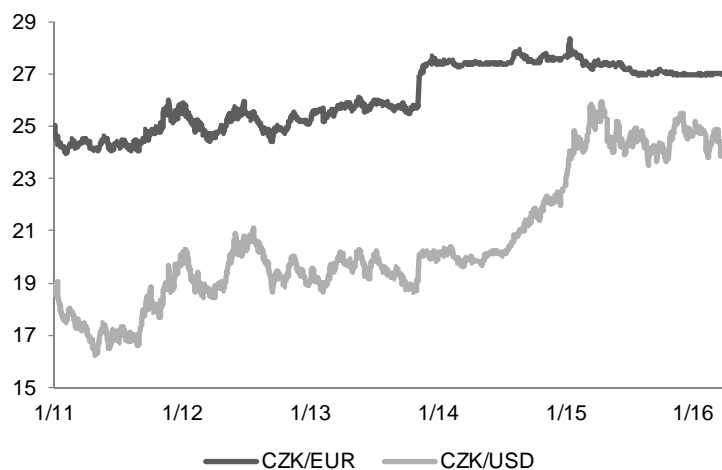
Monetary Policy and Economic Developments

The primary monetary policy objective as laid down in the Act on the CNB is to maintain price stability. Since January 1998, this has been achieved under an inflation targeting regime in which the CNB tries to keep inflation close to a declared target. Since 2010, the CNB's inflation target in terms of the consumer price index has been set at 2% with a tolerance band of ± 1 percentage point. This target is in line with the practice of advanced economies.

The Czech economy went through a lengthy economic recession in 2012–2013 owing to weak external and in particular domestic demand, reflecting budget consolidation and low household and business confidence. The labor market situation deteriorated. There was a risk that inflation would turn negative at the start of 2014 after the effect of tax changes faded away and that deflationary expectations would emerge, leading to a halt in the nascent economic recovery or even a renewed economic downturn. All this was going on in a situation where monetary policy interest rates were at technical zero and the room for using standard monetary policy instruments had thus been exhausted. In November 2013, the CNB, in line with its previous communication, started to use the exchange rate of the Czech koruna as an additional instrument for easing monetary policy. The one-sided commitment means that the CNB is ready to prevent excessive appreciation of the koruna below CZK 27 to the euro by intervening in the foreign exchange market, while allowing the koruna's exchange rate to float on the weaker side of this level.

Following the announcement of the exchange rate commitment the koruna quickly depreciated beyond the exchange rate commitment level. It then soon stabilized close to CZK 27.50 to the euro, which suggests that the exchange rate commitment quickly established a strong degree of credibility. The exchange rate stayed at this level throughout 2014 with no need for interventions by the CNB (Figure 1).

Figure 1 CZK/EUR and CZK/USD Exchange Rates



Source: CNB (2016). Inflation Report, vol. II.

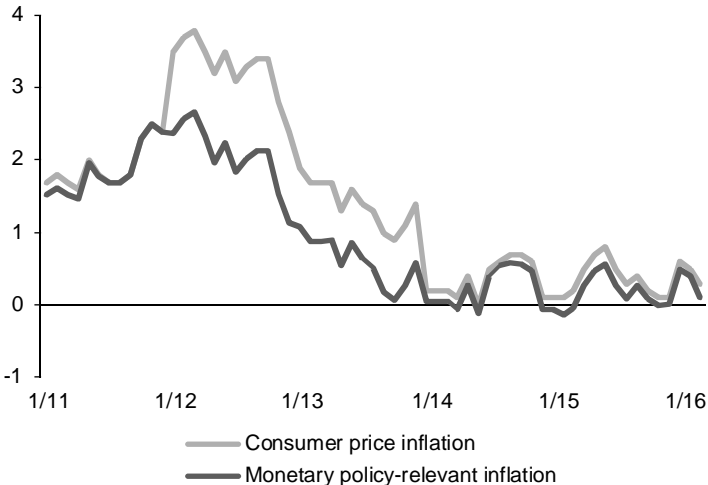
The Czech economy benefited from the weakening of the exchange rate. The economy grew by 2% in 2014. In addition easing monetary policy, the growth was due to the unwinding of the restrictive effect of domestic fiscal policy and, to a lesser extent, to a recovery in external demand. The weakening of the koruna's exchange rate boosted not only export growth, but also growth in domestic investment and consumption, as firms and households stopped deferring their expenditure. The economic recovery positively affected the labor market through a rise in employment and renewed wage growth in the corporate sector. However, headline inflation remained well below the CNB's target, or below the lower boundary of the tolerance band around the target, owing to deflation abroad and a decline in world commodity prices.

The exchange rate was markedly weaker in the first half of the year 2015, but in the summer it appreciated towards the commitment level and the CNB started to intervene automatically to maintain the commitment by buying euro on the foreign exchange market.

Czech economic growth accelerated sharply in early 2015 and economic activity increased by 4.3% in the year as a whole. All components of domestic demand, and in particular gross capital formation and household consumption, contributed to the annual growth in GDP. Economic growth continued to be supported by easy monetary conditions via the weakened koruna and by exceptionally low interest rates. Growth was also aided significantly by government investment, linked chiefly with the drawdown of EU funds from the previous programming period. Falling oil prices and rising external demand also acted in the same direction. The robust economic growth had a favorable impact on the labor market, fostering a continued increase in employment and an acceleration of wage growth. The average inflation rate in 2015 as a whole was 0.3%, the lowest level since 2003. This exceptionally low inflation rate was due mainly to a marked and deepening annual decline in fuel prices reflecting the drop in world oil prices and, in the second half of the year, also falling administered prices and a halt in food price inflation.

Both headline and monetary policy-relevant inflation increased slightly at the start of this year, but remained well below the CNB's target (Figure 2). The growth of the Czech economy slowed at the end of last year. It will continue to follow this trend this year. The actual and expected inflation developments during 2016 signals that significantly expansionary monetary conditions needed to be maintained and that sustainable fulfilment of the 2% target, which is a condition for a return to conventional monetary policy, would not occur until early 2017.

Figure 2 Inflation



Source: CNB (2016). Inflation Report, vol. II.

At its monetary policy meeting on 5 May 2016, the Bank Board decided to continue using the exchange rate as an additional instrument for easing the monetary conditions. The

Bank Board stated that the Czech National Bank will not discontinue the use of the exchange rate as a monetary policy instrument before 2017.

4 Conclusions

This paper describes the CNB's experience with using the exchange rate as a monetary policy instrument since November 2013 after reaching the zero lower bound in a situation of growing risks of deflation due to insufficient demand. The most interesting aspects of the CNB's experience include the debate on how to use the exchange rate as a monetary policy instrument at the ZLB and on how transparent it should be. This debate eventually resulted in the choice of a publicly declared, one-sided exchange rate commitment, i.e. the exchange rate level below which the CNB will not let the currency appreciate, using potentially unlimited foreign exchange interventions to this end. Looking back, it is clear that this exchange rate commitment quickly established a strong degree of credibility.

The use of foreign exchange interventions to ease monetary conditions in an open economy is a rational choice. This monetary instrument is used only when interest rates are at a zero level, i.e., when the standard natural tool is no longer available. The pass through at the zero lower bound is significantly higher than that assumed on the basis of past experience during normal times. The depreciation helps net exports, which is a good side-effect stimulating the economy. And finally, the power of the central bank when intervening against its own currency is not limited by the volume of reserves. In essence, in an economy with abundant liquidity in the banking sector, such as the Czech Republic, foreign exchange interventions are the most efficient way to implement quantitative easing.

The CNB's experience reveals that the use of this type of instrument may meet with strong criticism from experts and the general public. This debate was unpleasant from the point of view of the short-term perception of the central bank's activities by the public and forced the CNB to change its communication procedures towards shorter delays following monetary policy meetings, more direct communication with various groups in society and stronger institutional communication relative to presentation of the Bank Board members' individual views. From the perspective of the objective of the CNB's action, however, the debate helped the central bank to avert the risk of self-fulfilling deflation expectations.

Nowadays, the risk of deflation in the Czech economy is a virtually closed topic and foreign trade and domestic demand are recovering. Going forward, this should mean that the domestic economy will begin to generate moderate but sustained inflation pressures, allowing the CNB to start considering exiting the use of the exchange rate as a monetary policy instrument.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development is gratefully acknowledged.

References

- Babecká Kucharčuková, O., Franta, M., Hájková, D., Král, P., Kubicová, I., Podpiera, A., Saxa, B. (2013). What We Know About Monetary Policy Transmission in the Czech Republic: Collection of Empirical Results. *CNB Research and Policy Notes*, vol. 1.
- Borio, C., Disyatat, P. (2010). Unconventional Monetary Policies: An Appraisal. *Manchester School*, vol. 78(s1), pp. 53-89.
- Borys, M. M., Horváth, R., Franta, M. (2009). The Effects of Monetary Policy in the Czech Republic: An Empirical Study. *Empirica*, vol. 36(4), pp. 419-443.

- CNB (2016). *Inflation Report*, vol. II. Retrieved from: http://www.cnb.cz/en/monetary_policy/inflation_reports/2016/2016_II/.
- Franta, M., Horvath, R., Rusnak, M. (2013). Evaluating Changes in the Monetary Transmission Mechanism in the Czech Republic. *Empirical Economics*, May.
- Franta, M., Holub, T., Král, P., Kubicová, I., Šmídková, K., Vašíček, B. (2014). The Exchange Rate as an Instrument at Zero Interest Rates: The Case of the Czech Republic. *CNB Research and Policy Notes*, vol. 3.
- Lízal, L., Schwarz, J. (2013). Foreign Exchange Interventions as an (un)conventional Monetary Policy Tool. *BIS Papers*, No. 73(i), pp. 127–143.
- McCallum, B. T. (2000). Theoretical Analysis Regarding a Zero Lower Bound on Nominal Interest Rates. *Journal of Money, Credit and Banking*, 32, No. 4, pp. 870-904.
- Svensson, L. E. O. (2001). The Zero Bound in an Open Economy: A Foolproof Way of Escaping from a Liquidity Trap. *Monetary and Economic Studies*, 19(S-1), pp. 277–312.

Nexus of Bank Risk-taking and Interest Rates

Martina Sponerová¹, Miroslav Sponer¹

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 603 00 Brno, Czech Republic
E-mail: 136615@mail.muni.cz
sponer@econ.muni.cz

Abstract: *Many researches proved that the gradual decrease of interest rates from the early 2000s to the present caused the increase of the risk-taking appetite of banks. This theory suggests that a low interest environment drives, ceteris paribus, bank margins and informational asymmetries down. As a consequence, banks react by softening their lending standards, thus raising the level of risk assets in their portfolios and increasing the risk of failure. This paper analyses impact of low interest rates to bank risk-taking in the Czech banking sector and answers following questions. Do low interest rates increase risk-taking appetite of banks in the Czech Republic? How the Czech banking sector faces to low interest rates in connection with profitability?*

Keywords: interest rate, risk-taking, banking industry, non-performing loan, profitability

JEL codes: C25, E43, G21

1 Introduction

Following the collapse of Lehmann Brothers in September 2008 and subsequently with the eruption of the debt crisis in the euro area, central banks across the world have reacted promptly with bold measures. In the euro area, the European Central Bank (ECB) reduced the official policy rates to historically low levels and introduced unconventional measures to restore the monetary policy transmission mechanism. One contributing factor has been much discussed relates to the role of loose monetary policy: the argument is that, if had monetary authorities raised interest rates earlier and more aggressively, the consequences of the bust would have been much less severe. More recently, a related debate has been raging on whether continued exceptionally low interest rates are setting the stage for the next financial crisis. Dell'Ariccia et al. (2013)

It has been often argued that monetary policy has been one of the factors contributing to excessive risk-taking by banks. (Taylor 2009) As a result, a number of authors have referred to a new transmission mechanism of monetary policy, coining the term: "the risk-taking channel". Expressed simply, this channel exists where "low interest rates for too long" lead to an increase in "risk tolerance" by banks. The risk-taking channel operates in two main ways. First, in periods of too low interest rates there might be incentives for banks to "search for yield" more aggressively. In other words, when interest rates are subdued, banks might be more willing to invest in riskier assets, thereby lowering the yield from these assets. Second, the positive effect of low interest rates on investments valuations and cash flows could also induce banks to take on more risks. (Adrian and Shin 2009, Borio and Zhu 2012)

The risk taking channel, a term coined by Borio and Zhu (2012) prompted a recent empirical literature. One main finding of this literature is a negative relationship between the level of interest rates and bank risk-taking. (Dell'Ariccia et al. 2014) In light of observation, it has been argued that central banks could have prevented the build-up of risk to the financial crisis and the ensuing negative consequences for the macroeconomics by raising interest rates. (Taylor 2009, Borio and Zhu 2012)

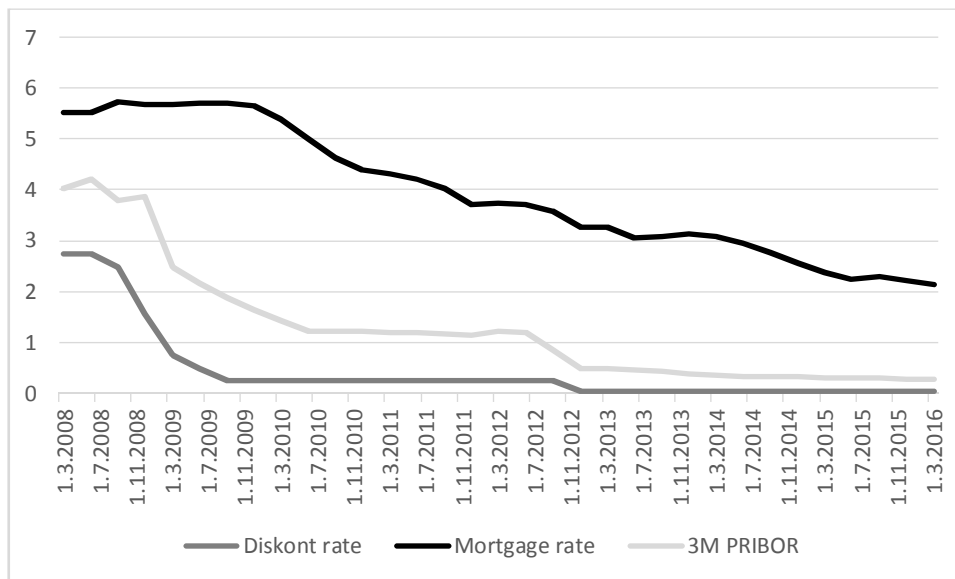
As it is written above, low interest rates may entail more risk-taking in lending by banks, directly in conjunction with weak banking supervision standards and high securitization. Because of severe agency problems in banking (due to bailouts and liquidity assistance), low interest rates may induce banks to soften their lending standards by improving banks' liquidity and net worth. Since banks rely mostly on short-term funding, low short-

term rates may spur risk-taking more than low long-term rates. Moreover, low interest rates make riskless assets less attractive and may lead to a search-for-yield by financial intermediaries. Rajan (2006), Maddaloni and Peydró (2011)

The aim of this paper is to analyze an impact of low interest rates to bank risk-taking in the Czech banking sector and answers following questions. Do low interest rates increase risk-taking appetite of banks in the Czech Republic? How the Czech banking sector faces to low interest rates in connection with profitability?

Below we enclose the figure of interest rates development in the Czech Republic. There is clearly seen the interest rate decrease from the beginning of 2008.

Figure 1 Interest Rates Development in the Czech Republic



Source: Own processing from CNB data (2016)

2 Methodology and Data

We work with two hypothesis – 1. Low interest rates increase risk-taking of the Czech banking sector, 2. There is negative relationship between the net interest income and the net profit of the banks.

The analysis is focused exclusively on the Czech banking sector because of its specifics. We used data from the ARAD system of Czech national bank. The data are available in a sufficiently long time series there.

To confirm or reject first hypothesis, we study the nexus of risk-taking and the interest rates decrease through OLS model. We examine not only the Czech banking sector at all, but we have divided the Czech banking sector to big sized banks, middle sized banks and small sized banks and we examine each group of banks separately. Than we analyze the net income of the Czech banking sector and the development of loan volume, net interest income and income from charges and provisions to verify second hypothesis.

Model Specification

The statistical method of analysis that had been used is linear regression analyses. Regression coefficients were estimated using following formula:

$$Y_i = \alpha + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \varepsilon_i \quad (1)$$

The left hand variable Y_i represents the dependent variable in the model, α is taken to be a constant overtime t , β is a p-dimensional parameter vector, X_i contains the set of explanatory (independent) variables., ε_i is random error.

The proposed period is from 2008 to 2015. The Z-score was used as dependent variable.

Z-score or the insolvency risk is very popular benchmark in empirical literature focusing on banking and financial stability. This indicator expresses the probability of bank's insolvency and it is often used in empirical literature because of its relative simplicity. This model is attributed to Hannan and Hanweck (1988) and Boyd et al. (1993).

Z-score equation is as follows:

$$Z = \frac{CAR + \mu ROA}{\sigma ROA} > 0 \tag{2}$$

CAR capital-to-asset ratio = E/TA

μ ROA median value of ROA

δ ROA deviation of ROA

This equation is based on the assumption, that the bank's insolvency is the situation when $(CAR + ROA) \leq 0$. It means that higher Z-score values indicates higher bank's stability. Sometimes is Z-score named to "distance-to-insolvency".

The explanatory variables are described in the Table 1 mentioned below.

Table 1 Explanatory Variables

	Variable description
INTINCTOASS	Interest income to Assets ratio
NPL_CL	Clients' Non-performing loans ratio = NPL of clients' to loan volume
CHARGTOINC	Income from charges and provisions to Financial and operational income

Source: Own processing

Multicollinearity and heteroscedasticity were tested and if needed transformations to predictors have been done. To check heteroscedasticity, the Breusch-Pagan test was used.

3 Results and Diskussion

The first hypothesis is: "Low interest rates increase risk-taking of the Czech banking sector." We acknowledge that empirically it is quite difficult to prove causality between monetary policy and bank risk-taking. Generally, the risk-taking behavior can be expressed by different indicators for example by loan volume, non-performing loan ratio or by provisions.

We tested the model not only on the Czech banking sector, but we also tested separately big sized banks, middle sized banks and small sized banks. The definition of banks sorting according Czech National Bank is following: as big sized banks are considered banks with balance amount equal or bigger than 250 mil. CZK, middle sized banks are banks with balance amount bigger than 50 mil. CZK but less than 250 mil. CZK, small sized banks are considered banks with balance amount not bigger than 50 mil. CZK. CNB (2016)

The result of OLS model for the Czech banking sector proves: if interest rates are decreasing the bank risk-taking is increasing. It confirms our first hypothesis. We can see the inverse character between Z-score and INTINCTOASS variable and positive dependence between non-performing loans of clients and Z-Score. Stronger dependence can be seen in model of big sized banks. However, it does not hold for middle and small sized banks. Decreasing interest rates do not affect them as they affect big sized banks. It can be also seen in the Figure 3.

The variable CHARGTOINC shows quite significant results which mean: if interest rates are decreasing the income from charges and provisions is increasing. The Czech banks are trying to compensate decreasing interest income by income from charges and provisions, which is special behavior of the Czech banks. Surprising result shows OLS

model for middle sized banks where above mentioned statement does not hold. Finally, we have to remark that p-values in all models are small, so we can reject null hypothesis in favor of the hypothesis that low interest rates increase risk-taking of the Czech banking sector.

Table 2 OLS Model of the Czech Banking Sector

	Coeff.	Std. Error	t-ratio	p-value
const	12.1382	0.0818952	148.2164	<0.0001
INTINCTOASS	-0.207367	0.0230226	-9.0071	<0.0001
NPL_CL	0.0362576	0.00455742	7.9557	<0.0001
CHARGTOINC	0.00407004	0.00181143	2.2469	0.0327

Source: Own processing from CNB data (2016)

Table 3 OLS Model of Big Sized Banks

	Coeff.	Std. Error	t-ratio	p-value
const	8.40817	0.0854869	98.3562	<0.0001
INTINCTOASS	-0.150849	0.014057	-10.7312	<0.0001
NPL_CL	0.0181703	0.00424868	4.2767	0.0002
CHARGTOINC	0.00238523	0.00251261	0.9493	0.3506

Source: Own processing from CNB data (2016)

Table 4 OLS Model of Middle Sized Banks

	Coeff.	Std. Error	t-ratio	p-value
const	7.17676	0.157468	45.5760	<0.0001
INTINCTOASS	0.0141136	0.0314747	0.4484	0.6573
NPL_CL	-0.00675421	0.00612723	-1.1023	0.2797
CHARGTOINC	-0.00474874	0.00630171	-0.7536	0.4574

Source: Own processing from CNB data (2016)

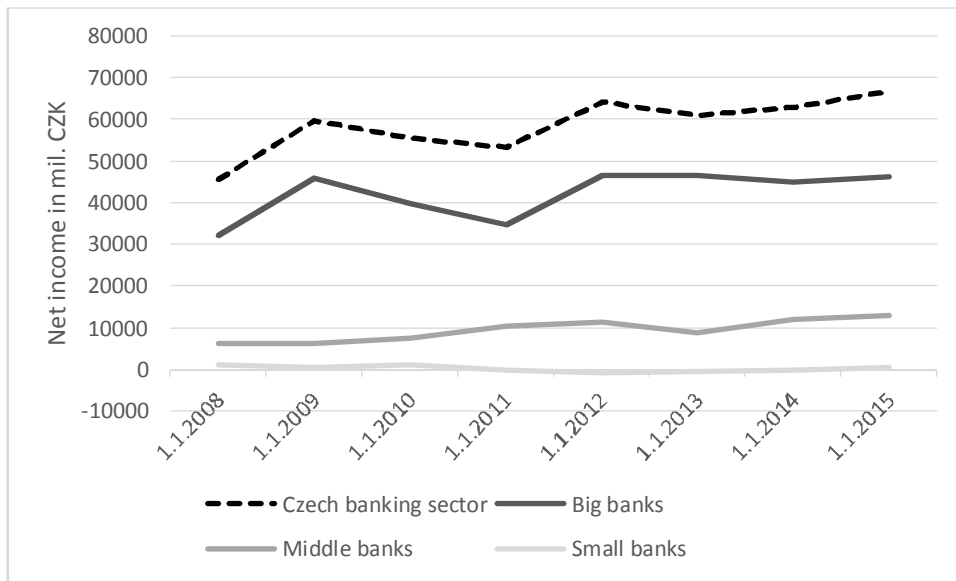
Table 5 OLS Model of Small Sized Banks

	Coeff.	Std. Error	t-ratio	p-value
const	0.652587	0.0274737	23.7531	<0.0001
INTINCTOASS	0.0170827	0.00886653	1.9266	0.0642
NPL_CL	0.00275047	0.00148838	1.8480	0.0752
CHARGTOINC	0.00210858	0.00102876	2.0496	0.0499

Source: Own processing from CNB data (2016)

The second hypothesis is the assumption that there exists negative relationship between the net interest income and the net profit of the banks. This is the answer of our second question - how the Czech banking sector faces to low interest rates in connection with profitability? The development of net income is quite favorable for the Czech banking sector. The net income of the whole Czech banking sector has increased by nearly 47% from beginning of 2008. We can say that the big banks are the main drivers of net income in the Czech banking sector. On the other side small banks faced losses during the crisis in the years 2012, 2013 and their net income decreased by 152%.

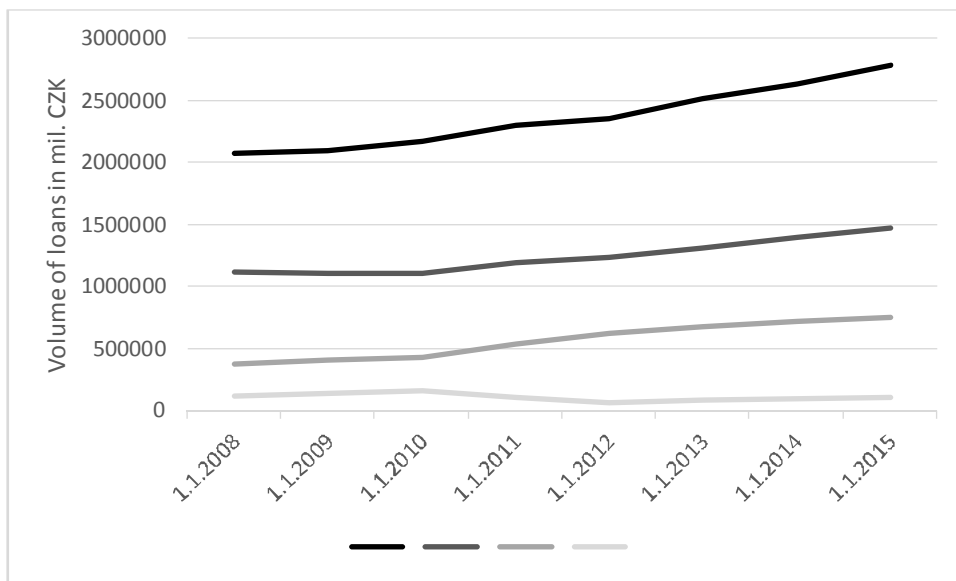
Figure 2 Net Income in the Czech Banking Sector



Source: Own processing from CNB data (2016)

Figure 3 shows development of loans in the Czech banking sector. We can see that low interest rates have positive impact for loan development of big and middle banks. Only small banks have decreasing trend of the loan volume.

Figure 3 Loan Volume in the Czech Banking Sector



Source: Own processing from CNB data (2016)

Table 6 describes the development of interest income, interest income to loan volume ratio and income from charges and provisions to interest income ratio. Even the interest rates and net interest income are decreasing, the Czech banking sector reaches quite good financial results. This result confirms our second hypothesis that there exists inverse character between the net interest income and the net profit of the banks. Within our study we found that the Czech banks compensate losses of interest income by other sources and were able to increase the net profit by 47% from the beginning of 2008. The income from charges and provisions can be considered as quite significant source of profit compensation.

Table 6 Interest Income Development

	Interest income	Interest income/Loan volume	Income from charges and provisions /Interest income
31.12.2008	191917	9.25%	24.37%
31.12.2009	174434	8.30%	26.80%
31.12.2010	166962	7.68%	28.97%
31.12.2011	172328	7.48%	29.02%
31.12.2012	170378	7.22%	28.85%
31.12.2013	154787	6.16%	32.22%
31.12.2014	158865	6.03%	30.82%
31.12.2015	150847	5.42%	31.55%

Source: Own processing from CNB data (2016)

4 Conclusions

The impact of lowering interest rates on the bank risk-taking behavior has been much documented in the literature, both theoretically and empirically. We re-examine this issue for the Czech banking sector in this paper. We worked with two hypothesis, the first is "Low interest rates increase risk-taking of the Czech banking sector". A decrease of the policy interest rate implies a reduction of the interest rate charged on each loan, which, in turn, decreases the bank's income. If the bank can solve asymmetric information, the fall in the average return can be balanced by changing the composition of the lending portfolio to finance more risk projects, which ensure a higher return. The first hypothesis was confirmed by OLS model for the Czech banking sector. Nevertheless, we have to remark that it does not hold for middle and small sized banks. Decreasing interest rates do not affect them as they affect big sized banks and it is not possible to confirm that low interest rates increase risk-taking of middle and small sized banks in the Czech Republic.

The second hypothesis is "There exists negative relationship between the net interest income and the net profit of the banks". Also the second hypothesis was confirmed by analysis of net interest income and net profit. Moreover, we found that, to secure stable or increasing amount of profit, the Czech banks, especially the group of big sized banks, increase their charges and provisions, what is the specialty of the Czech banking sector.

Acknowledgments

The support of the Masaryk University internal grant MUNI/A/1025/2015 Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development is gratefully acknowledged.

References

- Adrian, T., Shin, H. S. (2009). Financial intermediation and monetary economics. *Federal Reserve Bank of New York Staff Reports*, pp. 398.
- Borio, C., Zhu, H. (2008). Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism? *Bank for International Settlements. Working Paper*, pp. 268.
- Boyd, J. H., Stanley, L. G., Hewitt, R. S. (1993) Bank holding company mergers with nonbank financial firms: Effects on the risk of failure. *Journal of Banking*. Vol. 17(1), pp. 43-63.
- CNB (2016). *The time series Database*. Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_KOREN.
- CNB (2016). *The time series Database*. Retrieved from: http://www.cnb.cz/docs/ARADY/MET_LIST/icd_bs_cs.pdf.

Dell'Ariccia, G., Laeven, L., Suarez, G. (2013). Bank leverage and monetary policy's risk-taking channel: Evidence from United States. *International Monetary Fund*. Working paper, No. 14/143.

Dell'Ariccia, G., Laeven, L., Marquez, R. (2014). Real interest rates, leverage and bank risk-taking. *Journal of Economic Theory*. 149, pp. 65-99.

Hannan, T. H., Hanweck, G.A.. Bank Insolvency Risk and the Market for Large Certificates of Deposit. *Journal of Money, Credit and Banking*. 1988, 20(2), pp. 203-211.

Maddaloni, A., Peydró J. L. (2011). Bank risk-taking, securitization, supervision and low interest rates: Evidence from Euro area and U.S. lending standards. *Rev. Finan. Stud.* 24 (6), pp. 2121-2165.

Rajan, R. G. (2006). Has finance made the world riskier? *European Financial Management*. 12, pp. 499-533.

Taylor, J. B. (2009). The financial crisis and the policy responses: an empirical analysis of what went wrong. *National Bureau of Economic Research*. Working Paper. pp. 14631.

Verbeek, M. (2008). *A guide to modern econometrics*. 3rd ed. Chichester: John Wiley & Sons.

Selected Success Factors of Crowdfunding Projects

Tomáš Štofa¹, Martin Zoričák²

¹ Technical University of Košice
Faculty of Economic, Department of Banking and Investment
Němcovej 32, 04011 Košice, Slovak Republic
E-mail: tomas.stofa@tuke.sk

² Technical University of Košice
Faculty of Economic, Department of Finance
Němcovej 32, 04011 Košice, Slovak Republic
E-mail: martin.zoricak@tuke.sk

Abstract: *Crowdfunding projects gained in popularity in the recent years. There is, however, significant number of projects which have failed. Our aim in this paper is to analyze following factors of failed projects: crowdfunding campaign timing, funding campaign goal and categories relative size. The study analyses approximately 100 000 finished projects from crowdfunding website Kickstarter for years 2009 - 2014. We used logistic regression models to analyze impact of mentioned factors on success of projects. Findings show correlation between success of project and campaign timing in the beginning of and in the middle of the year. Goal has impact on a project success, in general, the lower the goal is, the higher chance to success a project has. Both, in higher and lower competitive categories group, projects in creative categories (e.g. Art, Film & Video, Dance) have higher chance to succeed.*

Keywords: crowdfunding, Kickstarter, success factors, seasonality

JEL codes: G19

1 Introduction

Small and medium sized enterprises have very important role in economy. Establishing a successful company requires business idea, right time, right place and also source of finance. Bank loans represent the most searched source of finance. There are many other ways, how to finance a company, including Private equity, Venture Capital and crowdfunding. Crowdfunding contain concepts like microfinance and crowdsourcing establishing a new way of fundraising provided by many internet platforms. Mollick (2013) Schwenbacher and Larralde (2014) offer their own definition of crowdfunding as "an open call, mostly through the Internet, for the provision of financial resources either in the form of donation or in exchange for the future product or some form of reward to support initiatives for specific purposes." Crowd, small contributions and internet platforms are the most important parts of all definitions. We have to mention one more peculiarity of crowdfunding, reward. Type of reward divide crowdfunding to four groups, donor, reward, equity and lending crowdfunding. In this paper we deal with reward-based model that is characteristic by obtaining specific reward for contribution. Authors usually offers more type of rewards depending on donated amount.

Campaign begins with creating business idea. Creators have to consider all details if they want to start a successful campaign. Crowdfunding portals, such as Kickstarter, help with marketing for new projects by presenting all important points including presentation of creators, product and plans for future. Some portals offer service of making propagation material. After publishing project page creators can get feedback from crowd and better up their project. When campaign starts it is very important to share this idea to make it more viral. Mollick (2013) identified, family and friends make a very important role in the beginning, because they are main source of first contributions. Usually they help in the end of project too, if it is not yet successful. Reward campaigns are usually of form "all or nothing". Creators can keep capital only when campaign is successful. In case of failure all contributions are returned. We can meet idea "keep it all" allowing to keep the entire collected amount, but it is not very popular because of issue of achieving of company

goal with much less amount. In the beginning creators set duration time and goal and campaign can start. Only successful projects are charged with fees consisting of bank charges and bonus for platform. After end of the campaign money is sent to creators and manufacturing process starts. After some time, contributors get their reward and product is ready for mass production.

We have to distinguish success of campaign and success of project. Failure of project is a situation when goal was reached, project was funded but contributors do not receive reward they bought. Crowdfunding is missing clear legal obligation to deliver reward in case of successful campaign, but this is related to nature of crowdfunding and donors should be aware of this risk. This risk should be minimized through control of platform and by backers deciding validity and worthiness of a project. Example of failure of project is Zano mini drone campaign. Project was promoted by 12 000 backers who put £2.3 million in Kickstarter successful campaign. Creators had a great plan, but they didn't realize all problems related with business and the project ended. No money was returned to the backers. Therefore, only project with higher quality seem to be more likely funded than others. Campaign is successful when level of contributions reaches or exceeds set goal. In case of unsuccessful campaign all pledges are returned to contributors and authors of project do not have to pay any fees. There are many reasons of failure, for example setting unrealistic goal weak marketing strategy and other. In this paper we try to find recommendations for creators by analyzing seasonality in crowdfunding. (Mollick, 2013)

According to Massolution ("2015CF Crowdfunding Industry Report," 2015) Crowdfunding Industry reached \$34 Billion in 2015. In year 2012 it was only \$2.7 billion dollars. The most important part is lending crowdfunding constituting 72.97% of all crowdfunding investment following by Equity, Donation and Reward model. Massolution report included P2P lending to lending crowdfunding, but European Crowdfunding Network sees it as another slightly different category required better legislation framework. (European Crowdfunding Network, 2014) 51% of all donations are made in North America with 82% annual percentage growth. Other regions reached lower number but with better percentage annual growth rate, for example in Europe by 98.6% and in Asia by 210%. United Kingdom is in Europe leader in crowdfunding followed by Germany and Nordic countries. On the other side Europe has biggest number of crowdfunding platforms, because of culture and language differences and later boom of these investments.

Literature review

Studies of Zheng et al. (2014) and Mollick (2013) use duration, logarithmic values of goal, marketing and also social capital to model crowdfunding campaign. All this factors significantly influence result of campaign, but do not provide accurate method to predict results of campaigns.

In this paper we can meet campaign goal and duration as explanatory variables. Values of goals are logarithms to reduce disparities between projects. Goal has negative impact on campaign success, with higher number the probability decrease. Duration has little, but surprisingly negative impact too. Longer duration leads to decreasing of probability of success. This can be clarified using two explanations. Creators of less innovative and interesting campaigns elect higher duration. The second factor is feeling to support short campaigns earlier because they don't have a lot of time for reconsideration. Etter et al. provided relative accurate model of campaign success by analyzing money pledged. On the other side models of Zhang et al. (Zheng et al., 2014) and Mollick (2013) can be used before campaign start to analyze chances to success. After 15% of the duration of campaign, they found of 85% correct predictions of campaign end. In the very beginning this number was lower increasing at a rapid pace. They recommend to use it with social network model, however, it has much lower prediction accuracy than money pledged (Belleflamme et al., 2014).

Seasonality is relative common in time series but it depends on nature of the data. We can meet seasonality in economy in many examples. Demand and supply of some goods

is influenced by weather or events like Christmas. January effect and weekend effect are visible in development of prices on stock market. These effects are typical for efficient-market hypothesis claiming that prices fully reflect all available information. In their development originate anomalies as these above-mentioned. ("e-Handbook of Statistical Methods," n.d.) Seasonality is widespread touching many scientific fields like economy, medicine, botany and others. On the other side it is very difficult to exactly define this notion. Brendstrup et al. (2004) analyzed historical approaches of seasonality. Pure Noise models saw seasonality as noise contaminating the data, Time Series models as a more integrated part of the modelling strategy. Last group of Economic models of seasonality speak about optimizing behavior into the modeling of seasonality. Seasonality can be characterized as periodic fluctuations of variable caused by different events.

According to Jaditz (1994) there are three factors influencing rise of seasonality in economic data: weather, calendar events and social conventions. These exogenous factors can positively or negatively affect subject. Their effect can be minimized or maximized by including this assumption to subject plan. Seasonality was linked to business cycle, but it could have many aspects effecting company in different stages of business cycle. Excluding seasonality can lead to errors and wrong conclusions and therefore there should be awareness of using economic data. In this paper, we will use seasonality to improve forecasting of campaigns.

January effect is very good example of seasonality in economic. It affects prices of stock market, especially stocks of small and medium enterprises. Their market prices are in December lower than in January creating opportunity to earn money. This effect is explained by two factors. First effect is explained by changing strategy, because investment managers are in December adopting new tactics for next year. Second reason is effort of investors to reduce their tax payments by selling falling stocks. According to Braun and Evans (1994), state of technology is according to their assumption most important source of economic fluctuation. They measured seasonal variation in the state of technology. Their model showed, last quarter of year is typical by rising at an annual rate of 24% and first quarter by falling at annual rate of 28%. Industrial production drops in the first quarter of year, no matter if economy is in expansion or a recession. Similar effect is observed in demand, where increased demand in last quarter of year is followed by decreased demand in first quarter of year. First quarter seasonality index quantified by Sampson (2012) indicates that first quarter sales are 9% lower than average quarter sale. According to his work the most important quarter was third quarter with 114% of average sales.

2 Methodology and Data

In this paper we deal with reward-based projects. Backers gain for their contribution some kind of product or service. This product does have to be a result of business and they get some kind of promo gifts. Creators of the project offer different rewards in limited quantity depending on amount, that contributors decide to provide. Backers can choose product itself too, and so this is understood as a form of preordering. Belleflame et al. (Belleflamme et al., 2014) found out that customers get this product usually for a higher price than is final price. The reason is exclusivity, because they get product much earlier than others and sometimes it is special edition of product. Usually early adopters occur in the process most often. Delivery time depends on complexity of manufacturing process and takes from few months to years.

Logistic regression

We used project status as a dependent variable. It is dichotomous variable assuming two states of crowdfunding projects: successful or failed. Regarding analyzed data, the most suitable method is logistic regression. This binary logistic model is used to estimate probability of binary response based on independent variables that are presented in this section. Construction of models is:

$$state = category + startmonth + duration + \log(goal) + \varepsilon \quad (1)$$

Data were tested for multicollinearity with no significant results distorting our model. Tests Anova Chi-sq test, McFadden's pseudo R² and Aikake information criterion (AIC) did not ruled out constructions and statistical significance of models.

Data description

Analyzed dataset consists of over 105 000 projects in years 2009 – 2014 funded via portal Kickstarter. Dataset is a part of freely accessible database consisting 6 crowdfunding platforms and was created in Haas School of Business University of California Berkeley. In original dataset were included following variables: Project ID, title, category, goal, amount pledged, state of project, start date, end date, state change date, location, founder, founder date, backers count, description, Web URL, download time, currency and currency rate. Founder date, download time, currency and currency rate did not contain any information which we would find significant. Project ID, Title and URL address represented only basic identification data. We did not include Geographical information in our model since majority of projects originated in USA we did not expect significant impact of this variable.

Table 1 Used Variables

Variable name	Description
Category	Categorical variable, 15 different categories
Goal	Numerical variable, range 1 – \$3 000 000
State	Dichotomous variable, failed - successful
Factor start date	Nominal variable, 1 - 12
Duration	Numerical variable, 1 - 92

Source: Own elaboration

Variable Category was represented by subcategories of projects. In order to standardize given variable, we transformed subcategories to 15 main categories as are stated on Kickstarter portal. Because of the uniqueness of projects with high target value, we filtered all projects with goal above \$3 000 000. Category and goal present very important variables forming a substantial part of our model. As the most important date we used, was start date of project. This date is release date of the project and beginning of project financing. Duration of project was calculated as difference between start and end date. Last very important variable was time variable created from start date. This variable represents a month of campaign beginning used to analyze seasonality in crowdfunding projects. Table shows all variables used in our model. For better picture of analyzed data, descriptive statistics is summarized in Table 2.

Table 2 Descriptive Statistics

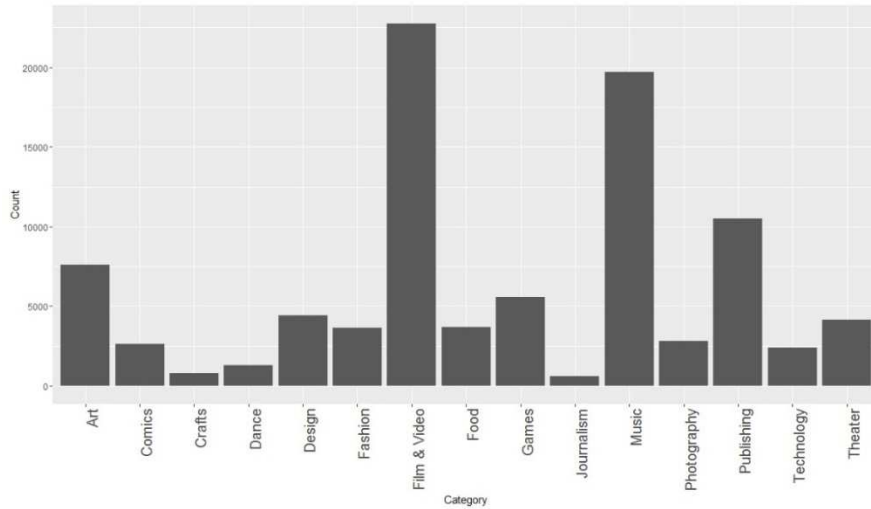
	Mean	Standard deviation	Median	Minimum	Maximum
Goal	14962.07	63087.14	5000	1	3.00E+06
log(goal)	8.4603	1.4192	8.5171	0	14.91412
Amount pledged	8104.378	73020.67	1335	0	10266846
Backers count	109.6181	919.3356	24	0	91585
Duration	35.8204	14.6575	30	1	92

Source: Own elaboration

After filtering over 92 000 projects remained in our dataset and we used these data to create logistic models. We decided to divide our dataset by concurrency competition of categories. Three categories, Film & Video, Music and Art contain over 54.09% of all projects in our database. These categories should have most active projects and

therefore we expect higher concurrency between projects and implied other factors of success. Composition of our database is shown in Figure 1.

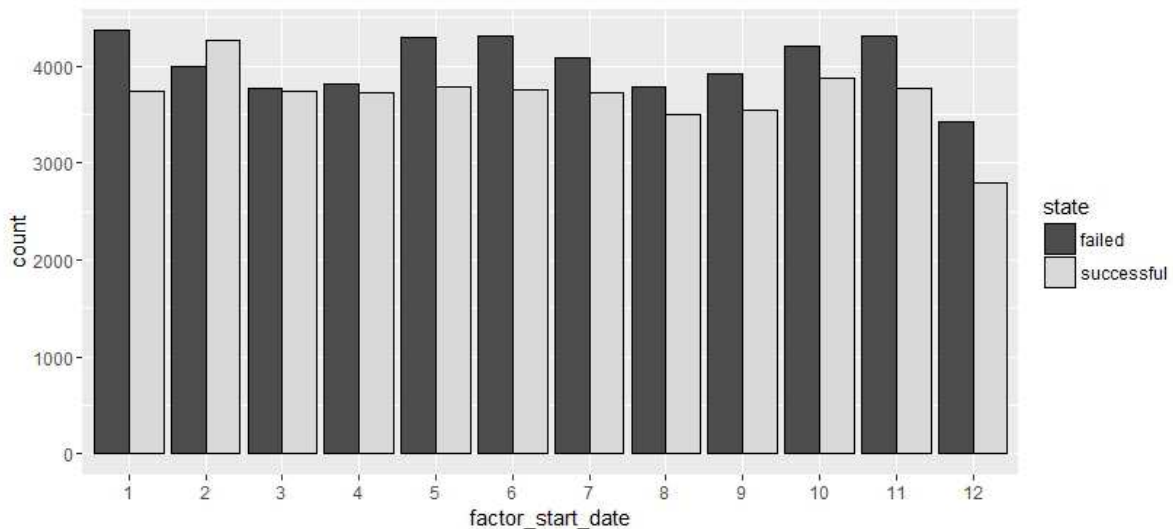
Figure 1 Frequency of Projects According to Category



Source: Own elaboration

After analyzing distribution of projects among categories, significant disparity (Figure) has occurred. Based on this fact, we decided to divide projects to two groups based on number of projects in categories. First category is projects in highly competitive categories – Film & Video, Music and Publishing. This group represents almost 50 % of all analyzed projects. Second group are projects in lower competition categories, which are all categories not included in first group.

Figure 2 Frequency of Successful and Failed Projects by Months



Source: Own elaboration

State of projects, used as depended variable, is a major sign of project success. In Figure 2 we can notice reasons of our assumption, that start date is a factor affecting success rate. Success rate is typically lower than fail rate, except February. In March, April we can see about the same ratio between successful and failed projects. December seems to be worst month as only 44.98% of all projects were successful. On the other hand, February recorded success rate at level of 51.65%. Average count of projects in one month is 7711.19 with standard deviation 544.04 representing 7.05% of average. All months, excluding December, average count is in interval limited by standard deviation, but last month we encountered frequency decrease by 19.43%.

3 Results and Discussion

In our study our aim was to find common attributes of successful projects and to investigate whether there is relationship between a month when project starts and success. In our first model (Table 3) we analyzed highly competitive categories during different months with respect of campaign goal and duration. Our referential variable (Intercept) is category Film & Video in January. As we can see there is almost 50 % higher chance to succeed in category Music than in category Film & Video, which is referential. On the other hand, there is 46 % chance less to be successful in category Publishing than in category Film & Video. In general, month when project starts do not have significant impact on project success; even 8 months didn't prove to be statistically significant. The most interesting findings regarding "starting month" are increase in February and relative decrease in summer months Jun and July. Our explanation is for better results in the beginning of the year presence of January effect in some form. Decline in summer months might be caused by holiday season. Interestingly, longer duration of a project has negative impact on a chance for project to succeed. Even though duration is statistically significant, it has virtually no significant impact on a chance for project to be successful. Similar effect has log Goal to odds of project success. Results show that the higher the percentage of goal is, odds for project to be successful are lower. This might imply that people, in general, tend to support projects with lower average goods price.

Table 3 Model - Higher Competition Projects

Variable	Coefficients	Odds ratio	Marginal effects
(Intercept)	3.4279 (***)	30.81	NA
Category	Music	1.49	0.0994 (***)
	Publishing	0.54	-0.1481 (***)
Start month	February	1.18	0.0421 (***)
	March	1.08	0.0194 (.)
	April	1.05	0.0115
	May	0.94	-0.0154
	Jun	0.91	-0.0236 (*)
	July	0.92	-0.0211 (.)
	August	0.97	-0.0065
	September	1.03	0.0068
	October	1.09	0.0226 (*)
	November	1.04	0.0092
	December	0.92	-0.0206 (.)
	Duration	0.99	-0.0038 (***)
log(Goal)	0.70	-0.0889 (***)	

(***) p<0.001; (**) p<0.01; (*) p<0.05; (.) p<0.1

Source: Own elaboration

Our second model (Table 4) with lower competition has more statistically significant variables, than previous model, especially for variable start month. Shown categories and months are compared to category Art in January. As we can see projects in category Art have relatively high odds to be successful. Only projects in category Dance has higher odds to be successful. Interesting result was, that category Technology was not statistically significant, even though there have been many technological projects which helped to promote crowdfunding platforms. Similar to results from previous model, longer duration has negative impact of odds for project success, however impact itself is low. Goal, on the other hand has significant impact on project success: 1 % rise of goal lowers project success probability by 8.83 %.

Table 4 Model - Lower Competition Projects

Variable	Coefficients	Odds ratio	Marginal effects	
(Intercept)	3.0714 (***)	21.57	NA	
Category	Comics	0.2263 (***)	1.25	0.0565 (***)
	Crafts	-0.5023 (***)	0.61	-0.1212 (***)
	Dance	0.9996 (***)	2.72	0.2376 (***)
	Design	0.0319	1.03	0.008
	Fashion	-0.6521 (***)	0.52	-0.1562 (***)
	Food	0.0131	1.01	0.0033
	Games	-0.0594	0.94	-0.0148
	Journalism	-0.3579 (***)	0.70	-0.0875 (***)
	Photography	-0.3832 (***)	0.68	-0.0938 (***)
	Technology	0.0514	1.05	0.0128
	Theater	0.7453	2.11	0.1827 (***)
Start month	February	0.2425 (***)	1.27	0.0606 (***)
	March	0.2334 (***)	1.26	0.0583 (***)
	April	0.2251 (***)	1.25	0.0562 (***)
	May	0.1318 (**)	1.14	0.0329 (**)
	Jun	0.1464 (**)	1.16	0.0366 (**)
	July	0.2114 (***)	1.24	0.0528 (***)
	August	0.1537 (**)	1.17	0.0384 (**)
	September	0.0824	1.09	0.0206
	October	0.1293 (*)	1.14	0.0323 (*)
	November	0.0871 (.)	1.09	0.0217 (.)
	December	0.0345	1.04	0.0086
	Duration	-0.0095 (***)	0.99	-0.0024 (***)
log(Goal)	-0.3543 (***)	0.70	-0.0883 (***)	

(***) p<0.001; (**) p<0.01; (*) p<0.05; (.) p<0.1

Source: Own elaboration

4 Conclusions

In our article we analyzed dataset of projects realized on crowdfunding site Kickstarter. Analyzed projects were divided into two groups with relative higher and lower competition within category based on number of projects in individual categories. These two groups were analyzed using logit model which included, in addition to Category, following variables: Start month, Duration and log Goal. In general, there is a higher chance for project to success if it starts in the beginning of the year. Projects in "performing" categories such as Music, Film & Video, Art, Dance and Theater are more likely to succeed. Since duration of all projects is usually 30 days, it has not significant impact on probability for project to succeed. Goal, however, has significant impact on project success probability where general rule is: the smaller the project is, the higher odds to succeed it has.

References

- Belleflamme, P., Lambert, T., Schwienbacher, A. (2014). Crowdfunding: Tapping the right crowd. *Journal of Business Venturing*, vol. 29(5), pp. 585–609.
- Braun, R. A., Evans, C. L. (1994). Seasonality and equilibrium business cycle theories (Staff Report No. 168). *Federal Reserve Bank of Minneapolis*. Retrieved from <https://ideas.repec.org/p/fip/fedmsr/168.html>.

- Brendstrup, B., Hylleberg, S., Nielsen, M. Ø., Skipper, L., Stentoft, L. (2004). Seasonality in economic models. *Macroeconomic Dynamics*, vol. 8(03), pp. 362–394.
- Crowdfunding Industry Report (2015). *Massolution*. Retrieved from http://reports.crowdsourcing.org/index.php?route=product/product&product_id=54.
- e-Handbook of Statistical Methods. (n.d.). NIST/SEMATECH. Retrieved from <http://www.itl.nist.gov/div898/handbook/>.
- European Crowdfunding Network (2014). Review of Crowdfunding Regulation: Interpretations of existing regulation concerning crowdfunding in Europe, North America and Israel. Retrieved from <http://www.eurocrowd.org/files/2014/12/ECN-Review-of-Crowdfunding-Regulation-2014.pdf>.
- Jaditz, T. (1994). Seasonality: economic data and model estimation. *Monthly Labor Review*, vol. 117(12), pp. 17–22.
- Mollick, E. R. (2013). *The Dynamics of Crowdfunding: An Exploratory Study (SSRN Scholarly Paper No. ID 2088298)*. Rochester, NY: Social Science Research Network. Retrieved from <http://papers.ssrn.com/abstract=2088298>.
- Sampson, S. (2012). *Quantitative Tools for Service Operations Management*. Retrieved from <http://services.byu.edu/t/quant/seas.html>.
- Zheng, H., Li, D., Wu, J., Xu, Y. (2014). The role of multidimensional social capital in crowdfunding: A comparative study in China and US. *Information & Management*, vol. 51(4), pp. 488–496. <http://doi.org/10.1016/j.im.2014.03.003>.

Reflection of Customer Satisfaction in Selected Performance Indicators of Food Enterprises

Petr Suchánek¹, Maria Králová²

¹ Masaryk University
Faculty of Economics and Administration, Department of Corporate Economy
Lipová 41a, 60200 Brno, Czech Republic
E-mail: suchy@econ.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Applied Mathematics and Computer Science
Lipová 41a, 60200 Brno, Czech Republic
E-mail: kralova@econ.muni.cz

Abstract: *The aim of this article is to describe characteristic features of food industry enterprises in Czech Republic in relation to customer satisfaction with respect to investors' diverse objectives. The performance of companies, measured by financial ratios such as ROA, ROE, ATO, EVA, etc., can be connected to different goals that investors might pursue (focusing on a long-term or short-term perspective, minimum risk, a preference for high turnover, etc.). The research shows what the typical values of selected financial ratios are in a group of companies with more satisfied or less satisfied customers and what financial ratios are significantly associated with customer satisfaction. These results may serve as a clue that helps investors to determine which companies best correspond with their goals. This paper is part of consumer satisfaction research based on a questionnaire on satisfaction completed by customers in 2015. The data related to the financial performance of enterprises are available in the Albertina database.*

Keywords: consumer satisfaction, performance, food industry, ratios, investors' strategy

JEL codes: L25, L66

1 Introduction

This article examines the links between customer satisfaction and various financial ratios that measure the performance of companies in Czech Republic. The aim is to identify those performance indicators which are significantly related to customer satisfaction and thereby enable company managers and investors to relevantly influence and engage with satisfaction factors in accordance with their investment goals. Differently designed financial performance indicators are associated with different corporate strategies, e.g. a strategy aimed at growth is associated with profitability ratios, one aimed at stability with debt or liquidity ratios, one aimed at efficiency with activity ratios, one aimed at value with the indicator EVA, etc.

The literature generally distinguishes between two types of customer satisfaction: transactional and cumulative (Spitery, Dion, 2004). In this article we work with cumulative customer satisfaction, since it better corresponds to the character of the research carried out. Here cumulative customer satisfaction can be defined as the overall purchasing experience, i.e. general satisfaction (cf. Johnson, Fornell, 1991 and Fornell, 1992). Cumulative satisfaction can also be understood as long-term, based on repeat purchasing and on the customer's overall experience with the product including the evaluation of the party which sells or supplies it (i.e. not only the manufacturer, but also the retailer). Overall satisfaction is determined by the performance of various specific components or attributes (Taplin, 2012).

Within research into customer satisfaction we work with seven factors which affect this satisfaction. These are image, customer expectation, perceived quality of the product, perceived value of the product, (general) customer satisfaction, complaints and customer loyalty.

Although performance is a much-used term (and not only in relation to customer satisfaction) and many authors have occupied themselves with measuring it, few authors have concerned themselves with defining it, despite the fact that there is no standard and generally applicable definition of this term. Because of this, comparing performance measured in different ways is problematic, since various tools may be measuring performance conceived in a different way.

Performance is defined variously, usually with regard to the level of generality. It can be defined as the company's ability to increase the value of capital invested (Hindls et al. 2003). In connection with customer satisfaction, performance can be defined as the company's ability to achieve its objectives by satisfying its customers more effectively and efficiently than its competitors (Kotler, 1984). Employing Škodáková's definition, performance can be defined for the purposes of this article as the company's ability to increase the value of the resources invested through its activities, to make a profit and to ensure future development (cf. Škodáková, 2009).

2 Methodology and Data

In the research, individual customer satisfaction factors were represented by groups of variables which will be described in detail below. Image can be understood as the name of the product or company in conjunction with the colours, symbols, words and slogans which are typical for this product (company). The evaluation of *company image* by the customer was measured through four variables with regard to: its brand (tradition, familiarity, prestige) – IMAGE 1; its overall quality (i.e. nutritional value, taste, composition, appearance, packaging etc.) – IMAGE 2; its price in comparison with competitors – IMAGE 3; the level of marketing communication (how attractive or memorable it is, the intensity of advertising, sales support etc.) associated with the product – IMAGE 4; all of this in comparison with competitors.

Customer expectations in relation to food can be broken down in terms of sensory characteristics, health, convenience, and process characteristics (Brunsø et al., 2002). The evaluation of *customer expectation* was measured through four variables focused on the degree to which the needs and desires of the customer are fulfilled by the product – CUSTOMER EXPECTATION 1; the degree of stability in product quality compared to the expected properties of the product – CUSTOMER EXPECTATION 2; the degree to which expectations of the product are fulfilled compared to promises and information about the product in advertising etc. – CUSTOMER EXPECTATION 3; and the evaluation of the product compared to expectations before its purchase and use – CUSTOMER EXPECTATION 4.

Perceived quality can be defined as the customer-perceived general quality or higher quality of the product with regard to its intended purpose in relation to alternatives (Aaker, 1991). The evaluation of *perceived quality* by the customer was measured through five variables focused on the evaluation of the relevant product's quality with regard to its: taste PERCEIVED QUALITY 1; composition (ingredients and their origin, the ratio of components in the content etc.) PERCEIVED QUALITY 2; appearance – PERCEIVED QUALITY 3; nutritional value (especially in the sense of utility – energy, health, sweetness, refreshing qualities etc. – PERCEIVED QUALITY 4; and overall quality (overall evaluation of its taste, composition, nutritional value, freshness, durability, appearance, smell, packaging etc.) – PERCEIVED QUALITY 5.

The perceived value of the product for the customer represents a general mental evaluation of a specific product (Yang, Peterson, 2004). The customer evaluation of *perceived value* was measured through five variables focused on comparing the price of the product (that which is normally paid) and: overall product quality – PERCEIVED VALUE 1; product properties (the taste, composition, appearance and smell of the product) – PERCEIVED VALUE 2; product utility (i.e. the degree to which it fulfils the expected functions, e.g. satiating hunger, tasting good, being refreshing etc.) – PERCEIVED VALUE 3. The remaining variables focused on evaluating: product costs associated with durability, with its shelf life, use, freshness etc. – PERCEIVED VALUE 4 –

and overall product quality, i.e. properties and utility compared to the total cost of the product – PERCEIVED VALUE 5.

General customer satisfaction was measured through three variables: overall satisfaction with the product supplied – CUSTOMER SATISFACTION 1; satisfaction with the product with regard to expectation (anticipated satisfaction) – CUSTOMER SATISFACTION 2; and overall satisfaction with the product compared to the ideal product – CUSTOMER SATISFACTION 3.

Another satisfaction factor is related to complaints, or complaining behaviour. Seven variables were identified in this area, three of which are regarded as crucial: perceived value of the complaint, faith in the success of the complaint, and intention of the complaint (Ors et al., 2015). Customer satisfaction with regard to *complaints* was thus measured through variables focused on whether the customer: made a complaint about the product because of its quality – COMPLAINT 1; wanted (at some time) to make a complaint about the product because of its quality – COMPLAINT 2; experienced (at some time) some degree of dissatisfaction with one or more of the product's properties – COMPLAINT 3.

Customer loyalty can be defined as the consumer's willingness to buy the product from the same manufacturer independently of external factors which might lead the consumer to change product or manufacturer (Li et al., 2012). The evaluation of *customer loyalty* was measured through five variables focused on: whether the customer has bought the product repeatedly and intends to go on buying it – CUSTOMER LOYALTY 1; how often he purchases a similar product from another manufacturer – CUSTOMER LOYALTY 2; whether the customer favours the evaluated product when several very similar products are available for a very similar price – CUSTOMER LOYALTY 3; whether the volume of the product purchased would change (decrease) if the price of the product were to rise (to a max. of 50% of the current price) – CUSTOMER LOYALTY 4; whether the customer would recommend the product to his friends and family or other customers – CUSTOMER LOYALTY 5.

Both absolute indicators (usually turnover and profit) and financial ratios (usually ROI or ROA) are used to measure a company's performance (cf. Terpstra, Verbeeten, 2014). Authors' findings indicate that it is better to assess performance using more than one indicator, i.e. that several financial ratios are better able to grade a company's performance. Various groups of financial indicators can be encountered as part of a comprehensive approach to measuring a company's performance. Some authors make use of indicators from the area of profitability, activity, debt, liquidity, growth ratios and asset structure ratios (see Delen et al. 2013). Others use indicators from the area of profitability, debt, liquidity and growth ratios (for more detail see Heikal et al. 2014).

A company's performance is most often researched and assessed in relation to customer satisfaction using the indicator ROA, measured as a proportion of EBIT (earnings before interests and taxes) and the company's assets. Another indicator very frequently used for evaluating a company's performance is ROE (Combs et al., 2005), measured as a proportion of net income and the company's equity. In view of the emphasis which scientists researching companies' performance in relation to customer satisfaction have placed on revenue (Swaminathan et al., 2014), the measurement of performance was also supplemented with the indicator asset turnover (ATO), measured as a proportion of the company's total revenue and assets (property), and ROS, measured as a proportion of net profit and total revenue.

Performance can also be understood as a value of the company (Sun, Dae-Young, 2013). Here the value of the company is taken to mean shareholder value, which is measured through capital market indicators such as Tobin's q or market-to-book ratio (Sun, Dae-Young, 2013). However, these indicators are not applicable in the Czech Republic, which is why they may be replaced by the indicator EVA, which takes account of business risk.

The structure of the indicator EVA was based on the methodology of the Ministry of Industry and Trade of the Czech Republic (Department of Economic Analyses, 2015), so

that it would be possible, if necessary, to make comparisons with sector averages. The general structure of the ratio, in which the indicators ROE, equity costs (re) and volume of equity (VK) also appear, is as follows:

$$\text{EVA} = (\text{ROE} - \text{re}) * \text{VK}$$

Equity costs are calculated using a modular method and represent the sum of the risk-free rate of return, business risk, risk of financial stability, risk of the business size and risk of the financial structure. The difference between ROE and re is the spread indicator.

It can be concluded that there are a number of other factors affecting a company's profitability, which is the primary measurement of performance. A company has to ensure solvency, since without good long-term solvency it will not survive. However, solvency represents a certain limitation on profitability, because it forces the company to retain a certain level of funds in its accounts which cannot, therefore, be used for investments and returns. The company must also maintain a reasonable proportion of debt and thus also a reasonable proportion of the risk associated with debt. This represents another limitation on profitability as the maximum debt would represent, on the one hand, the maximum return on equity (where financial leverage has a positive effect), but on the other hand, the maximum risk of overindebtedness (where financial leverage has a negative effect). That is why the above-mentioned indicators were supplemented by the liquidity ratio L3 and a ratio for the financial leverage of debt (Fin_lev.). The L3 ratio is measured as a proportion of current assets (excluding long-term debts) and short-term borrowings (including short-term bank loans). The financial leverage ratio is measured as a proportion of equity and total liabilities.

The research made use of a questionnaire which was presented to the respondents – customers of the companies under research. The questionnaire contained a total of twenty-nine scaled questions concerning customer satisfaction. The scale ranged from 1 to 10, where a higher value means a better evaluation of the company. In addition, the questionnaire also included a question to establish how well the customer knows the product. The customers who were tested – the respondents – were students. There were three respondents for each company, i.e. 363 customers and 121 companies in total.

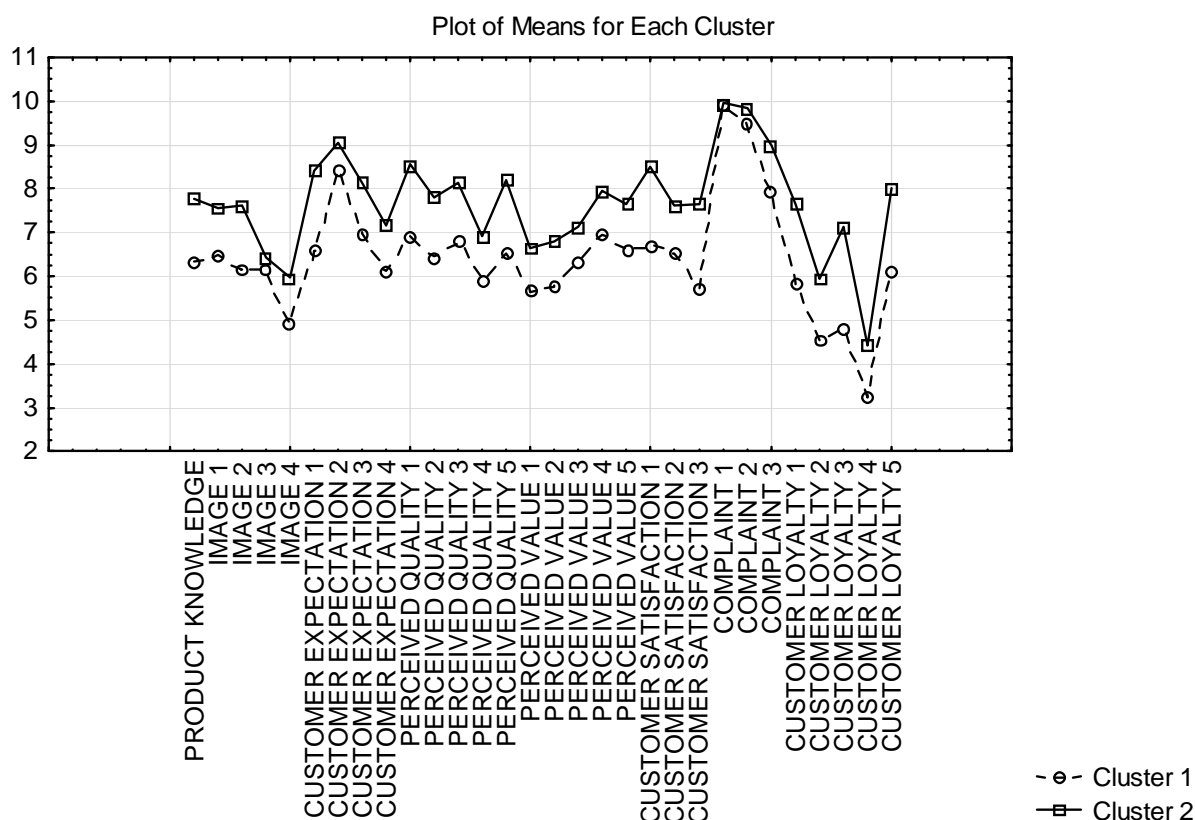
The research sample of 121 companies represented the population of companies from the food industry in the Czech Republic, with satisfaction ratings having been successfully obtained for all of them, and financial data for 102 of the companies. Specifically, these were companies from the manufacture of food and beverage products. They are companies which produce products for everyday consumption that are well known among consumers.

The companies were subsequently divided into two groups based on all of the satisfaction variables using the k-means method (the initial clusters were determined under the setting "Sorted distances and observations taken at constant intervals"). The individual financial indicators were compared between the groups using two-sample t-tests or, in cases where the assumption of homogeneity of variance was not met, Welch's adaptation of a two-sample test.

3 Results and Discussion

The companies examined were divided into two groups on the basis of 30 variables, of which twenty-nine represented 7 areas of customer satisfaction (see Figure 1).

Figure 1 The Mean Values for the Individual Variables Representing Customer Satisfaction Inside Each Cluster Separately. In the Cluster 2 are Companies with More Satisfied Customers and in the Cluster 1 Are Companies with Less Satisfied Customers.



Source: Authors

The companies which are the most similar in terms of all of the variables taken together were classified into one cluster using clustering algorithm methods for the averages. The result of the clustering procedure on the data is visually represented in figure 1, which illustrates the mean values of all of the variables considered for each cluster separately. Given that the lines indicating the averages for the first and second cluster never cross over one another, the clustering procedure resulted in a division of the companies which allowed for an unambiguous interpretation of the enterprise groups created.

Cluster 1 was made up of companies which have a worse evaluation for all of the variables representing consumer satisfaction than the companies in cluster 2. It can, therefore, be stated that the second cluster contains the companies which achieved higher satisfaction with customers for all of the variables examined. 66 of them ended up in cluster 2, for companies with more satisfied customers, and 55 of them were included in the cluster for companies with less satisfied customers.

The smallest difference between the averages for the two clusters was shown with the variable Complaint 1, which established whether the customer wanted (at some time) to make a complaint about the product because of its quality. Not only are the results for this variable very similar for both groups, but they also indicate that the customers of both groups of companies almost never made complaints about products due to their quality and or even wanted to make complaints about them.

The values of selected financial indicators – ROE, ROA, ATO, L3, financial leverage, ROS and spread – were then examined for both clusters. The results are set out in Table 1. The results show that there are differences between the two clusters, although only with two of these indicators – ROE ($p=0.04394$) and L3 ($p=0.04579$). At a significance level of

5%, these differences are statistically significantly better for companies whose customers are more satisfied. In terms of customer satisfaction and its individual factors, a change in values for these factors thus has a significant impact on the level of ROE and L3.

Table 1 The Mean Values of the Selected Financial Indicators Separately in the Group of Companies with Less Satisfied Customers (Group 1) and in the Group with More Satisfied Customers (Group 2) in the Year 2014.

Variable	Mean 1	Mean 2	t-value	df	p	Std. Dev. 1	Std. Dev. 2	F-ratio Var.	P Var.
ROE	-0,1783	0,1396	-1,7454 Welch	44	0,04394 one sided	1,1998	0,1620	54,8264	0,0000
ROA	0,0616	0,0798	-1,0627	100	0,2905	0,0862	0,0850	1,0289	0,9102
ATO	1,5714	1,7545	-0,9352	100	0,3519	1,0902	0,8872	1,5100	0,1449
L3	1,8470	2,7684	-1,7083 Welch	78	0,04579 one sided	1,4514	3,7543	6,6911	0,0000
Fin_lev.	0,5032	0,5031	0,0030	100	0,9976	0,2424	0,2173	1,2451	0,4354
ROS	0,0474	0,0695	-0,6265	100	0,5324	0,1244	0,2068	2,7619	0,0007
spread	0,7059	-0,1969	0,7158	100	0,4758	9,6158	0,2905	1095,31	0,0000

Source: Authors

With the indicators ROE, ROA, ATO, L3 and ROS, the companies with more satisfied customers performed better in the descriptive statistics. With the Fin_lev indicator, the value of the indicator is practically the same for both clusters, and with the spread indicator the companies with more satisfied customers fared worse than the companies with less satisfied customers, although the difference was statistically insignificant in both cases.

Therefore, if profitability (measured by the indicator ROE) and solvency (measured by the indicator L3) are particularly important for investors, then they have to find out whether customers view the company as being of high quality (through all the aforementioned indicators of satisfaction).

Tests for the significance of the differences between the two groups of companies were carried out only on the companies with known financial indicators, i.e. only 44 remained in the cluster of companies with less satisfied customers and 58 in the cluster of companies with more satisfied customers.

4 Conclusions

The research established that, based on all of the customer satisfaction factors examined, it was possible to divide the companies into two clusters characterized by higher or lower customer satisfaction. It also established that with regard to the selected financial ratios there are two indicators (ROE and L3) whose values are better to a statistically significant degree for companies with more satisfied customers. This means that the kind of effect on some or all of the customer satisfaction factors which leads to higher customer satisfaction should also lead to an increase in the indicators ROE and L3.

The ROE indicator represents profitability from the owner's perspective and usually in the short term (one year). In contrast, the L3 indicator represents long-term solvency and stability, although in terms of time it also means a one-year perspective. The time frame for liquidity is different from profitability with regard to the logical construction of both indicators, because liquidity is counted in days (in a year), whereas profitability is more likely to be counted in months (in a year).

Therefore, in terms of strategy it can be concluded that customer satisfaction is related to a combination of growth (represented by profitability) focused on the owner and stability, focused on solvency. In other words, customer satisfaction is related to the owners' profits and the company's long-term solvency. Therefore, if the investor favours either an independent growth strategy or stability, or any combination thereof, and monitors the ROE and L3 indicators, he should be interested in customer satisfaction. In

other words, if the investor makes an investment decision and monitors the ROE or L3 indicators as part of his strategy, then it pays to find out how satisfied customers are with the company in question. If the investor follows a different strategy or different indicators, then he will gain nothing by influencing customer satisfaction within the context defined by this article.

Acknowledgments

This article is an output of the project "Přístup managementu k redukci zpětných toků ve vazbě na spokojenost zákazníků a neustálé zlepšování", Czech Science Foundation no. GA 16-16260S.

References

- Aaker, D. A. (1991). *Managing Brand Equity*. The Free Press. New York.
- Brunsnø, K., Fjord, T. A., Grunert, K. G. (2002). *Consumers' food choice and quality perception*. MAPP working paper 77. Aarhus: Aarhus School of Business.
- Combs, J. G., Crook, T. R., Shook, Ch. L. (2005), The dimensionality of organizational performance and its implications for strategic management research. *Research methodology in strategy and management*, vol. 2, pp. 259-286.
- Delen, D., Kuzey, C., Uyar, A. (2013). Measuring firm performance using financial ratios: A decision tree approach. *Expert Systems with Applications*, vol. 40(10), pp. 3970-3983.
- Fornell, C. (1992). A national customer satisfaction barometer: The Swedish experience. *The Journal of Marketing*, vol. 56(1), pp. 6-21.
- Johnson, M. D., Fornell, C. (1991). Framework for comparing customer satisfaction across individuals and product categories. *Journal of Economic Psychology*, vol. 12(2), pp. 267-286.
- Heikal, M., Khaddafi, M., Ummah, A. (2014). Influence Analysis of Return on Assets (ROA), Return on Equity (ROE), Net Profit Margin (NPM), Debt To Equity Ratio (DER), and current ratio (CR), Against Corporate Profit Growth In Automotive In Indonesia Stock Exchange. *International Journal of Academic Research in Business and Social Sciences*, vol. 4(12), pp 101-114.
- Hindls, R., Holman, R., Hronová, S. (2003). *Ekonomický slovník*. 1. vyd. Praha: C. H. Beck.
- Kotler, P. (1984). *Marketing Management Analysis, Planning and Control*. New York: Prentice-Hall, Englewood Cliffs.
- Li, M. L., Green, R. D., Farazmand, F. A., Grodzki, E. (2012). Customer loyalty: Influences on three types of retail stores' shoppers. *International Journal of Management and Marketing Research*, vol. 5(1), pp. 1-19.
- Odbor ekonomických analýz, Finanční analýza podnikové sféry za rok 2014, Ministerstvo průmyslu a obchodu, 2015, Retrieved from: <http://www.mpo.cz/dokument157262.html>.
- Ors, H., Veysel Y., Rana, S. (2015). A structural equation model for the description and comparison of complaint behaviour after purchasing of electronic, food and textile products. *Journal of Business Economics and Finance*, vol. 4(2), pp. 268-288.
- Spiteri, J. M., Dion, P. A. (2004). Customer value, overall satisfaction, end-user loyalty, and market performance in detail intensive industries. *Industrial Marketing Management*, vol. 33(8), pp. 675-687.
- Sun, K.-A., Dae-Young, K. (2013). Does customer satisfaction increase firm performance? An application of American Customer Satisfaction Index (ACSI). *International Journal of Hospitality Management*, vol. 35, pp. 68-77.

Swaminathan, V., Groening, C., Mittal, V., Thomaz, F. (2014). *How achieving the dual goal of customer satisfaction and efficiency in mergers affects a firm's long-term financial performance. Journal of Service Research*, vol. 17(2), pp. 182-194.

Škodáková, P. (2009). *Návrh modelu pro měření a řízení výkonnosti podniků s využitím benchmarkingu v podmínkách klastrů*. Dissertation thesis, UTB FME Zlín.

Taplin, Ross H. (2012). The value of self-stated attribute importance to overall satisfaction. *Tourism Management*, vol. 33(2), pp. 295-304.

Terpstra, M., Verbeeten, F. H. M. (2014). Customer satisfaction: cost driver or value driver? Empirical evidence from the financial services industry. *European Management Journal*, vol. 32(3), pp. 499-508.

Yang, Z., Peterson, R. T. (2004). Customer perceived value, satisfaction, and loyalty: The role of switching costs. *Psychology & Marketing*, vol. 21(10), pp. 799-822.

Evaluation of the Business Cycle Synchronisation in Europe

Veronika Šulíková¹, Marianna Siničáková¹, Ľubica Štiblárová¹, Slavomíra Šulíková²

¹ Technical University of Košice
Faculty of Economics, Department of Finance
Němcovej 32, 040 01 Košice, Slovakia

E-mail: veronika.sulikova@tuke.sk, marianna.sinicakova@tuke.sk, lubica.stiblarova@tuke.sk

² Tatra banka
Spracovateľské centrum
Kúpeľná 3/A, 080 01 Prešov, Slovakia
E-mail: s.sulikova@gmail.com

Abstract: *The aim of the paper is to evaluate synchronisation in Europe throughout integration process in the European Union and/or the euro area. Gradually we apply Granger causality testing and cluster analysis to identify core and peripheral countries. These two alternative methodological approaches enable us to recognize synchronised countries, countries with rather asymmetric evolution, leading as well as lagging countries. Business cycle evolution is evaluated either through GDP growth or output gap indicators. In line with expectations, French and German business cycle have the most crucial impact on other countries' cycles. Our findings prove that degree of integration process can lead to higher synchronisation. However there is still significant number of countries which are not synchronised with core countries. This fact complicates application of single monetary policy instruments in the euro area and economic performance in the EU as a whole.*

Keywords: business cycle, synchronisation, Granger causality, clustering

JEL codes: E32, F44

1 Introduction

A history of national economies clearly proves that economy never grows uniformly in regular cycles as described by different theories (Kaldor, 1957; Lucas, 1987; Backus and Kehoe, 1992). Nowadays, in times of globalisation and economic integration, the synchronisation of economic cycles is highly topical. The synchronisation of cycle is important mainly from the point of view of single monetary policy.

The aim of the paper is to find the level of business cycles synchronisation in Europe and to regroup countries according to their similarities in cycles. Our ambition is to find how the evolution in core European countries can predict the evolution in new EU members, i.e. Central and Eastern European countries. At the same time we would like to consider validity of so called "endogeneity argument" according to which even large initial asymmetries should be gradually narrowing in time among integrated countries (Horváth, 2003). We would like to contribute to the existing empirical research by applying Granger causality testing and cluster analysis. The analysis covers European Union countries during the time period 2000Q1 – 2013Q3.

Researchers started to focus on the topic of business cycle synchronisation mainly in 1990', in times of the creation of the European monetary union. The authors try to analyse business cycle synchronisation, to find its determinants and important structural brakes influencing it.

The most traditional approach to the analysis of cycle synchronisation is the method of pair and cross correlation used e.g. by Fidrmuc and Korhonen (2006), Gouveia and Correia (2008), Tkáčová and Bánociová (2013). Fidrmuc and Korhonen (2006) analysed business cycle synchronisation of Central and Eastern European (CEE) countries in comparison with the euro area. Results of cross correlations showed that some new EU member countries (e.g. Slovakia, Poland, and Hungary) are even more synchronised with

the euro area as some old EU members applying euro. The correlation analysis was used also by Obradovic and Mihajlovic (2013) who analysed the synchronisation of Serbia with the euro area and other neighbouring countries (Bulgaria, Romania, Croatia, Hungary, Slovenia). According to their results, Serbia is less synchronised with the euro area than with its neighbours.

Darvas et al. (2005) analysed business cycle synchronisation in 21 OECD countries during 40 years. The authors found out that the cycles of countries with higher fiscal convergence (expressed by budget deficit-to-GDP) are more synchronised. Furthermore, they concluded that smaller budget deficit leads to tighter cycle synchronisation.

Savva et al. (2010) analysed business cycle synchronisation of new and expected EU members using VAR-GARCH model. Their results demonstrate that business cycle synchronisation of these countries double-increased when comparing the time period of 1990' and furthermore negative correlation changed to the positive one. Aguiar-Conraria and Soares (2011) studied business cycles synchronisation in the euro area. They applied methodology of wavelet transform and wavelet distance matrix. The euro area countries were divided into the core (Germany and France) and the periphery. Their results reveal that peripheral countries converge to the core by different speed, while near countries were more synchronised, i.e. some countries had a French accent (e.g. Spain), other countries the German one (e.g. Austria).

The paper is structured as it follows. The second part describes two methodological approaches and data used to test the synchronisation. Section 3 presents results of Granger causality testing and clustering tools. Finally, we discuss and summarise our results.

2 Methodology and Data

Granger causality test

In order to find whether the evolution of GDP in the core EU countries (i.e. France and Germany) can predict the evolution in other EU countries, we apply Granger causality testing to test causal relations between: a) the EU member and France, b) the EU member and Germany.

Granger causality test (Granger, 1969) reveals whether current values of x (i.e. output gap of an EU member) are explained by lagged values of y (output gap of France or Germany), i.e. whether y causes x .

We test null hypothesis that: y does not Granger cause x against the alternative one that: y Granger causes x . Granger causality test is based on the regression:

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \dots + \alpha_m x_{t-m} + \beta_1 y_{t-1} + \beta_m y_{t-m} + \varepsilon_t \quad (1)$$

This equation expresses that x is a function of its m lagged values (m is number of lags) and simultaneously function of m lagged values of y . We do not reject null hypothesis that $\beta_1 = \beta_2 = \beta_3 = \dots = \beta_m = 0$.

Generally speaking, it is better to choose more lags, as theory is formulated regarding past significance, i.e. lagged values. Higher number of lags captures in a better way the impact of past values of y . However, the power of test is decreasing when considering more lags. Here, we proceed to the test with 1, 2, 3 and 4 lags (quarters). We suppose that the evolution of output gap in France or Germany will predict the evolution in the EU members by no more than one year.

We assume that causality in case of countries with lagged GDP in comparison with France or Germany is following: *The evolution of output gap in France (Germany) Granger causes the evolution of output gap in other EU member*. In that case, the evolution of output gap in France (Germany) could predict the evolution in other countries. Null (H0) and alternative (H1) hypothesis are therefore formulated as it follows. H0: *The evolution of output gap in France (Germany) does not Granger cause the evolution of output gap in other EU member*. H1: *The evolution of output gap in France (Germany) Granger causes*

the evolution of output gap in other EU member. Granger causality testing is performed for the time period 2000Q1-2013Q3.

It should be noted that data of GDP (we use logarithmic form) are non-stationary, while time series of output gap are stationary.

Cluster analysis

Secondly, we apply cluster analysis through which we find similarities in the evolution of time series of calculated output gaps of real GDP in the European Union during the time period 2000Q1-2013Q3. Determination of similarity is based on the calculation of distances between time series, which are derived from correlation coefficients (Mantegna, 1999). Cluster analysis is therefore an extension of classical concept of correlations.

Let us consider simple correlations. The correlation ρ_{xy} between output gaps of the first country (y_t) and output gaps of the second country (x_t) is calculated by:

$$\rho_{xy} = \frac{\langle xy \rangle - \langle x \rangle \langle y \rangle}{\sqrt{(\langle x^2 \rangle - \langle x \rangle^2)(\langle y^2 \rangle - \langle y \rangle^2)}} \quad (2)$$

where $\langle x \rangle$ is an average of output gaps (x_t) during the time period $t = 1, 2, \dots, T$. Analogically, $\langle y \rangle$ is an average of output gaps (y_t). The correlation coefficient ρ_{xy} can be then transformed to the Euclidean metric distance between output gap x and output gap y (Mantegna, 1999):

$$d_{xy} = \left(2(1 - \rho_{xy})\right)^{1/2} \quad (3)$$

The higher is correlation ρ_{xy} between output gaps of two countries; the smallest is distance d_{xy} between them. Calculation of distances between each pair of output gap x and output gap y (i.e. between each pair of countries) gives distance matrix \mathbf{D} containing distances d_{xy} . This distance matrix \mathbf{D} is of the extent $n \times (n - 1)$ (where n is number of countries).

Creation of the clusters is then based on the distance matrix \mathbf{D} . We decided to apply Ward method of clustering. The aim of the clustering is to create clusters, while one cluster includes the most similar objects, in our case countries (i.e. the countries with the smallest pair distances). These countries have at the same time large distances regarding the countries in another cluster (Focardi, 2001).

3 Results and Discussion

We consider Germany and France to be leading countries in business cycle evolution as it was proved by other relevant studies e.g. Aguiar-Conraria and Soares (2011). Consequently we can categorized countries into three groups:

- 1) **Leading countries**, i.e. their GDP evolution leads France or Germany.
- 2) **Perfectly synchronised countries**, i.e. their GDP evolution is simultaneous when comparing with France or Germany.
- 3) **Lagged countries**, i.e. their GDP evolution is lagged when comparing with France or German.

Our ambition is therefore to find out whether GDP evolution in France (Germany) can predict evolution in other EU member countries. For that purpose, we enrich our analysis by Granger causal relations testing between France (Germany) and an EU country (Table 1). We assume that leading countries should cause the evolution in France (Germany). On the contrary, France (Germany) should predict GDP evolution in lagged countries. However impact on particular countries can be delayed, therefore we consider 4 lags in our testing. We suppose that the evolution in France and Germany will predict evolution in other countries in not more than 1 year (i.e. 4 quarters = lags). Synchronisation of business cycles appeared only between France and Germany mutually. No lag in their

harmonisation was captured. Other countries' GDP evolved in comparison with France and Germany with a certain delay or in the case of three countries (see Table 2) in advance.

Table 1 Granger Causality Testing France (FR) or Germany (DE) → EU Member

		FR (1 lag)	FR (2 lags)	FR (3 lags)	FR (4 lags)	DE (1 lag)	DE (2 lags)	DE (3 lags)	DE (4 lags)
AT	€	0.083	0.111	0.010	0.003	0.494	0.210	0.522	0.042
BE	€	0.834	0.373	0.672	0.336	0.411	0.015	0.346	0.084
BG		0.003	0.000	0.000	0.000	0.013	0.002	0.007	0.013
CY	€	0.020	0.049	0.045	0.106	0.025	0.009	0.032	0.070
CZ		0.057	0.011	0.031	0.020	0.175	0.191	0.335	0.423
DE	€	0.449	0.233	0.366	0.158	X	X	X	X
DK		0.370	0.242	0.326	0.152	0.137	0.030	0.059	0.054
EE	€	0.583	0.307	0.446	0.334	0.359	0.416	0.381	0.045
ES	€	0.003	0.001	0.006	0.029	0.030	0.027	0.322	0.195
FI	€	0.009	0.011	0.013	0.027	0.001	0.079	0.509	0.332
FR	€	X	X	X	X	0.068	0.064	0.366	0.157
HR		0.003	0.003	0.004	0.001	0.033	0.108	0.073	0.019
HU		0.146	0.031	0.064	0.119	0.011	0.025	0.065	0.098
IE	€	0.111	0.028	0.000	0.004	0.067	0.004	0.010	0.013
IT	€	0.003	0.002	0.003	0.003	0.001	0.000	0.284	0.032
LT	€	0.005	0.010	0.102	0.023	0.000	0.001	0.040	0.016
LU	€	0.674	0.414	0.727	0.720	0.668	0.367	0.560	0.079
LV	€	0.001	0.016	0.069	0.287	0.000	0.005	0.023	0.114
MT	€	0.009	0.007	0.022	0.003	0.010	0.001	0.006	0.000
NL	€	0.007	0.029	0.072	0.056	0.032	0.056	0.154	0.007
PL		0.034	0.036	0.088	0.168	0.147	0.266	0.481	0.674
PT	€	0.488	0.358	0.573	0.316	0.338	0.032	0.219	0.330
RO		0.064	0.107	0.041	0.066	0.202	0.611	0.320	0.504
SE		0.280	0.996	0.107	0.149	0.637	0.208	0.465	0.437
SI	€	0.063	0.076	0.191	0.348	0.035	0.181	0.358	0.533
SK	€	0.005	0.017	0.017	0.023	0.015	0.040	0.119	0.181
UK		0.222	0.948	0.202	0.170	0.493	0.541	0.739	0.574
Countries		10	6	6	6	5	7	3	2

Note: we display p-values; H0: The evolution of output gap in France (Germany) does not cause the evolution of output gap in a given EU country; grey colour: if p-value is less than 0.01, i.e. if we do not accept H0, then the evolution of output gap in France (Germany) causes the evolution in a particular EU country; € - the euro area countries

Source: Own calculation

According Table 1, 10 countries out of 27 followed French GDP evolution with a 3-month delay (Bulgaria, Spain, Finland, Croatia, Italy, Lithuania, Latvia, Malta, Netherlands, and Slovakia). After another 6-month period, 2 other countries (Austria, Ireland) joined the group of *French followers*. Surprisingly only 5 countries out of 27 followed German GDP with a 3-month delay (Finland, Italy, Lithuania, Latvia, and Malta). Gradually throughout the time other 4 countries (Bulgaria, Cyprus, Ireland, and Netherlands) joined the group of *German followers*.

We researched only one-directional causality up till now, i.e. the causality France → an EU member and Germany → an EU member. However, it is interesting to find out possible bi-directional causality, i.e. France → an EU member, an EU member → France, Germany → an EU member and an EU member → Germany (the results are displayed in Table 2). At the same time this opposite causality will enable us to identify possible leaders, i.e. countries with cycles influencing French and/or German cycles.

Table 2 Granger Causality Testing: Bi-directional Causality

		FR → EU country	EU country → FR	DE → EU country	EU country → DE
AT	€	0.083	0.000	0.494	0.035
BE	€	0.834	0.027	0.411	0.027
BG		0.003	0.415	0.013	0.217
CY	€	0.020	0.190	0.025	0.452
CZ		0.057	0.812	0.175	0.259
DE	€	0.449	0.068	X	X
DK		0.370	0.017	0.137	0.594
EE	€	0.583	0.015	0.359	0.251
ES	€	0.003	0.229	0.030	0.641
FI	€	0.009	0.964	0.001	0.237
FR	€	X	X	0.068	0.449
HR		0.003	0.895	0.033	0.027
HU		0.146	0.958	0.011	0.094
IE	€	0.111	0.021	0.067	0.214
IT	€	0.003	0.875	0.001	0.152
LT	€	0.005	0.358	0.000	0.164
LU	€	0.674	0.000	0.668	0.019
LV	€	0.001	0.521	0.000	0.720
MT	€	0.009	0.093	0.010	0.850
NL	€	0.007	0.448	0.032	0.140
PL		0.034	0.720	0.147	0.476
PT	€	0.488	0.774	0.338	0.293
RO		0.064	0.208	0.202	0.720
SE		0.280	0.019	0.637	0.142
SI	€	0.063	0.830	0.035	0.181
SK	€	0.005	0.317	0.015	0.013
UK		0.222	0.000	0.493	0.024
Countries		10	3	5	0

Note: we display p-values; H0 (FR → EU country): The evolution of output gap in France does not cause the evolution of output gap in a given EU country; H0 (EU country → FR): The evolution of output gap in EU country does not cause the evolution of output gap in France; H0 (DE → EU country): The evolution of output gap in Germany does not cause the evolution of output gap in a given EU country; H0 (EU country → DE): The evolution of output gap in EU country does not cause the evolution of output gap in Germany; grey colour: if p-value is less than 0.01, i.e. if we do not accept H0; € - the euro area countries

Source: Own calculation

Bi-directional causality between France or Germany and an EU member country is not observed. Reverse one-directional causality, i.e. when evolution in an EU member causes evolution in France, is confirmed in 3 countries (Austria, Luxembourg, and United Kingdom). These 3 countries are identified as leading countries towards France. Current output gap in Germany implies current values of output gap in 5 countries. No country significantly affects business cycle in Germany.

In Table 3 we summarize countries a) with no statistically significant marks of synchronisation with France or Germany, b) leading countries, c) perfectly synchronized countries (without time delay in synchronization of cycles), and d) lagged countries.

Table 3 Synchronisation between an EU Member and France (Germany): Summary

synchronisation	EU countries	regarding France	regarding Germany
NO	No synchronisation	BE, CY, CZ, DK, EE, HU, PL, PT, RO, SE, SI	AT, BE, CZ, DK, EE, ES, HR, HU, LU, PL, PT, RO, SE, SI, SK, UK
	Leading countries	AT, LU, UK	-
YES	Perfectly synchronised countries	DE	FR
	Lagged countries	BG, ES, FI, HR, IE, IT, LT, LV, MT, NL, SK	BG, CY, FI, IE, IT, LT, LV, MT, NL

Note: grey bold font = countries having leading evolution when comparing with France, while having perfectly synchronised evolution when comparing with Germany, black bold font = countries having the same synchronisation when comparing with France as well as Germany.

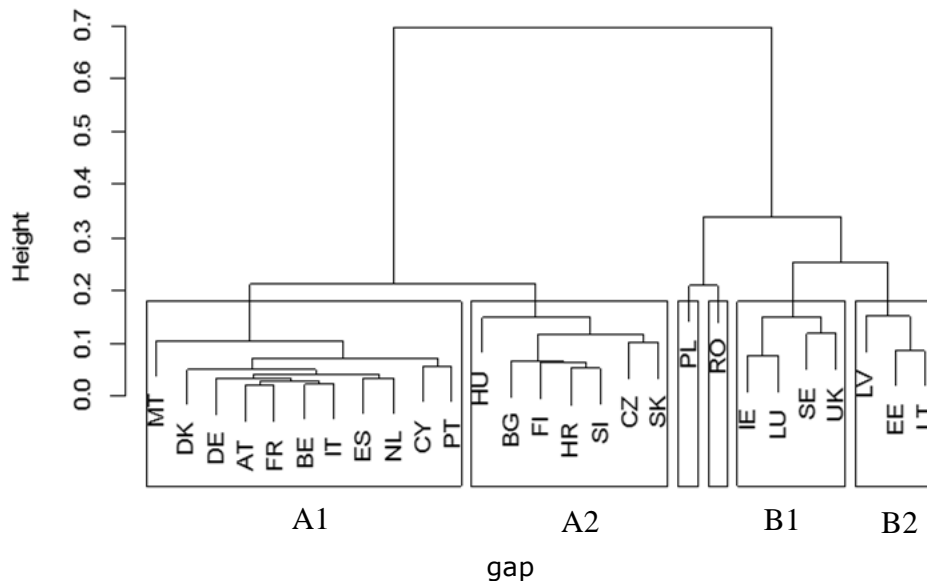
Source: Own calculation

Granger causality testing approved higher tendency to business cycle synchronisation in case of euro area members. Out of 13 countries influenced by French or German business cycles, 11 of them are applying euro. Therefore we assume that the degree of integration process can have a significant impact on GDP synchronisation and the endogeneity argument may be valid. Cluster analysis completes our findings.

Results of cluster approach to business cycle synchronisation

Cluster analysis represented by a dendrogram (Figure 1) based on the calculation of distances between time series of output gap, divided the analysed countries into several groups characterised by similar output gap evolution.

Figure 1 Clusters of Countries according to Their Similarities in Time Series of Output



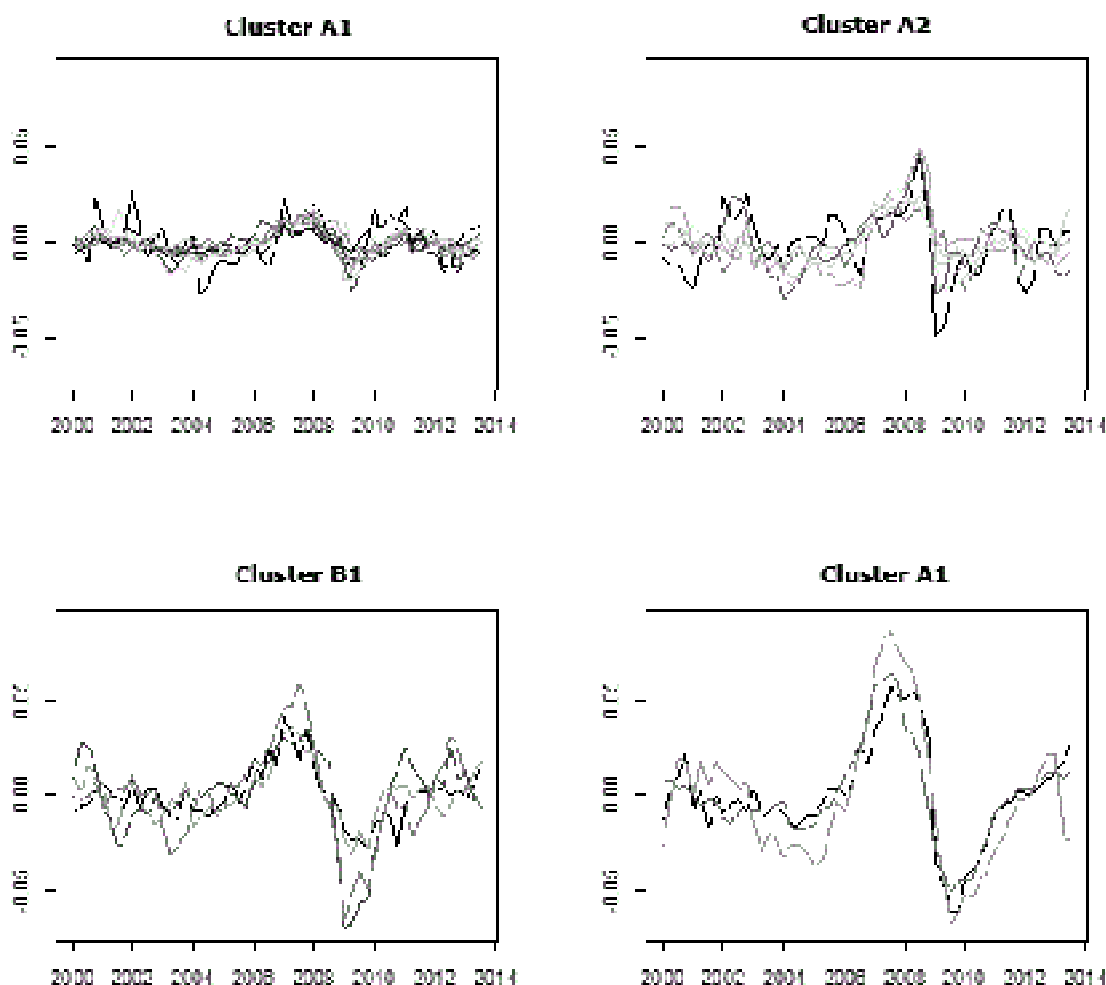
Note: Cluster dendrogram - Ward method of clustering
Source: Own editing in R.

Cluster dendrogram (Figure 1) identified two large clusters:

- 1) **Cluster A** (18 countries): MT, DK, DE, AT, FR, BE, IT, ES, NL, CY, PT, HU, BG, FI, HR, SI, CZ, SK, which can be divided into:
 - **Cluster A1:** MT, DK, DE, AT, FR, BE, IT, ES, NL, CY, PT, i.e. old EU member states (except for Malta and Cyprus),
 - **Cluster A2:** HU, BG, FI, HR, SI, CZ, SK, i.e. new EU members (except for Finland),
- 2) **Cluster B (9 countries):** PL, RO, IE, LU, SE, UK, LV, EE, LT, i.e. Northern European countries (except for Romania). When considering smaller distance, the countries can be divided into:
 - **Cluster B1:** IE, LU, SE, UK,
 - **Cluster B2:** LV, EE, LT, i.e. the Baltic countries.

When considering smaller distances, i.e. clusters A1, A2, B1, and B2; Poland (PL) and Romania (RO) become outliers not belonging to any cluster (Figure 1). However when considering higher distance, the countries belong to cluster B.

Figure 2 Output Gap Evolution in Particular Clusters



Note: **cluster A1**: MT, DK, DE, AT, FR, BE, IT, ES, NL, CY, PT; **cluster A2**: HU, BG, FI, HR, SI, CZ, SK; **cluster B1**: IE, LU, SE, UK; **cluster B2**: LV, EE, LT

Source: Own editing in R

Figure 2 captures output gap evolution in countries belonging to the identified clusters A1, A2, B1, and B2. The smallest volatility of output gap is observed in countries of cluster A1, while the highest volatility is observed in the Baltic countries in cluster B1. Consequently, Figure 2 just confirms the countries' incorporation into the similar clusters. In addition it confirms that level of integration process can have an impact on GDP synchronisation as old EU members are in different cluster than new member states.

4 Conclusions

The ambition of the paper was to reveal level of GDP synchronisation in the European Union. We assume that sufficiently harmonised economic evolution makes single monetary policy more efficient and consequently insures better economic performance of member countries. We researched all European Union member countries (apart from Greece due to missing data) as even non euro area countries are directly or indirectly implied subjects or objects of synchronisation. The Granger causality testing confirmed French and German mutual synchronisation in time without any delay. Several countries were identified as followers of French or German cycle. Three countries are in the position of leaders towards France. No country's GDP is leading German GDP evolution. The degree of integration process seems to be relevant for synchronisation. The euro

area members had higher tendency to GDP harmonisation. Synchronisation within the group (cluster) of old or new member states is more probable than between particular groups. However the group of countries with no obvious synchronisation with core countries is still important including many euro area member states. This phenomenon reduces efficiency of European single monetary policy, too.

Acknowledgments

The paper was elaborated within the project VEGA 1/0994/15.

References

- Aguiar-Conraria, L., Soares, M. J. (2011). Business cycle synchronization and the Euro: A wavelet analysis. *Journal of Macroeconomics*, vol. 33(3), pp. 477-489.
- Backus, D., Kehoe, P. (1992). International evidence on the historical properties of business cycles. *American Economic Review*, vol. 82, pp. 864-88.
- Darvas, Z., Rose, A. K., Szapáry, G. (2005). Fiscal divergence and business cycle synchronization: irresponsibility is idiosyncratic. *National Bureau of Economic Research*. Working paper no. 11580.
- Fidrmuc, J., Korhonen, I. (2006). Meta-analysis of the business cycle correlation between the euro area and the CEECs. *Journal of Comparative Economics*, vol. 34(3), pp. 518-537.
- Focardi, S. M. (2001). Clustering economic and financial time series: Exploring the existence of stable correlation conditions. *Discussion paper*.
- Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: Journal of the Econometric Society*, vol. 37(3), pp. 424-438.
- Gouveia, S., Correia, L. (2008). Business cycle synchronization in the Euro area – the case of small countries. *International Economics and Economic Policy*, vol. 5(1-2), pp. 103-121.
- Hodrick, R. C., Prescott, E. C. (1997). Postwar US business cycles: an empirical investigation. *Journal of Money, Credit, and Banking*, vol. 29(1), pp. 1-16.
- Horváth, J. (2003). Optimum currency area theory: A selective review. *BOFIT Discussion Paper No. 15/2003*.
- Kaldor, N. (1957). A model of economic growth. *Economic Journal*, vol. 67, pp. 591-624.
- Lucas, R. E. (1987). *Models of Business Cycles*. Basil Blackwell
- Obradovic, S., Mihajlovic, V. (2013). Synchronization of Business Cycles in the Selected European countries. *Panoeconomicus*, vol. 60(6), pp. 759-773.
- Savva, C. S., Neanidis, K. C., Osborn, D. R. (2010). Business cycle synchronization of the euro area with the new and negotiating member countries. *International Journal of Finance & Economics*, vol. 15(3), pp. 288-306.
- Tkáčová, A., Bánociová, A. (2013). Kompozitný predstihový indikátor hospodárskeho cyklu Slovenska. 2013. In: E + M. *Ekonomie a management*. vol. 16, no. 3 (2013), pp. 34-46.

Determination of Financial Strategy of Selected Company and its Importance for Other Business Development – Case Study

Veronika Svatošová¹, Zuzana Svobodová²

¹ Mendel University in Brno
Faculty of Regional Development and International studies,
Department of Regional and Business Economics
Třída Generála Píky 2005/7, 623 00, Brno, Czech Republic
E-mail: veronika.svatosova@mendelu.cz

² Mendel University in Brno
Faculty of Regional Development and International studies,
Department of Regional and Business Economics
Třída Generála Píky 2005/7, 623 00, Brno, Czech Republic
E-mail: zuzana.svobodova@mendelu.cz

Abstract: *The current business practice shows that the key factor of business success is the originally created and implemented corporate and business strategy. However, the importance of strategy is underestimated. The consequence is the fact that partial functional strategies in business practice do not often exist. The paper deals with the selected functional strategy – financial strategy with the aim to analyze its importance in business development. The paper focuses on the theoretical framework with emphasis on financial strategy and other related aspects. The literature review discovered that this research field is not deeply developed. Based on the theoretical background, the case study of selected company is elaborated. The main aim of this case study is to analyze and evaluate the financial strategy of the selected company and its importance in further business development. The main research methods of this paper are: case study, the selected methods of financial analysis, personal interview, the selected methods of descriptive statistics and modelling and simulating of financial strategy with the help of Vensim program. The results of the case study discovered that financial strategy of selected company focuses on conservative strategy with emphasis on lower profitability and higher liquidity. This financial strategy does not correspond with corporate investment strategy into the further development of the company. It could be stated the current financial strategy of the selected company does not reflect the whole corporate strategy and goes against other business development. It is recommended to change the financial strategy on aggressive approach with higher profitability that could follow the current corporate investment strategy.*

Keywords: strategy, financial strategy, strategic management, business development

JEL codes: M21, M29

1 Introduction

The theory and practice show that strategic management is generally among company deeply underestimated (Holátová, Březinová and Kantnerová, 2015). According to Srpová and Řehoř (2010) the priority focus of any company on financial strategy together with managing the finance is one of the key factors to be expanded as the large company with position of the leader in the market. The problem in practice is the fact that managing the finance is often confused with functioning accounting and no strategic approach is dedicated to the strategy on finance. This issue is managed on the operational or tactical level (see Blažková, 2007). The practice shows the financial strategy is not understood as the priority for managing the business development and is considered to be only additional element of management and strategy of the company. Therefore, the paper focuses on the importance and modelling the financial strategy in the selected company and its importance for the business development. The paper derives from the previous research activities that were based on proposal of financial strategy model with the help of Vensim program (published in previous scientific journals). Simulation of this model

can define the actual financial strategy of the selected company and its importance for other business plans and activities.

Theoretical Background

The literature review unfortunately shows that the financial strategy and its importance for other business development is underestimated. The paper has to work with insufficient theoretical background, i.e. no quality research articles were founded that could be primarily oriented on definition and implementation of financial strategy. Therefore, the theoretical background consists of the generally known facts about the financial strategy.

"Finance, traditionally, has been at the periphery of the strategic planning and innovative processes, gatekeepers of financial data as opposed to integral members of the process. With changes occurring in the finance and accounting professions, this categorization is shifting, and with the integration of strategy and a more comprehensive view of financial performance, there is an emerging trend toward a more integrated corporate finance function" (Smith, 2014, p. 20). The financial strategy is defined as a relatively coherent and interconnected set of strategic financial objectives, criteria and rules that underlie such planning (Landa and Polák, 2008). The main purpose of setting up the financial strategy is to find the balance among controlling mechanisms, high company performance and minimizing the cost of financial operation to reach the effective management of all three mentioned financial areas (Irwin, 2005). According to Bender and Ward (2012), financial strategy has two components: (1) the raising of funds needed by an organization in the most appropriate manner and (2) managing the employment of those funds within the organization, including the decision to reinvest or distribute any subsequent generated. The main purpose of setting up the financial strategy is to find the balance among controlling mechanisms, high company performance and minimizing the cost of financial operation to reach the effective management of all three mentioned financial areas (Irwin, 2005). Financial strategy is understood as a form of functional strategy that meets to main corporate and business strategy of the company and is derived from the long-term period and closely relates to the investment activities.

Financial strategy is then necessary to edit, update and manage on the basis of changes in the external financial environment and significantly affect the financial stability of the company and contribute to the growth and efficiency of the enterprise and maximization of its market value (Grasseová et al., 2010). Three steps to set up a successful financial strategy are following (Mallete, 2006): (1) Establish appropriate financial capital structure, which a determination would be made of the magnitude of its cash surplus, (2) Understand whether a firm is undervalued or overvalued in the market, by examining investors' expectations from growth, margins, investments and other financial measures, (3) Develop a financial strategy, to be proposed to the Board for approval, ensuring the company's operations are sufficiently funded, that financial balance is achieved, and that its growing cash reserve is deployed appropriately. The main stages of financial management are following (Calandro, Flynn, 2007): (1) strategy formulation, or the determination of how to satisfy customer preferences in unique ways, (2) resource allocation, or the process of funding and staffing strategic initiatives that are tied to delivering customer satisfaction, (3) performance measurement, or an assessment of the relative success or failure of business activities.

According to Režňáková (2012, p. 107-108), three basic financing strategies are then distinguished to: (1) *Aggressive financial strategy* – In case of aggressive financial strategy, net working capital is negative. The part of long-term assets is financed by short-term resources. These situations occur in a period of rapid business growth, extensive investment or withhold payments to suppliers, (2) *Conservative financial strategy* – A firm that applies this financial strategy also uses the long-term sources of financing to finance seasonal fluctuations in current assets. Here, it is typical lax approach to inventory management and collection of its receivables or prompt payment of liabilities to suppliers. This may result in reducing the return on invested capital, (3)

Balanced financial strategy – In this case, consistency between the maturity of financial sources with a lifetime of assets in the company is ensured.

The main impacts on the financial strategy could be observed in internal and external constraints (Ogilvie, 2009, p. 22). The main argument is the issue of optimizing capital structure, in which a certain level of indebtedness creates the effect of tax shield and leverage. Against this statement is the fact that the increasing level of indebtedness causes higher risk of financial instability. Traditional theories declare that can be planned and managed to maximize of value of the company. On the other hand, the Miller-Modigliani model has proved that the capital structure is for a company marginal because it is determined mainly by real assets and investments decision-makings. Financial managers have to formulate a policy that balances the effect of these opposing features (external and internal constraints), (Ogilvie, 2009, p.22-23).

2 Methodology and Data

The paper aims to analyze and evaluate the importance of the financial strategy in the selected company and its importance for other business development. The paper focuses on two main aspects – firstly, definition of current financial strategy of the selected company with the help of financial strategy (details see next chapter) and secondly, the level of importance of this financial strategy in other business development. The analytical part of the paper focuses on case study of the selected company – Foxconn with its current headquarter in Pardubice in the CR. The main aim of the case study is to define the actual financial strategy of the selected company and its importance for the further business development. The basis for evaluation is the financial analysis of the selected company in the period 2000 – 2014. The main research methods of the analytical part is modelling of financial strategy with the help of Vensim program and its subsequent simulation for the year 2010, 2012 a 2014 to see the development the financial strategy during the time, case study of the selected company supported by personal interview of the management and selected methods of financial analysis (as a basis for creating the financial strategy model, data derives from the financial statement of the company). Finally, the defined financial strategy and its importance for further business development is evaluated. *Business development* is for the cases of this paper understood as an economic and non-economic development of the company that is characterized by expansion of company, increasing of the competitiveness and share on the business market, increasing number of employees, customers and other stakeholder or improving the selected absolute and relative indicators of financial analysis during the time (i.e. profitability, liquidity, activity, indebtedness, etc.).

3 Results and Discussion

Model Specification – Proposal of Financial Strategy Model

This model derives from the basic principles of financial analysis that explores the profitability, liquidity and the cost and capital efficiency. Based on these basic criteria, the dynamic financial strategy was created. For creating the model, the selected variables of financial analysis were used (see Table 1) – i.e. ROE (Return on Equity) and ROA (Return on Assets) as a basic variables of profitability, Total (Current) Liquidity as a complex liquidity variable, Long-term Coverage (Level of Capitalization) and WACC (Weighted Average Cost of Capital) as a complex variable for cost and capital efficiency evaluation (details see Table 1). The possible limitations of this model could be founded in setting the cost of equity and cost of debt in the variable WACC. The solution of this issue was inspired by dynamic WACC model (Honková, 2012). Costs of capital are expenditures of the company that must be paid to obtain different forms of capital (Billet and Dolly, 2007, p. 113). Cost of equity is usually set by several methods (details see Dluhošová, 2006, p. 110). In case of dynamic financial strategy model, the modular model was selected, because is more universal for companies that are not trading on capital market and that is more suitable in Czech companies (based on INFA

methodology, details see MPO ČR, 2015). The costs of debts are in terms of dynamic financial strategy model set as the cost of bank credits.

Table 1 Variables in Financial Strategy Model

Return on Equity (ROE)	$ROE = \frac{EAT}{Equity}$
Return on Assets (ROA)	$ROA = \frac{EAT}{Equity}$
Total Liquidity	$Total\ Liquidity = \frac{Current\ Assets}{Short-term\ Liabilities\ and\ Credits}$
Long-term Coverage	$Level\ of\ Capitalization = \frac{Equity + Long-term\ Liabilities\ and\ Credits + Reserves}{Total\ Assets}$
WACC (Weighted Average Cost of Capital)	$WACC = R_E * \frac{E}{C} + R_D * (1 - t) * \frac{D}{C}$ $R_E = R_F + R_B + R_{FS} + R_{LA}$ $R_D = \frac{cost\ of\ interest}{the\ average\ value\ of\ bank\ credits} * (1 - t)$
Financial Strategy Model	$Financial\ Strategy = \frac{ROE + ROA + Total\ Liquidity + Level\ of\ Capitalization + WACC}{5}$

Source: Own work base on (Svatošová, 2015)

Legend: ROE – Return on Equity, ROA – Return on Assets, EAT – Earnings after Taxation, WACC – Weighted Average Cost of Capital, R_E – Cost of Equity, R_D – Cost of Debts, t – Tax rate, E – Equity, D – Debts, $C = E + D$ (Total Capital), R_F – risk-free rate, R_B – business risk, R_{FS} – risk premium of financial stability, R_{LA} – risk premium of company size

Afterwards, the scoring evaluation for individual variables in financial strategy model was determined (see Table 2). Based on received values of individual variables, the set points on interval 1 – 5 are determined, where 5 means the excellent result and 1 means very bad result. The selected values and set points of individual variables are inspired by Kralicek Quick test – mainly the values of profitability ROE and ROA (Sedláček, 2001, p. 125), the total liquidity is based on this source (Kislingerová, 2007, p. 368), the values of long-term coverage is based on this source (Fotr et al., 2012, p. 174; Sedláček, 2001) and the values of WACC as the variable of cost and capital efficiency is based on the practice.

Table 2 Evaluation of Variables in Financial Strategy according to Points (1 – 5)

	Excellent (5)	Very good (4)	Good (3)	Bad (2)	Very bad (1)
ROE	> 0.50	> 0.30	> 0.10	> 0.00	< 0.00
ROA	> 0.15	> 0.12	> 0.08	> 0.00	< 0.00
Total liquidity	> 1.80	> 1.50	> 1.00	> 0.80	< 0.80
Long-term coverage (level of capitalization)	> 1.1	> 1	> 0.98	> 0.95	< 0.95
WACC	< 0.05	> 0.05	> 0.15	> 0.25	> 0.30

Source: Own work based on (Svatošová, 2015)

Final results of the dynamic strategy model are pointed as an arithmetic average of received points of set variables of profitability, liquidity and cost of capital (see Table 1 and Table 3). Based on received total points (see Table 3), the final financial strategy is determined. A detail description of individual strategies is given in Table 3. The concrete financial strategies in terms of financial strategy model are inspired by these sources (Režňáková, 2012, p. 107-108; Živělová, 2014).

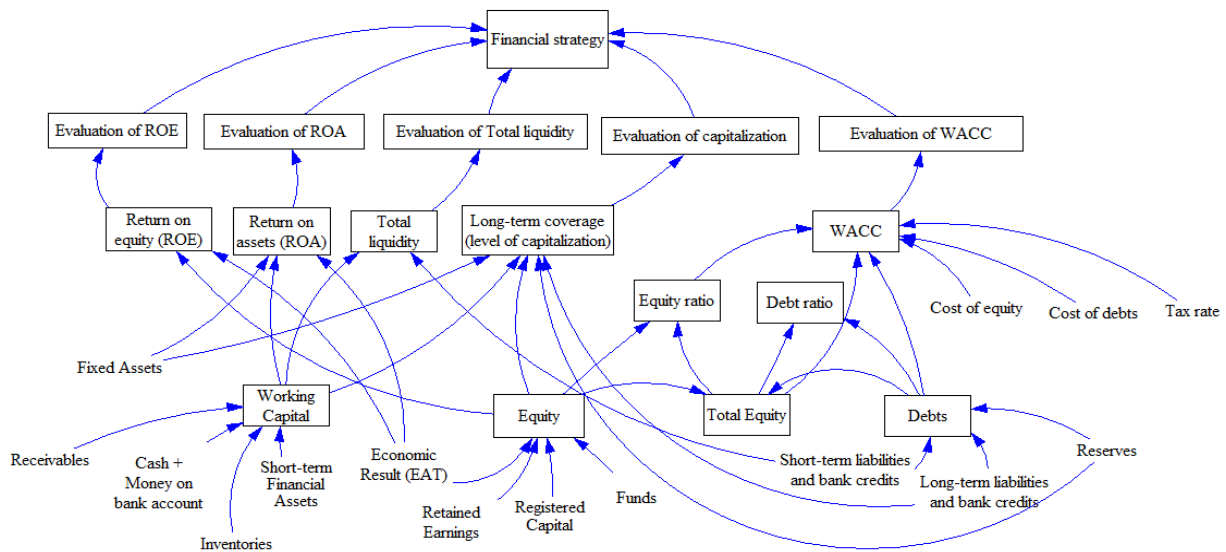
Table 3 Received Points and Final of Results to Concrete Financial Strategy

Evaluation According to Received Points	Type of Financial Strategy	Description of Financial Strategy
4 – 5	Strategy of maximum profitability	Aggressive strategy: maximizing the profitability, low or negative value of working capital, possibilities of high volume to long-term investments, potential of the company to be expanded and be progressive, the opportunity for absolute innovations
3 – 3.9	Strategy of proportional profitability and liquidity	Balanced strategy: reaching the reasonable value of working capital and acceptable profitability, the short-term investments or long-term investments with lower volumes could be realised, the expansion of company is possible, but only moderate, not progressive
2 – 2.9	Strategy of maximum liquidity	Conservative strategy: high volume of working capital, low profitability, conservative approach to the managing the long-term investments (no long-term expanding the company, focusing on operational issues of the business)
1 – 1.9	Crisis and remediation strategy	Rescue strategy: the effort to be rescued from bankruptcy, bad values of financial analysis (liquidity, profitability, indebtedness, etc., i.e. no comprehensive financial strategy is in the company realised, change of corporate and business strategy, the change of company conception, production and business, looking for new sources and opportunities for rescue and redevelopment of the company

Source: Own work based on (Svatošová, 2015)

Based on the information above (financial strategy variables, the results of financial strategy model – see Table 1, 2 and 3) the financial strategy model without dynamics (without set changes) in Vensim program was created (see Figure 1). In this model (see Figure 1), we can see direct links of dependent and independent selected variables that have direct impact on final results of financial strategy.

Figure 1 Financial Strategy Model without Dynamics



Source: Own in Vensim program based on (Svatošová, 2015)

Financial Analysis of the Selected Company (Case Study)

The subject of the case study is the manufacturing company – Foxconn with headquarter in Pardubice (since 2000), originally from Tchaj-wan. Foxconn is planning the expansion of its manufacturing (with a plan to set up a new technological and manufacturing center in the CR that characterizes the other company’s development); therefore the authors of paper were asked for creating the actual financial analysis as a basis for other plans. The results and data of this analysis are used for evaluating the actual financial strategy and its importance for other business plans and activities. Foxconn is one of the world's

largest manufacturer of electronics and computer components manufactured by other companies such as Apple, Intel, Hewlett-Packard, Sony, Microsoft, Motorola and Cisco. It manufactures all the components of a personal computer, with the exception of chips.

The following table 4 involves the financial analysis data for the years 2010, 2012 a 2014 to compare and observe the development of financial strategy during the time. The selected indicators are served for determination of actual financial strategy of the company Foxconn. The results are explained with the help of financial strategy model (in Vensim program) and its following simulation of this model (the example of simulation of the financial strategy model for the company Foxconn in 2014 see Figure 1; the year 2010 a 2012 are simulated with the help of financial strategy model as well).

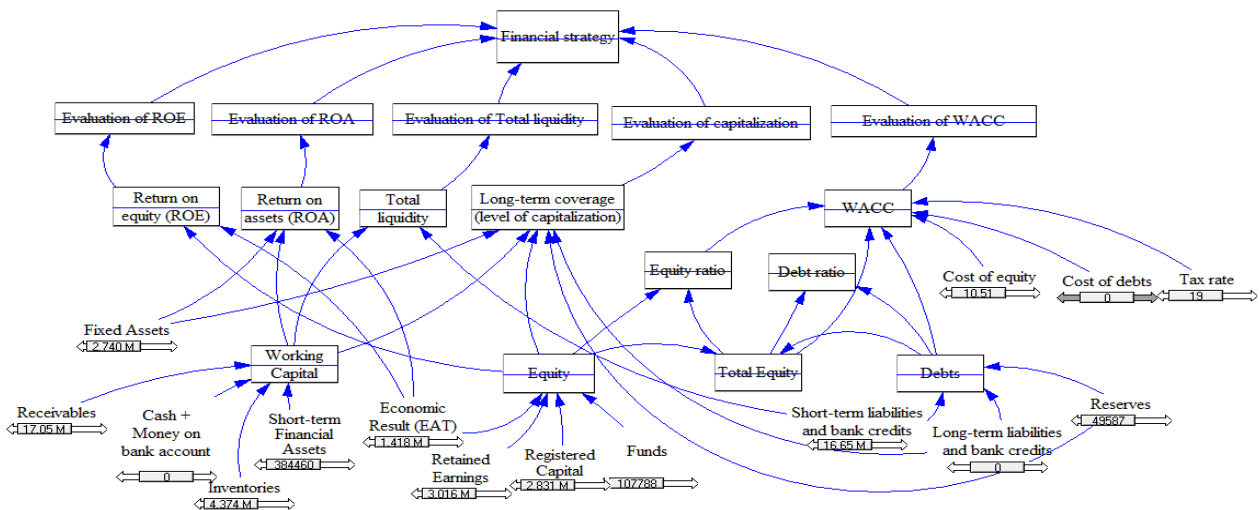
Table 4 Input Data for Creating the Financial Strategy Model (for Foxconn)

Issue/Year	2010	2012	2014
Assets	19 298 764	16 701 130	24 552 739
Fixed Assets	3 433 227	3 031 461	2 740 469
Current Assets	15 859 099	13 664 798	21 804 912
Inventories	3 965 970	2 900 588	4 373 603
Receivables	10 936 266	9 292 922	17 046 249
Short-term financial assets*	956 863	1 471 288	384 460
Equity	4 109 301	4 944 740	7 372 607
Registered capital	2 831 440	2 831 440	2 831 440
Funds	53 150	65 136	107 788
Retained earnings	841 257	1 189 830	3 015 517
Economic result (EAT)	383 454	858 334	1 417 862
Debts	14 682 963	11 751 063	16 652 146
Reserves	52 244	33 918	49 587
Long-term liabilities	0	0	0
Long-term bank credits	0	0	0
Short-term liabilities	13 619 905	10 062 254	16 652 146
Short-term bank credits	1 010 814	1 654 891	0
Cost of interests	2 248	26 621	1 643
t – tax rate	19%	19%	19%
r_f – risk-free rate*	3.71%	2.31%	1.58%
r_B – business risk*	2.57%	3.15%	2.64%
r_{fs} – risk premium of financial stability*	8.96%	7.86%	6.29%
r_{LA} – risk premium of company size*	0%	0%	0%
r_E – cost of equity	15.24%	13.32%	10.51%
r_D – cost of debts	0.18%	1.3%	0%
ROE	0.093 (2)	0.174 (3)	0.192 (3)
ROA	0.0198 (2)	0.051 (2)	0.0577 (2)
Total liquidity	1.08 (3)	1.17 (3)	1.31 (3)
Long-term coverage	0.216 (1)	0.298 (1)	0.302 (1)
WACC	0.0344 (5)	0.0469 (3)	0.0321 (5)
Financial strategy	2.6	2.8	2.8
Type of the financial strategy in current year	Strategy of maximum liquidity	Strategy of maximum liquidity	Strategy of maximum liquidity

Source: Own work with help of Vensim program (Note: the amounts are given in thousands CZK)

*calculated according to INFA methodology (details see MPO ČR, 2015), Ministry of Industry and Trade of the Czech Republic (for manufacturing industries)

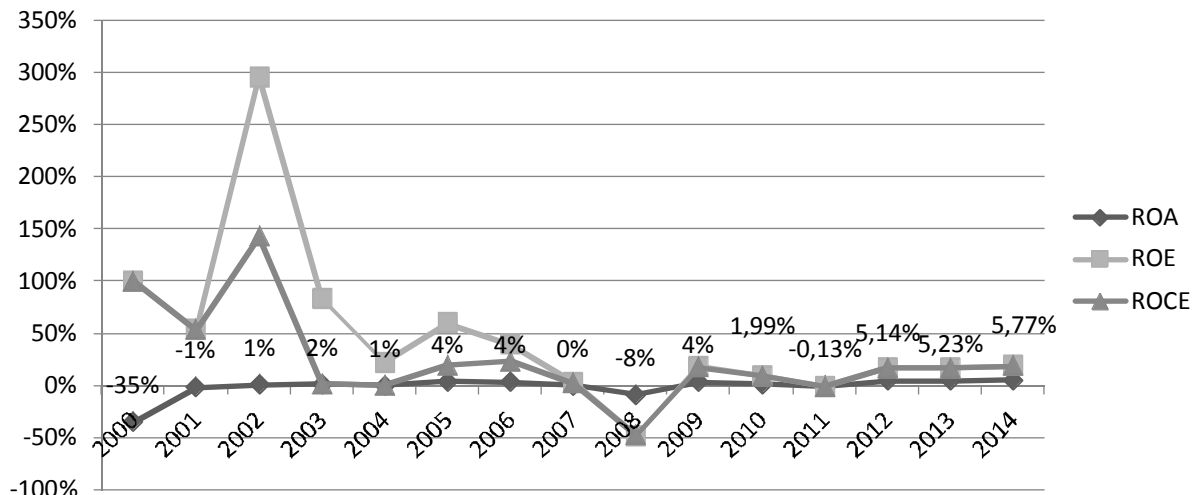
Figure 2 Financial Strategy Model (in 2014) for the Company Foxconn



Source: Own work with help of Vensim program

A detailed financial strategy model of the company Foxconn (see Figure 2) has simulated that the company applies a conservative strategy (i.e. strategy on maximum liquidity), focusing higher liquidity and lower profitability, generating lower levels of income. These findings do not reflect the overall corporate investment strategy that is based on other expansion (with a plan to set up new technological and manufacturing center) and other aspects for further development. Return on equity is moving between 9 and 19% and the company operates with moderate levels of total liquidity, i.e. the amount of current assets (details see Figure 3). This means that the funds are tied to short-term assets and are used to finance operations of the company. It could be stated that indicators of profitability (ROA, ROE, ROCE) should be dramatically raised to support other expansion corporate strategy.

Figure 3 Profitability ROE ROA, ROCE (in %) of the Foxconn among 2000 – 2014

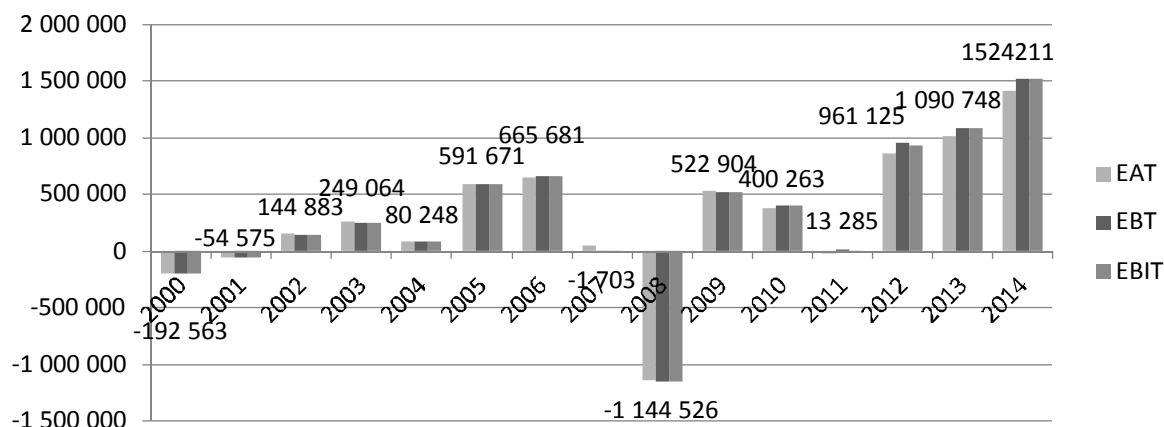


Source: Own work

On the other hand, we can see increasing trend in absolute indicators of profitability (EAT, EBT, EBIT – details see Figure 4). These results should be used for raising wages of potential employees (currently the average wages of manual workers in Foxconn are 20,826 CZK). The financial and regional analysis of the company showed that the Pardubice region has currently deep problem with sufficient workforce, therefore the biggest challenge of the future company project will be to find the necessary work force

(the plan is to employ over the 2,000 workers in short-time period), i.e. the earnings should be also used for raising average wages to increase job motivation.

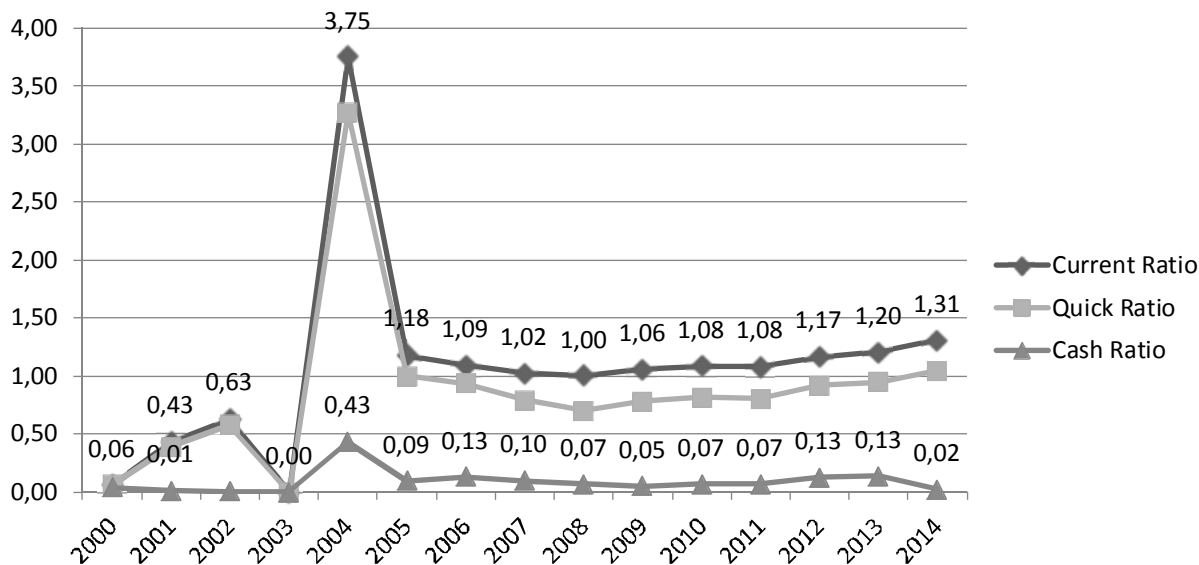
Figure 4 EAT, EBT and EBIT (in Thousands CZK) of the Foxconn among 2000 - 2014



Source: Own work

The company currently focuses on moderate values of liquidity, especially in indicators of current ratio and quick ratio (details see Figure 5). On the other hand, the cash ratio reaches in all monitored years very low values. This means the company reported irregularities in securing short-term solvency and optimizing the short-term financing.

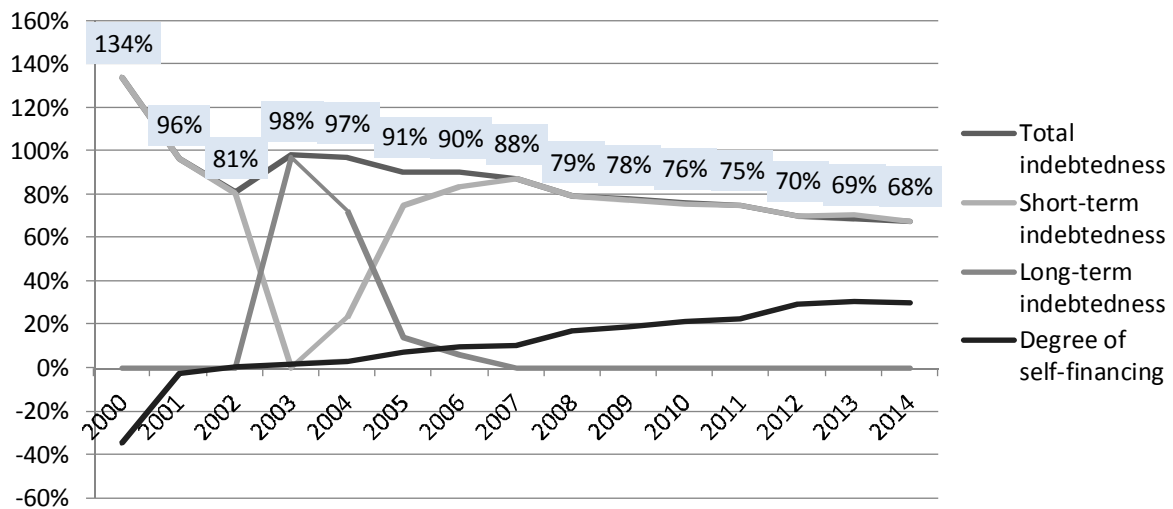
Figure 5 Liquidity of the Foxconn among 2000 - 2014



Source: Own work

The higher the rate the company's debts currently reach 70%. This rate debt consists mainly of short-term liabilities. The other 30% is financed from the company's own resources (details see Figure 6). This capital structure fully corresponds with the current trend of funding in manufacturing companies. This creates the effect of financial leverage and reduces the weighted average cost of capital. On the other hand, the company is significantly under-capitalized, i.e. that the long-term assets are also funded from the short-term resources. In the future, therefore the company should focus on optimizing the capital structure, financing structure of assets and other activities of the company and also improving conditions in short-term financing and liquidity. Afterwards, the short-term and long-term credibility of company could be improved, as well as business relationships with current and potential business partners.

Figure 6 Indebtedness of the Foxconn among 2000 – 2014



Source: Own work

The overall structure of the property is currently 90% in current assets, 10% in fixed assets. The largest share of the current assets are short-term receivables, i.e. 78%, and 20% of current assets create inventories. The turnover of receivables is on average over two months, the turnover of inventories is on average 16 days. These values indicate the high volume of orders, with a maturity of two months, which are able to generate high net gains (currently more than CZK 1.5 billion), and effective inventory management. The current value of the assets of the company amounts to 24 557 000 000 CZK, which is an increase of 4,405% compared to year 2000, when the company started.

On the basis of monitored indicators of financial analysis, it can be stated that Foxconn ranks among the financially stable and dynamically developing company, whose main priority is to implement pro-growth and investment strategy. On the other hand, the conservative financial strategy does not reflect the overall corporate investment strategy. The company should focus in the future on dramatic increasing the profitability with connection of stable increase in Earnings after taxes (EAT). This means, this company should change the conservative financial strategy into the aggressive financial strategy with a focus on maximum profitability and high net income that could be reinvested to the further business development. The improving in short-term financial planning could also stabilize and support the long-term financial and corporate plans.

4 Conclusions

The paper showed the importance of financial strategy is generally in business practice underestimated. This fact is supported by the literature review that is dedicated to the aspects of financial management, however, the separated research activities focused on the importance of financial strategy in business development is insufficient. Therefore, the financial strategy model was proposed, as the result of the previous primary research. The paper has demonstrated the validity and simulation of this model in real business practice.

The previous case study proved the current financial strategy of the selected company focuses on conservative financial strategy in all observed years, as financial strategy model has simulated. This financial strategy does not correspond with the overall corporate investment strategy focused on other business development. This means the company could be unsuccessful in realization of its ambitious plan for further development. It is recommended to change its financial strategy into the aggressive financial strategy with higher profitability and net income. The company should also focus on optimizing its capital structure a level of capitalization. The model could simulate, in what selected indicators the model should be changed to reach a desired financial

strategy. It comes to this that the financial strategy model could be used as the helping method for other strategic planning. The model could be served as a helping method for determination optimal financial strategy that reflects the overall corporate strategy. The company should firstly stabilize its short-term financial planning and decision-makings (in improving short-term financing) that could support the stabilization of long-term financing and financial plans.

The financial strategy model has proved its easy application in the business practice. It is also important to mention that the theoretically proposed model has its own limitations. Firstly, it is served for companies that are not trading on the capital market. The other limitation could be based on used methods for determination of cost of equity and cost of capital. The different methods could change the whole result of model. The used variables in this model could be also the subject of other expert discussion and could be updated and adapted to the current situation or business sector. The results of the case study could not be generalized for all business situations; nevertheless, the results will be served for other research activities and as basis for other experiment on bigger research sample of the selected companies.

Acknowledgments

This paper has been prepared in terms of the project IGA of the Mendel University in Brno labelled as "Aspects of Strategic Development of Small and Medium-sized Enterprises" with registration number FRRMS - IGA - 2016/006.

References

- Bender, R., Ward, K. (2012). *Corporate Financial Strategy*. 2nd ed. Oxford: Routledge.
- Billett, M., Dolly King, T.-H. (2007). Growth Opportunities and the Choice of Leverage. *Journal of Finance*, vol. 62, pp. 697-730.
- Blažková, M. (2007). *Marketingové řízení a plánování pro malé a střední firmy*. 1st ed. Praha: Grada Publishing.
- Calandro, J., Flynn, R. (2007). On Financial Strategy. *Business Strategy Series*, vol. 8(6), pp. 409-417.
- Dluhošová, D. (2006). *Finanční řízení a rozhodování podniku: analýza, investování, oceňování, riziko, flexibilita*. 1st ed. Praha: Ekopress.
- Fotr, J. (2012). *Tvorba strategie a strategické plánování: Teorie a praxe*. 1st ed. Praha: Grada Publishing.
- Grasseová, M. (2010). *Analýza podniku v rukou manažera*, 1st ed. Brno: Computer Press.
- Holátová, D., Březinová, M., Kantnerová, L. (2015). Strategic Management of Small and Medium-sized Enterprises. *WSAES Transactions on Business Economics*, vol. 12, pp. 65-73.
- Honková, I. (2012). Dynamic model WACC. In: *Advances in Finance & Accounting: Proceedings of the 1st WSEAS International Conference on Finance, Accounting and Auditing*. Zlín: Tomas Bata University, pp. 268-274.
- Irwin, D. (2005). *Finanční řízení: Podpora klíčových rozhodnutí*. 1st ed. Praha: Profess Consulting.
- Kislingerová, E. (2007). *Manažerské finance*. 2nd ed. Praha: C. H. Beck.
- Landa, M., Polák, M. (2008). *Ekonomické řízení podniku: Má podnik dostatečnou výkonnost?*, 1st ed. Brno: Computer Press.
- Mallete, F. (2006). A Framework for Developing Your Financial Strategy. *Corporate Finance Review*, vol. 10(5), pp. 11-20.

- MPO ČR. (2015). *Finanční analýza podnikové sféry se zaměřením na konkurenceschopnost sledovaných odvětví za rok 2014*. Retrieved from: <http://www.mpo.cz/dokument157262.html>.
- Nývltová, R., Marinič, P. (2010). *Finanční řízení podniku*, 1st ed. Praha: Grada Publishing.
- Ogilvie, J. (2009). *Financial Strategy*. 2nd ed. Oxford: Lima Publishing.
- Režňáková, M. (2012). *Efektivní financování rozvoje podnikání*. 1st ed. Praha: Grada.
- Sedláček, J. (2006). *Účetní data v rukou manažera – finanční analýza v řízení firmy*. 2nd ed. Brno: Computer Press.
- Smith, S. S. (2014). Strategy, Sustainability, and Innovative Financial Reporting. *Journal of Strategic Innovation and Sustainability*, vol. 10(1), pp. 19-23.
- Srpková, J., Řehor, V. (2010). *Základy podnikání: Teoretické poznatky, příklady a zkušenosti českých podnikatelů*. 1st ed. Praha: Grada Publishing.
- Svatošová, V. (2015) Modelling of Financial Strategy in Agricultural Company. In *Proceedings ICABR 2015*. 1. vyd. Madrid: Mendel University in Brno, pp. 976-989.
- Živělová, I. (2014). *Financial Management*. 2nd ed. Brno: Mendel University in Brno.

Algorithmic Trading Using Markov Chains: Comparing Empirical and Theoretical Yields

Milan Svoboda¹, Pavla Říhová²

¹ University of West of Bohemia
Faculty of Economics, Department of Economics and Quantitative Methods
Univerzitní 8, 30614 Pilsen, Czech Republic
email: svobodm@kem.zcu.cz

² University of West of Bohemia
Faculty of Economics, Department of Economics and Quantitative Methods
Univerzitní 8, 30614 Pilsen, Czech Republic
email: divisova@kem.zcu.cz

Abstract: *This study is focused on comparing empirical and theoretical yield of business strategies applied to stock markets. We continue in our previous articles in which we deal with the short-term prediction of stock markets and with creating business strategies using Markov Chains analysis. When defining a state space we assume that the stock price moves in three types of trends: primary, secondary and minor. The object of our interest is a minor trend which usually lasts for several days. During this trend the stock price accumulates a certain profit or loss in relation to the price at the beginning of the trend. The state space is defined by the size of the accumulated profit or loss. Business strategies are formed in the way that the states in which the stock price decreases generate buying signals and the states in which the stock price increases generate selling signals. Theoretical profitability of a business strategy is modeled on the basis of a matrix of transition between states probability, a matrix of evaluation of these transitions and the expected number of transactions. We calculate the parameters of this model, as well as empirical profitability, with historical data of CEZ stock during the ten years period from early 2006 to the end of 2015. In some cases empirical and theoretical results were nearly the same, in other cases they differed significantly.*

Keywords: algorithmic trading, stock market predication, Markov chains analysis

JEL codes: G17, C53

1 Introduction

In our long-term research we deal with models of short-time prediction of stock prices and their profitability in algorithmic trading. We work on the assumptions of Technical Analysis (TA). TA is understood as an extensive complex of methods which from the previous prices and trade volumes predict the future prices. Principles and methods of TA are described for example by Murphy (1999) or by Rejnuš (2011). One of the bases of TA is a thesis that share prices move in trends which have certain inertia. A trend change is determined by a change of the ratio between sellers and buyers. These trend changes are possible to be identified in time by studying historical prices and trade volumes. Technical analysts identify three types of trends: a primary trend, which lasts for a period from one year to several years, a secondary trend, which lasts for several months, and a minor trend, which lasts for days or weeks. Development cycles and formations repeat themselves. This fact allows predicting the future rate development.

It must be mentioned that academicians were for a long time rejecting the possibilities of TA to predict stock prices. The reason was generally admitted Efficient Market Theory by Fama (1965, 1970), according to which markets perform a random walk and therefore they are unpredictable. An effective market is thought to be such a market which immediately reacts to all new information. This information cannot be predicted, it comes randomly and thus a price change is also random. This means that according to this theory it is not possible to beat the market in the long term. Other reasons may have been some widely cited negative empirical studies about profitability of TA at stock markets, for example Fama and Blume (1966) or Jensen and Benington (1970). As

computer output becomes cheaper, electronic databases develop and the accessibility of on-line systems gets better, the number of studies, for example Sweeney (1988) or Brock et al. (1992), showing that it is possible to beat the market grows.

Our models work on assumption that the stock price moves in short-term trends and during the duration of this trend the stock price accumulates a certain profit or loss in relation to the stock price at the beginning of the trend. We also assume that the probability of this trend change grows with a growing accumulated loss or profit. We use the Markov Chains theory (MC) for modelling the trend change probability.

The aim of this study is to compare empirical and theoretical yields of algorithmic trading systems which use MC analysis.

2 Methodology and Data

MC theory is described for example in Hillier and Lieberman (1896). MC is a random process with a discrete set of states, discrete time and of that kind that the probability $p_i(n)$, that at the time moment t_n the process will be in state i , is stochastically dependent only on the state at the previous time moment, i.e. on the state at the time t_{n-1} . Particular realizations x_i are elements of a countable set $S = \{s_i\}$, $i = 1, 2, \dots, N$ which is called a state space. Behaviour of the described process is determined by:

- Vector of unconditional probabilities $p(n)^T = [p_1(n), p_2(n), \dots, p_N(n)]$, where T means transposition. For $n = 0, 1, 2, \dots$ $p_i(n)$ denotes probability that the process is in the moment n in the state i .
- Transition probability matrix \mathbf{P} whose elements p_{ij} give conditional probability of process transition from the state i to the state j . That could be formally described $p_{ij} = P(X_n = s_j | X_{n-1} = s_i)$, where $i = 1, 2, \dots, N$ and $j = 1, 2, \dots, N$ and where p_{ij} can depend on n . In case that p_{ij} does not depend on n at all we speak about homogenous MC, in the opposite case we speak about non-homogenous MC.

If we know the probability of particular states appearance at the time moment when the process starts, we can describe the process behaviour using the following relations:

$$p^T(n) = p^T(n-1)\mathbf{P} \quad \text{thus} \quad p^T(n) = p^T(0)\mathbf{P}^n \quad (1)$$

The transition between particular states is also connected with a certain profit or loss. The profit (loss) which is related to the transition for a state i to a state j is denominated r_{ij} . The profits r_{ij} for all pairs of states for $i = 1, 2, \dots, N$ and $j = 1, 2, \dots, N$ form a matrix of transition evaluation which is denominated \mathbf{R} . Let's use the denotation $v_i(n)$ to denote the expected yield (value of capital) of process which is after n transitions in a state i . For $v_i(n)$ the following recurrence relation is valid

$$v_i(n) = \frac{\sum_{j=1}^N v_j(n-1) \cdot p_j(n-1) \cdot p_{ji} \cdot r_{ji}}{p_i(n)}, \quad (2)$$

where p_{ji} are elements of matrix \mathbf{P} , r_{ji} are elements of matrix \mathbf{R} , $p_i(n)$ is probability that the process is in the moment n in the state i .

Average yield of the process (denoted \bar{v}_i), which ends in the state i at the time n with the probability $p(n)$, is determined according to the following relationship:

$$\bar{v}_i = \sum_{n=1}^{\infty} p_i(n) \cdot v_i(n) = \sum_{n=1}^{\infty} \sum_{j=1}^N v_j(n-1) \cdot p_j(n-1) \cdot p_{ji} \cdot r_{ji} \quad (3)$$

where $p_i(n)$ is probability that the process is in the moment n in the state i , $v_i(n)$ is the expected yield value of process which is after n transitions in a state i .

Data

The study is performed on the CEZ shares. We have daily closing prices at the Prague Stock Exchange for a ten years period from the beginning of 2006 to the end of 2015.

We define a state space according to paper Svoboda (2013), which shows that a convenient method for modelling a trend reversal is using cumulative daily share price changes. A cumulative share price change, denoted Y_t , is interpreted as short base indexes of daily closing prices, where the basic period is the day of a trend change, i.e. the transition from a decrease to a growth or vice versa. The duration of a trend is determined by the number of consecutive rising or falling closing prices. Y_t is calculated according to the following relations:

$$Y_t = Y_{t-1} \frac{P_t}{P_{t-1}} \text{ if } (P_{t-2} \leq P_{t-1} \leq P_t) \text{ or } (P_{t-2} \geq P_{t-1} \geq P_t)$$

$$Y_t = \frac{P_t}{P_{t-1}} \text{ otherwise} \tag{4}$$

where P_t is the daily closing price in the time t (price was increased by the dividend on the ex date). We define a state space on values Y_t . We use a set of eight states to sort out the data. The states when the share price decreases are denoted D_i , the states when the share price grows are denoted G_i . D_1 is the state with the lowest cumulative price decrease and the state D_4 is the state with the highest cumulative price decrease. G_1 is the state with the lowest cumulative price growth and G_4 is the state with the highest cumulative price growth. The width of the interval is equal to 0.02 which is approximately the size of a standard deviation (0.0184), during the reporting period. A state space is thus defined as follows:

$$D_4: Y_t < 0.9400 \qquad G_1: 1.000 \leq Y_t < 1.02$$

$$D_3: 0.940 \leq Y_t < 0.960 \qquad G_2: 1.020 \leq Y_t < 1.04$$

$$D_2: 0.960 \leq Y_t < 0.980 \qquad G_3: 1.040 \leq Y_t < 1.06$$

$$D_1: 0.980 \leq Y_t < 1.000 \qquad G_4: 1.060 \leq Y_t ,$$

The principle of assigning the states to particular days is shown in Table 1.

Table 1 Assigning the States to Particular Days

t	1	2	3	4	5	6	7	8	9
P_t	800	808	817	820	800	795	790	802	810
Y_t		1.010	1.021	1.025	0.976	0.970	0.963	1.015	1.025
state		G_1	G_2	G_2	D_2	D_2	D_2	G_1	G_2

Source: Authors, own calculation

Trading strategies

Trading strategies are made on the following principle. Gradually we combine all four levels of decrease with all four levels of increase. Thus, we will have 16 business strategies. Trading strategies are always realized according to the following rules. One trade (transaction) means the buying and subsequent selling of shares. If a buying or selling signal is generated one day, the trade is realized for the closing price from this day. The whole capital is always invested, transaction costs are not considered, after-tax dividends are reinvested, a short selling is not taken into account and two consecutive buyings are not possible. The value of the invested capital is calculated according to the following equation:

$$C_n = C_0 \prod_{i=1}^n \frac{S_i + D_i}{B_i} \tag{5}$$

where $C_0 = 1.000$ is initial capital value, C_n is capital value after the n_{th} transaction, S_i is selling price in the i_{th} transaction, D_i are dividends after tax in case that during the i_{th} transaction there was a record day, B_i is buying price in the i_{th} transaction.

3 Results and Discussion

Computational algorithms are created in VBA for Excel. The first step was assigning states to particular trading days (the principle is shown in Table 1) and then we

calculated the transition probability matrix. Transition probabilities are shown in Table 2. The discovered probabilities are displayed only with three decimals, therefore the probabilities sum does not have to equal 1 precisely. Direct transitions among some states are impossible and in these impossible transitions there is null without decimals. The last column gives the frequency of each state.

Table 2 Transition Probabilities

	D₄	D₃	D₂	D₁	G₁	G₂	G₃	G₄	n
D₄	0.381	0	0	0	0.238	0.286	0.048	0.048	84
D₃	0.286	0.210	0	0	0.352	0.114	0.038	0.000	105
D₂	0.044	0.167	0.298	0	0.415	0.064	0.009	0.003	342
D₁	0.003	0.020	0.207	0.280	0.435	0.051	0.001	0.003	690
G₁	0.001	0.010	0.060	0.385	0.301	0.214	0.024	0.006	715
G₂	0.003	0.003	0.078	0.401	0	0.285	0.183	0.047	344
G₃	0.008	0.016	0.065	0.423	0	0	0.252	0.236	123
G₄	0.019	0.019	0.192	0.308	0	0	0	0.462	104

Source: Authors, own calculation

Elements of matrix **R** are determined from average values in which the inputs and outputs from individual states occur. For example (in Table 1) the value 1.021 ($t = 3$) and 1.025 ($t = 9$) are inputs to the state G_2 , value 1.025 ($t = 4$) is output from the state G_2 . The value 0.976 ($t = 5$) is input to the state D_2 , the value 0.963 ($t = 7$) is output. The calculated average values of inputs into particular states and outputs from each state can be seen in Table 3.

Table 3 Average Values of Inputs to States and Outputs from States

state	input	output	state	input	output
D₄	0.9234	0.9083	G₄	1.0760	1.0958
D₃	0.9526	0.9509	G₃	1.0476	1.0493
D₂	0.9731	0.9707	G₂	1.0271	1.0293
D₁	0.9919	0.9898	G₁	1.0082	1.0106

Source: Authors, own calculation

Elements of matrix **R** are calculated from the output values in Table 3. The change of downtrend, it means transition from D_j states to G_i states, is evaluated by output value G_i . The change of uptrend, transition from G_j states to D_i states, is evaluated by output value D_i . Transitions in growing trend are evaluated by ratio G_j/G_i ($j>i$) and transitions in downtrend are evaluated by ratio D_j/D_i ($j>i$). Since it is calculated with output value, the diagonal elements of matrix **R** are only one. Transitions that cannot occur are evaluated by null. Elements of matrix **R** can be seen in the Table 4.

Table 4 Evaluation of Transitions

	D₄	D₃	D₂	D₁	G₁	G₂	G₃	G₄
D₄	1	0	0	0	1.0106	1.0293	1.0493	1.0958
D₃	0.9552	1	0	0	1.0106	1.0293	1.0493	1.0958
D₂	0.9357	0.9796	1	0	1.0106	1.0293	1.0493	1.0958
D₁	0.9177	0.9607	0.9807	1	1.0106	1.0293	1.0493	1.0958
G₁	0.9083	0.9509	0.9707	0.9898	1	1.0185	1.0383	1.0843
G₂	0.9083	0.9509	0.9707	0.9898	0	1	1.0194	1.0646
G₃	0.9083	0.9509	0.9707	0.9898	0	0	1	1.0443
G₄	0.9083	0.9509	0.9707	0.9898	0	0	0	1

Source: Authors, own calculation

The average theoretical yield of one transaction for each business strategy is calculated from the values of **R** and **P** matrices using formulas (1), (2) and (3). Because the business transaction is terminated by generating a sell signal, matrix **P** was modified. The probabilities of transition from the state which generates sell signals are equal to null.

Table 5 illustrates the calculation procedure for the trading strategy D_2-G_2 (buy in the state D_2 at the moment $n = 0$ and sell in the first occurrence of the state G_2). The column $p(n)$ indicates the probability that shares will be held in time n . The column $p(G_2)$ indicates the probability that shares will be sold just in time. Columns $v_i(n)$ indicate the mean value of the yield of the transaction, which in time n is in the state i .

Table 5 Calculating the Average Yield of Transactions for Strategy D_2-G_2 - Illustration

n	$p(n)$	$p(G_2)$	$v_i(n)$							
			D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4
1	1.000	0.064	0.9357	0.9796	1.0000	x	1.0106	1.0293	1.0493	1.0958
2	0.936	0.140	0.9356	0.9788	0.9963	1.0016	1.0047	1.0205	1.0373	1.0789
3	0.796	0.116	0.9349	0.9750	0.9877	0.9991	1.0011	1.0110	1.0288	1.0698
4	0.680	0.094	0.9326	0.9682	0.9832	0.9969	0.9989	1.0088	1.0247	1.0658
5	0.586	0.078	0.9285	0.9634	0.9808	0.9950	0.9971	1.0082	1.0229	1.0639
...
T	0.009	0.001	0.8713	0.9087	0.9264	0.9400	0.9421	0.9535	0.9671	1.0065

Source: Authors, own calculation

The average theoretical yield of one transaction for strategy D_2-G_2 is calculated using a modified formula (3). The calculation is terminated at the moment when the condition $p(n) < 0.01$ is true.

$$\bar{v}_{D_2-G_2} = \frac{\sum_{n=1}^T p_{G_2}(n) \cdot v_{G_2}(n)}{\sum_{n=1}^T p_{G_2}(n)} = 1.00551$$

Matrix \mathbf{R} is calculated from the output values. But buying and selling is realized with the values upon entering to the states. Therefore, the following corrections were made:

$$\bar{v}_{D_2-G_2}(\text{correction}) = \bar{v}_{D_2-G_2} \left(\frac{D_2(\text{output})}{D_2(\text{input})} \right) \left(\frac{G_2(\text{input})}{G_2(\text{output})} \right) = 1.00551 \cdot \frac{0,9707}{0,9731} \cdot \frac{1,0271}{1,0293} = 1,00085$$

Theoretical yields from one transaction for all strategies are given in the Table 6.

Table 6 Theoretical Yields from One Transaction

Trading strategies	G_1	G_2	G_3	G_4
D₁	0.99889	1.00082	1.00585	1.01127
D₂	0.99909	1.00085	1.00585	1.01128
D₃	1.00080	1.00226	1.00716	1.01256
D₄	1.00854	1.00964	1.01465	1.01971

Source: Authors, own calculation

The best strategy should be based on theoretical results in Table 6, where the buying is carried out after a big drop and selling after a strong growth. On the other side, these states have a lower frequency; it is possible that greater profits are achieved on strategies with a lower yield, but with more frequent occurrence. The profitability of the strategies is shown in Table 7, in which the empirical and theoretical yields are compared. For each trading strategy the overall empirical yield, the number of realized transactions N and recalculated theoretical yield for the number of transactions are determined. Let's add the information that with passive holding of shares (strategy Buy and Hold) the value of capital would be 0.869 (dividends are calculated).

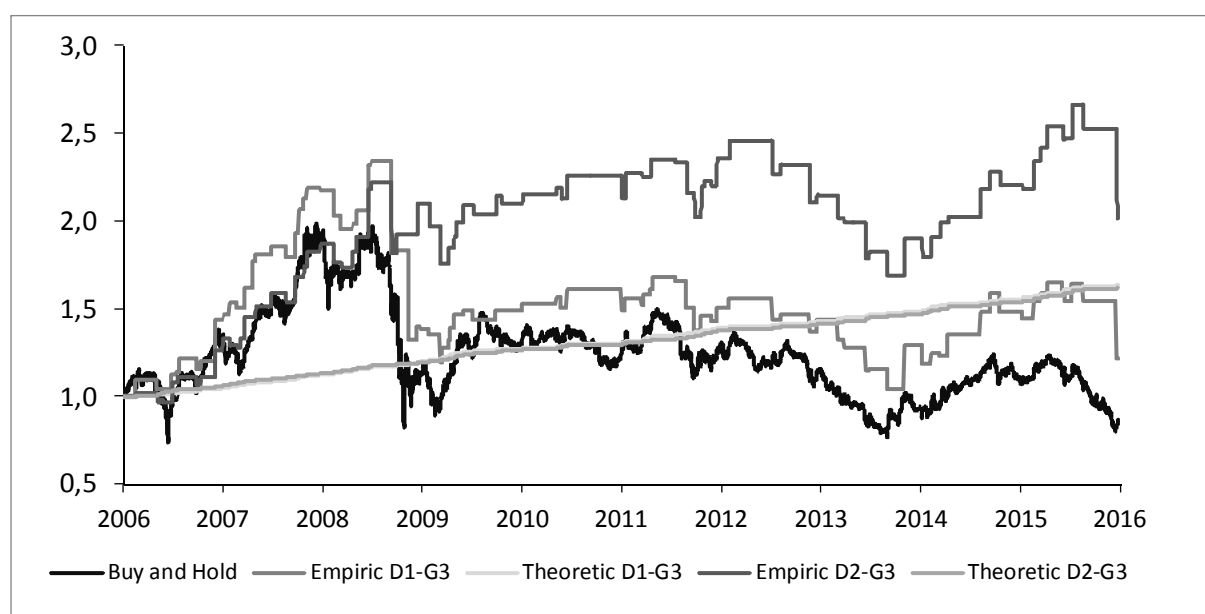
Table 7 Empirical and Theoretical Yields (Value of Capital)

buy	sell	G ₁		G ₂		G ₃		G ₄	
		C _n	N	C _n	N	C _n	N	C _n	N
D ₁	empiric	0.710	440	1.101	212	1.215	85	1.206	45
	theoretic	0.613		1.190		1.641		1.656	
D ₂	empiric	1.592	214	2.567	160	2.017	83	1.314	47
	theoretic	0.824		1.145		1.623		1.694	
D ₃	empiric	1.101	70	1.269	70	2.085	54	0.814	32
	theoretic	1.057		1.171		1.470		1.491	
D ₄	empiric	1.634	40	1.438	43	2.238	36	0.868	27
	theoretic	1.405		1.511		1.688		1.694	

Source: Authors, own calculation

The results presented in Table 7 show that most trading strategies beat the strategy Buy and Hold. The theoretical and empirical yields are similar in some cases, for example strategies D₁-G₁, D₁-G₂, D₃-G₁, in other cases they are very different, for example the strategies D₂-G₂, D₄-G₄, D₂-G₁.

To get a more complexed perspective of behavior of analyzed trading strategies, we will also demonstrate the development of theoretical and empirical yields in time which is shown in Figure 1. To make it clearer, there were chosen only two strategies D₁-G₃, D₂-G₃ and the strategy Buy and Hold for comparing.

Figure 1 Development of Yields

Source: Authors

4 Conclusions

The goal of this study was to compare empirical and theoretical yields of algorithmic systems which use MC analysis. On the basis of discovered results it can be stated that empirical results cannot be estimated in advance. In some cases empirical and theoretical results were nearly the same, in other cases they differed significantly. There can be a big number of reasons why theoretical and empirical results are different. We will name at least some of them:

- High and changing volatility of CEZ shares, as can be seen in Figure 1 in the strategy Buy and Hold.
- Inconveniently defined state space, especially the states D₄ and G₄, when the lowest value achieved in the state D₄ is 0.77 and the highest value in the state G₄

is 1.5. If we held shares in these states, we could realize a loss of over 20% or 50% profit in a single transaction.

- Unsuitable trading strategy. It is possible that the yields would be better predictable by modification of the trading strategy, for example by adding stop loss instruction.

In the following research we will focus on modified trading strategies, differently defined state space and on the analysis why theoretical and empirical yields are different.

Acknowledgments

The research project was supported by the grant no. GA15-20405S of the Grant Agency, Prague, Czech Republic

References

Brock, W., Lakonishok, J., LeBaron, B. (1992). *Simple Technical Trading Rules and The Stochastic Properties of Stock Returns*. Journal of Finance, vol. 47(5), pp.1731 – 1764.

Fama, E. (1965). *The Behavior of Stock Market Prices*. The Journal of Business, vol. 38(1), pp.34 - 105.

Fama, E. (1970). *Efficient Capital Markets: a Review of Theory and Empirical Work*. The Journal of Finance, 25(2), pp. 383-417.

Fama, E., Blume, M. (1966). *Filter Rules and Stock-Market Trading*, The Journal of Business, vol. 39(1), pp. 226-241.

Hillier, F. S., Lieberman, G. J. (1986). *Introduction to Operations Research*, 4th ed. New York: McGraw-Hill Publishing Company.

Jensen, M. C., Benington, G. A. (1970). *Random walks and technical theories: some additional evidence*. The Journal of Finance, vol. 25(2), pp. 469–482.

Murphy, J. (1999). *Technical analysis of the Financial markets*, 1st ed. New York: Penguin Group.

Rejnuš, O. (2011). *Finanční trhy*, 3rd ed. Ostrava: Key Publishing.

Svoboda, M.(2013). *Stock market modelling using Markov chain analysis*. In Proceedings of the 11th International Conference Liberec Economic Forum 2013. Liberec: Technical University of Liberec pp. 551-557.

Sweeny, R. J. (1988). *Some new filter rule tests: methods and results*. Journal of Financial and Quantitative Analysis, vol. 23(3), pp. 285–300.

Comparison of Building Savings Banks on the Czech Market

Libuše Svobodová¹, Martina Hedvičáková²

¹ University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: libuse.svobodova@uhk.cz

² University of Hradec Králové
Faculty of Informatics and Management, Department of Economics
Rokitanského 62, 500 03 Hradec Králové, Czech Republic
E-mail: martina.hedvicakova@uhk.cz

Abstract: *The paper is focused on the specialized financial product on savings and also on the second most used product in the field of own housing financing in the Czech Republic, building savings. These products provides five specialized banks on the Czech market. The aim of the paper is to analyze the situation on the financial market focused on the building savings in years 2014 and 2015. The organization of the paper is as follows. Firstly a theoretical background with a review of the literature is provided, then research methodology is described, the key part brings comparison of the share of individual building societies, market share by volume of loans, according to the proportion of the total amount of deposits and according of profit of building societies. The next part will be devoted to comparison of individual financial institutions in case of savings. Českomoravská stavební spořitelna was on the basis of the results classified as the main player on the market. The article is based on primary and secondary sources. A detailed research together with the analysis and critical assessment of accessible materials will enable to identify the main objectives in the field of study. The analysis of the initial state will consequently enable to identify the key factors and knowledge.*

Keywords: building savings, comparison, deposits, financial market, profitability

JEL codes: G21, G24

1 Introduction

Building savings schemes have been present on the Czech market for more than 20 years and have managed to establish a firm position on the financial market since then. The first building savings schemes were based on the principle of collective funding and subsequent drawing on one's own and other participant's funds. (Lukáš, Kielar, 2014). The fundamental idea has been maintained until nowadays.

Consumers mainly consider the profitability and risk level of their investment. Building saving is considered a very safe product owing to governmental regulation of the deposit flow and due to state subsidies. However, low risk level also involves a relatively low profitability. This combination is especially popular among conservative investors who wish to maintain the same rate of return every year or every month. How people spend their money depends on their current amount of funds available, which may also be influenced by other economic indicators.

Even though building saving is considered a conservative product, it is still being utilized by millions of citizens not only in the Czech Republic but also in Europe and worldwide. The results of the study (Top building savings executives in Prague once again) shows the situation of deposits and loans in building savings banks in selected countries. Unfortunately, annual report for 2015 from European Federation of Building Societies is not yet available. In the last report (Top building savings executives in Prague once again) was presented that the Czech Republic is a standard building savings country. On the first position was evaluated with the highest amount Germany. Deposits were €160,2 bn. and loans €121,1 bn. Germany was followed by Austria with €20,7 bn. deposits and €19 bn. loans and by Czech Republic with €14,9 bn. deposits and €9 bn. loans. The smaller amounts are in Slovakia, Hungary, Romania and Croatia.

The last few years, however, indicate a decrease in clients' interest. This decline may be attributed to changes in legislation concerning the provision of state support or interest taxation. On the basis of the Annual report 2014 (EFBS) is evaluated country comparison of savings rates of private households (as % of disposable income). In 2014, the highest savings rate in Europe was seen in Luxembourg (17.7%). Switzerland had the next highest (17.1%), ahead of Sweden (15.9%). In the comparison with countries from Visegrad group is the Czech Republic placed on the second position with 5.3%. In Hungary is the saving rate 7.4%, in Slovakia 3.2% and Poland is the only one country with the minus saving rate -3.4%. In Germany is saving rate 9.2% and in Austria 7.5%.

At present, we are facing a constantly growing tendency of almost all people wishing to live in their private-owned flats or houses. Young people prefer rather bigger towns for studies and subsequent work, where they create especially but not only housing conditions for setting up their families. Contrariwise, older generation may prefer a calmer way of life and thus tend to move into their own houses in calmer areas. Although the real estate prices are on a constant rise, interest rates keep decreasing. This makes them better attainable also for risky debtor groups (lower income, unstable repayment etc.), (Financial stability report 2014/2015).

However, building up a new house or buying an older house or flat requires a high amount of money, easily achieving the level of several million Czech crowns, representing amounts that a normal citizen does not dispose of immediately. Therefore, mortgage credits or building saving credits or bridging loans are utilized. Decisive factors for consumers are the following: interest rate level, instant of time (when they will need the money or how long they plan to pay back) and what credit repayments they can regularly make. Also those factors are the reasons for the topic of the paper when the authors focused on the analysis of the current situation on the building savings market in 2014 and 2015.

The fundamental legal regulation for providing building savings schemes, operating building savings societies and for defining product parameters is Act No. 96/1993 Coll., on Building Savings Schemes and State Support for Building Savings Schemes and on the Amendment of Czech National Council Act No. 586/1992 Coll., on Income Taxes, as amended by Czech National Council Act No. 35/1993 Coll., as amended. Act No. 21/1992 Coll., on Banks is another act regulating the operation of building savings societies, especially in areas non-regulated by the Building Savings Schemes Act because the legal regulation is identical both for banks and for building savings societies.

Soukal and Münsterová (2015) dedicated themselves to the new legal regulation of the Civil Code and modelled the situation in a selected building saving society. Dušek and Jánský (2012) provided an evaluation of state subsidies of building savings schemes, focussing on the impact on savings and income inequality. Further statistics are available for instance on the website of European Federation of Building Societies (EFBS). On the comparison of banking systems in the countries of former Yugoslavia and in the Czech Republic focused in the paper Černohorská and Filip (2014).

2 Methodology and Data

The goal of the paper is to analyse the current situation on the building savings market in 2014 and 2015. The key part brings comparison of the share of individual building societies, market share by volume of loans, according to the proportion of the total amount of deposits and according of profit of building societies. The next part will be devoted to comparison of individual financial institutions in case of savings. Some data indicate 2014 as the final period because by the time this work was being composed the building savings societies' annual reports for 2015 were not yet available. However, where certain up-to-date data was available for 2015, they are specified in the paper.

While composing this article, especially secondary sources from the various home savings societies but also official statistics by the Ministry of Finance were used. Information was also obtained from expert press, conferences, seminars and other sources. The obtained

data were further sorted, processed in custom tables, clearly set-out diagrams, and further analysed to provide a basic overview of the relevant problem area.

3 Results and Discussion

Association of Czech Building Savings Banks and members

Association of Czech Building Savings Banks was founded in 2000. Its fundamental purpose is to support and protect building savings banks on the Czech market. These should be stable and give consumers confidence in the entire system. Even before the foundation of the association, representatives of the various building savings societies informally agreed to pursue their common interests in the area of housing financing. From its foundation on, the Association consisted of six members, but in 2008 two of them (Raiffeisen and Hypo) merged. Therefore, there are currently only five association members:

- Českomoravská stavební spořitelna, a. s. (ČMSS)
- Stavební spořitelna České spořitelny, a. s. (SSČS)
- Modrá pyramida stavební spořitelna, a.s. (MPSS)
- Raiffeisen stavební spořitelna a.s. (RSTS)

Wüstenrot – stavební spořitelna a.s. (WÜST)

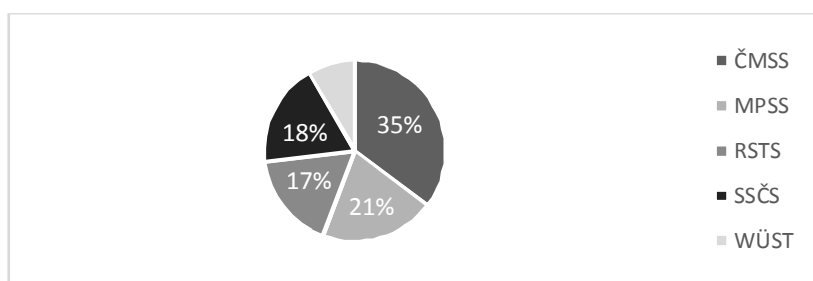
These institutions are at the same time members of the European Association of Building Savings Societies, Czech Banking Association and International Union for Housing Finance, a global organization uniting all institutions involved in housing financing.

Results and development of the Czech building savings societies

The next charts outlines the market positions of the various building savings societies. Building savings societies may be represented in either category - number of new concluded contracts, volume of new contracted target amount, number of credit contracts, volume of credits provided, profit and others. In the article will be provided selected categories due the limit of length of the paper. Totally 458 566 new contracts were concluded in 2015. These are both completely new concluded contracts and target amount increases. There were provided 75 029 new loans with 45.8 billion CZK in 2015. The average loan lent is 610,000 CZK and average savings are 110,000 CZK. At year end building savings banks had 3 503 349 savings contracts and 695 349 loan contracts. (Building savings in 2015)

In the figure 1 there is presented total amount of balance sheets. The highest amount of assets has Českomoravská stavební spořitelna followed by Modrá pyramida stavební spořitelna, Raiffeisen stavební spořitelna and Stavební spořitelna České spořitelny. The smallest one is Wüstenrot – stavební spořitelna.

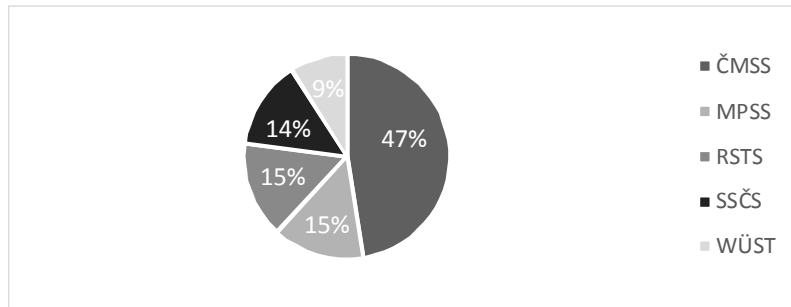
Figure 1 Balance Sheet Total in 2015



Source: Economic results of building societies

Next figure 2 presents the issued loans in all building societies in 2015. Leader of the market is Českomoravská stavební spořitelna with 47% followed by three close competitors Modrá pyramida stavební spořitelna, Raiffeisen stavební spořitelna and Stavební spořitelna České spořitelny. The smallest amount of issued loans had Wüstenrot – stavební spořitelna.

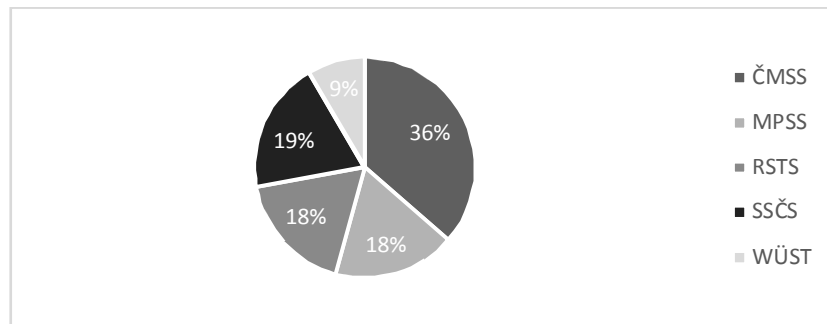
Figure 2 Issued Loans in 2015



Source: Economic results of building societies

Figure 3 presents the clients' savings in 2015. Leader of the market is again Českomoravská stavební spořitelna with 36% followed again by three close competitors Modrá pyramida stavební spořitelna, Raiffeisen stavební spořitelna and Stavební spořitelna České spořitelny. The smallest amount of clients' savings had.

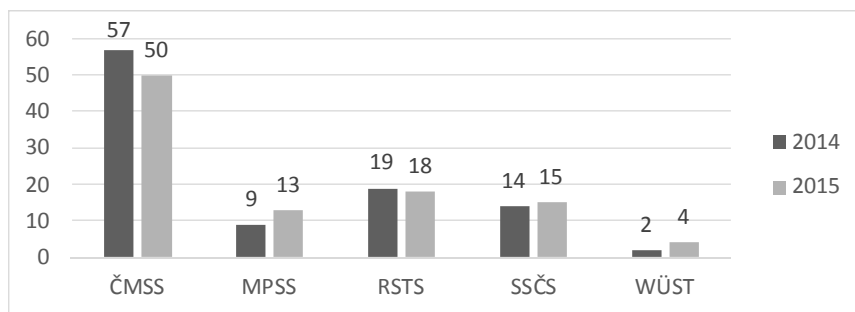
Figure 3 Clients' Savings in 2015



Source: Economic results of building societies

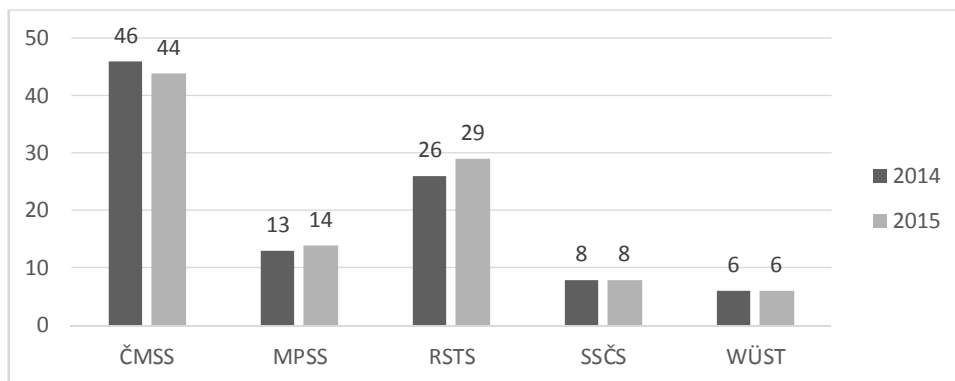
Next figures 4 and 5 presents market shares by volume of new loans and new savings contacts in years 2014 and 2015. From the graphs is evident the similar trend as in the previous three presented above. The leader on the market is again Českomoravská stavební spořitelna followed by Raiffeisen stavební spořitelna. Stavební spořitelna České spořitelny got more new loans than Modrá pyramida stavební spořitelna. In new savings contracts was the situation opposite, Modrá pyramida stavební spořitelna had more new savings contract than Stavební spořitelna České spořitelny. The situation of the savings will be compared in the next part of presented article. On the last position is still Wüstenrot – stavební spořitelna. There were done some changes in percentages in the analysed two years, but they were not significant.

Figure 4 Market Shares by Volume of New Loans, in %



Source: Business results of building societies

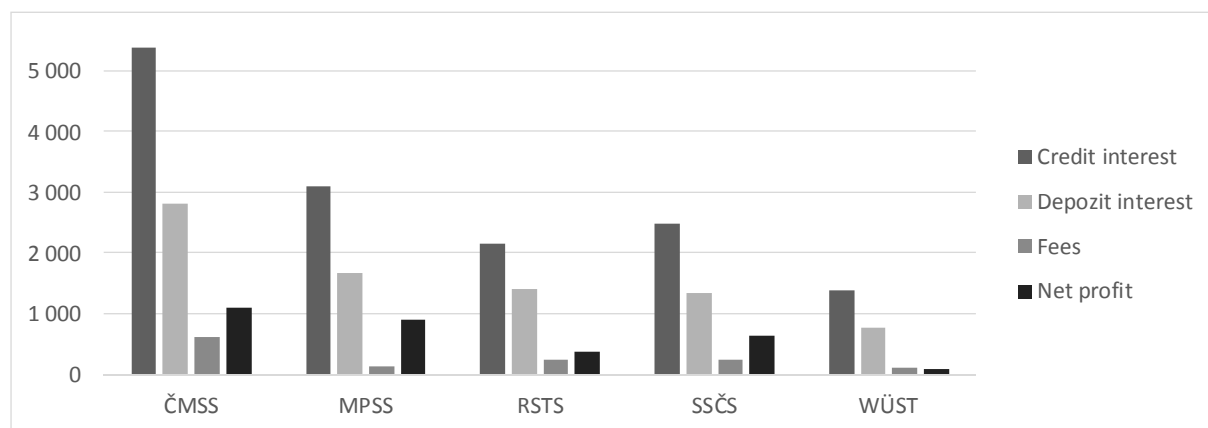
Figure 5 Market Shares by Volume of New Savings Contracts, in %



Source: Business results of building societies

Compared to banking institutions, building savings societies reach lower profits, mainly due to the fact that they only provide one single product and that their investment possibilities are subject to legal regulation. Their revenues mainly come from building savings credit interests and fees. Costs, on the other hand, include paid-out deposit interests. The amount of credit interests (revenue interests), deposit interests (expenditure interests), fees and profit is outlined in Figure 6.

Figure 6 Cost and Revenue Interests, Fees and Net Profit for 2015



Source: Economic results of building societies

As obvious from this chart, Českomoravská stavební spořitelna achieves the highest volume of revenue interests. It also reaches the highest net interest revenue amounting to CZK 2,574,799 thousand. The value is higher than it the previous year. Credit interest is 5,393,597 thousand CZK and deposit interest is 2,818,795 CZK. The value of net income from fees and commissions is 618,342 thousand CZK. Net profit gained ČMSS 1,103,909 thousand CZK. (Annual report of ČMSS, 2015) Comparing net interest revenue and fees for these two services (i.e. saving and credit stages) makes obvious that Modrá pyramida charges the lowest fees. The highest service fees, on the other hand, are charged by Raiffeisen. But this comparative evaluation may be slightly misleading.

Fincentrum runs an annual public inquiry called Bank of the Year, evaluating all banking institutions including building savings societies. Wüstenrot - stavební spořitelna has won in this inquiry for a fifth time in a row. In 2015, Českomoravská stavební spořitelna gained second position and Stavební spořitelna České spořitelny landed on the third place. This category is evaluated by around 70 financial experts while no one of them must be an employee of the evaluated institutions. Their task is to select the most attractive offer of services and products of the relevant building savings society and then make up a ranking list of them. As obvious from the charts above, expert evaluation

does not correspond with clients' requirements. The Building Savings Society of the year only has a marginal share of the total numbers of new clients or credits provided.

Comparison of financial institutions products in case of new savings contracts

The next part will be devoted to actual offer of financial products in the field of building savings contracts. For calculation was used web portal <http://www.stavebky.cz/>. The calculation was done in the last week of May 2016. In the calculations was calculated with the best option for state support. It means input each month 1,700 CZK. Saver will get thanks to the highest possible state support 20,000 CZK per year. It is expected that savings time will be 6 years. In table 1 there are evaluated all products that are nowadays possible to use in the Czech Republic. The calculation of earnings includes state support, all fees and taxes and everything is calculated using the same methodology.

Table 1 Comparison of New Savings Contracts and Profitability

Name of product	Earnings	Total in savings (CZK)
MPSS Mopísek, Spoření třetího věku	3.69%	136,813
WÜST ProSpoření OF-S + Kamarád + Kamarád+	3.52%	136,096
MPSS Mopy Junior	3.49%	135,992
SSČS Standard online	3.41%	135,641
ČMSS MULTI	3.34%	135,351
RSTS S 151 online	3.34%	135,346
WÜST ProSpoření OF-S online	3.32%	135,284
MPSS Moudré spoření	3.30%	145,171
SSČS Standard	3.15%	134,590
RSTS S 151	3.14%	134,534
WÜST ProSpoření OF-S	3.13%	134,471
ČMSS Garant 15	3.08%	134,272
RSTS U 152	2.70%	132,749
WÜST ProÚvěr OY-U + OZ-U	2.69%	132,688
RSTS U 153	2.35%	131,338

Source: Summary of tariffs for savings

From the results is evident that between the best option and the last one is difference 5,475 CZK. On the first positions are placed products for children, for people 55+ and for products founded online. The first position for the "normal" product occupied product of Českomoravská stavební spořitelna MULTI. There is the highest interest rate in this product 1.3%, contract processing fee is calculated 1% of the target amount, up to 15,000 CZK, account management fee is annually 330 CZK and there is no fee for statement account. 1% interest rate is nowadays in products SSČS Standard, RSTS S 151, WÜST ProSpoření, ČMSS Garant. The lowest rate is in the product RSTS U 153. In the name of this product U means credit. All others have the interest rate 0.5%. Fees for management of account are ranged from 310 to 330 CZK per year. The statement account is ranged from free to 30 CZK for sending.

In the calculations depends also on the server that is used for calculations. For example server <http://www.penize.cz/srovnani/stavebni-sporeni> has also own calculations. There are only selected products. There are missing products named online and products for children. On the other hand the highest ranked product is again ČMSS MULTI. The total savings will be after 6 years CZK 137,022. The second product is SSČS Standard with CZK 136,068, RSTS S 151 with CZK 136,007, WÜST ProSpoření with CZK 135,982, ČMSS Garant with CZK 135,946, MPSS Moudré spoření with CZK 134,353 and other. The lowest savings will be gained again by the product RSTS U 153 with the value 132,829 CZK.

4 Conclusions

Some participants use building saving schemes only to valorize their deposits, some use it for borrowing funds and some combine both phases of the building savings scheme. Saving products currently present on the market similar or smaller interest rates as those offered by building savings societies. One of the benefits of saving accounts is that they charge very little or no fees at all and they can be utilized immediately - they are highly liquid. Contrariwise, building savings societies charge fees not only for keeping an account but often also an "entrance" fee. If they lowered their fees, they would most probably gain new clients. The greatest benefit of building savings schemes is the possibility to obtain state support. The highest amount is 2.000 CZK per year. In future, building savings schemes might become more convenient as compared to other saving products or mortgages. This situation already occurred between 2008 and 2010.

In 2015 Českomoravská stavební spořitelna gained 36 percent of new savings contracts in saving phase out of the entire market, and almost a half of the market in credit contracts provided 47 percent. Českomoravská stavební spořitelna tries to be loyal to their clients who previously entered into a building savings contract and therefore offers them beneficial conditions for credits on condition of previous saving. Českomoravská stavební spořitelna gained the highest profit. On the last position is evaluated Wüstenrot stavební spořitelna. Next three institutions have similar number of deposits and credits. The highest net profit gained Českomoravská stavební spořitelna with 1,104 bill. CZK, on the second position is Modrá pyramida with 915 bill. CZK, Stavební spořitelna České spořitelny 648 bill. CZK and Raiffeisen stavební spořitelna with 392 bill. CZK. Wüstenrot stavební spořitelna gained only 93 bill. CZK. Most clients concluded new contracts with Českomoravská stavební spořitelna. As reported in their annual report, the most attractive product was the Multi Tariff, which currently provides deposit valorisation by up to 1 percent (excluding state subsidy), which is the highest rate in the building savings market. On the next positions are with similar results Modrá pyramida stavební spořitelna, Raiffeisen stavební spořitelna and Stavební spořitelna Česká spořitelny. Wüstenrot occupy the last position in all monitored indicators (instead of interest rate). The lowest rate is in new contracts at all – merely 0.5%. Next monitored indicator can be eg. time for conclusion, release, transfer money, therefore, according to the experience of other clients of the financial institution and other intangible indicators. Interest rates on bridging loans or from ordinary saving loans can be further crucial point in the selection of a financial institution. Loans from building societies are not primarily intended for the financing of new housing (substitute mortgage loan) because of the higher interest rate. It should be used for reconstruction or funding up a new household equipment. In this field it achieves very favorable interest rates compared to consumer loans. This trend is confirmed also by the fact that the average loan amount from building societies was 610 thousand. CZK in 2015.

Questions for discussion are for example whether the low interest rates on the financial market will be the motive for utilization of products from building societies? The mortgages have in the last years significantly lower interest rates than the loans from building societies. Will be those products more used for deposits and for smaller loans? Will the interest rates still fall or will they increase as to motive to utilize it for more deposits. The next issue for discussion can be the legal regulation connected with the small children and their contracts at the end when the court must be done and it have be shown that the money were used for children.

Acknowledgments

This paper is written with financial support from Internal grant project from Faculty of Informatics and Management at the University of Hradec Králové.

References

Černohorská, L., Filip, H. (2014). Comparison of banking systems in the countries of former Yugoslavia and in the Czech Republic. *Scientific papers of the University of Pardubice*. vol 21 (30), pp. 17-28.

Dušek, L., Jánký, P. (2012). Evaluation of government subsidies to building savings: impact on savings and income inequality. *Ekonomický časopis*. vol. 10, pp. 991-1004.

Lukáš, V., Kielar, P. (2014). *Stavební spoření a stavební spořitelny*. 2nd ed. Prague: Ekopress.

Soukal, I., Münsterová, M. (2015). Building savings development in recent years and the impact of the new civil code, In. *Proceedings International Conference Hradec Economic Days 2015*, pp. 115-122.

Act No. 21/1992 Coll., on Banks.

Act No. 96/1993 Coll., on Building Savings Schemes and State Support for Building Savings Schemes.

Act No. 586/1992 Coll., on Income Taxes.

Annual reports Building Societies 2014 and 2015.

Basic indicators of the development of building savings in the Czech Republic. Retrieved from: <http://www.mfcr.cz/cs/soukromy-sektor/stavebni-sporeni/vyvoj-stavebniho-sporeni>.

Building savings in 2015. Association of Czech Building Savings Bank. Retrieved from: <http://www.acss.cz/en/news/building-savings-in-2015/>.

Business results of building societies. Retrieved from: <http://www.stavebky.cz/obchodni-vysledky-stavebnich-sporitelen/>.

Economic results of building societies. Retrieved from: <http://www.stavebky.cz/ekonomicke-ukazatele-stavebnich-sporitelen/>.

European Federation of Building Societies. Annual reports. Retrieved from: <http://www.efbs.org/index.php?id=90&L=1>.

Financial stability report 2014/2015, CNB. Retrieved from: https://www.cnb.cz/en/financial_stability/fs_reports/index.html.

Fincentrum, Bank of the year. Retrieved from: <http://www.bankaroku.cz/>.

Summary of tariffs for savings. Retrieved from: <http://www.stavebky.cz/stavebni-sporeni-sporici-tarify/>.

Top building savings executives in Prague once again. Retrieved from: <http://www.acss.cz/en/news/top-building-savings-executives-in-prague-once-again/>.

Co-operative Banks in Poland, Current Issues

Łukasz Szewczyk

University of Economics
Faculty of Finance and Insurance, Department of Banking and Financial Markets
1 Maja Street No. 50, 40-287 Katowice, Poland
E-mail: lukasz.szewczyk@ue.katowice.pl

Abstract: *The aim of this study is to present current problems that co-operative banks in Poland have to face. These banks play an important role in Polish financial system but they are seen as weak and vulnerable to changes (especially connected with new regulations). It is discussed if new capital requirement regulations and directive CRR/CRD IV will have an impact on capital position of these banks in a long period of time. It is also important that in 2015 one co-operative bank collapsed and it has been the first bankruptcy in Polish banking sector since 2001. This shows that co-operative banking sector should be assessed in terms of capital adequacy and other issues. The main problem that will be discussed in this paper is connected with the adjustment of co-operative banks in Poland to the new market conditions. Capital position and efficiency of these banks will be presented through various figures and ratios. It will also be discussed what are the main barriers for development of these banks. A main research method used in this paper is critical analysis of literature connected with the subject and reports issued by different institutions (e.g. Financial Supervisory Authority). Results of the research will help to understand current problems of co-operative banking sector in Poland in a better way.*

Keywords: co-operative banks, global financial crisis, financial system

JEL codes: G21

1 Introduction

Co-operative banks play an important role in the Polish banking system. They are responsible for financing the agriculture and rural development in a great extent because they are present mainly in rural areas and smaller cities. It is important to say that they are seen as rather weak and vulnerable, especially in terms of capital and efficiency issues. It has been discussed for several years if new capital requirements introduced during global financial crisis will have any impact on this sector. On the other hand, it can be seen that co-operative banks handled the global crisis very well. It is the result of their business models. They are concentrated on classical banking operations (accepting deposits and lending money to their clients).

The aim of this study is to show how does the sector of co-operative banks function in Poland. This issue will be presented through various financial indicators (e.g. efficiency, capital ones). It may help to understand what problems do they have to face nowadays and what are the challenges for them in the future.

2 Methodology and Data

The problem of functioning of the co-operative banking sector in Poland is very broad. The analysis will be done through critical look at the literature connected with this subject and presentation of different ratios that can assess co-operative banks. Among them are figures showing co-operative banks' market share in terms of total assets, loans and deposits, efficiency indicators (ROA, ROE, cost to income ratio) and capital adequacy indicators. Data mainly come from Financial Supervisory Authority (Komisja Nadzoru Finansowego).

3 Results and Discussion

This chapter covers selected aspects on co-operative banking sector functioning from both European and Polish perspective. It is important to say that these banks play significant role in Poland and during global financial crisis much attention has been paid to them, especially because they can be seen as very stable and resistant to financial shocks.

Co-operative banks as a part of banking system

The history of many co-operative banks can be trace back to the financial exclusion faced by many communities in nineteenth century Europe. With the industrial revolution in full swing, the emerging financial services sector was primarily focused on wealthy individuals and large enterprises in urban areas. The rural population, in particular farmers, small businesses and communities they supported, were effectively excluded from financial services. Most co-operative banks were established following the ideas of Hermann Schulze and Wilhelm Raiffeisen. Independently from each other, they started to promote the idea of credit co-operatives, with Schulz focusing on helping small business owners and artisans in urban areas and Raiffeisen seeking to assist the rural poor (Rabobank, 2009, p.15).

The market environment has altered dramatically for co-operative banks over the years. Quite a few co-operatively organised banks did not or could not succeed, or now just live a marginal existence. Many countries never had a co-operative sector of any significance, because the co-operative ideas did not find very fertile soil. In other countries, co-operative banks chose to be acquired by other banks or to transform themselves into private banks. This was the case in Denmark, Sweden, the U.K. and Belgium. In Sweden, the Föreningsbank network was taken over by the savings bank network, while in Belgium the legal structure of co-operative banks CERA (now part of the KBC group) and BACOB (now part of the Dexia group) was changed in such a way that they are no longer classified as co-operative banks. In the UK, a number of building societies have converted into public, quoted companies in order to expand their activities (Rabobank, 2009, p.16).

The key differentiators of co-operative banks in their home country can be divided into six main categories. They are presented in table 1.

Table 1 The Key Differentiators of Co-operative Banks

Specific corporate governance: membership ownership	Members, who are also customers, own the entire organisation and are able to influence its decision-making. Members have a more direct say in the local member bank's policy, for instance on the branch location, opening hours, services and sponsoring activities
Customers' interests first	Co-operative banks have an edge in portraying trustworthiness as they publicly state that they do not aim to maximise profits but rather to maximise customer value
High capitalisation, high rating and low funding costs	Co-operative banks barely distribute profit but add it to their reserves or the banks' own funds. Consequently, co-operative banks are some of the more highly capitalised institutions in Europe as a result of their unique model and ownership structure
Profit as a necessary condition	healthy profitability is an important necessary condition for co-operative banks to safeguard their continuity, to finance growth and credit, and to provide a buffer for inclement times
Conservative business model: focus on retail banking	Member ownership leads to a conservative business model, focused on sustainable retail banking. This leads to good liquidity and sound asset quality.

Source: (Rabobank, 2009)

Co-operative banks in Europe

European co-operative banks have long been an integral and well-established part of the European financial system. Cooperative banks operate with a full banking license and serve many non-members nowadays. In the early days, membership was compulsory in order to be eligible to obtain a loan from a local co-operative bank. Many co-operative banks abolished this requirement a long time ago. This was mainly due to fundamental changes in the economic structures of countries, i.e. from an agricultural to an industrial focus, increasing individualism and large innovations in payments services as well as the upcoming demand for mortgages due to increasing popularity of home ownership (Groeneveld, 2015, p.8).

Taking a global view, two distinct groups can be seen, the European co-operative banks and the global credit union movement, each represented by different trade bodies. The main differences between them are that in the credit unions customers have to be members, whereas the co-operative banks are also able to serve non-members. Key figures describing co-operative banks in Europe are presented in table 2.

Table 2 Key Figures in the European Co-operative Banking Sector (in 2010)

Members	50 millions
Assets	5 647 bln €
Deposits	3 107 bln €
Loans	3 305 bln €

Source: (International Labour Office, 2013)

After the crisis, two of Rabobank's researchers studied forty-five European banks. They compared the performance of co-operative banks in Europe with their investor-owned competitors on a crucial measure of bank stability called the Tier 1 ratio. They found that, while the market required Tier 1 ratios of 8 per cent, the co-operative banks nearly all had higher ratios than this. Their explanation was that the co-operative banks focused more on retail and added profits to reserves, while their competitors were more diversified and had to distribute profits to their shareholders. The study showed that the average Tier 1 between 2002 and 2007 was 9.2 per cent for the co-operative banks compared to 8.4 per cent for the investor-owned banks, so that they went into the crisis with a strong capital base which they subsequently strengthened. During 2008, Raiffeisen, Rabobank and Pohjola Banks all had over 12 per cent Tier 1, while others strengthened theirs to over 8 per cent (International Labour Office, 2013, p. 23).

By April 2009, the ratings for co-operative banks were all still good at A upward, with Rabobank taking the prize as one of the world's strongest banks with an AAA rating. Profitability was lower than for the investor-owned banks, because of the co-operative banks having a higher capital core and lower leverage, which makes them less risky. The study showed that from 2002 to 2008 co-operative banks had a return on equity of 9.3 per cent compared to the investor-owned banks that had a return of 13.4 per cent (International Labour Office, 2013, p. 23).

In Spain, co-operative banks have been damaged more by the wider economic crisis that was triggered by the banking crisis. Going into the crisis they limited their exposure to the real estate and construction sectors, and during it were better at getting loans repaid than the other banks. At the end of 2009 their non-performing loan rates were much lower those of their competitors. This may have to do with the kind of relationship the co-operatives have with their borrowers. Their ability to screen potential borrowers and monitor their progress in paying off a loan are distinct informational advantages that are more apparent in an economic downturn (International Labour Office, 2013, p. 27). Effects of global financial crisis on co-operative banking sector are presented in table 3.

Table 3 Key Figures in the European Co-operative Banking Sector (2007-2010)

Years	Assets (bln €)	Market share of deposits (%)	Market share of loans (%)	Number of clients (mln)
2007	5 150,2	21,0	18,0	158,8
2008	5 581,5	21,0	19,0	176,5
2009	5 523,7	18,8	20,1	176,0
2010	5 647,3	21,0	19,0	181,1

Source: (International Labour Office, 2013, p.27)

In general, the European co-operative banks have come out of the crisis very well. Seven of them are in the top 50 safest banks in the world, and across Europe, they exceed the minimum legal capital ratio requirement of eight per cent, with an average ratio of about 9 per cent. This is reflected in very good credit ratings, which range between AA- and AAA for the largest co-operative banking groups (International Labour Office, 2013, p.27).

Polish sector of co-operative banks- some remarks

Co-operative banks constitute small but important part of the financial industry in Poland. The main areas of co-operative banks' activities are small and medium towns as well as villages. The prominent role of this sector is reflected in the financing of agriculture and rural development. The existence of rural co-operative banks has always been beneficial for promoting the development of farms, processing industry and non-farm economic activities. The special role of the co-operative banking sector in the development of Polish rural communities arises mainly from the providing loans to farmers, other businesses and public institutions to finance various investment projects. Co-operative banks are the main external source of capital required to finance the modernization projects in agriculture, the economic activities and jobs which promote multifunctional development as well as progress in technical and social infrastructure in rural areas. Those banks help to overcome credit rationing in agricultural loan market, the phenomenon that significantly determines both the capital accumulation and investment decisions of farmers and as a result their supply functions (Siudek, 2010, p.117).

Since Poland's accession to the European Union (EU), the co-operative banks have become an important element of the channel through which money from the common budget to national farmers (ex. direct payments) and local self-governments (ex. structural measures) are sent. Thus, they are active contributors to agricultural and regional policy delivery in Poland (Siudek, 2010, p.117).

Poland has a relatively low concentrated banking sector, with a traditional bank business model. Foreign capital dominates, but the Treasury is also an important shareholder. Polish private capital dominates in smaller banks and co-operative banks. Overall, the Polish banking sector in the post crisis period is characterized by good performance as well as by solid fundamentals. Selected indicators showing Polish banking sector performance are presented in table 4.

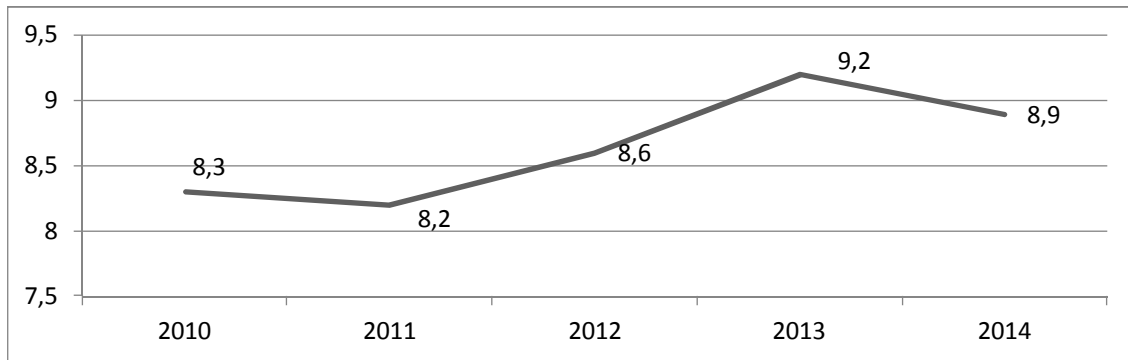
Table 4 Selected Indicators Showing Polish Banking Sector Performance

Banks/Year	ROA (%)			ROE (%)			C/I (%)		
	NO	H	NOH	NO	H	NOH	NO	H	NOH
Sector	1,1	1,1	0,7	10,1	9,9	6,8	53,0	50,9	58,5
Commercial	1,1	1,1	0,9	10,1	10,0	7,7	51,0	48,8	56,8
Co-operative	0,8	0,7	0,5	7,8	7,4	5,0	70,9	68,9	75,7

Source: (KNF, 2016)

Since 1989, Polish co-operative banks have undergone comprehensive restructuring in order to adapt to market economy rules, and later to adjust to EU requirements. The restructuring was painful- their number decreased from 1510 in 1995 to 571 in 2016. On the whole, however, co-operative banks have benefited from the consolidation process and today serve over 10 million customers through a countrywide network of 4600 branches (Miklaszewska and Kil, 2014). Today co-operative banks represent 25% of bank branches and 20% of employment but only 8,9% of banking assets, which is shown in figure 1.

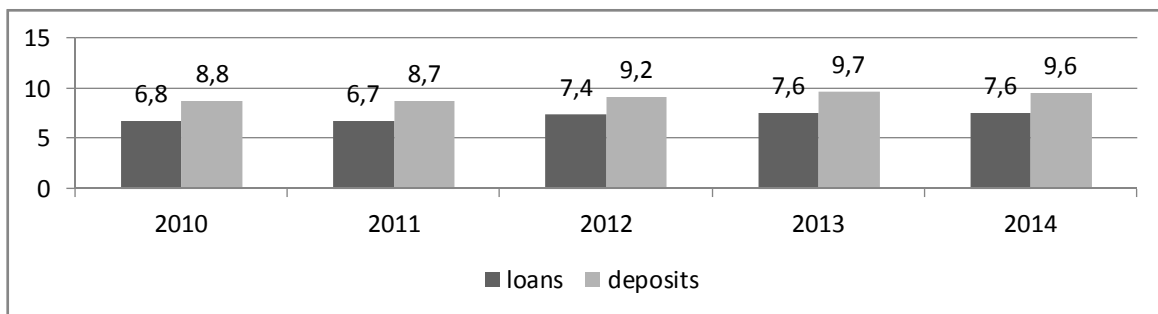
Figure 1 Co-operative Banks' Market Share in Total Assets (in %)



Source: (UKNF, 2015)

The problem for co-operative banks in Poland is very low market share in terms of loans and deposits, which is shown in figure 2.

Figure 2 Co-operative Banks' Market Share in Total Loans and Deposits (in %)



Source: (UKNF, 2015)

What is important, co-operative banking sector can be described as the one having high capital adequacy ratios, which is especially important in changing capital conditions, especially those introduced by CRD IV/CRR IV requirements (table 5). This problem has been pointed out in recent years, and major risks in co-operative banking sector are as follows (Miklaszewska and Kil, 2014):

- credit risk, connected with macroeconomic deterioration,
- liquidity risk, connected with the implementation of CRD IV,
- operating risk, connected with the necessity to change the business model of co-operative banking.

Table 5 Capital Adequacy Ratio and Tier 1 Ratio (in %)

Years	2011	2012	2013	2014	2015
Capital adequacy ratio (CAR)	13,4	13,8	14,3	15,8	15,9
Tier 1 ratio	12,6	13,0	13,4	14,7	14,9

Source: (KNF, 2013)

Both for the Polish co-operative banks and globally, the implementation of post crisis regulations will impose considerable new costs concerning the quality of capital, higher capital requirements, the introduction of leverage ratio and new liquidity standards (Miklaszewska and Kil, 2014).

It is also important to say that 2016 saw the bankruptcy of one of the co-operative banks in Poland SK Bank (Co-operative Bank of Agriculture and Craftsmanship). It's been the first bankruptcy in the Polish banking sector since 2001. The main reason that led to this situation was improper credit policy (Bankier.pl, 2015):

- credit portfolio wasn't diversified,
- interest margin was very low,
- collaterals weren't valued correctly,
- provisions for credit risk were too low.

It is also important that six of co-operative banks in 2014 didn't have the obligatory capital (1 mln €). Two of the banks performed recovery proceedings and three received information and recommendations to develop proposals for recovery from Financial Supervision Authority.

4 Conclusions

Co-operative banks in Poland are in rather good financial conditions (excluding some exceptions). It is stated that they are characterized by good performance, as the whole banking sector in Poland. It can be seen through different efficiency indicators, like ROA or ROE. The main problem nowadays is very high cost to income ratio, which is growing constantly and in 2015 it reached 75,7%. It is the main factor that influences net profit of these banks and it is important to add that in current economic conditions (e.g. introduction of bank levy in 2016 and additional financial burdens connected with the implementation of resolution fund) it may be a serious problem in the future. Co-operative banking sector can be also seen through high solvency ratios. Both capital adequacy ratio and Tier 1 ratio are much higher than the minimal requirements. From this point of view it can be seen that global financial crisis didn't affect co-operative banks very much. The major challenge for these banks is to handle new capital requirements implemented by CRD IV/ CRR IV in the future. They also should think over their business models, so they can meet the needs of local communities. They should also increase the effectiveness of their operations and decrease their costs.

References

Miklaszewska, E., Kil, K. (2014). The role of diversity of banking models: Position and prospects of Polish co-operative banks. *Bezpieczny Bank*, vol. 2 (55), pp. 50-64

Groeneveld, H. (2015). Governance of European Cooperative Banks: Overview, Issues and Recommendations. *TIAS School for Business and Society Working Paper*, September.

Rabobank (2009). *Co-operative banks in the new financial system*.

International Labour Office (2013). Resilience in a downturn. *The power of financial cooperatives*.

Komisja Nadzoru Finansowego (2016). *Raport o sytuacji banków w 2015r.*

Urząd Komisji Nadzoru Finansowego (2015). *Informacja o sytuacji banków spółdzielczych i zrzeszających w 2014r.*

Komisja Nadzoru Finansowego (2014). *Raport o sytuacji banków w 2013r.*

Bankier.pl (2015). Co pograżyło SK Bank? Retrieved from: <http://www.bankier.pl/wiadomosc/Co-pograzyl-SK-Bank-7287983.html>.

BIS (2011). Basel III: A global regulatory framework for more resilient banks and banking systems. Retrieved from: <http://www.bis.org/publ/bcbs189.pdf>.

Joint Deterministic and Stochastic Approach to Cash Balance Modelling: a Cash Model Specification and Verification

Aleksandra Szpulak¹, Tomasz Michael²

¹ Wroclaw University of Economics
Faculty of Economic Sciences, Department of Business Forecasts and Analysis
ul. Komandorska 118/120, 53-345 Wroclaw, Poland
E-mail: aleksandra.szpulak@ue.wroc.pl

² University of Opole
Faculty of Mathematics, Physics and Computer Science, Institute of Mathematics and Computer Science
ul. Oleska 48, 45-052 Opole, Poland
E-mail: tomasz.michael@hotmail.com

Abstract: *This paper refers to cash balance modelling at a company level. The goal is to specify a cash balance model that simultaneously satisfy 3 conditions: (1) it captures deterministic nature of cash flows, as cash is controllable variable, (2) it captures random component of cash flows, as cash flows are subjected to risk factors, and (3) it incorporates endogenous random component from real deviations, as typically a stochastic model build with Monte Carlo simulation technique captures exogenous random component. It is assumed in this research that a process generating cash balance can be broken down into two parts: (i) a core of a process giving base case cash balance under the managerial control, and (ii) a stochastic process generating random fluctuations about base case cash balance. It is hypothesized in the paper that separate modelling of a core and stochastic process yields a model that satisfy conditions (1) – (3) and therefore accurately describes the underlying cash balance process. Therefore, the core of a process is described by deterministic model, while a series of random fluctuations is described by compound Poisson stochastic process. In this paper, we derive and next verify a cash balance model under such joint deterministic and stochastic approach to cash balance modelling. Results indicate accurate description of the underlying process and provide promising evidence to support our research hypothesis.*

Keywords: *cash balance model, financial modelling, deterministic model, stochastic model*

JEL codes: *G39, C53*

1 Introduction

Typical approach to cash balance modelling is a stochastic one. A final (stochastic) model is usually described: (i) as a stochastic process, with seminal paper of (Miller, Orr 1966) and further developed by (e.g. Eppen and Fama 1969, Daellenbach 1971, Hinderer and Waldmann 2001, Gormely and Meade 2007, Yao et al. 2006), (ii) as the econometric model, such as these suggested by (Stone and Wood 1977, Miller and Stone 1985; Stone and Miller 1987), and (iii) as a probability distribution of cash flows and cash balance gained with the application of Monte Carlo simulation (e.g. Scott et al. 1979). As first pointed by Orgler (1969) and emphasized by Stone and Wood (1977) cash flows are at least to some extent under the managerial control and therefore purely stochastic approach to cash balance modelling is improper unless it is applied for estimating the “demand for money by firms” at a macroeconomic level. Contrary, financial deterministic model, planned to support corporate financial management, incorporates the decision variables and relationships between these variables and controllable one under certainty. One alternative to purely stochastic or purely deterministic approach is a two-steps financial modeling procedure of (Charnes 2007), i.e.: (1) building deterministic financial model and (2) running Monte Carlo simulation on it. However, the Monte Carlo simulation results in endogenous random component, i.e. as probability distributions are assumed for explanatory variables the random component enters exogenously to the financial model. Finally, such procedure, as reported by (Brandimarte 2014), may result in a

probability distribution of dependent variable which does not overlap a real one. All these reported drawbacks of current state of the financial art in the field of cash balance modelling justifies an attempt to formulate different approach to cash balance modelling.

The goal of this research is to specify a cash balance model that simultaneously satisfy 3 conditions: (1) it captures deterministic nature of cash flows, as cash is controllable variable, (2) it captures random component of cash flows, as cash flows are subjected to risk factors, and (3) it incorporates endogenous random component. To satisfy these requirements the following is assumed about the cash balance generating process: The process generating cash balance can be broken down into two parts: (i) a core of a process giving base case cash balance under the managerial control, and (ii) a stochastic process generating random fluctuations about base case cash balance. As each of these parts can be successfully described by relevant modelling techniques, it is hypothesized here that separate modelling of a core and stochastic process yields a model that satisfy conditions (1) – (3) and therefore accurately describes the underlying cash balance process. The core of a process exploits information outside of cash balance time series, namely it uses: production plans, sales prices, collection rates, materials and labor usage, materials and labor costs, capital expenditures plans and capital structure decisions. The core may be well described by deterministic model. A series of random fluctuations constitute stochastic process which may be well described by compound Poisson process. In this paper, we derive (in section 3) and next verify (in section 4) a cash balance model structure under such joint deterministic and stochastic approach to cash balance modelling. In section 2 we shortly review the application of deterministic models and compound Poisson process in financial modelling.

Literature review

Deterministic financial models are widely applied in corporate financial management, particularly in the capital budgeting, cash budgets, or valuation. Such model describes real business situation as if the dependent variable was completely under managerial control. All variables included in the model are nonrandom. In such a model managers have perfect knowledge about the variables and relationships between them, and they perfectly accurate predict the possible result of each particular decision. In the field of cash management there are three seminal papers of (Baumol 1952, Tobin 1953, Beranek 1963) which adopts deterministic approach to cash balance modelling. Today, such a deterministic model is built with the application of spreadsheet (e.g. Sengupta 2004), and its desired structure is consistent with financial statement's structure (Maier et al. 1981). Although the analysis of dependent variable based only on deterministic financial model is vastly limited, as it excludes random component, it gives managers at least the better insight into the business situation under consideration and constitutes the step prior to stochastic analysis.

Poisson compound Process fairly accurately describes the human behavior and therefore is widely applied in social sciences (Ross 2010), particularly in economics in areas such as insurance to model a sum of random payoff, financial markets to model a jump-diffusion process and cash forecasting to model net cash flows. At the origins, Poisson process was applied to model a moment of low-frequent events such as a claim at the call center or a payoff from an insurance (Good 1986). Next, this idea developed to compound Poisson process applied to model a sum of high-frequent events such as a sum of random payoff from an insurance (Kingman 2002). In the cash management area compound Poisson process was applied to describe net cash flows by (Tapiero, Zuckerman 1980).

Prior approaches to cash balance modelling, to the best of our knowledge, have two properties: (i) so far, while modelling cash balance solely as a stochastic process, excluded was the deterministic nature of cash balance process, and (ii) while utilizing deterministic financial model in Monte Carlo simulations excluded was a stochastic process to describe real random deviations. Our joint deterministic and stochastic approach to cash balance modelling differs from the current state of financial art in that it

mergers a deterministic financial model and a stochastic process to describe stochastic in nature process which generates cash balance at a company level.

2 Methodology and Data

We limit our considerations in this paper to cash generated on operating activity and exclude taxes. We solve our task in the following way: (1) first, we build a deterministic financial model of cash balance to describe the core of a process generating cash balance, the dependent variables in it are daily cash inflows and outflows, (2) second, we subtract the base case cash balance, as calculated from deterministic cash balance model, from real values of cash inflows and outflows to derive on real deviations about the core, (3) third, we describe the real deviations by compound Poisson process.

The theoretical model designed below is next a subject to verification. Verification ensures that formulas and model structure are correct and model faithfully mimics the process which generates cash balance. We use verification to get some experience on how model works in practice. Verification is done on the simulated data.

Cash balance is defined as:

$$C(t) = C(t-1) + CF_+(t) - CF_-(t) \quad (1)$$

where: C - is a cash balance, CF_+ - daily cash inflows, CF_- - daily cash outflows, t - days, $t=1,2,\dots,T$, T - end of planning horizon.

The deterministic cash balance model

Financial deterministic model of cash balance is a formal presentation of variables and relationship between variables, all constituting a process generating cash balance under certainty. Model was built under fixed rules of cooperation between customers and suppliers and rules for production process organization. These rules are defined and followed by our hypothetical company. Note, however, that these rules may freely vary. It is possible to adjust the deterministic model to other rules without any changes in the model's logic. Model enables to investigate cash inflows and outflows from operating activity raising each day of company operations. To derive on cash balance at a particular date such incremental flows as given by the model need to be summarized over the desired period.

On the input is a demand described by discretionary trend function:

$$D_t = D_0 f(t) \quad (2)$$

where: D_0 - demand at $t = 0$, $f(t)$ trend function such that $f(t) \geq 0$. On the output are cash inflows and outflows. The parameters included in the model refers to decision variables, all used in the field of operating working capital management. These decision variables are: the length of: ordering cycle, materials delivery cycle, accounts payable deferral period, accounts receivable settlement period, wages calculating cycle, wages deferral period; sale unit price, materials consumption per unit, materials unit price, and labor costs per unit. Model consists of the equations 3 to 10.

Production

Production relies on equal dispersion of all orders placed in advance on each day of company operations:

$$S_i(t) = \begin{cases} \sum_{t=(i-1)T_0+1}^{iT_0} D_0 f(t) & t = iT_0 \\ 0 & t \neq iT_0 \end{cases} \quad (3)$$

where: S_i - orders in units, i - order no., D_t - demand at day t , T_o - ordering cycle in days.

Ordering cycle T_o is at the same time a length of time required to realize order S_i , therefore production equals:

$$Q_i(t) = \begin{cases} \frac{S_i}{T_o} & t < iT_o \\ S_i - \sum_{t=(i-1)T_o+1}^{iT_o-1} Q_i(t) & t = iT_o \end{cases} \quad (4)$$

where: $Q_{t,i}$ - daily production resulting from the order S_i .

Materials delivery

For production company consumes r materials, $r = M1, M2, \dots$. Materials delivery are placed in fixed cycles equals $T_{MD,r}$. Materials orders are placed prior to production and are realized on the next day. Materials deliveries at subsequent days equals:

$$MD_{r,j}(t) = \begin{cases} \sum_{t=(j-1)T_{MD,r}+1}^{jT_{MD,r}} Q(t) \cdot m_r & t = (j-1)T_{MD,r} + 1 \\ 0 & t \neq (j-1)T_{MD,r} + 1 \end{cases} \quad (5)$$

where: $MD_{r,j}$ - material r delivery j in units, $T_{MD,r}$ - materials r delivery cycle in days, j - materials delivery no., $j = 1, 2, \dots$, m_r - material r usage in units per units of production.

Labor costs

Wages are calculated for the period equals T_L days:

$$LC_g(t) = \begin{cases} 0 & t \neq gT_L \\ \sum_{t=(g-1)T_L+1}^{gT_L} Q(t) p_l & t = gT_L \end{cases} \quad (6)$$

where: LC_g - labor costs over g period, p_l - labor costs per unit of production, g - wages calculating period no., T_L - wages calculating cycle in days.

Operating cash outflows

Operating cash outflows rise in two sources: materials delivery and labor costs:

$$CF_-(t) = \sum_r CF_{-,r}(t) + CF_{-,L}(t) \quad (7)$$

where: CF_- - operating cash outflows at day t , $CF_{-,r}$ - cash outflows resulting from material r delivery, $CF_{-,L}$ - cash outflows resulting from labor costs

$$CF_{-,r}(t) = p_r MD_r(t - T_{r,AP} + 1) \quad t \geq T_{r,AP} \quad (8)$$

where: $T_{r,AP}$ - accounts payable deferral period in days, p_r - unit material r price

$$CF_{-,L}(t) = LC(t - T_W + 1) \quad t \geq T_W \quad (9)$$

where: T_w – wages payment deferral period in days.

Operating cash inflows

Inflows are realized from credit sales:

$$CF_+(t) = p_s S(t - T_{AR} + 1) \quad t \geq T_{AR} \quad (10)$$

where: $CF_{+,t}$ - operating cash inflows at day t, T_{AR} - accounts receivable settlement period, p_s - unit sales price.

Having starting cash balance C_0 and calculated from the model cash inflows (equation 10) and cash outflows (equation 7) for particular days of planning horizon $t=1, \dots, T$ we may substitute these in equation 1:

$$C(t) = C_0 + \sum_{t=1}^T CF_+(t) - \sum_{t=1}^T CF_-(t) \quad (11)$$

Resulting $C(t)$ are base case cash balance under certainty. These values refer to a core of a cash generating process.

Stochastic process for random deviations about the core

Life is stochastic. In order to obey this rule we need to include randomness in our certainty (deterministic) model of cash balance, as given by equation 11. We utilize for this purpose random deviations about base case cash inflows and outflows. These deviations, i.e. (1) deviations about base case cash inflows, and (2) deviations about base case cash outflows are described separately by compound Poisson stochastic process.

Referring to the approach to cash balance modelling taken in this paper, we divide the planning horizon $t = 1, \dots, T$ into time-intervals T_k . All intervals T_k constitutes a set of $\{T_k, k = 1, \dots, T\}$. Next, we build two sets of random variables $\{Y_{CF+,k}, k=1,2,\dots,T\}$ and $\{Y_{CF-,k}, k=1,2,\dots,T\}$ representing a random deviations about the base case cash inflow and outflow respectively. Finally, for each T_k we have a random variable $Y_{CF+,k}$ and $Y_{CF-,k}$. We do not assume any probability function of $Y_{CF+,k}$ and $Y_{CF-,k}$, we assume only that probability distribution of $Y_{CF+,k}$ and $Y_{CF-,k}$ has expected value and variance. A number of random deviations over t is a random variable $N(t)$ generated by Poisson process with intensity λ . A sum of random deviations over t constitutes a compound Poisson process. Compound Poisson process for random deviations about base case cash inflows is:

$$X_{CF_+}(t) = \sum_{k=1}^{N(t)} Y_{CF+,k} \quad (12)$$

And compound Poisson process for random deviations about base case cash outflows is:

$$X_{CF_-}(t) = \sum_{k=1}^{N(t)} Y_{CF-,k} \quad (13)$$

where: $X_{CF_+}(t)$ is a random sum of deviations about base case cash inflows, $X_{CF_-}(t)$ is a random sum of deviations about base case cash outflows.

Incorporating equations 12 and 13 into equation 11 constitutes a cash balance model under uncertainty:

$$C(t) = C_0 + \sum_{t=1}^T CF_+(t) - \sum_{t=1}^T CF_-(t) + \sum_{k=1}^{N(t)} Y_{CF+,k} - \sum_{k=1}^{N(t)} Y_{CF-,k} \quad (14)$$

Typical values for cash balance over planning horizon

In order to define upper and lower border of an interval for typical values of cash balance we use, following (Ross 2010), expected value and variance of a sum of random deviations:

$$E(X_{CF_+}(t)) = \lambda t E(Y_{CF_+,1}) \quad \text{and} \quad E(X_{CF_-}(t)) = \lambda t E(Y_{CF_-,1}) \quad (15)$$

$$Var(X_{CF_+}(t)) = \lambda t E(Y_{CF_+,1}^2) \quad \text{and} \quad Var(X_{CF_-}(t)) = \lambda t E(Y_{CF_-,1}^2) \quad (16)$$

Next, we build a family of typical intervals for cash inflows at t:

$$\left[\sum_{t=1}^T CF_+(t) + \lambda t E(Y_{CF_+,1}) - \sqrt{\lambda t E(Y_{CF_+,1}^2)}, \sum_{t=1}^T CF_+(t) + \lambda t E(Y_{CF_+,1}) + \sqrt{\lambda t E(Y_{CF_+,1}^2)} \right] \quad (17)$$

and cash outflows at t:

$$\left[\sum_{t=1}^T CF_-(t) + \lambda t E(Y_{CF_-,1}) - \sqrt{\lambda t E(Y_{CF_-,1}^2)}, \sum_{t=1}^T CF_-(t) + \lambda t E(Y_{CF_-,1}) + \sqrt{\lambda t E(Y_{CF_-,1}^2)} \right] \quad (18)$$

For simplicity, we note equation 17 as $[a(t), b(t)]$, and equation 18 as $[c(t), d(t)]$. Finally, merging equations 14, 17 and 18 we receive a whole set of typical values for cash balance separately for each t over the planning horizon:

$$[C_0 + a(t) - c(t), C_0 + b(t) - d(t)] \quad (19)$$

Parameters estimations

Parameters of deterministic models are defined directly by company managers. Parameters of compound Poisson process we estimate in the following way. We calculate values of base case cash inflows and outflows from our deterministic cash balance model for past period of n, $i = 1, 2, \dots, n$. Next, we subtract base case cash inflows and outflows from real values of cash inflows and outflows, as delivered by company. Resulting are random deviations $y_{CF_+,i}$ and $y_{CF_-,i}$. Based on the observation of the underlying cash balance process, we are almost certain that random deviation about the base case cash inflow (outflow) appears on each day of planning horizon. Therefore we assume that random deviations about base case cash inflow (outflow) have $\lambda = 1$ and consequently $1/\lambda = 1$ regardless of the length of analyzed time-interval. Next, in order to estimate expected value and variance of a sum of random deviations we utilize n real random deviations $y_{CF_+,i}$ and $y_{CF_-,i}$. Following (Ross 2010), we take a sample mean and variance as the estimators for expected value and variance of a sum of random deviations (equations 15 and 16 respectively):

$$E(Y_{CF_+,1}) = \frac{1}{n} \sum_{i=1}^n y_{CF_+,i} \quad \text{and} \quad E(Y_{CF_-,1}) = \frac{1}{n} \sum_{i=1}^n y_{CF_-,i} \quad (20)$$

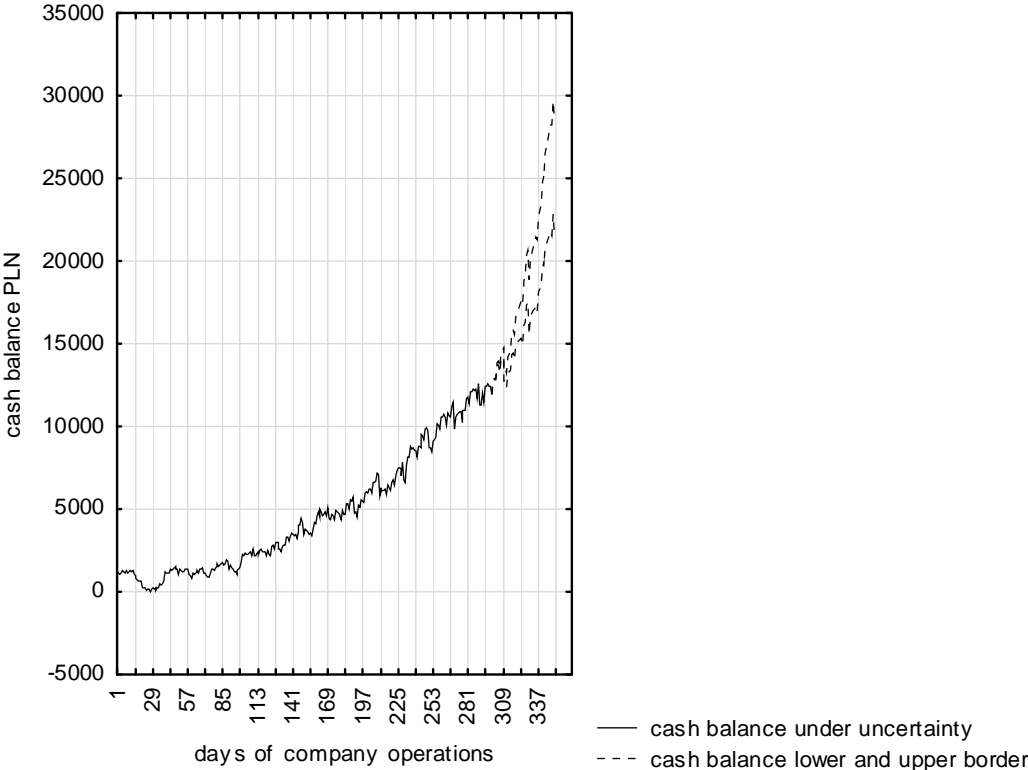
$$E(Y_{CF_+,1}^2) = \frac{1}{n} \sum_{i=1}^n y_{CF_+,i}^2 \quad \text{and} \quad E(Y_{CF_-,1}^2) = \frac{1}{n} \sum_{i=1}^n y_{CF_-,i}^2 \quad (21)$$

3 Results and Discussion

We verify our cash balance model as given by equation 14 by running simulations. For this purpose we have created the following hypothetical business situation. We assume producing company which produces one product. It utilizes two types of materials: M1

and M2. Demand for a product is given by simply function $D(t) = 0,25t$. Ordering cycle, T_0 is fixed on 3 days. Sales price, p_s , equals 4PLN per unit. Accounts receivable settlement period, T_{AR} , equals 14 days. Material M1 usage, m_{M1} , is 2 units per unit of production, its price, p_{M1} , is 1PLN per unit, materials delivery cycle for M1, $T_{MD,M1}$, is 6 days, and payment deferral period, $T_{AP,M1}$, is 6 days as well. Material M2 usage, m_{M2} , is 2 units per unit of production, its price, p_{M2} , is 1PLN per unit, materials delivery cycle for M2, $T_{MD,M2}$, is 12 days, and payment deferral period, $T_{AP,M2}$, is 10 days. Labor costs per unit of production, p_l , is 1PLN, wages calculating cycle, T_L , equals 20 days, and wages payment deferral period, T_w , is 10 days. Random deviations are generated from hyperbolic probability distribution, separately for inflows and outflows. We run our simulations over 300 consecutive days of business operations. Result is plotted on the figure 1 as a solid line on the graph. Next, we use formulas 20 and 21 to estimate mean and variance estimators. We extend deterministic simulations over next 50 days of company operations to get base case cash inflows and outflows over planning horizon. These base case values and calculated estimators of mean and variance of random deviations are entered into formulas 17 and 18. Finally, based on formula no. 19 we estimate typical interval of cash balance lower and upper border. The borders are depicted on the figure 1 as dashed lines on the graph.

Figure 1. Results of Simulations Based on Cash Balance Model Build under Joint Deterministic and Stochastic Approach to Cash Balance Modelling



Source: Own calculations

4 Conclusions

The goal of this research was to specify a cash balance model that simultaneously satisfy 3 conditions: (1) it captures deterministic nature of cash flows, as cash is controllable variable, (2) it captures random component of cash flows, as cash flows are subjected to risk factors, and (3) it incorporates endogenous random component from real deviations. This was done under joint deterministic and stochastic approach to cash balance modelling. We first specified a deterministic model which incorporates a variety of

decision variables allowing in this way for the cash balance control. Next, we add the compound Poisson process to capture uncontrollable risk factors. Our final model was a subject for verification, which we did based on simulations. Results are promising and encourage us to further research, namely we shall validate the model on the real data.

References

- Baumol, W. J. (1952). The transactions demand for cash: an inventory theoretic approach. *Quarterly Journal of Economics*, vol. LXV(4), pp. 545-556.
- Beranek, W. (1963). *Analysis of Financial Decisions*: Homewood, Illinois.
- Brandimarte, P. (2014). *Handbook in Monte Carlo Simulation*: Wiley.
- Charnes, J. (2007). *Financial Modelling with Cristal Ball and Excel*: Wiley.
- Daellenbach, H. G. (1971). A Stochastic Cash Balance Model with Two Sources of Short-Term Funds. *International Economic Review*, vol. 12(2), pp. 250-256.
- Eppen, G. D., Fama, E. F. (1969). Cash Balance and Simple Dynamic Portfolio with Proportional Costs. *International Economic Review*, vol. 10(2), pp. 119-133.
- Good, I., J. (1986). Some Statistical Applications of Poisson's Work, *Statistical Science*, Vol. 1(2), pp. 157-180.
- Gormely, F. M., Meade, N. (2007). The utility of cash flow forecasts in the management of corporate balances. *European Journal of Operational Research*, vol. 182, pp. 923-935.
- Hinderer, K., Waldmann, K. H. (2001). Cash Management in a randomly varying environment. *European Journal of Operational Research*, vol. 130, pp. 468-485.
- Kingmann, J., F., C. (2002). *Procesy Poissona*. Waszawa: PWN.
- Maier, S. F., Robinson, D., W., Weide, J., H., V. (1981). A Short-Term Disbursement Forecasting Model, *Financial Management*, pp. 10-20.
- Miller, M. H., Orr, D. (1966). A Model of The Demand for Money by Firms, *Quarterly Journal of Economics*, vol. 80(3), pp. 413-435.
- Miller, T. W., Stone, B. K. (1985). Daily Cash Forecasting and Seasonal Resolution: Alternative Models and Techniques for Using the Distribution Approach. *The Journal of Financial and Quantitative Analysis*, vol. 20(3), pp. 335-351.
- Orgler, Y. E. (1969). An Unequal-Period Model for Cash Management Decisions. *Management Science*, vol. 16(2), pp. B77-B92.
- Ross, S., M. (2010). *Introduction to Probability Models*, 10th edition: Elsevier.
- Scott, D. F., Moore, L., Saint-Denis, A., Archer, E., Taylor, B. W. (1979). Implementation of a Cash Budget Simulator at Air Canada. *Financial Management*, pp. 46-52.
- Sengupta, C. (2004). *Financial Modelling Using Excel and VBA*: Wiley.
- Stone, B. K., Miller, T. W. (1987). Daily Cash Forecasting with Multiplicative models of Cash Flow Patterns. *Financial Management*, Winter 1987, pp. 45-54.
- Stone, B. K., Wood, R. A., (1977). Daily Cash Forecasting: A Simple Method for Implementing the Distribution Approach. *Financial Management*, Fall 1977, pp. 40-50.
- Tapiero, C, S., Zuckerman, D. (1980). A note on the optimal control of a cash balance problem, *Journal of Banking & Finance*, Vol.4(4), pp. 345-352.
- Tobin, J. (1956). The Interest-Elasticity of Transactions Demand For Cash. *The Review of Economics and Statistics*, vol. 38(3), pp. 241-247.
- Yao, J., Chen, M., Lu, H. (2006). A fuzzy stochastic model for cash management. *European Journal of Operational Research*, vol. 170, pp. 72-90.

Sovereign Wealth Fund Ownership and Financial Performance of Companies Listed on the Warsaw Stock Exchange

Dariusz Urban¹

¹ University of Lodz
Faculty of Management, Department of Finance and Strategic Management
Matejki Street 22/26, 90-237 Łódź, Poland
E-mail: durban@uni.lodz.pl

Abstract: *Sovereign Wealth Funds are investment vehicles established in order to manage in a profit oriented way pool of national wealth for future generations. Nowadays over 70 funds exist and operate on global financial markets. Similarly to other institutional investors, Sovereign Wealth Funds possess huge amounts of capital. What distinguishes them the most from other financial institutions is the fact that they are owned, managed and controlled by sovereign states, have limited liquidity needs, a lower-than-market-average-level of redemption risk, a long-term, intergenerational investment horizon and relatively high risk tolerance. The aim of this study is to test empirically the impact of Sovereign Wealth Funds' ownership on the financial performance of targeted companies. Using the data of companies listed on the Warsaw Stock Exchange, we employ regression to analyze the relationship between the funds' investment and financial performance of the company. The empirical findings of this research suggest that Sovereign Wealth Funds' ownership has a positive influence on the price to book value of the firm. This article contributes to ongoing research in the field of studies related to financial aspects of SWF's investment behavior by providing empirical evidence from emerging market.*

Keywords: sovereign wealth funds, institutional investor, investing, emerging economies

JEL codes: G11, G23, C13, F21

1 Introduction

Sovereign Wealth Funds (SWFs) are still considered to be new-born institutional investors, in international financial markets, as well as innovative investment vehicles, despite their relatively long history. Several funds have been operating at a global level for more than fifty years, however the number of those created after the year 2000 represents the majority of the total in existence. For many years, these state-run funds have been almost anonymous investors, existing in the shadows, maintaining a low profile in the public eye. SWFs have been regarded as investment vehicles established in order to manage, in a rational and profit-oriented way, pools of national wealth for future generations. These funds gained public attention during the last financial crisis, playing the role of investors of last resort for top global financial institutions. Nowadays, SWFs are among the most important institutional investors in global financial markets, and constitute a solid element in the architecture of the international financial safety net. Similarly to other financial institutions, Sovereign Wealth Funds possess huge amounts of capital. During the last decade the funds have doubled their assets under management, and, in spite of losses accrued in consequence of the last financial crisis, by the end of 2015 these amounted to over 7 billion US dollars. What distinguishes them the most from other financial institutions is the fact that they are owned, managed and controlled by sovereign states, have limited liquidity needs, a lower-than-market-average-level of redemption risk, a long-term, intergenerational investment horizon and relatively high risk tolerance. Sovereign Wealth Funds, because they are hybrid in nature, combine private sector methods of investment with public-sector goals determined by governments.

The rise and growth of Sovereign Wealth Funds reflect a broader phenomenon of equity ownership concentrations within a group of institutional investors rather than in the hands of individuals. Today institutional investors hold around 60% of all publically listed stock in the United States, around 72% in Japan and around 89% in the UK (Çelik and

Isaksson, 2014). There is no commonly accepted definition of an institutional investor thus far; however in the broadest sense, "institutional investor" refers to three categories of entities. The first group of institutional investors refers to traditional institutional investors and comprises pension funds, investment funds and insurance companies. The second group, labeled alternative institutional investors, consists of hedge funds, private equity funds, exchange-traded funds and sovereign wealth funds. The third group are asset managers, who invest in their clients' names (Çelik and Isaksson, 2014). Institutional investors assume an increasing role in global capital markets as well as the main force shaping the new financial landscape (Mizuno, 2010). Given their size, estimations suggest that they account for more than half of global equity market value worldwide, and that when these investors act together, they can shape the financial markets into the form they desire (Rogers, 2014). Foreign institutional investors are quantitatively a very important group especially in emerging markets (Frankel and Menkhoff, 2003), where they have become a significant channel providing capital (Chang et al., 2013). This group of investors is growing fast in emerging markets, where SWFs still predominate as a source of long-term capital (Della Croce et al., 2011).

Institutional investors as a whole, with Sovereign Wealth Funds playing a significant role, are also the key element of today's global economic and financial landscape, which has been described as a fiduciary capitalism. This term, which was used for the first time by Hawley and Williams, characterizes a new pattern of ownership in which institutions such as *e.g.* pension funds and mutual funds, own equity on behalf of others *e.g.* retirees or future retirees (Hawley and Williams, 1997). The fiduciary capitalism is typified by highly diversified equity holdings by a large number of institutional owners, however holdings are in fact, concentrated in the hands of a relatively small number of the very largest entities – universal owners (Hawley and Williams, 2007). These fiduciary institutions, with the Norwegian Sovereign Wealth Fund being a leading example, are highly diversified investors, holding portfolios that represent almost every asset class from almost every regional financial market. Similarly to Sovereign Wealth Funds, other relatively new intuitions have recently become important equity owners alongside the more traditional investors, such as pension funds and investment funds. In a similar vein, Bortolotti et al. (2014) suggest that SWFs are the single most important expression of the force that can be called the rise of the fiduciary state. What makes this phenomenon especially significant is the fact that the largest number of government equity purchases have been acquisitions in foreign companies, where a state purchaser has limited ability to exercise any sovereign regulatory or supervisory power. SWFs as state shareholders have no more authority to monitor target firm managers than do private investors, especially if they are politically constrained.

A large body of research suggests that governments usually have a negative impact on a firm's financial performance, which improves with privatization (Estrin et al., 2009; Sun and Tong, 2003). Sovereign Wealth Funds, due to their political connections, are likely to have objectives other than obtaining the highest possible financial return. Hence, a company with a SWF as a shareholder might be relatively inefficient and experience reductions in their market value, because managers will cater also to the interests of politicians (Fernandes, 2014). In case of public-private ownership, empirical findings of research suggests that such mixed ownership also has a negative impact on the value of the company (Borisova et al., 2012). However looking at this issue from a different perspective it, is likely that SWFs may be able to increase their performance and the value of the companies they invest in by opening doors to new markets, and by helping them to market their products in their home markets. These state-run funds, due to their long-term investment horizon, can significantly relax financing constraints of firms, thereby allowing them to undertake promising investments with more distant payoffs. Thus, if such advantages are important, one possible outcome is that companies with SWF ownership become more efficient and experience increases in their market value (Fernandes, 2014).

Similar conclusions to those presented above can be drawn from the next strand of literature that focuses on the relation between institutional investor ownership and the

financial performance of firms. The prediction that large institutional owners can have a positive influence on the value of the company arises from the assumption that these investors have an incentive to and can efficiently monitor insiders, reducing the likelihood that insiders will make sub-optimal decisions (Navissi and Naiker, 2006). Woidtke (2002) finds that Tobin's Q is positively related to the ownership proportion of the private pension fund. For public pension funds, such relations were negative. Similarly Cornett et al. (2007) find a significant relation between a company's operation cash flow returns and both the shareholding proportion and the number of investors, for those institutional investors less likely to have a business relationship with the firms. In a similar vein, the empirical finding of Yuan, Xiao and Zou (2008) suggest that equity ownership by mutual funds has a positive effect of firm performance. Elyasiani and Jia, analyzing the distribution of institutional ownership, have found that there is a positive relationship between company performance and institutional ownership stability (Elyasiani and Jia, 2010). The empirical results presented by Hsu and Wang (2014) show that the increasing stability of institutional holdings is related to better company performance.

On the other hand, the literature provides evidence on the negative relationship between institutional ownership and company performance; e.g. the empirical findings of Liang, Lin and Huang (2011) suggest that institutional shareholdings negatively affect firm performance. Also Charfeddine and Elmarzougui (2010) argue that institutional ownership has a significant negative impact on firm performance as measured by a proxy for Tobin's Q. In contrast, the other studies find no significant relation between the above-mentioned variables (Faccio and Laser, 2000; Duggal and Millar 1999). Summing up, the impact of institutional stock ownership on firm performance is still unclear.

While the motives of creating Sovereign Wealth Funds and macroeconomics profits for the domestic economy as well as for transparency and geopolitical concerns are well recognized in the literature (see e.g. Quadrio Curzio and Miceli, 2010; Jiráňková, 2012; Alhashel, 2015), many questions concerning the financial aspects of funds' activities still remain relatively unanswered. Moreover, the empirical results found in the literature are controversial with reference to the short versus the long term, as well as to investment and divestment issues which are relatively sparse, mainly due to difficulties in obtaining comprehensive and systematic data (Heaney, Li, Valencia, 2011) and information gaps (Ciarlone and Micelli, 2014).

Knill et al. (2012), looking at the at risk-reward performance of target companies, argue that SWFs do not bring benefits to the companies they invested in, as other institutional investors do. Fotak et al. (2008) find evidence suggesting that in the long term these state-run funds are value destroying. Bortolotti et al. (2014) argue that companies targeted by active SWFs tend to achieve an abnormal return over the long term, while companies targeted by passive SWFs tend to underperform. Dewenter et al. (2010) suggest that over a five year investment horizon there exists mixed positive evidence on the relation between SWF ownership and the stock performance of targeted firms, which is consistent with Kotter and Lel's (2011) findings of zero-returns over the long run. There are other papers, however, that have found that SWFs bring value to their target firms. The empirical findings regarding the stock performance of target companies suggest that there are positive abnormal returns around the day of investment announcement (Kotter and Lel, 2011; Fotak et al., 2008). In similar vein, Fernandes (2011) argues that there is an SWF premium; companies with the fund as a shareholder have 10-15% higher values than comparable firms, *ceteris paribus*. Bertoni and Lugo (2014) find that the Credit Default Spread (CDS) of target companies drops following a SWF's investment. Fernandes (2014) provides statistically significant evidence of both increases in a company's value following SWF investments, as well as significant improvements in operational performance.

Summing up, we can see that the spectrum of empirical findings on the relationship between institutional investors and the financial performance of a target company is very wide and dispersed. Additionally, previous research has been focused mainly on

developed markets. Therefore, there is a need for deeper investigation, especially on emerging markets.

2 Methodology and Data

The main goal of this research is to answer the question of whether investment from Sovereign Wealth Funds determines changes in corporate financial performance of target companies. The key variables of interest is measure of the firm's performance – price to book value (P_BV) and Sovereign Wealth Funds' ownership in the company (SWF). For SWF we used a dummy variable (SWF_1), and a variable representing the percentage of ownership rights (SWF_2). We also included over 1% of an ownership variable (SWF_3) to examine the presence of ownership effect after a certain threshold.

In order to control the other possible determinants of company performance, which were not captured by the ownership variable, we also included some observed company characteristics as control variables. The control variables used in the study have been selected with reference to those employed in earlier empirical studies; variables that have been shown to be related to international investment choices (see *e.g.* Fernandes, 2011). We used the size of the company, its financial leverage, annual stock return, and growth opportunities as the right-hand side variables. The size of the company has a significant however ambiguous effect on company performance. On one hand, larger companies can be less efficient than smaller ones because of loss of control by top managers over strategic and operational activities within the firm. On the other hand, large firms may turn out to have better performance as they are likely to exploit economies of scale, employ more skilled managers and have the formalization of procedures (Kumar, 2004). We used the logarithm of total assets (SIZE) to control company size. The cost of capital derived from leverage being used by the company can affect their financial performance in different ways, including tax shield, a higher business operating risk and highest interest burden (Morck, Shleifer, Vishny, 1988). Given this, including this variable (LEVER) in the model seems to be reasonable. We measure leverage as the debt to asset ratio, which equals the book value of total debt divided by the book value of total assets. The lagged annual stock return of the company (PERF) is likely to capture the market's expectations on the future performance of the company, and therefore, to account for the possibility that SWFs only select companies with good performance to invest in, we included this variable in the model (Yuan, Xiao, Zou, 2008). Therefore, after controlling for this variable, an observed positive coefficient on SWF is more likely to reflect the effect of SWFs' ownership on company financial performance, rather the other way around. The next variable, growth opportunities (GR_OPP), reflect the possibility that the fund prefers companies with a higher than average increase of sales, to invest in. Thus, to control for this variable, a sales growth rate is included, similar to that used by Elyasiani and Jia (2010) and Fernandes (2014).

In order to answer the question about the relationship between SWFs' ownership and the financial performance of the company, we run regressions in which the company's P_BV were a function of various right-hand side variables, discussed in the previous section. The relationship between the investor's capital involvement and the financial performance of the company, however, as previous research suggests, is subject to a potential simultaneity bias. The institutional investors might be attracted to companies with a superior operating performance, and as a consequence of this, a positive association between investors' ownership and financial performance can be observed even if that ownership is not directly beneficial to performance. To eliminate this potential simultaneity bias we employed several tools. First we normalized a company's P_BV by the market-average, which eliminated relations between relative performance and a firm's characteristics. Second, we included a lag variable reflecting return on stock over the previous year, a lag variable of assets and a lag variable of growth opportunities. We also used a lag measure of SWFs' ownership by one year. This lag mitigates simultaneity issues and allowed us to verify the hypothesis that SWFs ownership improves company financial performance over the hypothesis that SWFs increase holdings in companies with better recent financial performance. If SWFs do

effect management and investors decisions, and because of that have a positive impact on financial performance target firms, they presumably would do so prior to the year of better performance, which is consistent with the use of a lag.

As a consequence of the adjustments described above, the equations of model regressions are as follows:

$$P_BV_{i,2014} = \beta_0 + \beta_1 SWF_{i,2013} + \beta_2 PERF_{i,2013} + \beta_3 SIZE_{i,2013} + \beta_4 LEVER_{i,2013} + \beta_5 GR_OPP_{i,2013} + U_{2013}$$

where: $P_BV_{i,2014}$ – price to book value of i-company in year 2014, $SWF_{i,2013}$ – ownership of Sovereign Wealth Fund in i-company in year 2013, $PERF_{i,2013}$ – stock return of i-company in year 2013, $SIZE_{i,2013}$ – logarithm of total assets of i-company in year 2013, $LEVER_{i,2013}$ – debt ratio of i-company in year 2013, $GR_OPP_{i,2013}$ – growth of sales of i-company in year 2013, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ – coefficients of right hand side variables, U_{2013} – the means error term.

Additionally, for each of the dependent variables we also estimated regressions with the use of incremental left-hand variables (ΔP_BV) to analyze the potential influence of SWF ownership on changes in financial performance, rather than on the level of financial variables.

The sample initially comprised all companies listed on the Warsaw Stock Exchange. Three restrictions were then applied. First financial companies (e.g. banks, insurance and financial companies) were excluded as they tend to have capital structures different from other companies. Secondly, the data base was restricted to companies that have been listed for at least one full year as of the end of 2013, to ensure that its performance and the capital structure are not significantly affected by the new listing, which may have an impact on the interpretation of results. Finally, companies with missing data have been excluded. The above criteria yielded a usable sample of 336 firms. Within this group, using a unique Sovereign Wealth Funds Institute database, 36 firms were identified as targeted for investment by Sovereign Wealth Funds. The sample of Polish companies represents over 80% of the total companies from Central and Eastern European Countries that were chosen for investment in 2013. All financial indicators characterizing listed companies have been obtained from Stock Ground, provided by Notoria Services.

3 Results and Discussion

Looking at the results collectively, we can see mixed evidence of a relationship between Sovereign Wealth Fund investment and the financial performance of companies. In four out of eight models, the data suggests the positive impact of a fund's ownership on price to book value of the firm. In three models, the coefficient of the SWF variable are statistically significant with $p=1\%$. It may suggest that, *ceteris paribus*, companies with SWF as investors have higher market valuations in comparison to the companies not targeted by the fund. The obtained results are consistent with those presented by Fernandes (Fernandes, 2014), however in this research the positive impact of ownership is not limited to the variable with threshold restriction. Higher level of R^2 characterizes those regressions with deltas as the left-hand variables. Regression models (4), (5), (6) and (8) fit a given set of data relatively well (R^2 close to 99%).

As regards to other variables, the level of debt in the company, measured by leverage ratio, has a mixed influence on price to book value of the company. The variable LEVER is statistically significant with $p=1\%$ level in all regressions however the sign of the coefficient is positive in regressions (1) (2) (3) (7) (8) and negative in models (4) (5) (6). The variable GR_OPP doesn't hold statistical significance in all eight models. The coefficient of variable SIZE is statistically significant only in regression (5) and (6) with p value equals 5%. These empirical results suggest that the size of the company measured by the logarithm of assets, has a positive influence on price to book value changes. Finally, the variable PERF seems to have a positive impact on price to book value of companies, suggesting that the return on a company's stocks in the previous year influences the changes as well as level of price to book value in the current year.

Table 1 SWF Ownership and Price to Book Value of the Company – Part 1

	Model 1 P_BV	Model 2 P_BV	Model 3 P_BV	Model 4 ΔP_BV
SWF_1	0.414562 (0.004)	-	-	0.142817 (0.027)
SWF_2	-	0.05219 (0.193)	-	-
SWF_3	-	-	0.038577 (0.333)	-
PERF	0.026262 (0.015)	0.028811 (0.015)	0.026696 (0.015)	0.00407 (0.034)
SIZE	-0.004292 (0.361)	-0.004028 (0.883)	-0.002737 (0.921)	0.02036 (0.134)
LEVER	0.015061 (0.000)	0.014102 (0.000)	0.014107 (0.000)	-0.10872 (0.000)
GR_OPP	0.001482 (0.209)	0.001585 (0.199)	0.001592 (0.199)	0.00083 (0.139)
CONS	1.21618 (0.025)	0.851187 (0.124)	0.8297569 (0.135)	-0.20307 (0.459)
R²	0.3641	0.3466	0.3457	0.9894
OBSERV.	289	289	289	289

Source: Own calculations.

Table 2 SWF Ownership and Price to Book Value of the Company – Part 2

	Model 5 ΔP_BV	Model 6 ΔP_BV	Model 7 P_BV	Model 8 ΔP_BV
SWF_1	-	-	0.383352 (0.008)	0.171388 (0.006)
SWF_2	0.18721 (0.545)	-	-	-
SWF_3	-	0.01401 (0.646)	-	-
PERF	0.00472 (0.032)	0.00475 (0.031)	0.02709 (0.014)	-
SIZE	0.027302 (0.044)	0.02776 (0.040)	-	-
LEVER	-0.108701 (0.000)	-0.10871 (0.000)	0.14091 (0.000)	0.10908 (0.000)
GR_OPP	0.00079 (0.165)	0.00079 (0.168)	-	-
CONS	-0.32803 (0.231)	-0.33563 (0.220)	0.75112 (0.000)	0.17589 (0.000)
R²	0.9893	0.9892	0.3591	0.9892
OBSERV.	289	289	289	289

Notes: This table presents estimates of coefficients of the regression of price to book value ratio (P_BV) and Δ P_BV respectively. Models (1) and (4) present results using a dummy variable for SWF investment that equals 1 if there is equity investment, and 0 otherwise, models (2) and (5) using a percentage of SWF ownership, models (3) and (6) using a percentage of large investment by the fund with threshold restrictions. Models (7) and (8) present estimations with the use of backward- and forward-stepwise selection. All specifications use standard errors corrected for heteroscedasticity. In parentheses are *t*-statistics where a P-value is reported.

Source: Own calculations.

Summing up, the empirical findings of this research along with previous analysis point to difficulties in measuring the impact of Sovereign Wealth Funds' ownership on financial

performance and the value of a company. Using panel data and comparing results from other emerging markets seems to be promising avenue for future research on this ground.

4 Conclusions

With billions of USD assets under management and global investment activity, Sovereign Wealth Funds seems to be important institutional investors with possible implications not only for stock markets but individual target companies as well. The motivation of this study was to shed some light onto the debate about the relationship between Sovereign Wealth Fund ownership and the financial performance of the company. The empirical findings of this research, although consistent with previous ones, does not provide clear evidence of the examined relation. However the positive impact of the fund on the company listed on the emerging market seems to be similar to the relation that can be observed in developed markets.

References

- Alhashel, B. (2015). Sovereign Wealth Funds: A Literature Review. *Journal of Economics and Business*, vol. 78, pp. 1-13.
- Bertoni, F., Lugo, S. (2014). The effect of sovereign wealth funds on the credit risk of their portfolio companies. *Journal of Corporate Finance*, vol. 27, pp. 21-35.
- Borisova, G., Brockman, P., Sales, J., Zagorchev, A. (2012). Government ownership and corporate governance: Evidence from the EU. *Journal of Banking and Finance*, vol. 36, pp. 2917-2934.
- Bortolotti, B., Fotak, V., Megginson, W. (2014). The Rise of Sovereign Wealth Funds: Definition, Organization and Governance. *BAFFI Research Series*, vol. 163, pp. 1-26.
- Çelik, S., Isaksson, M. (2014). Institutional investors and ownership engagement. *OECD Journal: Financial Market Trends*, vol. 2, pp. 93-114.
- Chang, L-L., Hsiao, F.D., Tsai, Y-Ch. (2013). Earnings, institutional investors, tax avoidance and firm value: Evidence from Taiwan. *Journal of International Accounting Auditing and Taxation*, vol. 22, pp. 98-108.
- Charfreddine, L., Elmarzougui, A. (2010). Institutional Ownership and Firm Performance: Evidence from France. *The IUP Journal of Behavioral Finance*, vol. 7(4), pp. 35-46.
- Ciarlone, A., Micelli, V. (2014). Are Sovereign Wealth Funds contrarian investors?. *Banca D`Italia Working Papers*, vol. 972, pp. 1-39.
- Cornett, M. M., Marcus, A. J., Saunders, A., Tehranian, H. (2007). The impact of institutional ownership on corporate operating performance. *Journal of Banking and Finance*, vol. 31, pp. 1771-1794.
- Della Croce, R., Stewart, F., Yermo J. (2011). Promoting longer-term investment by institutional investors: selected issues and policies. *OECD Journal: Financial Market Trends*, vol. 1, pp. 1-20.
- Dewenter, K., Han, X., Malatesta, P. (2010). Firm values and sovereign wealth funds' investments. *Journal of Financial Economics*, vol. 98(2), pp. 256-278.
- Duggal, R., Millar, J. (1999). Institutional ownership and firm performance: The case of bidder returns. *Journal of Corporate Finance*, vol.5, pp. 103-117.
- Elyasiani, E., Jia, J. (2010). Distribution of institutional ownership and corporate firm performance. *Journal of Banking & Finance*, vol. 34, pp. 606-620.
- Estrin, S., Hanousek, J., Kočenda, E., Svejnar, J. (2009). The effects of privatization and ownership in transition economies. *Journal of Economic Literature*, vol. 47, pp. 699-728.

- Faccio, M., Lasfer, M. (2000). Do occupational pension funds monitor companies in which they hold large stakes? *Journal of Corporate Finance*, vol. 6, pp. 71-110.
- Fernandes, N. (2014), The Impact of Sovereign Wealth Funds on Corporate Value and Performance, *Journal of Applied Corporate Finance*, vol.26(1), pp. 76-84.
- Fotak, V., Bortolotti, B., Megginson, W. (2013). The Sovereign Wealth Fund Discount: Evidence from Public Equity Investment. *Paolo Baffi Centre Research Paper Series*, vol. 140, pp. 1-57.
- Fotak, V., Bortolotti, B., Megginson, W., Miracky, W. (2008). The financial impact of sovereign wealth funds investment in listed companies. Unpublished working paper, University of Oklahoma and Università di Torino.
- Frenkel, M., Menkhoff, L. (2003). Are foreign institutional investors good for emerging markets? *Discussion Paper*, vol. 283, pp. 1-30.
- Hawley, J.P., Williams, A.T. (2007). Universal Owners: challenges and opportunities. *Corporate Governance*, vol. 15(3), pp. 415-420.
- Heaney, R., Li, L., Valencia, V. (2011). Sovereign Wealth Funds Investment Decisions: Temasek Holdings. *Australian Journal of Management*, vol. 36(1), pp. 109-120.
- Hsu, M-F., Wang, K. (2014). The Level and Stability of Institutional Ownership and Firm Performance: Evidence from Taiwan. *Emerging Markets Finance & Trade*, vol. 50, pp. 159-173.
- Jiránková, M. (2012). Nation-States as Investors in a Globalized World. *Ekonomický časopis / Journal of Economics*, vol. 60(8), pp. 854-870.
- Knill, A., Lee, B., Mauck, N. (2012). Sovereign wealth funds investment and the return to risk performance of target firms. *Journal of Financial Intermediation*, vol. 2, pp. 315-340.
- Kotter, J., Lel, U. (2011). Friends of foes? Target selection decisions of sovereign wealth funds and their consequences. *Journal of Financial Economics*, vol. 101(2), pp. 360-381.
- Kumar, J. (2004). Does Ownership Structure Influence Firm Value? Evidence from India. *The Journal of Entrepreneurial Finance and Business Venture*, vol. 9(2) pp. 61-93.
- Liang, C. J. Lin, Y. L., Huang, T. T. (2011). Does endogenously determined ownership matter on performance? Dynamic evidence from emerging Taiwan market. *Emerging Markets Finance and Trade*, vol. 47, pp. 120-133.
- Mizuno, M. (2010). Institutional investors, corporate governance and firm performance in Japan. *Pacific Economic Review*, vol. 5(5), pp. 653-665.
- Morck, R., Shleifer, A., Vishny R. (1988). Management ownership and market valuation: An empirical analysis. *Journal of Financial Economics*, vol. 20, pp. 293-315.
- Navissi, F., Naiker, V. (2006). Institutional ownership and corporate value. *Managerial Finance*, vol. 32(3), pp. 247-256.
- Quadrio Curzio, A., Miceli, V. (2010). *Sovereign Wealth Funds: A Complete Guide to State-Owned Investment Funds*, Petersfield: Harriman Finance Essentials.
- Rogers, J. (2014). A New Era of Fiduciary Capitalism? Let's hope so. *Financial Analyst Journal*, CFA Institute, May/June, pp. 6-11.
- Sun, Q., Tong, W. (2003). China's share issue privatization: The extent of its success. *Journal of Financial Economics*, vol. 70, pp. 183-222.
- Woidtke, T. (2002). Agents watching agents? Evidence from pension funds ownership and firm value. *Journal of Financial Economics*, vol. 63, pp. 99-131.
- Yuan, R., Xiao, J.Z., & Zou, H. (2008). Mutual funds' ownership and firm performance: Evidence from China. *Journal Banking and Finance*, vol. 32, pp. 1552-1565.

Connection between Exchange Rate and Balance of Payments Accounts: The Case of the Czech Republic

Tomáš Urbanovský

Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 507/41a, 602 00 Brno, Czech Republic
E-mail: urbanovsky@mail.muni.cz

Abstract: Relationships between nominal exchange rate, current account and financial account of balance of payments in the Czech Republic have been investigated in presented paper. Implemented cointegration analysis and vector error correction model suggest one pair of Granger causality. It has been discovered that change in current account balance Granger-causes change in financial account balance. This relationship has nature of two-way Granger causality, which means that reversed relationship holds as well. Other relationships implying Granger causality were not found. Error terms were significant only in regressions with both accounts as dependent variables, which imply that only these variables return to their long-term equilibria. Because increase in financial account surplus leads to decrease in current account surplus (or deepening the current account deficit), excessive liberalization of Czech financial system can lead to large capital inflow, jeopardizes current account sustainability and results in currency crisis in the Czech economy.

Keywords: Exchange rate, balance of payments, cointegration, VECM

JEL codes: C32, C51, F32

1 Introduction

Currency crises, sometimes known as balance of payments crises, are still very real danger to market economies. The experience of currency crises indicates that a persistent current account deficit serves as a warning indicator for an impending crisis. The aim of this paper is to find out, whether development of nominal exchange rate and financial account affect the development of current account in the Czech Republic, or not. Proved existence of these relationships can be very important for Czech monetary authority, because proper monetary policy can affect the development of financial account and (or) nominal exchange rate, which can prevent undesirable worsening of the current account (which can result in currency crisis in the Czech Republic).

Because we have three variables, we can find three potential relationships. Relationship between current and financial account proceeds from balance of payments identity. According to the balance of payments identity, a country's current and financial account have to be balanced ex post, meaning that trade deficits (surpluses) will have to be accompanied by net capital inflows (outflows) of the same magnitude. Therefore a negative correlation between current and financial account must exist. However, direction of causality is not clear at first sight and usually depends on sample of countries under study (whether countries are developed or developing), as well as on length of period.

According to Oeking and Zwick (2015) the current account generally Granger-causes the financial account in OECD countries. However, for short-term flows the direction changes over the business cycle: financial account components finance the current account during economic downturns, while inducing its changes during upturns. In Yan (2005), Yan and Yang (2008) and Guerin (2004) Granger causality tests were implemented to find out that the financial account is responsible for the current account in developing countries - instead of financing the current account, the financial account thrusts the current account into an imbalance. Ersoy (2011) used Granger causality analysis under VAR framework to reach the same conclusion for Turkish economy - unidirectional causality runs from financial account to current account. Mastroiannis (2012) examined Portuguese

economy and implemented cointegration analysis suggests existence of a long run relationship between foreign capital inflows and current account position that is based upon a unidirectional causal long-run relationship, running from foreign capital inflows to current account position. He found a bidirectional relationship between the two variables in the short-run.

Nevertheless, Yan (2005) discovered reversed relationship in developed countries - the financial account serves to finance a current account imbalance. Lau and Fu (2011) also observed that current account Granger causes financial account suggesting that current account can be used as the control policy variable for the flows of capital in Asian countries of Indonesia, Korea, the Philippines and Thailand. The same conclusion can be found in Tang (2014) - this time for US economy. And finally, Turan (2015) investigated relationship between current and financial account in several CEE countries, but results differ across selected sample of countries.

Forogue and Veloce (1990) empirically proved the existence of bidirectional causality between the financial and the current accounts for Canada. Kim and Kim (2010) proved the same bidirectional causality for Korea. Fry et al. (1995) find that some developing countries have unidirectional, some have bidirectional and some have no causality between the financial and the current accounts.

Current account and nominal exchange rate are connected through international trade. Increased (decreased) exports will increase (decrease) the demand for the domestic currency, and subsequently cause an appreciation (depreciation) of the domestic currency. Second factor is imports development. Increased (decreased) imports will increase (decrease) the supply of the domestic currency, and subsequently cause a depreciation (appreciation) of the domestic currency. But again, direction of causality is not clear at first sight – it is possible that the causality flows from exchange rate to components of current account. Studies on relationship between current account and nominal exchange rate are based on theoretical macroeconomic models elaborated mostly in 1970s and 1980s. Dornbusch and Fischer (1980) suggest existence of causal relationship, in particular that current account is an important element in exchange rate determination. On the other hand, Martin (2016) used panel of 180 countries over the 1960–2007 period and found evidence for reversed relationship, which holds especially in non-industrial countries – flexible exchange rate arrangements deliver a faster current account adjustment. According to Larrain (2003), relationship has a nature of two way causality, in particular that exchange rate determines the current account, and the current account in turn determines exchange rate.

Financial account and nominal exchange rate are connected through capital flows. Inflow of foreign capital will increase the demand for domestic currency, and subsequently cause an appreciation of the domestic currency. Outflow of foreign capital will increase the supply of domestic currency, and subsequently cause a depreciation of the domestic currency. Again, direction of causality can differ across economies under study. Regarding relationship between financial account and nominal exchange rate, Siourounis (2003) implemented unrestricted VAR and found causality flowing from financial account to exchange rate in UK, Germany, Switzerland and Japan. Gyntelberg et al. (2015) reached the same conclusion for the economy of Thailand. On the other hand, Kandil (2009) proved that fluctuations in the exchange rate are an important determinant of the financial balance in developing countries, but fluctuations in capital flows appear, in general, to be random in many developing and industrial countries, with limited evidence regarding systematic correlation with exchange rate fluctuations.

Because of reasons mentioned in first paragraph of this section, the aim of this paper is to examine nexus among nominal exchange rate, current and financial account of balance of payments in the case of the Czech Republic. The rest of the paper is organized as follows. Section 2 covers the description of the data and relevant methodology. Section 3 presents results of the analysis. Section 4 contains summary and conclusions.

2 Methodology and Data

Presented analysis works with above mentioned macroeconomic variables: nominal exchange rate, current account and financial account of balance of payments. Data on each variable were acquired via time series database ARAD administrated by Czech National Bank and processed in econometric software Gretl. ARAD contains data only since 1995, therefore seasonally adjusted quarterly data on these variables for the Czech Republic from 1995Q1 to 2015Q4 are used, which means that 84 observations for each variable were collected from this period. Table 1 contains a short description of variables and their abbreviations used in the analysis.

Table 1 Variables Used in Analysis

abbreviation of variable	variable characteristic
cur	current account balance expressed in millions of CZK
fin	financial account balance expressed in millions of CZK
rate	nominal exchange rate expressed as CZK/USD

Source: Author

Is it possible that exchange rate CZK/EUR would be more appropriate, because eurozone countries are the most important trade partners of the Czech Republic. Instead CZK/USD was used and there are two main reasons for this decision:

- The euro came into existence on 1 January 1999, therefore we would get only 68 quarterly observations, which means relatively short time series. This fact can lead to potential robustness worsening of the empirical analysis.
- Current instability in eurozone (Brexit, Greek crisis, migration crisis, etc.) results in high volatility of euro. This volatility is independent on situation of Czech economy. With use of CZK/EUR in the analysis we would risk occurrence of no significant relationship between CZK/EUR and macroeconomic indicators of the Czech Republic.

Because the model works with quarterly data, it is reasonable to suspect that the value of variable from the same period year ago can help explain value in current period (i.e. value in second quarter 2012 can explain value in second quarter 2013, etc.). For this reason, the highest number of lags is set at four. After omitting insignificant lags, this final regression will be known as autoregressive model of order p (AR(p) model) and because three variables are considered in the analysis, there will be three equations. AR(p) model can be expressed more formally as:

$$X_t = \alpha + \sum_{i=1}^p \phi_i X_{t-i} + \varepsilon_t \quad (1)$$

where X_t represents corresponding variable.

Crucial characteristic of non-stationary time series is a presence of unit root. Presence of unit root is demonstrated by a coefficient ϕ_1 equal to unity in equation (1). However, for testing unit root behavior it is convenient to subtract X_{t-1} from both sides of the equation (1). Formally:

$$\Delta X_t = \alpha + \rho X_{t-1} + \sum_{i=1}^p \gamma_i \Delta X_{t-i} + \varepsilon_t \quad (2)$$

where $\rho = \phi - 1$. $\rho = 0$ implies that the original time series in form of AR(p) contains unit root and is non-stationary. Test performed by means of equation (2) is called augmented Dickey-Fuller test, invented in Dickey and Fuller (1979) - from now on it will be abbreviated as ADF test.

Testing for presence of unit roots in variables under study follows the procedure based on ADF tests. This procedure was originally developed by Dolado, Jenkinson and Sosvilla-Rivero (1990). Procedure used in this paper is a modification of this procedure done by Enders (2010). Because the actual data-generating process is not known, it seems reasonable to start testing the hypothesis $\rho = 0$ using the general model, which includes also time trend component. Formally:

$$\Delta X_t = \alpha + \delta t + \rho X_{t-1} + \sum_{i=1}^p \gamma_i \Delta X_{t-i} + \varepsilon_t \quad (3)$$

ADF test is very popular, however it is not sufficient to be interested only in (testing) the value of coefficient ρ , because results of ADF tests can be influenced by statistical significance of trend and (or) constant. From these reasons, joint hypotheses concerning α , δ and ρ need to be tested. The whole testing procedure proceeds from equation (3) and have complex multistage form, which is not stated here, but is available upon request.

Model specification

Previous studies showed that it is likely to find these variables to be non-stationary. Non-stationarity of all selected variables allows us to test the sample for existence of cointegration relationships among variables. Johansen's cointegration test, developed in Johansen and Juselius (1990), allows to test how many cointegrating relationships is present among variables, i.e. to specify co-integration rank. The decision is based on results of trace test and maximum eigenvalue test.

Once the cointegration rank is determined, short-term analysis in form of vector error correction model (VECM) can be performed. This particular model is convenient, because it allows to identify patterns of Granger causality between variables. Furthermore, inclusion of error correction term (ECT) is crucial to determine, whether variables displaying previous period's deviation from long-run equilibrium are drawn back to their long-run equilibria or not. Formally, VECM can be written as:

$$\Delta Y_t = \alpha + \sum_{i=1}^p \eta_i \Delta Y_{t-i} + \sum_{i=1}^p \zeta_i \Delta W_{t-i} + \sum_{i=1}^p \theta_i \Delta Z_{t-i} + \sum_{i=1}^r \lambda_i ECT_{t-i} + e_t \quad (4)$$

To be more precise, this is only one of total number of three equations, which together form VECM. These three equations differ in dependent variable. Each equation regresses a dependent variable on selected number of lags of all the variables in the VECM (number of lags p is determined by information criteria). Only one equation is stated to save space. Note also that number of ECTs depends on cointegration rank (r) – number of cointegrating relationships is equal to number of ECTs. Statistical significance of corresponding coefficient implies Granger causality, meaning that variable with this coefficient Granger-causes dependent variable.

3 Results and Discussion

Simple OLS regressions were used to determine the order of $AR(p)$ process for each variable under study in order to find out potential correlation between consecutive values of each variable. Results of performed OLS regressions of variables under study on their lags are stated in Table 2 (only coefficient estimates and p-values are included in table in order to save space). Please note that expression X in first column always represents lags of corresponding dependent variable.

Regression results for variable *cur* and *fin* correspond with the assumption presented in previous section of paper, in particular that the value of variable from the same period year ago can help explain value in current period. In case of variable *rate*, statistically insignificant lags were sequentially dropped from regression in order to receive more accurate estimations of significant coefficients – these dropped lags are illustrated by

blank spaces. It is obvious that current value of variable *rate* depends only on instantly preceding value.

Table 2 OLS Regressions of Variables under Study on Their Lags

explanatory variables	dependent variable (X_t)					
	cur_t		fin_t		$rate_t$	
	coef.	p-value	coef.	p-value	coef.	p-value
const.	-7601,44	0,1499	868,71	0,8373	0,8089	0,2764
X_{t-1}	0,0012	0,9899	0,0926	0,3081	0,9680	2.36e-050 ***
X_{t-2}	-0,1131	0,2256	0,0498	0,5842		
X_{t-3}	0,0548	0,5563	0,06	0,4894		
X_{t-4}	0,6624	7.27e-09 ***	0,7149	6.00e-010 ***		
R^2	0,412094		0,420036		0,936856	
adjusted R^2	0,380739		0,389094		0,936077	
P-value (F)	3.68e-08		2.25e-08		2.36e-50	

Note: significance at ***1%

Source: Author's own elaboration based on Gretl output and on data acquired via ARAD

Based on results, we can see that the best way how to describe behavior of variable *cur* and *fin* is by means of AR(4) processes and variable *rate* by means of AR(1) process. After specification of AR processes, it is possible to construct equations for ADF tests:

$$\Delta cur_t = \alpha_1 + \rho^{cur} cur_{t-1} + \sum_{i=1}^3 \gamma_i^{cur} \Delta cur_{t-i} + \varepsilon_t^{cur} \quad (5)$$

$$\Delta fin_t = \alpha_2 + \rho^{fin} fin_{t-1} + \sum_{i=1}^3 \gamma_i^{fin} \Delta fin_{t-i} + \varepsilon_t^{fin} \quad (6)$$

$$\Delta rate_t = \alpha_3 + \rho^{rate} rate_{t-1} + \varepsilon_t^{rate} \quad (7)$$

Next step is testing for presence of unit roots. Results are not stated here, but they are available upon request. Nevertheless, conclusion is that all original time series are first-order integrated or $I(1)$, which means every variable contains unit root and displays non-stationary behavior. All variables are non-stationary, therefore testing for existence of cointegration is desirable. First step is to find appropriate number of lags with the use of information criteria. The best option appears to be option with 1 lag according to BIC and HQC (although AIC suggests inclusion of four lags).

Now it is time to proceed to Johansen's cointegration test to find out how many cointegrating relationships is present among variables, i.e. to specify cointegration rank. Results are summarized in Table 3. According to trace test, the null hypothesis of existence of two cointegrating relationships cannot be rejected. The same outcome is received with usage of maximum eigenvalue test. Therefore, both tests suggest that the subsequent short term analysis should have the form of VECM with cointegration rank 2.

Table 3 Rank Determination (Johansen Cointegration Test)

Null Hypothesis	Alternative hypothesis	Eigenvalue	Test statistic	p-value
Trace test				
$r = 0$	$r > 0$	0,52979	109,99	0,0000
$r \leq 1$	$r > 1$	0,42579	47,363	0,0000
$r \leq 2$	$r > 2$	0,015748	1,3175	0,251
Maximum eigenvalue test				
$r = 0$	$r = 1$	0,52979	62,63	0,0000
$r = 1$	$r = 2$	0,42579	46,045	0,0000
$r = 2$	$r = 3$	0,015748	1,3175	0,251

Source: Author's own elaboration based on Gretl output and on data acquired via ARAD

Outputs of estimated VECM with cointegration rank 2 are stated in Table 4. Note that lag length established earlier is respected in VECM analysis, therefore each variable is regressed on one lag of all variables under study plus two error correction terms (because two cointegrating relationships are present). Again, only coefficient estimates and p-values are included in table in order to save space.

Table 4 VECM with Cointegration Rank 2

explanatory variables	dependent variable					
	Δcur_t		Δfin_t		$\Delta rate_t$	
	coef.	p-value	coef.	p-value	coef.	p-value
const.	-22319,0	0,0002 ***	-675,78	0,9202	0,0668	0,8498
Δcur_{t-1}	0,6744	0,0003 ***	-0,6049	0,0051 ***	-9,09952e-06	0,4086
Δfin_{t-1}	-0,4469	0,0059 ***	0,5268	0,0056 ***	6.43684e-06	0,5070
$\Delta rate_{t-1}$	1011,49	0,6010	2519,70	0,2673	-0,0300	0,7998
ECT_{t-1}	-1,5895	0,0000 ***	-0,4955	0,0959 *	4.11315e-06	0,7896
ECT_{t-2}	-0,3614	0,0088 ***	-0,4619	0,0634 *	-3.48784e-06	0,7862
R^2	0,586298		0,518505		0,013576	
DW stat.	2,034006		2,034319		2,006379	

Note: significance at *10%, ***1%

Source: Author's own elaboration based on Gretl output and on data acquired via ARAD

First interesting finding is that two of three regressions display relatively high value of determination coefficient (R^2) – in case of dependent variable Δcur_t almost 59 %, which means that given variables explain in 58,62 % the variability of variable Δcur_t . Only equation with dependent variable $\Delta rate_t$ has low R^2 (1,35 %) due to statistical insignificance of all explanatory variables. The last row represents values of Durbin-Watson statistics. All values are relatively close to value 2, which indicates desirable property of regressions - no autocorrelation of residuals.

Look at regressions themselves reveals several facts. First of all, lags of dependent variables are statistically significant in regressions with Δcur_t and Δfin_t as dependent variables. It means that current changes in variables Δcur_t and Δfin_t can be explained by previous changes of these variables. This is clearly not the case of dependent variable $\Delta rate_t$, because previous value of $\Delta rate_t$ has no explanatory power.

Secondly, only one pattern of Granger causality is obvious from the table. In the equation with Δcur_t as the dependent variable, it is clear that past financial account balance change has explanatory power for current account balance change – in other words, past financial account balance change Granger-causes current account balance change. And from the look to regression with Δfin_t as dependent variable, it is obvious that reversed relationship exists - past current account balance change Granger-causes financial account balance change. Because causality flows in both direction, two-way Granger causality exists between financial and current account of balance of payments. And because there is negative sign in both cases (-0,4469 and -0,6049), positive change of explanatory variable is associated with negative change of dependent variable and vice versa. Specifically, increase (decrease) in financial account balance is linked to worsening (improvement) of current account balance and increase (decrease) in current account balance is linked to worsening (improvement) of financial account balance. This is in accordance with balance of payments identity mentioned in first section of the paper.

Finally, error correction terms are significant in two regressions, which correspond with previously discovered two cointegrating relationships. Corresponding coefficients also have negative sign, which is crucial for VECM. This necessity is demonstrated on variable *cur*. If error term in previous period is positive (negative), previous value of variable *cur* is too high (low) to be in equilibrium. And because this positive (negative) error term will be multiplied by negative coefficient, the product will be negative (positive) and variable *cur* will start falling (rising) in the next period and error will be corrected. The same holds for variable *fin*. This means that these two variables are drawn back to their equilibria, in

other words, past equilibrium error is corrected in the model only in cases of these two variables.

This reasoning does not hold in case of variable *rate*, because error correction terms coefficients are not statistically significant. And what's more, exchange rate change not only does not have any explanatory power in regressions with Δcur_t and Δfin_t as dependent variables, but also Δcur_t and Δfin_t cannot help explain exchange rate change. It means that there is no connection between exchange rate and these two accounts of balance of payments, therefore changes in exchange rate should not affect the balance of payments development and vice versa – exchange rate development should be independent on balance of payments development.

The main contribution of presented empirical paper is that bidirectional causal relationship between current and financial account has been proved in the case of the Czech Republic. Similar conclusions were reached by Forogue and Veloce (1990) for the Canadian economy and Kim and Kim (2010) for Korean economy. Crucial is the situation when increase in financial account surplus leads to decrease in current account surplus (or deepening the current account deficit), because, as mentioned in first section of this paper, long-lasting current account deficit can result in currency crisis. Final conclusion is that excessive liberalization of Czech financial system can lead to large capital inflow and put current account sustainability into jeopardy.

These findings from presented empirical study complement current research studies on issues related to the interaction between financial account development and adjustment of current account imbalance.

4 Conclusions

Relationships between three macroeconomic variables – nominal exchange rate, current account and financial account of balance of payments - in the Czech Republic were investigated in the presented paper. After brief theoretical insight into this issue, data and the methodology used in subsequent analysis were introduced. Several facts have been found in the empirical part of the paper. Implemented VECM showed that two-way Granger causality exists between current and financial account, in particular: increase (decrease) in current account balance leads to decrease (increase) in financial account and vice versa. Statistical significance of error terms also suggest that these two variables return to their long-term equilibria. Because increase in financial account surplus leads to decrease in current account surplus, main conclusion of presented paper is that excessive liberalization of Czech financial system can lead to large capital inflow, put current account sustainability into jeopardy and elicits currency crisis in the Czech Republic.

Acknowledgements

The support of the Masaryk University internal grant MUNI/A/1025/2015 Risks and Challenges of the Low Interest Rates Environment to Financial Stability and Development is gratefully acknowledged.

References

- Dickey, D. A., Fuller, W. A. (1979). Distribution of estimators for time series regressions with a unit root. *Journal of the American Statistical Association*, vol. 74, pp. 427-431.
- Dolado, J., Jenkinson, T., Sosvilla-Rivero, S. (1990). Cointegration and Unit Roots. *Journal of Economic Surveys*, vol. 4(3), pp. 249-273.
- Dornbusch, R., Fischer, S. (1980). Exchange Rates and the Current Account. *The American Economic Review*, vol. 70(5), pp. 960-971.
- Enders, W. (2010). *Applied econometric time series (3rd ed.)*. Hoboken: Wiley.

- Ersoy, I. (2011). The Causal Relationship between the Financial Account and the Current Account: The Case of Turkey. *International Research Journal of Finance and Economics*, vol. 75, pp. 187-193.
- Faroque, A., Veloce, W. (1990). Causality and Structure of Canada's Balance of Payments. *Empirical Economics*, vol. 15, pp. 267-283.
- Fry, M., Claessens, S., Burridge, P., Blanchet, M-C. (1995). Foreign Direct Investment, Other Capital Flows and Current Account Deficit: What causes what? *World Bank Policy Research Working Paper*, no. 1527.
- Guerin, S. S. (2004). The relationship between capital flows and current account: volatility and causality. *ECARES, Université Libre de Bruxelles*.
- Gyntelberg, J., Loretan, M., Subhanij, T. (2015). Private information, capital flows, and exchange rates. *Swiss National Bank: Working paper*, no. 12.
- Johansen, S., Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration - with Applications to the Demand for Money, *Oxford Bulletin of Economics and Statistics*, vol. 52, pp. 169-210.
- Kandil, M. (2009). Exchange Rate Fluctuations and the Balance of Payments: Channels of Interaction in Developing and Developed Countries. *Journal of Economic Integration*, vol. 24(1), pp. 151-174.
- Kim, C-H., Kim, D. (2010). Do Capital Inflows cause Current Account Deficits? *Applied Economics Letters*, vol. 18(5), pp. 497-500.
- Larrain, M. (2003). Central bank intervention, the current account, and exchange rates. *International Advances in Economic Research*, vol. 9(3), pp. 196-205.
- Lau, E., Fu, N. (2011). Financial and current account interrelationship: An empirical test. *Journal of Applied Economic Sciences*, vol. 6(1), p. 34-42.
- Martin, F. E. (2016). Exchange rate regimes and current account adjustment: An empirical investigation. *Journal of International Money and Finance*, vol. 65, pp. 69-93.
- Mastroiannis, A. (2012). Causality Relationships in the Structure of Portugal's Balance of International Payments. *International Journal of Business and Social Science*, vol. 3(15), pp. 54-61.
- Oeking, A., Zwick, L. (2005). On the Relation between Capital Flows and the Current Account. *Ruhr Economic Papers #565*.
- Siourounis, G. (2003). Capital Flows and Exchange Rates: An Empirical Analysis. *London Business School, IFA Working Paper*, No. 400.
- Tang, T. Ch. (2014). Fiscal Deficit, Trade Deficit, and Financial Account Deficit: Triple Deficits Hypothesis with the U.S. Experience. *Monash University Malaysia: DISCUSSION PAPER*, vol. 6.
- Turan, T. (2015). Causal relationship between current account and financial account balance in selected CEE countries. *Journal of Economics*, vol. 63(9), pp. 959-974.
- Yan, H., Yang, Ch. (2008). Foreign Capital Inflows and the Current Account Imbalance: Which Causality Direction? *Journal of Economic Integration*, vol. 23(2), pp. 434-461.
- Yan, H-D. (2005). Causal Relationship Between the Current Account and Financial Account. *International Advances in Economic Research*, vol. 11(2), pp. 149-162.

Comparing Financial Performance of Slovak Excellent Companies

Lukáš Vartiak¹

¹ University of Žilina
Faculty of Operation and Economics of Transport and Communications,
Department of Communications
Univerzitná 8215/1, 010 26 Žilina, Slovakia
E-mail: lukas.vartiak@fpedas.uniza.sk

Abstract: *Every company tries to achieve financial prosperity and overall success which leads to an achievement of the Business Excellence status. In Slovakia, Business Excellence is being assessed annually in the National Quality Award (NQA). The EFQM Excellence Model serves as an assessment tool in the NQA. Based on the results of self-assessment, companies can be awarded as winners, finalists, performance improvers and participants. NQA's winners gain the highest possible degree of recognition which empowers them to differentiate themselves from the competitors in the field of quality management and performance. The aim of the paper is to compare financial performance of the Slovak NQA winners within a specified time frame. To achieve the aim of the paper, financial performance of the Slovak NQA winners in the year before winning, in the year of winning and in the year after winning the Slovak NQA is being compared. These financial indicators were selected for a comparison of the Slovak NQA winners' financial performance: sales revenue (T), earnings after taxes (EAT), return on assets (ROA), gross margin (GM) and total indebtedness (TI). A comparison is being performed with an assumption that achievement of the Business Excellence status improves financial performance of a company. Methods of analysis, comparison, selection and mathematics are being used. As a main finding may be considered that our assumption was not confirmed among all of the analyzed companies. There can be various reasons of non-improved financial performance of the Slovak NQA winners which obliges us to future research aimed at finding these reasons.*

Keywords: *Business Excellence, quality, financial performance, financial indicator*

JEL codes: *G31, L15, O16*

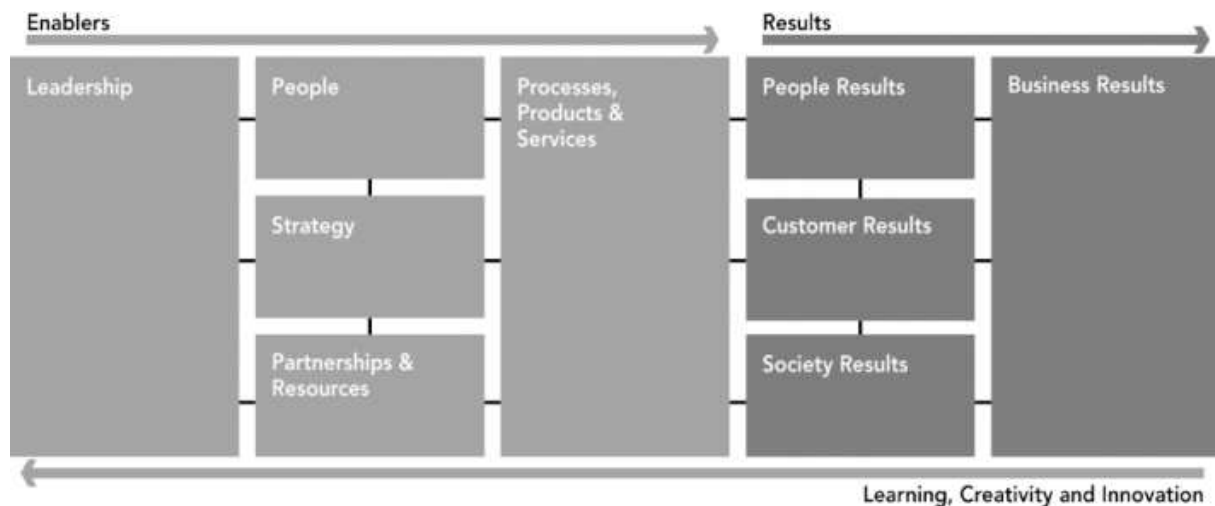
1 Introduction

In times of geo-political, social and economic uncertainty, companies are in a process of change. Companies try to achieve financial prosperity and overall success. It requires a change in financial management, as well as in strategic management. Hereby, companies need to reassess their fundamental activities and seek to achieve the best results possible (Hill, 2008). Financial performance of a company might have a direct impact on its value. In this context, company's value is determined by "discounting all future cash flows with the weighted average cost of capital." It is important to determine whether the weighted average cost of capital can be minimized by selecting an optimal mix of debt and equity financing (Team of authors, 2008). From a different perspective, company's value is determined by its results achieved in the field of quality management and performance. This is represented by the term Business Excellence, assessment of which is a subject of National Quality Awards (NQA) all over the world.

Business Excellence means exceptionality in company's strategies, practices and stakeholder-related performance results. This definition of Business Excellence is valid when company's results have been validated by an assessment based on specific Business Excellence model. This implies that company's journey towards excellence has to be verified properly (Ionică, Baleanu, Edelhauser and Irimie, 2010). According to Mann, Mohammad and Agustin (2012a), such verification is based on Business Excellence Self-Assessment which is defined as "a systematic and regular review of a company's activities and results referenced against Business Excellence model." Business Excellence is also about developing and strengthening company's management systems, especially quality management, and processes of a company to improve performance and create

value for stakeholders (Mann, Mohammad and Agustin, 2012b). Many countries use Business Excellence models as key mechanisms for their NQAs, focused on improving the performance of companies, as well as national competitiveness (Ionică, Baleanu, Edelhauser and Irimie, 2010). In Slovakia, Business Excellence is being assessed annually in the Slovak NQA in which the EFQM Excellence Model (Figure 1) serves as an assessment tool.

Figure 1 The EFQM Excellence Model



Source: EFQM (2012). An Overview of the EFQM Excellence Model. Brussels: EFQM.

The EFQM Excellence Model can be used to assess a company's current capabilities. "The output of an assessment is normally a number of strengths and opportunities to improve future performance." Identification of company's strengths is important because these strengths may help in addressing the issues identified. Also, it doesn't stop doing the things it's good at (EFQM, 2012).

Based on the last year's results of the EFQM Excellence Model self-assessment (maximum of 1000 points), company can be awarded as a winner (over 450 points), finalist (401-450 points), performance improver (301-400 points) or participant (200-300 points). Required score may be obtained by more than just one company, thus number of awarded companies is not limited. Slovak NQA's winners gain the highest possible degree of recognition which empowers them to differentiate themselves from the competitors in the field of quality management and performance (ÚNMS SR, 2016).

Since Business Excellence is about achieving excellence in everything that a company does and most importantly achieving superior financial performance (Mann, Mohammad and Agustin, 2012b), Business Excellence can also be assessed by the results of a financial analysis (Jankalová, 2015). Financial analysis is generally defined as effective diagnostic tool that allows a company to assess its financial health (Kotulič, Király and Rajčániová, 2007). Financial health of a company depends on its financial performance and financial position (Jenčová and Rákoš, 2010). Financial analysis is focused on assessing past, present and future financial condition of a company (Štofková, Rostašová, Štofko, Štofková and Kaštánek, 2012).

The aim of the paper is to compare financial performance of the Slovak NQA winners within a specified time frame. The paper consists of four sections. To address the issue of the paper, introduction includes theoretical background. Next section, Methodology and Data, contains of identification of research assumptions, as well as methods and formulas used in the paper. The main findings are reviewed in the section entitled Results and Discussion. The last section is devoted to conclusions.

2 Methodology and Data

The aim of the paper is to compare financial performance of the Slovak NQA winners within a specified time frame. To achieve the aim of the paper, financial performance of the Slovak NQA winners in the year before winning, in the year of winning and in the year after winning the Slovak NQA is being compared. These financial indicators were selected for a comparison of the Slovak NQA winners' financial performance: sales revenue (T), earnings after taxes (EAT), return on assets (ROA), gross margin (GM) and total indebtedness (TI). Definitions of mentioned financial indicators are listed in Table 1.

Table 1 Definitions of Financial Indicators Used for a Comparison

T	indicator of an amount gained from selling goods and/or services in the normal operations of a company in a specified period
EAT	indicator that refers to financial result after taxation which is available for a company and its owners
ROA	indicator of a company's profitability in relation to its total assets
GM	indicator which represents the percentage of company's total sales revenue after incurring the direct costs associated with producing the goods and services sold by a company
TI	indicator expressing the ratio between company's own and borrowed capital

Source: Jenčová, S., Rákoš, J. (2010). *Finančno-ekonomická analýza a finančné plánovanie*, 2nd ed. Prešov: Fakulta manažmentu Prešovskej university v Prešove.

Formulas of ROA (1), GM (2) and TI (3) are expressed as follows (Jenčová and Rákoš, 2010):

$$ROA = \frac{EBIT}{assets} = \frac{EAT + interest(1-t)}{assets} \quad (1)$$

$$GM = \frac{sales\ revenue - cost\ of\ goods\ sold}{sales\ revenue} \quad (2)$$

$$TI = \frac{borrowed\ capital}{own\ capital} \cdot 100 \quad (3)$$

Secondary research is being performed with these research assumptions (RA):

- RA1: T tends to increase
- RA2: EAT tends to increase
- RA3: ROA tends to increase
- RA4: GM tends to increase
- RA5: TI tends to decrease

Online database of FinStat, provider of comprehensive information about companies in Slovakia and their financial performance, was used as a main source of a comparison. Secondary research includes comparison, analysis, selection and mathematical methods. Based on these methods, financial performance of Slovak excellent companies is to be compared and RAs are to be tested. Results are to be presented in the form of text, graphs and tables.

3 Results and Discussion

A comparison is being performed with an assumption that achievement of the Business Excellence status improves financial performance of a company. To perform a comparison, companies awarded as winners of the Slovak NQA were selected. By the means of obtaining such award, these companies may be labeled as excellent. Winners of the Slovak NQA in the period 2013-2015 are listed in Table 2.

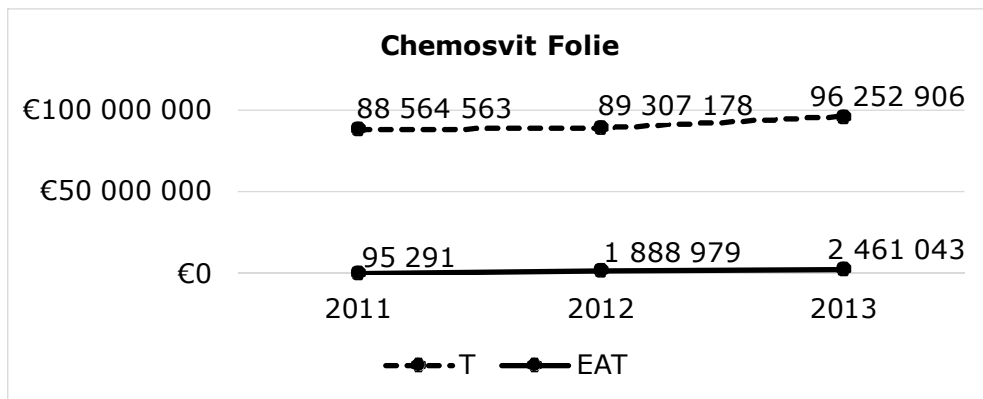
Table 2 Winners of the Slovak NQA in the Period 2013-2015

Year	Company	Field
2013	Slovak Post	Universal postal service provider
2013	Chemosvit Folie	Production of plastics
2014	I. TRAN.	Production of textile
2014	HANIL E-HWA Slovakia	Automotive
2015	SIMS	Business consulting services

Source: ÚNMS SR (2015). *Vítězi a ocenění 2000 – 2015*. Retrieved from: <http://www.unms.sk/?vitazi-a-oceneni-2000-2015>

Since Slovak Post's financial indicators necessary for a comparison are not available and HANIL E-HWA Slovakia has been repealed, a comparison consists of the remaining three companies. Chemosvit Folie's financial performance is illustrated in Figure 1 and Figure 2.

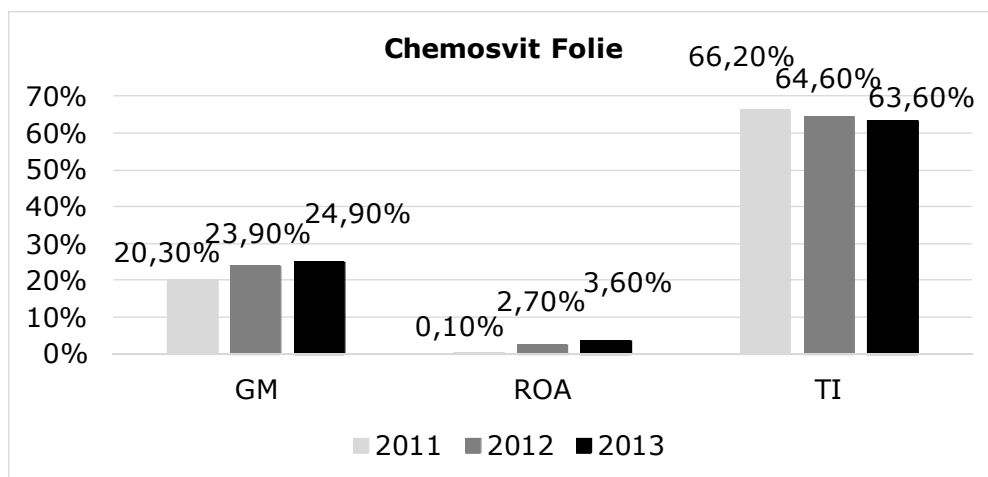
Figure 1 Chemosvit Folie's Financial Performance (T and EAT in €)



Source: FinStat (2016a). *CHEMOSVIT FOLIE, a.s.* Retrieved from: <http://finstat.sk/31719724>

Both Chemosvit Folie's financial indicators illustrated in Figure 1 (T and EAT) were increasing from 2011 to 2013. Consequently, it can be stated that in this case RA1 and RA2 were confirmed.

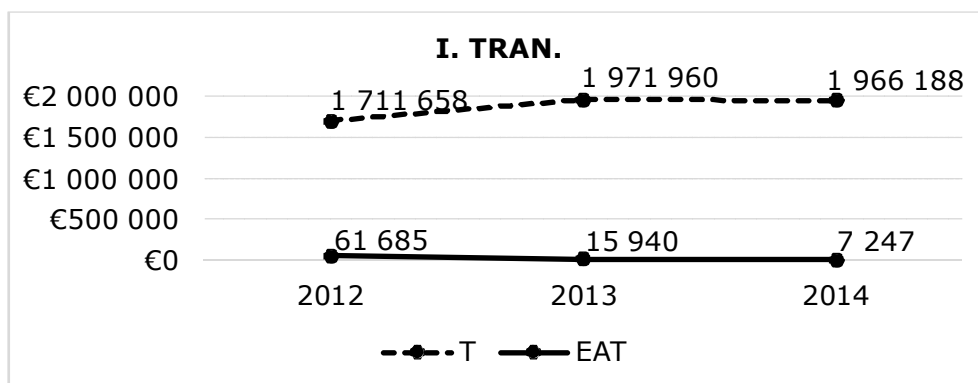
Figure 2 Chemosvit Folie's Financial Performance (GM, ROA and TI in %)



Source: FinStat (2016a). *CHEMOSVIT FOLIE, a.s.* Retrieved from: <http://finstat.sk/31719724>

Figure 2 illustrates continuous increase of Chemosvit Folie's GM and ROA. It also illustrates continuous decrease of Chemosvit Folie's TI. Therefore, RA3, RA4 and RA5 were confirmed. We can state that Chemosvit Folie's positive financial performance is a result of achieving the Business Excellence status. I. TRAN.'s financial performance is illustrated in Figure 3 and Figure 4.

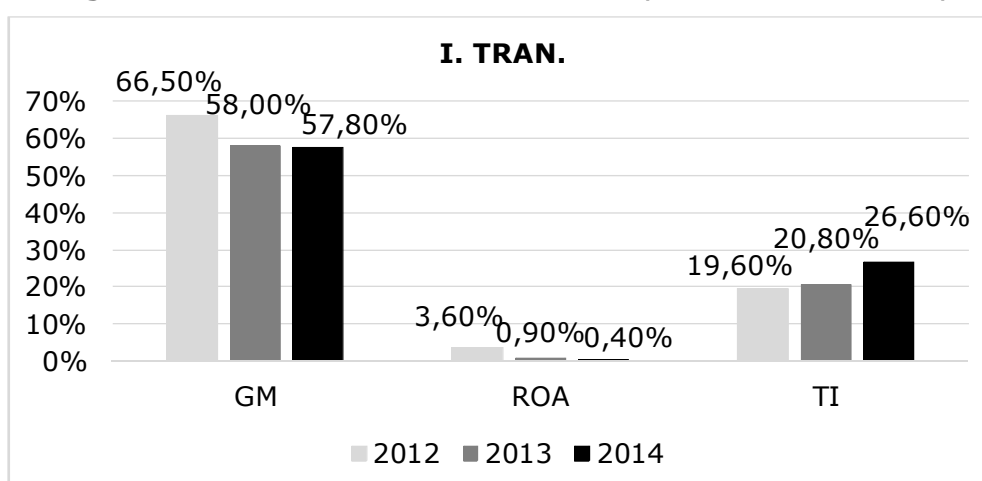
Figure 3 I. TRAN.'s Financial Performance (T and EAT in €)



Source: FinStat (2016b). *I. TRAN., s.r.o.* Retrieved from: <http://finstat.sk/31396402>

According to Figure 3, from 2012 to 2014, there was not a continuous increase in I. TRAN.'s T and its EAT was actually decreasing. Consequently, RA1 and RA2 were not confirmed.

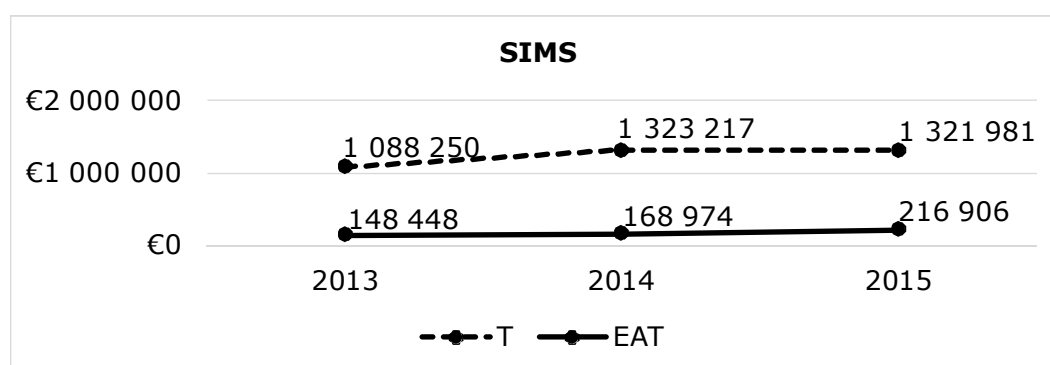
Figure 4 I. TRAN.'s Financial Performance (GM, ROA and TI in %)



Source: FinStat (2016b). *I. TRAN., s.r.o.* Retrieved from: <http://finstat.sk/31396402>

From 2012 to 2014, I. TRAN.'s GM and ROA were also decreasing and conversely, its TI was increasing. RA3, RA4 and RA5 were not confirmed so in this case, it can't be stated that I. TRAN.'s financial performance was affected by the achievement of the Business Excellence status. SIMS' financial performance is illustrated in Figure 5 and Figure 6.

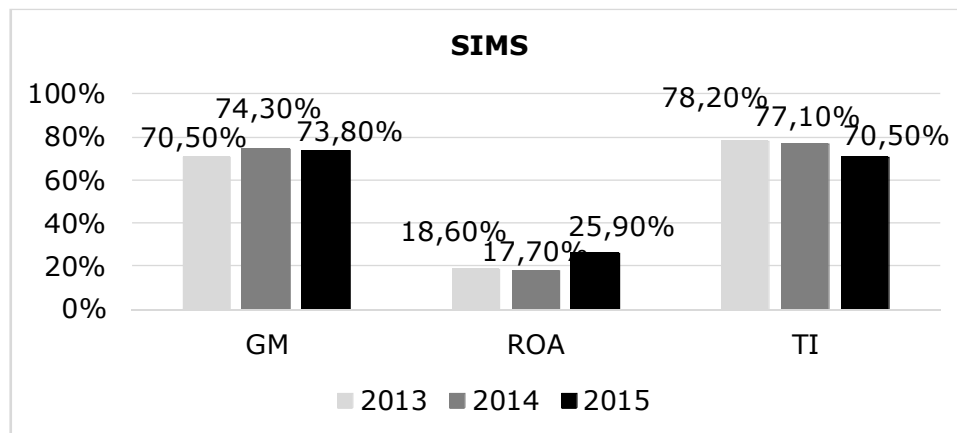
Figure 5 SIMS' Financial Performance (T and EAT in €)



Source: FinStat (2016c). Slovenská informačná a marketingová spoločnosť, a. s. Skrátený názov: SIMS, a. s. Retrieved from: <http://finstat.sk/31425836>

Figure 5 illustrates continuous increase of SIMS's EAT from 2013 to 2015. On the other hand, its T were not continuously increasing. Therefore, RA1 was not confirmed and RA2 was confirmed.

Figure 6 SIMS' Financial Performance (GM, ROA and TI in %)



Source: FinStat (2016c). Slovenská informačná a marketingová spoločnosť, a. s. Skrátený názov: SIMS, a. s. Retrieved from: <http://finstat.sk/31425836>

According to Figure 6, there was not a continuous increase in SIMS' GM and ROA from 2013 to 2015. It means that RA3 and RA4 were not confirmed. On the other hand, SIMS' TI was decreasing, thereby RA5 was confirmed. Since two of five RAs were confirmed, we can only assume that some financial indicators of SIMS were affected by the achievement of the Business Excellence status.

4 Conclusions

Companies try to achieve financial prosperity and overall success which leads to an achievement of the Business Excellence status. Generally, it can be assumed that that an achievement of the Business Excellence status has a positive effect on a company. In Slovakia, excellent companies are being awarded annually in the Slovak NQA. The aim of the paper was to compare financial performance of the Slovak NQA winners within a specified time frame. To achieve the aim of the paper, financial performance of the Slovak NQA winners in the year before winning, in the year of winning and in the year after winning the Slovak NQA was compared. A comparison was performed with an assumption that achievement of the Business Excellence status improves financial performance of a company. To verify our assumption, five financial indicators (T, EAT, GM, ROA, TI) were selected for a comparison and these five RAs were set:

- RA1: T tends to increase
- RA2: EAT tends to increase
- RA3: ROA tends to increase
- RA4: GM tends to increase
- RA5: TI tends to decrease

Testing of RAs was based on financial performance of selected Slovak NQA winners. Results of RAs testing are summarized in Table 3.

Table 3 Research Assumptions Testing

	RA1	RA2	RA3	RA4	RA5
Chemosvit Folie	✓	✓	✓	✓	✓
I. TRAN.	x	x	x	x	x
SIMS	x	✓	x	x	✓

Source: Author

According to Table 3, in the case of Chemosvit Folie, all RAs were confirmed. On the other hand, all RAs in the case of I. TRAN. was not confirmed and only two of five RAs were confirmed in the case of SIMS. Therefore, as a main finding may be considered that our assumption was not confirmed among all of the analyzed companies. We can only assume that in some cases, financial indicators of a company are affected by the achievement of the Business Excellence status. Overleaf, reasons of non-improved financial performance of the Slovak NQA winners may vary. For example, a company may invest in its further development as a consequence of winning the Slovak NQA. It may be followed by an increase of company's costs and TI. Also, a company which wins the Slovak NQA may be encouraged to produce new products or to provide new services which can cause an increase of the direct costs. It may be followed by a decrease of company's GM. We could continue with other reasons but it would be just our conjectures. This obliges us to future research aimed at finding the real reasons of non-improved financial performance of the Slovak NQA winners.

Acknowledgments

The paper was undertaken as a part of research projects VEGA 1/0916/15 and VEGA 1/0693/16.

References

- EFQM (2012). *An Overview of the EFQM Excellence Model*. Brussels: EFQM.
- FinStat (2016a). *CHEMOSVIT FOLIE, a.s.* Retrieved from: <http://finstat.sk/31719724>.
- FinStat (2016b). *I. TRAN., s.r.o.* Retrieved from: <http://finstat.sk/31396402>.
- FinStat (2016c). *Slovenská informačná a marketingová spoločnosť, a. s.* Skrátený názov: SIMS, a. s. Retrieved from: <http://finstat.sk/31425836>.
- Hill, R. A. (2008). *Strategic Financial Management*. London: bookboon.com Ltd.
- Ionică, A., Baleanu, V., Edelhauser, E., Irimie, S. (2010). TQM and Business Excellence. *Annals of the University of Petrosani*, vol. 10(4), pp. 125-134.
- Jankalová, M. (2015). *Hodnotenie stavu Business Excellence*. Bratislava: DOLIS s.r.o.
- Jenčová, S., Rákoš, J. (2010). *Finančno-ekonomická analýza a finančné plánovanie*, 2nd ed. Prešov: Fakulta manažmentu Prešovskej university v Prešove.
- Kotulič, R., Király, P., Rajčániová, M. (2007). *Finančná analýza podniku*. Bratislava: IURA edition.
- Mann, R., Mohammad, M., Agustin, T. A. (2012a). *Implementing Business Excellence: A guidebook for SMEs*. Tokyo: Asian Productivity Organization.
- Mann, R., Mohammad, M., Agustin, T. A. (2012b). *Understanding Business Excellence: An awareness guidebook for SMEs*. Tokyo: Asian Productivity Organization.
- Štofková, J., Rostášová, M., Štofko, S., Štofková, K., Kaštánek, P. (2012). *Financie a finančné riadenie*. Žilina: Žilinská univerzita v Žiline.
- Team of authors (2008). *Corporate Finance*. London: bookboon.com Ltd.
- ÚNMS SR (2015). *Víťazi a ocenení 2000 - 2015*. Retrieved from: <http://www.unms.sk/?vitazi-a-oceneni-2000-2015>.
- ÚNMS SR (2016). *Štatút súťaže Národná cena SR za kvalitu*. Bratislava: ÚNMS SR.

The Evaluation of Financial Health of the Insurance Sector in the World's Insurance Centers

Eva Vávrová¹, Svatopluk Nečas²

¹ Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno
E-mail: 38979@mail.muni.cz

² Masaryk University
Faculty of Economics and Administration, Department of Finance
Lipová 41a, 602 00 Brno
E-mail: necas@econ.muni.cz

Abstract: *Within the world insurance market the processes associated with the globalization of markets and the integration of financial institutions concur. These processes have been affected by the outbreak, continuance and subsequent lingering of the global financial crisis. The financial crisis has manifested itself in various regions of the world insurance market in varying extent. The main objective of this paper is to assess the development of the financial health of the global insurance market during the lingering financial crisis and to adopt conclusions driven based on the analysis of the insurance sector.*

Keywords: *financial crisis, insurance market, insurance company, premiums written, return on assets, return on equity*

JEL codes: G22

1 Introduction

In all developed market economies, the insurance industry is considered as a highly important part of the financial market, whose functions are irreplaceable. According to Brokešová, Pastoráková and Ondruška (2014), in 2012 insurance premiums represented 8.59 per cent of GDP in advanced economies. Ducháčková (2015) mentions three major global insurance centers including North America, Western Europe and Japan. Each of these three centers has its own specifics: in Japan, for about 80% of premiums written relate to life insurance, in North America the non-life insurance dominates. In the EU, market structure in each country is different.

An integral part of the insurance market is represented by commercial insurance companies, which, due to the total complexity of their activities, must be conducted by a credible and highly professional management. The management cares about the efficient use of resources, analyzes the situation and sets goals for the future. The basic condition of good decisions is a permanent analysis and interpretation of indicators that characterize the financial situation of the company. The results of the analyses evaluate the situation of the economic activity in terms of efficiency gains and benefits for the company, and consider whether the insurance company is financially stable and healthy. Financial analysis therefore plays an irreplaceable role in this sector of the economy. According to the publication by Vernimmen, Quire, Dallochio, Le Fur and Salvi (2005, p. 124), a financial analysis should be regarded as "*a rigorous approach to the issues facing a business that helps rationalise the study of economic and accounting data*".

The close link between financial analysis and accounting is accentuated by Lasher (2011, p. 71). However, while in accounting we are interested in the creation of financial statements, in finance we are interested in their use for evaluating companies and their prospects for the future (Lasher, 2011, p. 71).

It is possible to deduce that financial analysis is searching for problems in the financial health of a company. Lasher (2011, p. 71) mentions that "in particular, financial analysis looks for problems, places where things may not be as they seem, or where results

indicate the firm may be heading for trouble". The author Pamela Peterson Drake defines the financial analysis of a company in a publication whose main authors are Clayman, Fridson and Troughton (2008, p. 311) as "a process of selecting, evaluating and interpreting financial data, along with other pertinent information, in order to formulate an assessment of the company's present and future financial condition and performance. We can use financial analysis to evaluate the efficiency of a company's operations, its ability to manage expenses, the effectiveness of its credit policies, and its creditworthiness, among other things".

There are many reasons for performing financial analysis. Similarly, there is a number of techniques of financial analysis, and often it is the analysis of large volumes of data. For this reason it is necessary to adjust an analytical approach according to the situation. Before starting the process of financial analysis it has to be clarified: (a) what the purpose of the analysis is, (b) what questions the analysis has to answer, (c) what level of detail to select for fulfilling the purpose of analysis, (d) what data are available for analysis, (e) what factors or relationships affect analysis, (f) what the analytical limitations are, and if so, whether they can potentially affect the analysis. (Robinson, van Greuning, Henry, Broihahn, 2008, p. 261)

Problems of financial analysis in insurance are not yet sufficiently explored. In comparison with conventional financial analysis of a company or firm, there doesn't exist any relevant monograph. But it is noted that the financial analysis of a company is similar in many details. In this paper, the authors will follow the general principles of financial analysis and the text will focus solely on the financial analysis of commercial insurance companies. Financial analysis of insurers is understood by Pastoráková (2007) as "*broad and multifaceted activity that analyzes the whole structure of the processes in an insurance company, evaluates the last results, seeking and finding strengths and weaknesses and identifies factors affecting individual processes, as well as ways and methods to improve them, respectively elimination of negative factors, realizes the prognosis for future development and provides all necessary indicators, analyses and evaluations needed for effective decision making*". (Pastoráková, 2007, p.7)

The basic difference between the financial analysis of an insurance company and the analysis of other companies or businesses is given by different priorities in carrying out the tasks and achieving the goals. The financial analysis of commercial insurance company is more complicated because it should take into account the context of the risk underwriting and investment activities and assess their risk exposure. Moreover, it is essential to choose a different approach to life and non-life insurers. The primary task of every insurance company should be to reduce or eliminate adverse effects caused by random events, which corresponds to the original idea of insurance. In terms of economics, this generally means creating technical provisions of the contributions of insureds in order to cover needs or cover damages arising out of the insured incidents. Technical provisions are recorded as liabilities (foreign resources), i.e. insurance liabilities and their production reduce economic result. On the other hand, they work as a necessary and de facto the only source for paying claims of clients and their importance is therefore fundamental. (Čejková, Nečas, Řezáč, 2003, p. 104-105)

The unique nature of insurance operations, however, requires some modifications due to the fact that most entities outside the insurance sector can usually estimate its costs fairly accurately before pricing of products. Insurance companies must determine prices without knowing exactly the costs associated with the services provided by them. The second difference to other companies is that the insurance company must master the management of the insurance portfolio and the investment portfolio. Thus it can achieve its goals (e.g. earnings) and meet the requirements of insurance authorities. Both these portfolios are exposed to risk. The portfolio of insurance contracts is influenced by the risk of damages that cannot be predicted, and the investment portfolio depends on movements on the capital market, not to mention subjective errors when making investment decisions. A third aspect that should be taken into account is that there are differences in the accounting of insurance companies and other financial institutions not

only essential (e.g. in technical provisions), but also detailed (e.g. special items for insurance companies). It is not even possible to abstract from differences in national accounting systems (US, EU, Czech), respectively of different accounting standards (GAAP, IFRS, Czech accounting standards). (Mesršmíd, Keller, 1998, p. 9)

The above clearly shows links between the financial health of commercial insurance companies and their financial analysis. The basic difference between the financial analysis of insurance companies from the analysis of other companies or businesses is given by different priorities in meeting the challenges and achieving goals.

Financial analytical tools are getting more important in times of crisis, i. e. including the financial crisis, which took place at the end of the past decade. Daňhel (2010) notes that despite its relatively smaller losses from the impact of the crisis in the insurance sector compared to the banking sector the insurance sector was also affected by stricter regulation. The elements of stricter regulation of financial institutions (incl. commercial insurance companies) resulted in creation of supranational supervisory institutions with the aim of preventing any recurrence of the financial crisis.

The aim of this paper is to assess the development of the financial health of the global insurance market during the lingering financial crisis and to adopt conclusions driven based on the analysis of the insurance sector. The assessment of the financial health of the insurance sector in different areas of the global insurance market shows into which extent, or not at all, were particular parts of the global insurance market affected by the financial crisis.

2 Methodology and Data

Basically, for the financial analysis of insurance companies we can use the same basic ratios as for the analysis of the financial health of any other company, i.e. debt ratio indicators, indicators of profitability, liquidity and activity, but some of them only to a limited extent. One of the important indicators that will help us to determine the financial health of the insurance company is debt indicator. This indicator can be defined as the ratio of external resources to equity or total assets. Debt indicator is a key criterion for long term ensuring of liquidity. The higher the debt the greater the risk that liabilities cannot be repaid on time. For a more objective assessment of the debt several indicators are used. In the insurance industry it is necessary to approach this indicator very cautiously and modify it appropriately. It is obvious that in the insurance sector the debt indicator (modified with respect to the amount of technical provisions) may have on the contrary a positive significance in evaluating the financial health of an insurer.

Ratio indicators also include the above mentioned profitability indicators. In general, these indicators can be defined as the ratio of total income to the amount of sources that have been used to achieve it. The analysis of profitability determines the effectiveness of the invested funds. The data in the numerator of the profitability ratio is the profit that can be determined from the profit and loss report of an insurance company. In the denominator different data alternate depending on which embedded resources are analyzed. Most often it is the equity the size of which we can see in the balance sheet. In the numerator it is possible to put profit after tax, earnings before interest and taxes, etc., depending on the desired content of the indicator, but also on the habits and circumstances. Also profitability ratios must be modified in the insurance sector.

Profitability of equity / return on equity (ROE)

$$\text{ROE} = \frac{\text{profit after taxes}}{\text{equity}} \times 100 \quad (1)$$

This indicator of financial analysis refers to the owners of capital appreciation in the period. It provides an indication of whether injecting capital is reproduced with an intensity corresponding risk investments for investors. (Růčková, 2007, p. 68)

Profitability of total assets / return on assets (ROA)

$$ROA = \frac{\text{profit after taxes}}{\text{total assets}} \times 100 \quad (2)$$

This indicator refers to the valuation of assets without regard to the structure of their sources of funding and is therefore a measure of the overall efficiency of the test operation. (Wagner, 2009, p. 172)

The dynamics of premiums written

$$\frac{\text{net premiums written for current year}}{\text{net premiums written for previous year}} \quad (3)$$

Rapid increase of net premiums written naturally requires larger capital coverage than slow growth. The recently established insurance company would love to show a higher growth dynamics in early years. This can be accepted, provided that their capital base is sufficient. It is necessary to take into account that the rapid changes may be the result of mergers, changes in product or changes in reinsurance. On the new insurance markets this indicator can be seen as marginal. (Mesršmíd, Keller, 1998, p. 10)

Model Specification

The authors used time series in the range of years 2005-2014 for the analysis. This time series in particular years 2005-2014 captures the period before the outbreak of the financial crisis, the period of its impact and the period after alleviation of the financial crisis in the world insurance market. Regarding the areas/regions the analysis is focused on, the authors used a selection of the three core areas of the world insurance market for the analysis, i.e., European Union insurance market, North American insurance market and Far East and Central Asian insurance market. In each of these core areas were groups of 5 of 10 largest insurance companies analyzed and compared. The size of one insurance company is normally measured by the size of premiums written in individual years. 5 of 10 largest insurance companies in the insurance market of the EU represent approx. an average share of 13% of the market, measured by the size of premiums written. 5 of 10 largest insurance companies in the insurance market of the North America represent approx. an average share of 16% of the market, measured by the size of premiums written. And finally 5 of 10 largest insurance companies in the insurance market of the Far East and Central Asia represent approx. an average share of 14% of the market, measured by the size of premiums written (on the basis of ISIS data).

For the considered analysis, the authors used the data from the ISIS database published by the company Bureau van Dijk. The ISIS database focuses on data of the world insurance market, but it does not include absolutely all insurance companies in each region. The comprehensive database called ISIS collects the financial data from companies and private company data of subjects on the global insurance market. During the last year 2015, the authors received only a time limited access to the database with data mostly involving the year 2014.

3 Results and Discussion

According to the above mentioned theoretical specification and on the basis of ISIS database the authors found out the following results solved in three core areas of the world insurance market. The results are divided into three indicators of the financial analysis (ROE, ROA, the dynamics of premiums written).

Profitability of equity / return on equity (ROE)

Table 1 ROE – Sample European Union (in %)

	2005	2006	2007	2008	2009
AXA	17,14	16,41	17,91	1,08	12,04
Prudential Plc	41,36	38,56	21,43	-41,00	24,72
Talanx Aktiengesellschaft	16,23	33,33	35,58	12,58	29,82
AVIVA Plc	34,63	26,87	13,07	-19,15	17,51
Mapfre SA	25,09	28,71	31,44	28,17	23,42
	2010	2011	2012	2013	2014
AXA	8,02	11,62	9,86	11,81	10,93
Prudential Plc	25,80	21,15	30,09	21,58	26,70
Talanx Aktiengesellschaft	18,16	19,92	21,85	21,89	21,37
AVIVA Plc	18,66	0,12	-25,06	28,76	24,49
Mapfre SA	21,88	23,21	17,40	19,94	19,92

Source: ISIS database (Bureau van Dijk, 2015)

Table 2 ROE - Sample North America (in %)

	2005	2006	2007	2008	2009
UnitedHealth Group Inc	27,16	31,37	36,41	22,25	24,60
Anthem Inc	15,57	20,00	22,87	14,57	29,78
Metropolitan Life Insurance Company	21,84	20,43	23,66	6,03	19,05
Humana Inc	16,06	24,96	32,00	22,28	27,73
Allstate Insurance Company	10,34	32,86	30,45	-23,93	7,48
	2010	2011	2012	2013	2014
UnitedHealth Group Inc	28,59	28,13	27,65	27,73	29,75
Anthem Inc	18,28	17,00	16,23	14,92	18,05
Metropolitan Life Insurance Company	19,70	20,74	22,17	17,44	18,70
Humana Inc	25,26	27,72	21,60	20,62	22,50
Allstate Insurance Company	5,92	5,24	16,06	15,81	18,99

Source: ISIS database (Bureau van Dijk, 2015)

Table 3 ROE - Sample Far East and Central Asia (in %)

	2005	2006	2007	2008	2009
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	3,00	6,56	7,41	3,34	6,10
Nippon Life Insurance Company	7,77	5,56	7,05	13,05	6,75
Life Insurance Corporation of India	20,93	24,97	21,57	24,06	26,32
Meiji Yasuda Life Insurance Company	10,43	9,38	9,53	14,06	7,41
Dai-ichi Life Insurance Company Limited	8,17	8,23	12,67	17,61	4,71
	2010	2011	2012	2013	2014
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	4,61	0,85	3,64	5,98	5,69
Nippon Life Insurance Company	7,93	13,13	4,79	5,47	4,53
Life Insurance Corporation of India	290,24	247,54	289,04	309,74	326,10
Meiji Yasuda Life Insurance Company	7,49	13,34	7,87	7,14	6,77
Dai-ichi Life Insurance Company Limited	2,13	9,59	3,24	5,76	6,42

Source: ISIS database (Bureau van Dijk, 2015)

The tested sample of EU insurance companies showed a significant response to the impact of the financial crisis. Most of the companies recovered after the alleviation of the crisis quite quickly and already in 2009 began to approach the results reached before the financial crisis. The situation in the tested sample in the North American region is quite similar to the development in the EU. All analyzed insurers generated an increase of the ROE figures immediately after the big drop in 2008. Most of the selected insurers from the Far East and Central Asia (in simplification for the purpose of this paper called Asian insurers) were able to generate even better values during the financial crisis than before.

For detailed data and comparison see the Table 1 (sample EU), Table 2 (sample North America) and Table 3 (sample Far East and Central Asia).

Profitability of total assets / return on assets (ROA)

Table 4 ROA - Sample European Union (in %)

	2005	2006	2007	2008	2009
AXA	1,10	1,08	1,15	0,06	0,80
Prudential Plc	1,04	0,98	0,59	-0,97	0,68
Talanx Aktiengesellschaft	0,96	1,36	1,51	0,52	1,43
AVIVA Plc	1,35	1,16	0,59	-0,68	0,58
Mapfre SA	2,13	3,62	3,84	3,53	3,56
	2010	2011	2012	2013	2014
AXA	0,55	0,75	0,70	0,85	0,87
Prudential Plc	0,80	0,67	1,04	0,65	0,87
Talanx Aktiengesellschaft	0,85	0,99	1,27	1,24	1,22
AVIVA Plc	0,72	0,01	-0,80	1,00	0,98
Mapfre SA	3,14	3,17	2,53	2,91	2,86

Source: ISIS database (Bureau van Dijk, 2015)

Table 5 ROA - Sample North America (in %)

	2005	2006	2007	2008	2009
UnitedHealth Group Inc	11,72	13,51	14,35	8,29	9,84
Anthem Inc	7,59	9,53	10,10	6,46	14,21
Metropolitan Life Insurance Company	0,76	0,68	1,04	0,24	0,83
Humana Inc	5,87	7,55	10,01	7,61	11,32
Allstate Insurance Company	12,78	35,21	34,94	7,20	11,55
	2010	2011	2012	2013	2014
UnitedHealth Group Inc	11,71	11,72	10,66	10,89	11,18
Anthem Inc	8,68	7,59	6,56	6,21	7,14
Metropolitan Life Insurance Company	0,82	0,84	0,88	0,58	0,57
Humana Inc	10,86	12,62	9,57	9,27	9,25
Allstate Insurance Company	8,93	1,59	15,09	18,12	18,95

Source: ISIS database (Bureau van Dijk, 2015)

Table 6 ROA - Sample Far East and Central Asia (in %)

	2005	2006	2007	2008	2009
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	0,14	0,34	0,33	0,16	0,34
Nippon Life Insurance Company	0,88	0,63	0,58	0,51	0,52
Life Insurance Corporation of India	0,11	0,12	0,11	0,11	0,09
Meiji Yasuda Life Insurance Company	1,01	1,02	0,70	0,57	0,61
Dai-ichi Life Insurance Company Limited	0,68	0,71	0,63	0,36	0,25
	2010	2011	2012	2013	2014
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	0,26	0,06	0,27	0,45	0,48
Nippon Life Insurance Company	0,52	0,93	0,45	0,61	0,69
Life Insurance Corporation of India	0,09	0,09	0,10	0,10	0,09
Meiji Yasuda Life Insurance Company	0,56	1,10	0,86	0,85	0,99
Dai-ichi Life Insurance Company Limited	0,09	0,47	0,22	0,44	0,74

Source: ISIS database (Bureau van Dijk, 2015)

This indicator shows a similar result as ROE. All selected insurance companies from the European Union suffered from a significant decrease of the reported value in year 2008. However, in the following year they came almost to pre-crisis values. The North American region generated a decrease, too, but without any minus items in the indicator. The Asian companies were not affected significantly, although a certain decrease of this indicator in 2008 is remarkable. Anyway, this indicator is a little bit more difficult to interpret, because during the financial crisis (as a result of falling financial markets) a

certain reduction occurred in the value of total investments, which is the part of total assets. For detailed data and comparison see Tables 4-6.

The dynamics of premiums written

Table 7 The Dynamics of Premiums Written - Sample European Union (YoY)

	05/04	06/05	07/06	08/07	09/08
AXA	0,91	1,21	1,35	0,94	1,09
Prudential Plc	0,83	1,21	1,16	0,75	1,18
Talanx Aktiengesellschaft	1,01	1,40	1,10	0,96	1,18
AVIVA Plc	0,95	1,24	1,10	0,85	1,04
Mapfre SA	0,99	1,76	1,27	1,10	1,13
	10/09	11/10	12/11	13/12	14/13
AXA	0,91	0,94	1,07	1,06	0,89
Prudential Plc	1,17	1,03	1,16	1,09	1,02
Talanx Aktiengesellschaft	1,01	1,01	1,14	1,11	0,91
AVIVA Plc	0,90	0,81	0,87	1,01	0,93
Mapfre SA	1,01	1,11	1,11	1,04	0,92

Source: ISIS database (Bureau van Dijk, 2015)

Table 8 The Dynamics of Premiums Written - Sample North America (YoY)

	05/04	06/05	07/06	08/07	09/08
UnitedHealth Group Inc	1,22	1,56	1,05	1,07	1,08
Anthem Inc	2,17	1,28	1,07	1,02	0,99
Metropolitan Life Insurance Company	0,98	0,98	1,02	1,29	0,74
Humana Inc	1,10	1,48	1,18	1,15	1,07
Allstate Insurance Company	1,04	1,00	1,00	0,98	0,98
	10/09	11/10	12/11	13/12	14/13
UnitedHealth Group Inc	1,08	1,08	1,08	1,10	1,05
Anthem Inc	0,96	1,04	1,01	1,17	1,04
Metropolitan Life Insurance Company	1,25	1,17	0,98	0,86	1,36
Humana Inc	1,09	1,07	1,05	1,05	1,18
Allstate Insurance Company	0,99	1,00	1,03	1,04	1,05

Source: ISIS database (Bureau van Dijk, 2015)

Table 9 The Dynamics of Premiums Written - Sample Far East and Central Asia (YoY)

	05/04	06/05	07/06	08/07	09/08
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	0,92	0,92	1,20	1,18	1,08
Nippon Life Insurance Company	0,92	1,00	1,18	1,05	1,01
Life Insurance Corporation of India	1,19	1,44	1,28	0,82	1,34
Meiji Yasuda Life Insurance Company	0,80	0,96	1,21	1,03	1,29
Dai-ichi Life Insurance Company Limited	0,88	0,97	1,11	0,96	1,03
	10/09	11/10	12/11	13/12	14/13
National Mutual Insurance Federation of Agricultural Cooperatives (Zenkyoren)	1,24	0,95	0,99	0,80	0,81
Nippon Life Insurance Company	1,14	1,11	0,87	0,83	0,95
Life Insurance Corporation of India	1,11	0,87	0,97	1,03	0,97
Meiji Yasuda Life Insurance Company	1,35	1,33	0,62	0,90	0,81
Dai-ichi Life Insurance Company Limited	1,21	1,01	0,83	0,90	0,98

Source: ISIS database (Bureau van Dijk, 2015)

The last indicator solves dynamics of the business performance of commercial insurance companies and works with net premiums written. For the representatives of the European Union a distinct decline between 2007 and 2008 is remarkable once again, with a subsequent increase in the following reporting period. However, the North American region also recorded a decrease with a one-year delay and much lesser extent. For detailed data and comparison see Tables 7-9.

4 Conclusions

The results arising from the calculations above are obvious but much more important is the ability to put the results into links and connections and comment it correctly. The difficulty of a correct analysis lies in the proper interpretation which depends on the expertise and experience. In this context it should be noted that according to Dluhošová, "*diagnosis of basic characteristics (indicators) of the financial situation, a deeper analysis of the causes to the condition, identifying the main factors of undesirable development and proposed measures*" belong to the phases of financial analysis (Dluhošová, 2006, p. 68). Dluhošová identifies the main task of financial analysis, if possible as a comprehensive assessment of the level of the current financial situation (financial health), assessment of prospects for the financial situation in the future and prepare measures to improve the economic situation of the company, ensuring its continued prosperity and to prepare and improve decision-making processes. The basic financial analysis uses ratios, while absolute and differential indicators play a supplementary role. (Dluhošová, 2006, pp. 68-69)

The authors can adopt conclusions driven based on the results of analyses of financial indicators defined above in the explored samples in the three core areas of the world insurance market, namely European Union, North America and Far East and Central Asia. The North American region was actually hit by the financial crisis as the first and the figures confirm the development. Insurance companies were immediately reacting to the outbreak of the financial crisis and recovered after its alleviation.

Considering the indicator ROE, the tested sample shows a significant decrease to the level of a negative result in the case of one analyzed insurer in the North American region in year 2008. Similar decrease with negative result in the year 2008 relates to two European insurers. Very interesting development is observed in the case of one particular European insurer of the analyzed sample, whose ROE indicator dropped to negative numbers in the year 2008 and in the year 2012 and formed so called W-pattern (observed in the case of development of different types of crises). Asian insurers in analyzed sample were, on the contrary, not affected by the financial crisis at all. It is remarkable that one of the Asian insurers, a life insurance company, demonstrates unusually high values of the ROE indicator after the year 2010.

In the case of indicator ROA, the impact of the financial crisis is observed in the sample of European insurers. One of the insurers is showing another example of W-pattern in the years 2008 and 2012. The sample of North America shows visible remarkable results of the impact of the crisis, but not to a negative level. The Asian companies were not affected significantly, although a certain decrease of this indicator in 2008 is remarkable.

And the last analyzed point, the dynamics of premiums written, accepts the assumption of authors. Mainly the analyzed sample of European insurers shows undoubtedly a slowdown of its dynamics in the year 2008 in comparison with the year 2007. In North America, we can see only very mild impacts of the crisis and in the sample of Asian insurers the reasons of changing dynamics differ from the reasons in the EU.

The authors were excited about the unique chance to use the ISIS database published by Bureau van Dijk within their research. To their disappointment, the database ISIS cannot be used as a source for all intended research questions, as it has some limitations. It is very difficult to find a comprehensive time series with complex filled out data. The authors would like to continue their research and deepen it focusing on other contemporary approaches and other analyzed indicators.

References

Brokešová, Z., Pastoráková, E., Ondruška, T. (2014). Determinants of insurance industry development in transition economics: empirical analysis of Visegrad group data. *The Geneva papers on risk and insurance - issues and practice*, vol. 39, pp. 471-492.

Bureau van Dijk (2015). ISIS Database.

- Clayman, M. R., Fridson, M. S., Troughton, G. H. (2008). *Corporate Finance: A Practical Approach*. 1st ed. Chichester: John Wiley & Sons.
- Čejková, V., Nečas, S., Řezáč, F. (2003). *Pojistná ekonomika*. 1st ed. Brno: MU ESF.
- Dluhošová, D. (2006). *Finanční řízení a rozhodování podniku: analýza, investování, oceňování, riziko, flexibilita*. 1st ed. Praha: Ekopress.
- Ducháčková, E. (2015). *Pojištění a pojišťovnictví*. 1st ed. Praha: Ekopress.
- Ducháčková, E., Daňhel, J. (2010). *Teorie pojistných trhů*. 1st ed. Praha: Professional Publishing.
- Lasher, W. R. (2011). *Financial Management: A Practical Approach, Sixth Edition*. 6th ed. London: South Western College.
- Mesršmíd, J., Keller, J. (1998). Finanční analýza v pojišťovnictví. *Pojistné rozpravy*, No. 3, pp. 5-15.
- Pastoráková, E. (2007). *Finančná analýza v poisťovniach: praktikum*. 1st ed. Bratislava: Vydavateľstvo EKONÓM.
- Robinson, T. R., Van Greuning, H., Henry, E., Broihahn, M. A. (2008). *International Financial Statement Analysis*. 1st ed. New Jersey: John Wiley & Sons.
- Vernimmen, P., Quiry, P., Dallochio, M., Le Fur, Y., Salvi, A. (2005). *Corporate Finance: Theory and Practice*. 6th ed. Chichester: John Wiley & Sons.
- Wagner, J. (2009). *Měření výkonnosti: jak měřit, vyhodnocovat a využívat informace o podnikové výkonnosti*. 1st ed. Praha: Grada.

Expenses and Revenue Classifications for Managerial Purposes in the Czech State Administration Units

Jana Vodáková¹, Nela Sglundová²

1 University of Defence
Faculty of Military Leadership
Kounicova 65, 662 10 Brno, Czech Republic
E-mail: jana.vodakova@unob.cz

2 University of Defence
Faculty of Military Leadership
Kounicova 65, 662 10 Brno, Czech Republic
E-mail: nela.sglundova@unob.cz

Abstract: *This paper deals with classification of expenses and revenue mainly for managerial purposes in the area of the Czech state administration. From 2011 the Czech public sector units prepare accounting data under the accrual basis obligatorily. This means among others that they record and release expenses and revenue data to external users in accordance with mandatory regulations. The main aim of the paper is to examine obligatory rules of expenses and revenue classification used by the state administration units and possibilities of their utilization for managerial purposes. Further the paper concentrates on a current state of internal cost classifications and allocation especially in the context of financial management and 3E concept monitoring. As main data sources the paper uses the Ministry of Finance of the Czech Republic standardized data, the Ministry of Defence of the Czech Republic internal data, relating legal regulations and scientific papers. Description, analysis, comparison, and synthesis of main findings were used in the paper as basic scientific methods.*

Keywords: expense, revenue, expenses classification, cost allocation, state administration

JEL codes: H83, H71, H72

1 Introduction

In past the public sector units around the world organized their accounting mostly under the cash basis. It meant among others that expenses and revenue reporting was not complete, objective and standardized. Some kinds of expenses were not recorded at all (such as depreciations or provisions), existing expenses and revenue were not fully accrued and financial statements differed significantly across the public sector. The situation started to change in developed countries at the end of 80th of the last century in connection with a growth of the public sector indebtedness and "new public management" implementation. Hood (1991) for example characterized this process among the first as an attempt to introduce performance indicators to the public sector, to decrease expenses of the public sector activities and to improve financial control.

In this connection a barrier of insufficient expenses and revenue data sources has arisen because under the cash basis mostly budget incomes and outcomes (expenditures) were recorded. As a result of searching for suitable methodological solution the public sector drew its attention to the business sector and started to implement the accrual basis to financial accounting of the public sector units. Among supporters of this idea may be mentioned Pina and Torres (2002) who advocated the accrual basis and possible advantages of accrued accounting information they saw in improved management, control and analytical process. Lüder and Jones (2003) then supported methodically European reforming process and compared it in single countries.

Carlin (2005) on the other hand summarized main arguments of the accrual accounting opponents. Mainly they lied in an argument that both business and the public sector have significantly different aims, markets and nature of sources. Further there existed some remarks to possible distortions in the case of an application business accounting

appraisal methods to the public sector area, a weak link between data transparency and real performance improvement or better budget sources allocation. Though initial opinions on the accrual methodology implementation was not univocally positive it can be stated that majority of the public sector units prepare their financial statements under the accrual basis at present.

Partly due to the European Union pressure also the Czech Republic has decided to implement the accrual basis to the public sector in 2005. Unlike the other European countries the Czech implementation process was relatively fast so even in 2011 vast majority of the Czech public sector units has prepared financial statements for period 2010 under the accrual basis for the first time (closely about the implementation process for example Vodáková, 2012a or Hruža a Valouch, 2014).

As a consequence of the accounting reform the public sector units dispose of accrued expenses and revenue data, financial statements are standardized, their content enlarges and information capability grows. On the other hand it is still questionable whether former expectations concerning indebtedness management or efficiency improvement were really accomplished because practical evidence is rather contradictory. Though some authors advocate benefits of managerial methods implementation (for example Poister, Pasha, Edwards, 2013), more others point out that real performance improvement is unproven (Sanger and Bryna, 2013 and others). Also opinions on probable reasons of this situation differ among authors. Some of them ascribe it to business tools unsuitability for the area of the public sector (Carlin 2005), majority of them attributes it to improper or inconsistent implementation of business tools (De Vries, 2010) and some point out political or lobby pressure (Blöndal, 2003). The paper examines the Czech experience with expenses and revenue reporting and managerial tools utilization.

2 Methodology and Data

This paper deals with expenses and revenue classification used in the area of the Czech state administration. Its content is divided into four parts. The first one (Introduction) gives a brief historical review of expenses and revenue reporting methodology development and attitude to management in the area of the state administration. The second chapter describes the aim of the paper, used scientific methods, limiting conditions and main data sources. The third chapter summarizes main findings of the paper and comments some questionable points. Principal conclusions are formulated in the fourth chapter finally.

The aim of the paper is to find out a real situation in reporting of expenses and revenue of the state administration units and used classifications of expenses and revenue for external and internal purposes. Two main research questions are following:

- What is obligatory classification of expenses and revenue used by the state administration units and released for purposes of external users?
- What are revenue and cost classifications used for internal purposes of the state administration units mainly in the context of 3E Concept?

Description, analysis, comparison and synthesis were used as basic scientific methods in the paper. With respect to a considerable extent of the public sector the paper is limited to the state administration observation only. There are several reasons for this decision. The first one lies in an importance of the state administration as a significant user and redistributor of budgetary sources. The second one is connected with our former research orientation and findings in this area which enables us a deeper insight and possibility of time comparison. For purposes of the second research question the paper is further limited to the specific state administration unit, i.e. the Ministry of Defence of the Czech Republic as an important subject included to the state administration area. Revenue and cost classifications are observed mainly from the point of view of managerial requirements, i.e. in the context of 3E Concept (Economy, Efficiency and Effectiveness).

This concept and its partial principles are understood in the sense of Act No. 320/2001 Coll. on Financial control in the public administration.

As main data sources mainly scientific papers relating to financial reporting and economic management of the public sector were used for review of historical development. Further relating legal regulations, the Ministry of Finance of the Czech Republic and primarily the Ministry of Defence of the Czech Republic data were gathered, analyzed and summarized for the purposes of the third chapter.

3 Results and Discussion

This chapter summarizes main findings concerning expenses and revenue reporting and classification in the state administration units. The first part of the chapter describes the structure and the content of expenses and revenue data reported to external users. The second part analyses costs classification and allocation for managerial purposes in the Ministry of Defence units.

Financial reporting of expenses and revenue – reporting for external users mainly

From 2011 the Czech state administration units prepare financial statements as a standardized set of reports consistently under the accrual basis and release them electronically via the Ministry of Finance web portal for external users' utilization. These statements include among others the statement of financial performance in which external users find a detailed information concerning expenses and revenue.

Obligatory form of the statement is included in Annex 2 to Decree No. 410/2009 Coll. This decree determines generic classification of expenses and revenue, obligatory sequence and the content of expenses and revenue items. Further the decree prescribes to the state administration units to report expenses and revenue separately for main activities and economic (business) activities. As main activities are regarded activities for that accounting unit was constituted. Economic activities include business, complementary or side activities. Not only expenses and revenue but also net income must be recorded separately for main and economic activities while identical generic classification of expenses and revenue is used for both types of activities.

Generic classification separates expenses and revenue into four groups, i.e. expenses and revenue from activity, financial, relating to transfers, relating to taxes and fees. Unlike businesses the public sector units report expenses and revenue separately and the net income is stated at the end of the statement. Income tax is situated at the end of expenses items. Expenses from activity include among others material cost, energies, utilities, services, salaries and wages, insurance, depreciations, repair and maintenance, taxes and others. Revenue from activity may encompass sales of services, goods or product, sales of the long-term assets, fees or others.

Expenses and revenue data may be found also in other parts of financial statements. For example statement of financial position contains depreciations and provisions in a separate column of assets. Unlike a statement of financial performance net income in the statement of financial position is presented as one figure (in total for main and economic activities). Also statement of cash flow and statement of changes in owners' equity include some revenue and expenses relating data (depreciations, provisions, dividends, sale of the long-term assets, differences in valuation, corrections).

An important source of expenses and revenue data or their completion and explanation may be found in notes. In this part of financial statements used depreciation methods, provisions, revenue and expenses concerning revaluation to real value and other facts are explained. Besides, one special part of notes is devoted to additional information to the statement of financial performance. Accounting the fact that personal cost represents very important part of the total expenses also additional information concerning their components may be beneficial for external users and so these data are also published in separated part of notes.

To summarize this part of the paper it can be stated that the range of reported revenue and expenses data enlarges and their information capability increases thanks to used accrual methodology. Also data transparency improves significantly thanks to release of expenses and revenue data to external user via internet pages. Financial accounting methodology was harmonized across the substantial part of the public sector and it became closer to accounting of businesses which could be beneficial for mutual time and cross sectoral comparison. The Czech accounting regulations for the public sector entities seem to follow recommended international generally accepted principles relatively closely. Financial statements of the state administration units are supplemented by other (mostly budgetary) data on the Ministry of Finance web portal which offers also some additional analysis to users. It can be stated that the whole database may be very well utilizable not only by external but also internal users though due to unique character of the state administration units some intended applications as mutual comparison may be debatable. Another problem represents diverse methodology used for accounting and budgetary data recording. But still managerial utilization of accrued expenses and revenue data may be used successfully for purposes of budget negotiations, planning, standard setting, analysing of past development and so on mainly on the top managerial level (i.e. governmental, sectoral, departmental).

Managerial reporting of expenses and revenue – reporting for internal users

From detailed managerial point of view however above described expenses and revenue classification would not be sufficient probably. Accounting the fact that one state administration unit (such as a particular ministry) encompasses many internal components or units that should be managed in accordance with 3E Concept which generally obligatory and also internal regulations and directives prescribe, it is evident that for purposes of performance evaluation it is desired to identify also expenses and revenue of specific internal units or activities. Particular 3E Concept principles usually require measuring of recorded outputs (revenue in the strict sense) and inputs (expenses or costs of particular activities). Even if outputs are not expressed financially in the state administration units often, expenses or costs of activities are identifiable relatively easily.

The problem is that there still exists relatively low demand for such measurement as also our preliminary research suggested (Vodáková, 2012b). Further some convenient conditions are required such as corresponding software solution, stable organizational structure, clear vision, personal training or any system of personal responsibility and incentives. At this point it seems that accounting data utilization is at very beginning at the state administration. Though our preliminary survey was directed at the Ministry of Defence it is probable that similar situation prevailed within all ministries. However the situation could change thanks to proceeding accounting reform.

Some basic rules concerning organization of managerial accounting, resp. managerial classification of costs and revenue are prescribed in obligatory regulations for the public sector units. Specifically Decree No. 410/2009 Coll. and mainly Czech accounting standards No. 701 Accounts and rules of bookkeeping on accounts and No. 702 Opening and closing of accounting books regulate this area in general features. Czech accounting standard No. 702 enables to organize internal accounting for purposes of the public sector unit and others, including information for the public finance monitoring. This standard further prescribes to organize internal accounting by way of analytic accounts, synthetic accounts of 7th and 8th account classes, other method, or combination of all above mentioned way. Internal accounts must be integrated to the chart of accounts compulsory. So in our survey we concentrated also on a method of internal accounting organization.

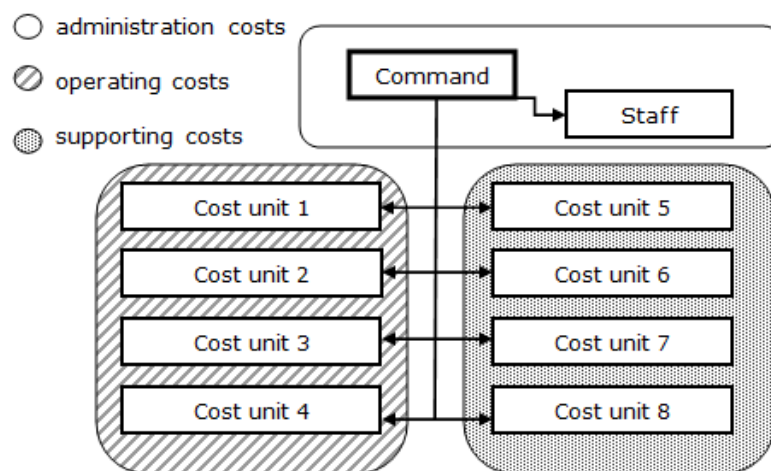
First attempts to measure costs of specific activities in the Ministry of defence referred to the turn of millennium. Camfrla (2009) for example depicts problems connected with planning and 3E Concept monitoring and possibilities of some improvements. However due to former cash methodology and existing management conception his observations were rather hypothetical. An important step toward was represented by Conception of economic management that came in force in 2013 (Ministry of Defence of the Czech

Republic, 2013). This conception declares 4 particular managerial levels for performance monitoring and implementation of controlling as a tool of economic management.

From 2014 the conception was implemented subsequently to the practice. In 2015 a pilot project was launched that was aimed at controlling implementation. First step of the pilot project is to allocate costs to specific cost units of the 3rd and 4th managerial level, which means particular brigades, battalions and further troops. As figure 1 implies, there exist three types of relatively independent subunits within one common cost unit. The first one: performance or operating subunits, where monitored activity is realized. The second one: supporting subunits, where activities as clothing, material supplying and further are provided for performance subunits. The third type of subunits represents command and relating administration. Inside a cost unit particular types of costs should be identified and joined to monitored activities. The main accent should be put on data utilization for managerial purposes.

Within our analysis we concentrated on one cost unit: selected rapid deployment brigade. This brigade is structured internally into 4 performance subunits, 4 supporting subunits and 1 command and administration unit. Thanks to many mutual relationships it is not easy to identify particular activities and assign costs to these activities and subunits. It was found that cost classification and allocation is organized by combination of analytic accounts and utilization and other method. In fact it is an enlargement of accounting entries by additional attributes. This means that used analytic classification of costs comes from synthetic gender classification described in previous text with their completion by attributes as target or activity, type of financing, closer identification of property and so on.

Figure 1 Common Structure of Cost Unit

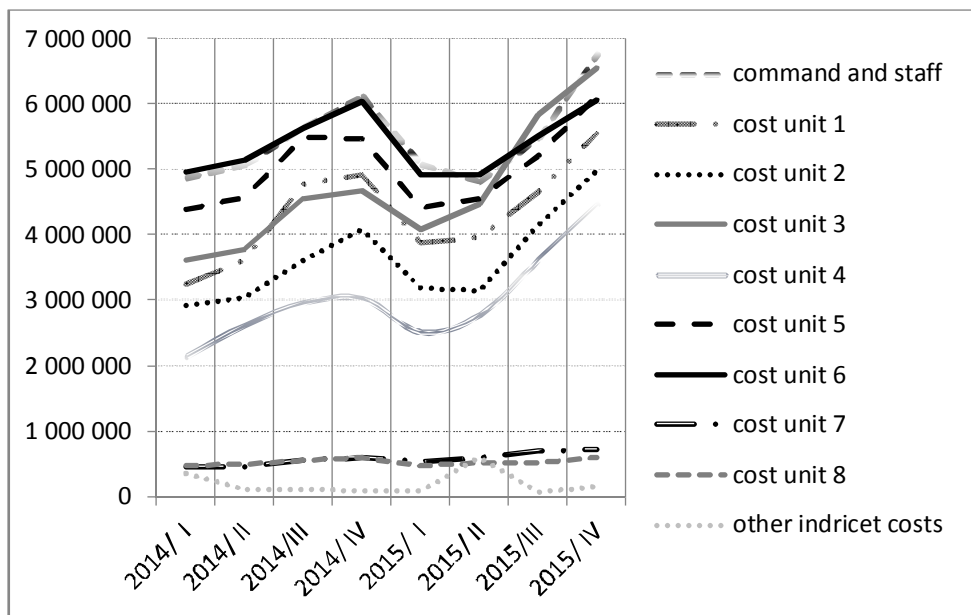


Source: Own processing

Cost allocation process itself is organized in four steps. The first one represents posting financial accounting expenses and revenue data to controlling journals. Besides financial accounting data, a special module called RON (Cost allocation) and DFF CNT (Data controlling cube) are used. The aim of the step is to allocate as much costs as possible to relevant cost unit. Figure 2 illustrates an example of wage costs allocation and development in examined cost unit. Wages were chose for their importance in relation to the total costs naturally.

As it is evident wages are allocated not only to examined cost unit but also to all 9 subunits. Besides, some portion of total costs was not able to allocate to particular subunit so they are identified as other indirect costs meanwhile. Cost development in particular quarters of 2014 and 2015 further suggests a relatively common trend in the public sector when remuneration is not planned and realized in a balanced way fully during monitored period. Relatively important portion of wages is disbursed in last quarters as extraordinary wage sources, maybe partly without any causal context.

Figure 2 Wage Costs Development in Selected Cost Unit



Source: Own processing

During the second step of cost allocation process indirect costs as energies, repairs, depreciations and further common to more activities or subunits are allocated by the way of selected bases such as exploited area, number of employees or others. In this step additional attributes of accounting entries are used as a method. Allocated costs are indicated as other indirect and continue to the third step of the allocation process. At this moment all direct and allocated indirect costs should be registered at responsible cost unit. At present an identification of all centrally recorded costs and choice of proper allocation base are still debatable. However a solution of these issues is not in the competence of cost units but controlling department.

The third phase is characterized by continuing allocation of other indirect costs to particular subunits. As a result all direct and indirect identifiable costs should be recorded to the lowest responsible unit. As allocation base a ratio of direct wages should be used, which again could be debatable. The final fourth step should encompass allocation of administration and relating support costs. Also in this case a ratio of direct wages (administration) and direct material (support) should be used however corresponding portion of costs should be allocated to operating (performance) subunits only.

Thanks to above described fourth-step process of cost allocation the Ministry of Defence should dispose of complex costs picture that would enable to monitor, analyze and plan costs of all units and subunits responsible for consumption of departmental sources. It can be considered as a definite step forward. On the other hand there exist also some shortages or debatable points connected with this process. Firstly quite often organization, methodical and structural changes within the ministry may influence total costs of the process and its efficiency. The whole process of the economic conception implementation is also time-consuming and demanding for used sources (financial, personal and software solution including). Further some methodical issues occur such as identification of all costs and their linkage to responsible units, subunits or activities, choice of proper base or pattern for allocation of other indirect costs.

However the most questionable point in our opinion means an expectation that thanks to controlling implementation 3E Concept compliance could be controlled. If we consider partial principles of 3E Concept in the sense of Act No. 320/2001 Coll. on Financial control in the public administration it is evident that at least effectiveness and efficiency could not be measured this way. In the case of controlling application as it was described in previous text we will still measure inputs only. Maybe economy compliance could be

evaluated with controlling data utilization. However, even in this case the quality of outputs could be supervised somehow. In opposite case there is a danger of immediate cost minimization at a price of quantity or quality of outputs decrease or additional cost necessity as we can see quite often in practice. Therefore for purposes of 3E Concept evaluation controlling data need to be compared with outputs that very often (or almost always) are non-financial. For this reason the current economic conception should be supplemented by an appropriate system of outputs indicators (for example partial non-financial criteria or more sophisticated managerial tools that work with non-financial criteria).

4 Conclusions

Expenses and revenue classification and reporting for external users are organized consistently under the accrual basis in the state administration and it is released regularly via internet database together with additional (mostly budgetary) data. Nevertheless diverse budgeting and accounting methodology these data may be used for purposes of central analyzing, planning or standard-setting relatively conveniently. In the case of internal costs classification the state administration units are at very beginning mostly. However it is evident that proceeding accounting reform has enabled to economic managers to utilize expenses and revenue data for various purposes. They can transform relevant financial accounting data by way of proper managerial tool to internal databases organized according to their specific needs. Apart from other things they can also serve to 3E Concept monitoring. In this case however it is desired to select optimal managerial tool or modify the existing in accordance with requirements of partial 3E Concept criteria to measure not only inputs but also outputs of realized activities.

Acknowledgments

This paper was supported by University of Defence, Faculty of Military Leadership (FVL) project "Applied economy in the Ministry of Defence".

References

- Act No. 320/2001 Coll. on Financial control in the public administration, 2001.
- Blöndal, L. R. (2003). Accrual accounting and budgeting: Key issues and recent development. *OECD Journal on Budgeting*, vol. 3 (1), pp. 43-59.
- Camřrla, J. (2009). Výkaznictví nákladů na činnosti a způsob označování účetních dokladů v působnosti Společných sil v r. 2008. In: Odehnal, J., *Manažerská ekonomika a manažerské účetnictví v armádách NATO*, Brno: Univerzita obrany, pp. 13-18.
- Carlin, T. M. (2005). Debating the Impact of Accrual Accounting and Reporting in the Public Sector. *Financial Accountability & Management*, vol. 21 (3), pp. 309-336.
- Czech Accounting Standard No. 701. Accounts and rules of bookkeeping on accounts, MF ČR, 2011.
- Czech Accounting Standard No. 702. Opening and closing of accounting books, MF ČR, 2011.
- Decree No. 410/2009 Coll. to Act. No. 563/1991 Coll. on Accounting, MF ČR, 2009.
- De Vries, M. S. (2010). Performance measurement and the search for best practices. *International Review of Administrative Sciences*, vol. 76(2), pp. 313-330.
- Hood, C. (1991). A public management for all seasons. *Public Administration Review*, vol. 69(1), pp. 3-19.
- Hrůza, F., Valouch P. (2014). Innovation of Public Financial Management Practice Trough New Accounting and Management Approach. In: Zhu, X., Zhao, S., *Proceedings of 2014 International Conference on Public Administration (10th)*. Chengdu: UESTC Press, pp. 621-628.

Lüder, K., Jones, R. (2003). *Reforming governmental accounting and budgeting in Europe*, 1st ed. Frankfurt am Main: Fachverlag Moderne Wirtschaft.

Ministry of Defence of the Czech Republic (2013). *Conception of economic management in the Ministry of Defence, 121/2013*.

Pina, V., Torres, L. (2002). Accounting Developments of Spanish Local Governments: An International Comparison. *Journal of Public Budgeting, Accounting & Financial Management*, vol. 14 (4), pp. 619-652.

Poister, T. H., Pasha, O. Q., Edwards, L. H. (2013). Does Performance management lead to better outcomes? Evidence from the US public transit industry. *Public Administration Review*, vol. 73(4), pp. 625-636.

Sanger, M. B., Bryna, M. (2013). Does Measuring Performance Lead to Better Performance? *Journal of Policy Analysis and Management*, vol. 32(1), pp. 185-203.

Vodáková, J. (2012a). *Akruální účetnictví ve veřejném sektoru*, 1st ed. Praha: Wolters Kluwer ČR.

Vodáková, J. (2012b). Financial statements of the public sector entities and their utilisation for economic management. *Economics and Management*, vol. 3(2012), pp. 148-155.

The Incorrectness of Estimating of Tax Base in Income Taxes in the Verdicts of Supreme Administrative Court in 2014 in Poland

Radosław Witczak

¹ University of Lodz

Faculty of Economics and Sociology Institute of Finance

Narutowicza 68, 90-131 Lodz, Poland

E-mail: radoslaw.witczak@uni.lodz.pl

Abstract: *Important task of the tax administration is diminishing the tax evasion of income taxes. One way of reduction the tax evasion is estimating of tax base. The provisions point out different methods of estimating of the tax base. The aim of the article was the identification of mistakes made by the tax administration in using the methods of estimating of tax base of income taxes. The analyse of using the methods of estimating of tax base by the tax authorities was given. The scope of the analyse were different cases from the Supreme Administrative Court. The cases concerned different types of methods of tax estimation used by tax administration. In the majority of analysed cases the use of methods of estimating of tax base was correct. However, there were cases where methods of estimating of tax base were used in not a proper way. Different kinds of mistakes have been identified.*

Keywords: taxation, tax fraud, income taxes, the estimation of tax base, tax collection

JEL codes: H26, H25, H24 H83, K42

1 Introduction

The tax systems cannot exist without tax administration. Important task of the tax administration is diminishing the tax evasion of income taxes. One way of the reduction of the tax evasion is the estimation of the tax base. The purpose of this process is to calculate as close as possible the estimation of the amount of tax a taxpayer should pay in case of tax fraud. The provisions point out different methods of estimation of the tax base. If those methods are not able to be used, tax authorities may also use other methods which were not listed in provisions. Generally the activity of polish tax administration is judged very critically. In spite of the vast number of studies concerning the tax fraud in the economy there has been little take-up of activity of tax administration in using the income tax estimation to date.

The aim of this article is to determine the mistakes of tax administration in income estimation in the verdicts of Supreme Administrative Court.

The research hypothesis is as follows: The tax administration uses the income estimation methods in not a proper way.

2 Methodology and Data

The Tax Ordinance Act allows tax authorities to estimate the tax base. It indicates also the reasons for the tax base estimation. According to the law the tax estimation is allowed in following cases:

- there are no tax books or other data necessary to determine the tax base;
- the taxpayer has breached the conditions entitling him or her to lump-sum taxation taxpayers' taxable incomes;
- the data resulting from the tax records do not allow the taxable base to be determined.

The last reason for estimation is involved with the reliability of tax evidences. The law in force stats that tax records should be kept reliably and correctly. Tax registers are considered as reliable if their entries reflect the actual state. The effect of unreliable tax evidences can be estimation of the tax base (the Tax Ordinance Act, art. 23 item 1).

It is stated in the law that the estimation of the tax basis may be abandoned if there are other evidences collected in the course of the proceeding supplemented the evidence from tax records making it possible to determine the tax base (the Tax Ordinance Act, art. 23 item 2).

The Tax Ordinance Act provides tax authorities with a list of six tax base estimation methods they can use. These are (Dzwonkowski, 2013):

- the internal comparative method,
- the external comparative method,
- the inventory method,
- the production method,
- the cost method,
- the type of income as a percentage of turnover.

The internal comparative method consist in comparing the amount of turnover with the previous years' turnover figures in the same company. The external comparative method consists in comparing turnover figures of companies that are similar to the one audited in terms of business scope and conditions. According to its legal definition the inventory method consists in comparing the value of the assets of the enterprise at the beginning and at the end of the period, taking into account the turnover speed rate. The next method is production method. It estimates the production capacity of the taxpayer. The cost method derives the turnover figure from a company's expenses based on a coefficient indicating their share of turnover. In the type of income as a percentage of turnover method the amount of income is calculated from the sale of particular goods and particular services based on their share of total turnover (the Tax Ordinance Act, art. 23 item 3).

In cases when none of methods indicated in the provision is applicable, tax authorities may use other methods to estimate the tax base. It was stated in the law in 2014 that tax administration can use them only under especially justified circumstances. The law does not indicate what these methods should be (the Tax Ordinance Act, art. 23 item 4). Following methods as 'non-statutory' methods are presented as in the literature (Schneider, 2007; Brzeziński B. et al., 2007; Kosikowski 2013):

- determination the turnover figure from information sources,
- determination the percentages of particular products in total production
- determination the percentages of some goods in the total turnover of the company,
- analysing the formulas used to make particular products,
- estimation business expenses in relation to turnover,
- examining the consumption of electricity,
- estimation a company's incomes based on its expenses,
- investigating net profits,
- utilising an econometric model of costs.

Tax authorities should calculate a taxpayer's liability as accurate as possible (the Tax Ordinance Act, art. 23 item 5).

3 Results and Discussion

The empirical part of this article is based on the analysis of case studies derived from the rulings of the Supreme Administrative Court. All rulings that the Supreme Administrative Court made in 2014 and which were available in the Lex database on 18 April 2015 were analysed. As many as 219 rulings issued in connection with article 23 of the Tax Ordinance Act regulating the use of the tax base estimation rules were examined. By analysing court rulings concerning the application of estimation methods, the incorrectness of particular methods made by tax authorities in the process of assessing taxpayers' incomes can be identified. Taxpayers challenging tax authorities' decisions may lodge a complaint with the Voivodeship Administrative Court (VAC). VAC is competent to assess whether a particular decision is legally sound. A complainant who

disagrees with the ruling issued by the Voivodeship Administrative Court may submit a cassation appeal to the Supreme Administrative Court. The rulings of Supreme Administrative Court which were examined involved different types of taxes (see table 1).

Table 1 The Types and Numbers of Taxes to Which Estimation Methods Apply

Tax	PIT cases as a percentage of all rulings	CIT cases as a percentage of all rulings	VAT and Excise cases as a percentage of all rulings	Other taxes	Other tax as a percentage of all rulings
No. of cases	142	9	57	11	5%
	65%	4%	26%		

Source: Developed by the author.

Almost 70% of the analysed rulings (see table above) concerned income taxes, mainly personal income tax (PIT). Whereas, corporate income tax (CIT) was dealt with in only 9 of the rulings. Excise and Value-added tax was analysed in 26% of cases. 11 rulings related to other taxes like lump sum turnover-based tax, environmental duties including fuel duties.

A more detailed analysis was applied to rulings made in cases where the provisions concerning tax base estimation in income taxes (both personal income tax and corporate income tax) were used. Income was estimated by tax authorities in 40 cases (see Table 2).

Table 2 Numbers of Rulings Concerning Estimation Methods and Other Matters Related to Income Taxes

No. of analysed rulings	No. of rulings in cases in which tax base estimation methods were used	No. of rulings in cases in which tax base estimation methods were used as a percentage of all rulings on income taxes	No. of rulings on matters other than the use of estimation methods	No. of rulings on other matters as a percentage of all rulings on income taxes
151	40	26.5%	111	73.5%

Source: Developed by the author.

The data in Table 2 show that tax authorities did not estimate the tax base in 73,5% of cases related to income tax. The reasons for the decision not to use a tax base estimation method were varied, such as dummy invoices used as a source of deductible costs. Taxpayers lodged a complaint with VAC demanding using the estimation of tax base. Other reasons were a withdrawal from an estimation procedure or the non-applicability of estimation methods. In 40 analysed cases involving income taxes, tax authorities used different methods to estimate taxable income (see Table 3).

Table 3 No. of Rulings on Cases Involving the Use of Particular Tax Base Estimation Methods

Other methods as a percentage of analysed rulings	Other methods	The type of income as a percentage of turnover method as a percentage of analysed rulings	The type of income as a percentage of turnover method	The internal comparative method as a percentage of analysed rulings	The internal comparative method	The cost method as a percentage of analysed rulings	The cost method
80%	32	2.5%	1	2.5%	1	7.5%	3
No. of rulings							

Source: Developed by the author.

Tax authorities used the statutory methods in only 12.5% of cases. Other methods were used for income estimation as many as 80% of rulings. There was no information on applied estimation method in three cases. Evaluating tax administration activity is useful to take into consideration the number of rulings in favour of the taxpayer (see Table 4).

Table 4 No. of Rulings in Favour of the Taxpayer

No. of rulings in favour of the taxpayer	No. of rulings in favour of the taxpayer as a percentage of analysed rulings	No. of rulings in favour of the tax administration	No. of rulings in favour of the tax administration as a percentage of analysed rulings
11	27.5%	29	72.5

Source: Developed by the author.

The data in Table 4 show that 27.5% rulings were made in favour of the taxpayer. In 2014 VAC revoked 21.31% of tax decisions which were lodged a complaint with this court.

Comparing these numbers one can state that tax administration estimating the income has not acted quiet properly. The share of 27.5% cases in which the Supreme Administrative Court made rulings in favour of the taxpayer is too high.

It is very important to identify the types of mistakes made by tax administration. Different kinds of incorrectness could appear in particular cases. There were following incorrectness concerning the income estimation in analysed rulings:

- lack of justifying using 'non-statutory' methods;
- no estimation of the costs of enterprises;
- unexplained differences in opinions of experts.

One of the mistakes made by the tax authorities was the lack of justifying using 'non-statutory' methods in spite of methods pointed out in provisions. Such situation took places in 5 cases. The tax administration had estimated the income of taxpayer and had used method which was called the cost method. The taxpayers had lodged with director

of tax chambers (tax authority of second instance). Director of tax chambers admitted that the used method was named incorrectly because this method of estimation belonged to 'non-statutory' methods. Nevertheless, according to tax authority of second instance the estimation was made correctly. Such an opinion was stated as well by the VAC. The judgment at first instance had been repealed. The Supreme Administrative Court maintained that if the 'non-statutory' methods had been used, the tax administration should have justified the lack of using the methods pointed out in provisions. Due to fact that the tax administration had not made it the decision should be repealed. One does not know what kind of a estimation method was used in fact and this should be explained.

Another type of the mistakes made by the tax authorities was that they did not estimate the costs of sold goods. They calculated the level of revenues whereas the number of costs was taken from tax records. The tax records were considered as unreliable, but the costs were as high as in tax evidences. According to a court if the level of revenues registered in the bookkeeping system was not reliable the number of costs was not either. So it is a question if the costs should be estimated as well. The tax administration did not justify decision of taking the amount of costs from tax records. That is why the tax authorities should take into consideration if estimation of costs should take place. Such a kind of incorrectness appeared in 3 analysed cases.

The next incorrectness concerned unexplained differences in opinions of experts. The tax administration estimated incomes of taxpayer doing business on surface extraction of sand, gravel etc. The 'non statutory' method was used with the help of an expert opinion. The expert calculated the amount of extracted minerals. However, the taxpayer challenged the expertise presenting opinion of another expert witness. There was difference between the calculation of extracted surface in both expertises equalling as many as 25%. The level of extracted minerals was lower in the expert witness. What is important another local tax authority used the calculations of expert witness for assessment of exploitation duty. The Supreme Administrative Court ruled that such difference between opinions of experts should be explained by the tax authority. That is why the decision had been repealed. The tax administration should ask the expert witness showing of the necessary background through questions in proceedings what demanded the taxpayer. Moreover, the taxpayer maintained that the surplus of minerals (above the indicated in tax records as sold sand, gravel etc) was used in building a road and parking. Tax authority should consider if such activity could have happen.

There are some rulings of the Supreme Administrative Court which are in favour of taxpayer but do not consider directly the used estimation method. There were following reasons for repealing the rulings of the VAC:

- the shortage of justifying the ruling by the VAC;
- the imposing the application of imposed tax base estimation method in the ruling by the VAC.

The shortage of justifying the ruling by the VAC appeared in verdict concerning the investigation of the income of hairdresser. The tax authority named used estimation method as cost method with elements of the external comparative method. The taxpayer lodged with the VAC and the decision was repealed due to not setting up the expert on hair colouring. The taxpayer lodged with the Supreme Administrative Court. The Supreme Administrative Court repealed the verdict of VAC stated the shortage of justifying the ruling. That is why the Supreme Administrative Court could not consider if the method used by the tax administration was applied properly. However, one can draw a conclusion that even though the Supreme Administrative Court did not express its opinion on estimation, the tax authorities had not estimated the income correctly.

Another reason for repealed in favour of taxpayer the verdict of VAC was the imposing the application of imposed tax base estimation method in the ruling by the VAC. The taxpayer sold electronic goods but did not register the business activity. The income was estimated by the use of a non statutory method. The cash flows on the accounts were

used to estimate the tax base. According to tax authorities such estimation method aimed to determine the amount of tax base close to the actual taxable base and that is why this method should be used instead of methods pointed out in the provisions. However, VAC did not agree with the argumentation of tax administration. It stated that the tax authority determining the taxable base by estimation did not justify the choice of the applied estimation method. Moreover, the VAC imposed the tax administration to use the external comparative method. The taxpayer lodged with the Supreme Administrative Court. The Supreme Administrative Court repealed the verdict of VAC due to imposing the tax administration the application of external comparative method. As for the estimation it is task of the tax authority in the repeated proceeding to consider the best method to use. To sum up the Supreme Administrative Court indirectly admitted that tax administration had not properly justified the choice of estimation method. Such ruling concerned 4 cases.

There are cases where formally Supreme Administrative Court supported the decision of tax administration, however, there are doubts if the decision was correct due to following mistakes:

- the lack of estimation of all costs of sold goods;
- underestimation of the income.

The tax administration does not always estimate all costs of sold goods. The purchased values of goods were not calculated by the tax administration while the tax base was estimated. Only selling commissions were taken into consideration. According to verdicts goods sold in gray economy may come from crime. It is also possible that the goods were bought at cheaper prices without taxation in the gray market. In such a situation the purchased value of goods should not be calculated into tax base. Such rulings concerned 4 cases. Although the Supreme Administrative Court gave rulings allowing such estimation, the judgment can be questioned. The goods selling require purchasing them firstly. There is likely to sell goods coming from crime in gray economy. However, if they were stolen it should be proved. That's why the number of purchased costs should be estimated as well.

There are cases when the tax administration underestimated the income. For example the VAC admitted that tax authorities estimated the income of hairdresser's in favourable terms. The income of hairdresser's was estimated by the use of one of non statutory method. The tax administration used information from external sources like enterprises on prices of different types of hair's colouring. The evidences for VAT purposes showed that 80 % of services of colouring were most expensive. Other cheaper types of hair's colouring equalled 20 % of all services. However, the price of most numerous services were not taken from taxpayer's cash register. The tax authorities calculated the price as the average prices of all services. This means that the price was lower than those calculated with the respect of the structure of particular services. As a result the estimated income was lower either. Nevertheless, such a kind of incorrectness was not a reason for repealing the decision. The Supreme Administrative Court repealed the verdict of VAC due to the shortage of justifying the ruling, so had not expressed itself on the estimation method. Although the Supreme Administrative Court did not express its opinion on the estimation method one can say that such estimation is not proper. It seems to be uncorrected due to the fact that tax administration should estimate the income as close as possible to the actual one. Thus the taxpayers who committed tax fraud pay less taxes comparing to those who pay their tax liabilities honestly. Also, we find that such incorrectness is the result of a fear of tax administration to lose a case in a court. If the tax income is estimated too high it is obvious the taxpayer would lodge with the court and the administrative court would repeal the decision. In opposite situation the administrative court would not repeal the decision.

Some cases ruled in favour of tax administration do not consider directly the used estimation method. For example the cases concerned the expiration of tax liabilities and considering if the taxpayer was doing business and income tax on business activity should be imposed consequently. The rulings concentrated on those issues. Although the

verdicts did not express the mind on estimation methods one can say the tax authorities estimated the income correctly in those cases.

4 Conclusions

Estimation of tax base is not an easy proceeding. The analysed data show that 27,5% cases the Supreme Administrative Court ruled in favour of the taxpayer. The most important problem is lack of justifying using 'non-statutory' methods. There were cases when only revenues or costs were estimated although the tax records were considered as unreliable. In such a situation tax administration should remember to justify taking the number of revenues (costs) from unreliable tax evidences. Other kind of mistake was differences in opinions of experts in calculation tax base. Moreover, there was some incorrectness in estimation when formally the Supreme Administrative Court ruled in favour of the tax authorities. The findings demonstrate that underestimation of income appeared in some cases. It creates in fact the advantages for enterprises which commit the tax fraud.

So the hypothesis was verified that the tax administration uses the income estimation methods in not a proper way. These findings suggest that tax administration may improve the estimation of tax base.

References

Biuro Orzecznictwa Naczelnego Sądu Administracyjnego (2015). Warszawa. Retrieved from: <http://www.nsa.gov.pl/sprawozdania-roczne.php>, access: 28.07.2015.

Brzeziński, B., Kalinowski, M., Masternak, M., Olesinska, A. (2007). *Ordynacja podatkowa. Komentarz T.1.*, Toruń: Dom Organizatora.

Dzwonkowski, H. (2013). *Ordynacja podatkowa 2013*, Legalis: electronical edition.

Kosikowski, C. (2013). *Ordynacja podatkowa. Komentarz*, Lex: electronical edition.

Schneider, K. (2007). *Błędy i oszustwa w dokumentach finansowo-księgowych*, Warszawa: Polskie Wydawnictwo Ekonomiczne. *Tax Ordinance Act 29.08.1997 r.*, Dz.U, 2012 r. no. 749, 1997.

Typology of the Municipal Bonds Risk – Application for Polish Organized Bonds Market

Agnieszka Wojtasiak-Terech

Wroclaw University of Economics
Faculty of Management, Information Systems and Finance,
Department of Financial Investments and Risk Management
Komandorska 118/120, 53-345 Wroclaw, Poland
E-mail: agnieszka.wojtasiak@ue.wroc.pl

Abstract: *The objective of the paper was to work out municipal bonds financial risk categories and sub-categories from the investor and issuer point of view and verify which types of risk are crucial for municipal bonds traded on the Polish bonds organized market - Catalyst. Risk categorization was based on risk factors. Conducted research proved that both investors and issuers should consider: market risk, credit risk, liquidity risk, operational risk, legal risk, additional rights risk, business risk and political risk. However different risk sub-categories were identified or risk sub-categories were the same but consequences of risk factors influence were different. The analysis of the municipal bonds traded on the Catalyst market showed that in between all types of financial risk the most crucial for investors are liquidity and market risk, for issuers operational risk, market risk and legal risk.*

Keywords: municipal bonds, bonds risk, risk typology, bonds organized market

JEL codes: G32, G10, G23, H74

1 Introduction

The role of financial resources gained by local governments in Poland from bonds issuance has been growing over last decade and we can assume that this trend will continue. Desk research and in-depth interviews proved that there are several reasons behind it. First of all resources earned from issuing bonds by Polish municipalities can be used to co-finance European Union projects during Multiannual Financial Framework 2014-2020. Secondly, according to Polish public finance law, municipality individual debt ratio does not take into the consideration payments on redemption of securities which are issued in connection with the agreement on the implementation of the program, project or tasks financed with the participation of the funds from the budget of the European Union or the financial assistance granted by the European Free Trade Association States. This ratio does not include as well payments from revenue bonds. Municipalities are also encouraged to issue bonds because: conditions related to bonds issuance can be more convenient than credit conditions, tender opening for selection of the issue organizer is not required, implemented by local governments tasks and projects should have diversified sources of financing and new Bonds Act is favorable to local governments which plan to issue bonds. Moreover financial market institutions and advisory institutions in Poland (examples: Warsaw Stock Exchange (WSE), PwC, Central Securities Depository of Poland, PKO BP, Bank Gospodarstwa Krajowego), promote capital market instruments among municipalities.

Municipal bonds in Poland can be traded on an organized market – Catalyst or not organized market. For the further analysis author will concentrate only on the Catalyst market because of high level of its development and transparency of information supplied by issuers. Catalyst comprises four trading platforms. Two platforms operated by the WSE (a regulated market and Alternative Trading System (ATS)) are dedicated to retail investors, two BondSpot markets (regulated market and ATS) are dedicated to wholesale investors. The difference between regulated market and ATS from the issuer point of view refers to admission requirements and scope of information the issuer supplies for the bondholders. Table 1 presents value of the municipal bonds market in Poland for years 2009-2015 and value of the municipal bonds traded on Catalyst.

Table 1 Municipal Market Growth in Poland from 2009 to 2015 (Data for End of the Year)

	2009	2010	2011	2012	2013	2014	2015
Value of the municipal bonds market, mld PLN	6.9	10.9	14.3	15.6	18.6	19.1	20.0
Value of the municipal bonds traded on Catalyst, mld PLN	0.9	1.8	2.2	2.4	3.1	3.2	3.3

Source: Own study based on www.gpwcatalyst.pl, data on June 20, 2016; Fitch Ratings Reports 2009-2016, www.fitchpolska.com.pl; data on June 23, 2016

Taking into account the growth potential of the municipal bonds market in Poland, the knowledge about risk related to municipal bonds is crucial. Moreover conducted in-depth interviews proved that one of the main obstacles in issuing bonds by the municipality is lack of awareness of municipal bonds market functioning and risk. The objective of the paper is to work out municipal bonds financial risk categories and sub-categories from the investor and issuer point of view and verify which types of risk are crucial for municipal bonds traded on the Polish bonds organized market - Catalyst.

2 Methodology and Data

The methods applied in the research were: description, analysis, synthesis and individual case studies. Author conducted primary and secondary research. Data collection methods used in the study included desk research and in-depth interviews. In particular author:

- carried out review of the literature, risk management international standards, and researches on municipal bonds markets and risk,
- carried out analysis of municipal bonds market in Poland (in particular organized market – Catalyst) and in the USA, Polish and American regulations related to municipal bonds, local government bankruptcies in the USA, reports and budget statements of all municipalities which bonds are traded on the Catalyst market and
- conducted in-depth individual interviews with three Warsaw Stock Exchange representatives responsible for municipal bonds trade on the Polish organized market and relations with municipal bonds issuers, investors and brokers. The interview included 9 questions. The goal of these interviews was to find out if the bonds market should be important source of gaining capital for municipalities and, if the answer was positive, what are the reasons behind it, what are main obstacles of municipal market development in general and Catalyst market in particular, what are main risk categories for bond issuer and investor and what are sources of risk.

To work out risk categories and sub-categories author as the reference point use municipal bonds market in the USA, because of accessibility to data, and the fact that this market is unique in the world for its size, legal and tax structure.

Approach to risk and its typology applied in the research

In the paper author applied negative approach to risk. Risk is understood as the possibility that an event will occur and adversely affect the achievement of objectives established by investors or issuers [COSO 2004].

There are many ways of describing or categorizing risk. For the purpose of analyzing the risk associated with financial instruments, typology based on the risk factors is commonly used. According to Crouhy, Galai and Mark (2006) risk factors can be broadly grouped into the following categories: market risk (the risk that changes in financial market prices and rates will reduce the value of a security or portfolio), credit risk (the risk that the issuer will fail to satisfy the terms of obligations and/or that the issuer will be downgraded by a rating agency), liquidity risk (liquidity risk is the risk that an investor will not be able to execute a transaction at the prevailing market price because there is, temporarily, no appetite for the deal on the other side of the market), operational risk (risk of loss resulting from inadequate or failed internal processes, people and systems or from external events, (BIS 2003)), legal and regulatory risk (the risk that a contract is not enforced as expected because of legal reasons, or/and changes in law have an

impact on the market value of a position), business risk (industry/sector -related risk, which is driven by changes in economic and social environment), strategic risk (risk of significant investments for which there is a high uncertainty about success and profitability), reputation risk (risk of loss the confidence of customers, creditors, regulators and the general marketplace). Similar typology, based on the risk factors is applied by Cuthbertson and Nitzsche (2001), Penza and Bansal (2001).

On the basis of general financial instruments risk classifications, conducted analysis and in-depth individual interviews author defined municipal bonds risk categories and sub-categories, which were next applied to identify risk related to the municipal bonds traded on the Catalyst market.

3 Results and Discussion

Taking into the account mentioned risk categories and conducted research on municipal bonds market, author divided municipal bonds risk into: market risk, credit risk, liquidity risk, operational risk, legal risk, additional rights risk, business risk and political risk. For some risk categories, author worked out own municipal bonds risk sub-categories.

Market risk

For the municipal bonds two types of market risk must be considered: interest rate risk and foreign exchange risk.

Interest rate risk for the investor in municipal bonds is the risk that assets will yield a lower return and for the bond issuer that liabilities will be more expensive because of a change in interest rates. This risk applies only to interest-sensitive assets and interest-sensitive liabilities (Penza, Bansal 2001). Interest rate risk can be divided into:

- risk of individual bond value - for the investor it is the risk that the value of a bond will decline when interest rates increase. Factors affecting bonds price sensitivity to changes in interest rates are presented for instance by Yohannes (1996). From the issuer point of view important are conclusions coming from Marlowe (2009) analysis of the municipal bonds secondary market. He examined price volatility in this market and found that price volatility increases borrowing costs,
- risk of cash flows - in case of variable interest rate bonds, the interest investors receive/issuers must pay can fluctuate based on prevailing interest rates,
- risk of portfolio - in complex portfolios of bonds, different kinds of exposure can arise from differences in maturities, nominal values, and reset dates of instruments (Croughy and others 2006),
- risk of the exposure to derivatives - the most common use for derivatives by municipal issuers is the execution of interest rate swaps in order to reduce borrowing costs and/or manage interest rate risk. This strategy pose problems for municipalities when the rate on the municipal bonds they issued does not move in sync with the benchmark rate that determines the payments received from the swap dealers (US Securities and Exchange Commission 2012b), (Dodd 2010),
- reinvestment risk - the risk that investors' proceeds from bonds available for reinvestment must be reinvested at a lower interest rate than it was expected.

Foreign exchange risk can have a form of:

- overall currency fluctuation risk - arises when the position in foreign currency bonds is open or imperfectly hedged (Fabozzi 2001),
- size of the currency bid/ask spread risk - the bigger the size of the spread the higher the risk.

Credit risk

Credit risk can be divided into three types of risk: default risk, risk of lack of credit enhancement and credit rating risk.

Default risk is the risk that the municipality will be unable to make the required payments on their debt obligations. The default risk can be divided into:

- risk of financial condition - municipality fiscal situation is mainly affected by: not planned in the budget expenditures, overestimated incomes, inappropriate financial and risk management, demographic changes, changes in the economy,
- type of the bond/project/obligor risk - municipal bonds default rates vary considerably depending the types of the bonds issued, type of the project financed and whether the ultimate obligor is a municipal entity or non-municipal entity (US Securities and Exchange Commission 2012a), (Liaw, Moy 2001).

The lack of credit enhancement has influence on: possibility of adding the investors an extra layer of protection, possibility of lower-rated issuers save costs of bonds' obligations, gaining access to the municipal market for lower-quality municipal issuer, improving the security's liquidity in the market (Martell and others 2012).

Rating agencies generally assign ratings upon the issuance of the municipal bonds and periodically review and update the ratings to reflect changes in the issuer's credit status. In many instances, the price of bonds will go down when their credit ratings are lowered. However, some individual municipalities' ratings are not consistent with their financial ratios, because the rating agencies do bring subjective judgments into the final mix (Berstein, Damodoran 1998), what can as well generate a risk for the investor.

Liquidity risk

The municipal securities market is characterized by relatively low liquidity. Trading activity is usually heavily concentrated among a few institutions. The low liquidity is influenced as well by the fact that there is a tendency of municipal securities investors to "buy and hold" bonds until maturity. Most active trading occurs in newly issued municipal bonds, as trading declines significantly in the months following issuance (US Securities and Exchange Commission 2012b). Empirical evidence shows that liquidity risk is an important determinant of municipal bond yields [Wang and others 2008].

The costs of illiquidity to issuers are of two types. First, there are the direct costs incurred in issuing the bonds. Second, there are the indirect costs—the price concessions that must be made to an investor who knows the bond may be costly or difficult to sell in the future should the need arise (Ang, Green 2011).

Operational risk

Author will concentrate only on the selected types of operational risk, which are most important for bonds issued by local governments. These types include:

- information risk - can have a form of information asymmetry risk, insufficient information risk and compliance with disclosure requirements. Information asymmetry first of all is related to the fact that disclosure practices of municipalities are inadequate with timeliness of reporting (Peng, Brucato 2004). Secondly it is asymmetry of access to pricing information for individual and institutional investors. Usually municipal bonds issuers are obliged to disclose financial information once a year, what is not sufficient for market participants in order to take a rational decision (US Securities and Exchange Commission 2012b) As the conducted in-depth interview proved one on the main issuers concerns is adequate and timely fulfilling disclosure requirements,
- municipality advisors risk - issuers of municipal bonds rely on external advice for transactions. Poorly structured bond deals and the use of complicated financial instruments advocated by some municipality advisors but approved by issuer officials, can contribute to severe financial stresses on many local governments,
- price transparency risk is connected with the fact that because of relative illiquidity and asymmetry of access to pricing information for individual and institutional investors it is difficult to determine the fair-market value of the investment. Moreover municipal bonds are usually not traded on centralized exchanges where prices are visible to the investor. Instead, municipal securities

trade in decentralized, OTC broker-dealer markets where trades are negotiated over the phone or through electronic means between broker-dealers and investors (US Securities and Exchange Commission 2012b),

- management risk - the analysis of municipalities defaults in the USA¹, indicates that events related to management of the municipality were very often reasons of municipality financial problems. Within management risk the most important are: internal fraud, wrong financial decisions and risk management, wrong responsibilities and task allocations.

Legal risk

The most significant reasons for legal risk for the municipal bonds investors are: unclear law in respect with bond investor rights in case of municipality default and not sufficient information included in the municipal bond issuers official statements. For the bond issuers main sources of legal risk constitute: regulations which include statements not possible to fulfill by municipalities, particularly related to generating incomes from revenue bonds, lack of regulations for municipalities financial advisors/issue organizers regarding their transactions in municipal securities and financial advice they provide (Luby, Hildreth 2014) and changes in law.

Business risk

Business risk is driven by changes in economic and social conditions of the municipality. Main types of business risk are identified on the base of bankruptcies analysis of Orange County, Prichard, City of Vallejo, Westfall, Jefferson County, Harrisburg, Stockton, San Bernardino and Detroit. Within business risk we can distinguish:

- competition risk - connected with the fact that the client (municipality citizen) will change the supplier of the goods or services. Competition risk is significant if the municipality incomes rely in high extend on one industry,
- population decline risk - significant population decline of people in working age means for the municipality decrease in tax incomes. Aging population means increasing cost of public services,
- overall economic situation risk - as a result of slowdown or recession in economy incomes to the public budget are lower and municipality debt services might increase.

Additional rights risk

Some municipal bonds have call provisions. The issuer may call back the bonds when prevailing interest rates decline, making it difficult for holders to reinvest the proceeds at the same rates they received on the bonds prior to their redemption (Liaw, Moy 2001). The risk of a possible call can adversely affect the market price of a bond. Some municipal bonds can have put provisions. If interest rates rise after bond purchase, the future value of coupon payments will become less valuable. Therefore, investors sell bonds back to the issuer and may lend proceeds elsewhere at a higher rate. If an issuer has a severe liquidity crisis, it may be incapable of paying for the bonds when the investors wish.

Political risk

Political risk can be classified as municipality specific risk (micro – risk) and country-specific risk (macro - risk). This risk has influence on bonds yields. Micro – risk is related to the characteristics of municipality, in particular to changes in self government what can lead to changes in conducted by previous government policy. Country-specific risk is associated with changing country political conditions. Political risk studies usually include an analysis of the historical stability of the country in question, evidence of present

¹ Concluded on the basis of analysis bankruptcy of: Orange County (1994), Prichard (1999 and 2009), City of Vallejo (2008), Westfall – Pennsylvania (2009), Jefferson County (2011), Harrisburg (2011), Stockon (2012), San Brenardino (2012), Detroit (2013)

turmoil or dissatisfaction, indications of economic stability and increasing by the government the scope of assigned for municipalities tasks.

Risk of the municipal bonds traded on the Catalyst market

To define risk related to the municipal bonds traded on the Catalyst market author analyzed all local government bonds placed on this market. Table 2 presents basic characteristics of the municipal bonds traded on the Catalyst market.

Table 2 Characteristics of the Municipal Bonds Traded on the Catalyst Market

Number of issuers/series	19 issuers/ 62 series
Nominal value of the bond	- 100 zł - 1000 zł
Type of issued bonds	General obligation bonds
Bonds currency	All bonds are offered in Polish currency
Coupons calculation	- Fixed rate – (1 issuer –Warsaw) - Floating rate (WIBOR6M) + premium (17 issuers), average 52-week Treasury Notes rate + premium (1 Issuer – Rybnik), premium rate is from 0,8% to 3,0%
Bond lengths	• 5-10 years – 21 series; 11-15 years – 29 series; 16-20 years – 10 series; above 20 years - 2 series
Trading platform	• WSE Regulated Market – 15 issuers • BondSpot Regulated Market – 15 issuers • WSE Alternative Trading System – 4 Issuers • BondSpot Alternative Trading System – 0 issuers

Source: Own study based on www.gpwcatalyst.pl, data on 16 May 2016

Table 3 presents identified above risk categories and sub-categories with respect to the municipal bonds traded on the Catalyst.

Table 3 Municipal Bonds Traded on the Catalyst Market Risk Categories and Sub-Categories

Risk category and sub-category	Description
Market risk	
• Interest rate risk	<ul style="list-style-type: none"> • Since 2009 National Bank of Poland has changed 20 times interest rates, but most issues have coupons based on floating rate, what lowers the risk, in 2015 average interests rate paid on floating rate municipal bonds was 3,47%, on fixed rate 6,32% what indicates high risk of fixed rate bonds • Interest rate changes influence prices and interests paid on new issued bonds • Municipalities in Poland are not entitled to invest in derivatives
Credit risk	
• Default risk	<ul style="list-style-type: none"> • Financial conditions of the municipalities are affected mainly by: overestimated incomes, higher than expected expenditures for co-financing EU Programmes, additional, not planned in budget expenditures • None of the listed entities has defaulted
• Risk of lack of credit enhancement	• None of the issuers use any form of credit enhancement
• Credit rating risk	• Two municipalities have rating assigned:

Krakow – Long-term international rating A- /Stable (S&P 2015)

Warszawa – Long-term domestic rating AAA/Stable (Fitch 2015)

Liquidity risk

- Very low liquidity of municipal bonds, on 29 series there was no trade since the listing, others were traded very occasionally, investors have tendency of buy and hold. According to yearly trade data from Catalyst market, number of transaction on municipal bonds in 2015 was only 69, turnover value 10.3 mil PLN

Operational risk

- Information risk
 - Municipalities must share only the last annual report on the budget implementation
 - Disclosure practices are inadequate with timeliness of reporting
 - Main issuers concerns is adequate and timely fulfilling disclosure requirements, however all issuers fulfill disclosure requirements on time
- Issue organizer risk
 - Only one issue organizer - PKO BP SA in all cases of placing issue on the regulated market

Legal risk

- Changes in law, particularly public finance law
- Regulations which include statements not possible to fulfill by municipalities
- Possibility of overrunning by the public sector Constitutional limit for public debt to GDP ratio (60%), what will influence local finances
- Possibility of overrunning by the issuer individual debt limits

Business risk

- Population decline risk
 - Aging population in Poland
- Economics instability risk
 - Economic slowdown results unemployment rate and inflation increase, prices of properties go down, local businesses work out lower profit

Additional rights risk

- Call risk
 - 5 issuers introduced bonds with call provisions

Political risk

- As the research shows election by municipality habitants of the certain candidate for the local authority is related to familiarity with the candidate and its experiences what not necessary means continuation or changes in the financial policy. Main factors influencing Governor decisions have social and political nature
- Policy changes and instable political situation on government level influences bond prices on local level

Source: Own study based on: www.gpwcatalyst.pl, conducted in-depth individual interviews, Information documents, Conditions of issue and budget statements of municipalities which bonds are listed on the Catalyst market, data on 16 May 2016.

Conclusions

Conducted research of the financial risk on the municipal bonds market proved that both investors and issuers should consider the same risk categories: market risk, credit risk, liquidity risk, operational risk, legal risk, additional rights risk, business risk and political risk. However for each of these groups different risk sub-categories are identified or risk sub-categories are the same but consequences of risk factors influence are different.

Analysis of Polish organized municipal bonds market – Catalyst indicated that all considered risk categories are significant. Also almost all worked out risk sub-categories can be referred to Catalyst. Exceptions are: foreign exchange risk (all municipal bonds traded on Catalyst are issued in local currency), put risk (no traded on Catalyst municipal bonds have put provision), competition risk (none of the municipalities, which bonds are listed on Catalyst relies solely on one industry). Conducted analysis, in particular in-depth interviews, proved that in between all types of financial risk the most crucial for investors are liquidity and market risk, for issuers operational risk (timely fulfilling disclosure requirements), market risk (changes in interest rates which can influence prices of new issued bonds) and legal risk (changes in regulations related to sources of public incomes and expenditures, fulfilling requirements related to individual debt ratio).

References

- Ang, A., Green, R. (2011). *Lowering Borrowing Costs for States and Municipalities Through CommonMuni, Hamilton Project. Discussion Paper*. Retrieved from: https://www0.gsb.columbia.edu/faculty/aang/papers/THP%20ANGGREEN%20DiscusPape_Feb2011.pdf.
- BIS (2003). *Sound Practices for the Management and Supervision of Operational Risk*. Retrieved from: <http://www.bis.org/publ/bcbs96.pdf>.
- Berstein, P., Damodoran, A. (1998). *Investment Management*, New York, Chichester, Weinheim, Brisbane, Singapore, Toronto: John Wiley&Sons, Inc.
- COSO (2004). *Enterprise Risk Management – Integrated Framework. Executive summary*. Retrieved from: http://www.coso.org/documents/coso_erm_executivesummary.pdf.
- Crougny, M., Galai, D., Mark, R. (2006). *The Essentials of Risk Management*, New York, Chicago, San Francisco, Lisbon, London, Madrid, Mexico City, Milan, New Delphi, San Juan, Seoul, Singapore, Sydney, Toronto: McGraw-Hill.
- Cuthberston, K., Nitzsche, D. (2001). *Financial Engineering, Derivatives and Risk Management*, Chichester, New York, Toronto, Brisbane, Singapore, Weinheim: John Wiley&Sons, Inc.
- Dodd, R. (2010). Municipal Bombs. In: International Monetary Fund, *Finance and Development*. pp. 33-35.
- Fabozzi, F. (2001). *The handbook of financial instruments*. New Jersey: John Wiley&Sons Inc.
- Luby, M., Hildreth, W. B. (2014). A Descriptive Analysis of the Municipal Advisors Market. *Municipal Finance Journal*, vol. 34(4), pp. 69-98.
- Liaw, K. T., Moy, R. L. (2001). *The Irwin Guide to Stocks, Bonds, Futures and Options*. New York: The McGraw-Hill Companies, Inc.
- Marlowe, J. (2009). *Method of Sale, Price Volatility, and Borrowing Costs on New Issue Municipal Bonds*. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1333396.
- Martell, Ch., Kravchuk, R. (2012). The Liquidity Crisis: The 2007–2009 Market Impacts on Municipal Securities. *Public Administration Review*, vol. 72(5), pp. 668-677.
- Peng, J., Brucato, P. (2004). An empirical analysis of market and institutional mechanisms for alleviating information asymmetry in the municipal bond market. *Journal of Economics and Finance*, vol. 28(2), pp. 226–238.
- Penza, P., Bansal, V. K. (2001). *Measuring Market Risk with Value at Risk*. Chichester, New York, Toronto, Brisbane, Singapore, Weinheim: John Wiley&Sons, Inc.

US Securities and Exchange Commission (2012a). Municipal Bonds: Understanding Credit Risk. In: *Investor Bulletin*: Office of Investor, Education and Advocacy. Retrieved from: <https://www.sec.gov/investor/alerts/municipalbondsbulletin.pdf>.

US Securities and Exchange Commission (2012b). *Report on the Municipal Securities Market*: Retrieved from: <http://www.sec.gov/news/studies/2012/munireport073112.pdf>.

Wang, J., Wu, Ch., Zhang, F. (2008). Liquidity, default, taxes, and yields on municipal bonds. *Journal of Banking & Finance*, vol. 32(6), pp.1133-1149.

Yohannes, A. G. (1996). *The Irwin guide to risk & reward*. USA: Irwin, Times Mirror Higher Education Group.

Fiscal Federalism and Redistributive Politics for Income Tax: Case of Russia's Regions

Nadezhda Yashina¹, Maria Ginzburg², Louisa Chesnokova³

^{1,2,3} Lobachevsky State University

Institute of Economics and Entrepreneurship, Finance and Credit Department

Gagarin ave. 23, Nizhny Novgorod 603950, Russian Federation

E-mail: yashina@iee.unn.ru, ginzburg@iee.unn.ru, chesnokova@iee.unn.ru

Abstract: *The budget system of the country with a federal form of government requires special attention to the allocation of tax revenues between levels of budgets in order to comply with the budgetary principles and to maintain capacities of the regions. Currently in Russian Federation taxes are allocated on the basis of the regulatory criteria. The authors of the study suggested that the use of the theory of weights for determining the amounts of taxes to the distribution in the Federal and regional budgets will increase the sustainability of each part of the budget system. Based on the results of current researches, the authors have developed a scorecard on the allocation of corporate income tax and personal income tax, and suggested an algorithm for derivation of tax revenues. While conducting this research, the authors were using data of economic indicators dynamics for years from 2008 to 2014 for 83 regions of Russian Federation. Regions were divided into groups according to the size of planned tax revenue. The algorithm of distribution allowed to differentiate income taxes between the regional and the federal budgets of Russian regions, taking into account the socio-economic characteristics of the territories. Application of algorithm developed by the authors, could give a solution to the following tasks facing regional budgets: expand the tax base, increase the territorial taxes collectability, raise the level of own income for regions, increase the capacity of regional budgets, related to the financing of expenditure commitments; reduce the dependency of regional budgets from federal budget transfers; improve the quality of life of the population in the regions of Russian Federation.*

Keywords: *fiscal federalism, income tax, tax revenues, coefficient of variation, weights*

JEL codes: *H21, H230, H61, H77*

1 Introduction

Throughout the history of the Russian Federation tax revenues provided the basis of State and municipal income. Similar trend is true for many countries. The question of differentiation of tax revenues is important for the economies of most countries in the world. Due to the fact that budgets of many countries are facing the deficit problem at current stage of economic development, the issue of effective income tax attachment seems to be especially important. Efficient allocation of taxes according to the levels of the budgetary system provides for increased efficiency, productivity and stability of each part of the budget system (Yashina et al., 2015). At the moment Russian Federation tax distribution is conducted on the basis of the budget and tax legislation. Standards of tax deductions to the budgets of each level are set by regional laws and the Budget Code of the Russian Federation. It is possible to change those standards annually in accordance with the aims of the income endowment for budgets at all levels.

Scientists actively discuss the problem of tax distribution between levels of the budgetary system since the fifth decade of the 20th century (Boren, 1976; Dexter, 1978; Dixit & Londregan, 1998). Taking into consideration peculiarities of State structure, tax distribution concerns primarily Federal States such as Germany, the United States, Japan, Russia, Switzerland, Argentina (Neyapti and Bulut-Cevik, 2014). Thus, in early 80-s of the XX century, Dexter (1978) and Frank (1980) suggested to develop a mechanism for reasonable tax distribution between levels of budgetary system based on a unified approach, associated with calculation method using statistics by region, but practical algorithm was never implemented. In his study Hatfield (2015) examined the relationship of tax revenues and budget levels, depending on the socio-economic

potential of the territories. Jimenez and Reckers (2012), Graham and Shackelford (2012) in their studies examined the relationship between tax revenue and tax potential of territories. They proved that the higher capacity of the territory, the larger share of tax deductions should it have. In his study, dedicated to the United States, Greene et al. (2014) conducted tax differentiation according to indicators of territorial budgets balance. According to their results, the higher the indicator of territorial budgets balance is, the higher the amount of tax revenue should be related to a specific state. Roper et al. (2009), taking into account differentiation of tax revenues between the budgets, proposed to use the "principled approach", which describes a clear correlation between tax revenue received and performance indicators, collection indicators. Froment-Meurice (2005), Ramirez et al. (2014) in their studies suggest that tax revenues within a particular level of the budget should be determined by the planned administrative expenditure of the unit and tax redistribution should be annual. Froment-Meurice (2005) finds that expenditures ultimately determine the amount of taxes due for entry into a specific budget. Laopodis et al. (2016) in his study calculated indicators, which reflect the ratio of planned tax revenues, subsidies and expenditures. Talking about the tax distribution system between the levels of the budgetary system of the Russian Federation, we should say that it is based on a unified approach to the units, described by Shmelyov (1998) and Stroev (1998). Nevertheless, a specific mechanism of tax distribution between levels of the budgetary system, which could avoid the subjectivity of individual legislators and could provide the performance and stability of the budgetary system of the Federal State, has not been developed so far.

2 Methodology and Data

Literature review showed that many economists (Boren, 1976; Vorlicek, 1989; Arena and Roper, 2010; Cordano and Balistreri, 2010; Graham et al. 2012; Froment-Meurice, 2005) agree, that tax distribution among levels of budgetary system should depend on the analysis of criteria of their mobility, scale, regularity, exporting, balance, validity and efficiency. These criteria are considered to be the basis of tax and budget policies of many countries. That means, that the bigger, more mobile and more irregular tax base of a certain tax is, the higher level should it be administered at, and should it enroll in higher budget level. This implies a subjective approach to assessment criteria by criteria setters. Other scholars (Shmelev, 1998, Stroyev, 1998; Smith, 2016; Greene et al., 2014) propose to change the existing system of tax distribution between levels of the budget on the basis of statistical data analysis and quantitative interpretation of the above criteria. Taking into account the results, obtained by Vorlicek (1989), Dixit (1998), Martinez (2008), Roper (2010), Wood (2012), Agranov (2015) in their studies, we have formulated the following hypothesis. We hypothesized that:

Income tax distribution, paid by Russian companies to regional and federal budgets should be made by calculation method based on analysis of statistical indicators that will increase the sustainability of each part of the budgetary system.

To prove our hypothesis, taking into account the experience of foreign and Russian scientists, we have developed a system of uniform quantitative indicators for taxes differentiating. The order of our actions was as follows: in *the first step* of our research, we have developed a system of indicators to assess tax revenues. As *the second step* of the study we developed the algorithm of calculating the tax differentiation indicators between levels of the budgetary system. In *the third step*, we calculated those indicators according to our algorithm. As *the fourth step*, the scorecard was corrected according to the results of hands-on testing. Taking into account previously developed techniques, for example, Agranov and Palfrey, (2015); Ginzburg et al. (2016), Kashina and Petrov (2015); Vorlicek and Satellite (1989); Ramirez et al. (2014); Kotsogiannis and Martinez (2008); Krasnova et al. (2016), Shmelev (2008), we quantitatively interpreted the theoretical distribution criteria, that exist in Russian Federation. The main difference of our algorithm is that when computing indicators we didn't focus on a balanced budget. In our study, we developed indicators from legislation requirements. Such scorecard is under discussion in Russian Federation at the moment. In other countries, according to

foreign scholars (Jimenez and Rekers (2012); Hatfield (2015); Benatar and Ashcroft (2015)), not more than 5-6 indicators in the tax revenue redistribution are being used. Such indicators suggest the interdependence of multiple taxes through category "tax capacity". Thus, the known scorecard suggest to divide tax revenues through the share of the tax capacity of the region or through sustainability and balance of the territory budget. In our study we construct following indicators to distribute income tax:

1) *Tax Base Mobility Indicator (TBMI):*

$$TBMI_{ij}1 = \frac{TB_{ij}}{B_{ij}} \text{ (by number of territories in the region)} \quad (1)$$

$$\text{or } TBMI_{ij}2 = \frac{\Delta TB_{ij}}{\Delta B_{ij}} \text{ (by elasticity)} \quad (2)$$

$$\text{or } TBMI_{ij}3 = \frac{TB_{ij}}{T_{ij}} \text{ (by taxpayers quantity)} \quad (3),$$

where: TB_{ij} – tax base (for income tax) for i-region of Russian Federation in j-fiscal period; B_{ij} – number of territories in i-region for j-fiscal period; ΔTB_{ij} – tax base adjustment for i-region in j-fiscal period toward (j-1) fiscal period; ΔB_{ij} – territories number adjustment in i-region for j-fiscal period toward (j-1) fiscal period; T_{ij} – the number of taxpayers in i-region for j-fiscal period. Formula (1) reflects tax revenue escape, depending on regions.

2) *Tax Base Immensity Indicator (TBII):*

$$TBII_{ij} = \frac{T_{ij}}{TR_{ij}} \quad (4),$$

where T_{ij} - tax amount (income tax) in i-region of Russian Federation j-fiscal period; TR_{ij} - tax revenue in i-region for j- fiscal period.

3) *Tax Base Equality Indicator (TBEQI):*

$$TBEQI_{ij} = \frac{TB_{ij}}{TA_{ij}} \quad (5),$$

where TB_{ij} – tax base (for income tax) for i-region of Russian Federation in j-fiscal period; TA_{ij} -taxpayers amount in i-region for j-fiscal period for.

4) *Tax Base Disbalance Indicator (TBDI):*

$$TBDI_{ij} = \frac{T_{ij}}{E_{ij}} \quad (6),$$

where E_{ij} - expenditures of the consolidated budget on i-region in j-period.

5) *Tax Base Stability Indicator (TBSI):*

$$TBSI_{ij} = \frac{T_{ij}}{GDP_{ij}} \quad (7),$$

where GDP_{ij} - Gross Domestic Product in i-region for j-fiscal period.

6) *Tax Base Efficiency Indicator (TBEI):*

$$TBEI_{ij} = \frac{Su_{ij}}{T_{ij}} \quad (8),$$

where Su_{ij} - tax payment surcharge in i-region for j-period.

7) *Revenue Self-Sufficiency Indicator (RSSI):*

$$RSSI_{ij} = \frac{T_{ij}}{S_{ij}} \quad (9),$$

where S_{ij} – subsidies in i-region of Russian Federation for j-period.

8) *Well-Being Indicator (WBI):*

$$WBI_{ij} = \frac{T_{ij}}{I_{ij}} \quad (10),$$

where I_{ij} - population income in i-region of Russian Federation in j-period.

The indicators, mentioned above, are presented in relation to the income tax. We have also developed similar indicators for VAT, excise tax and personal income tax. In the study, we used the data of the Federal State Statistics Service, Federal Tax Service of the Russian Federation for the period 2010-2014 for all 83 federal subjects of the Russian Federation (excluding the affiliated territories of the Republic of Crimea and Sevastopol for the year 2014).

Based on the obtained data on regions (in terms of time series), we calculated coefficients of variation, showing the uniformity of the chosen indicators change from year to year. The coefficient of variation is chosen because it represents one of the generic statistical indicators, reflecting the degree of values dispersion regardless of their scale and units of measurement. Coefficient characterizes the homogeneity of data, provides a comparative evaluation of those data. As a consequence, the coefficient of variation identified regions of the Russian Federation with the most stable and least sustainable criteria. Actually received values of the coefficients of variation for the income tax for a number of regions of the Russian Federation are presented in Table 1.

Table 1 Variations in Terms of the Criteria for the Income Tax Redistributive, Depend on Levels of the Budget System of the Russian Federation (Fragment)

Region	Coefficients of variation (%)									
	$C_{TBM1_{ij}}$	$C_{TBM2_{ij}}$	$C_{TBM3_{ij}}$	$C_{TBI_{ij}}$	$C_{TBEQ_{ij}}$	$C_{TBDI_{ij}}$	$C_{TBSI_{ij}}$	$C_{TBEI_{ij}}$	$C_{RSSI_{ij}}$	$C_{WBI_{ij}}$
Moscow region	14.10	57.23	20.24	14.76	5.21	17.56	17.58	9.29	35.12	13.98
City of Moscow	16.55	57.65	29.20	17.91	5.76	22.45	29.03	18.04	57.52	33.53
Leningrad region	12.90	57.35	34.83	12.09	5.13	13.75	11.16	45.54	15.14	8.20
City of Sankt-Petersburg	22.67	57.62	46.97	21.84	2.20	18.10	27.86	14.99	37.76	52.34
Republic of Karachaevo-Cherkessia	49.57	59.38	40.71	49.53	33.34	9.01	10.01	6.84	6.14	7.87
Republic of Chechnya	35.77	60.52	21.43	35.01	18.78	18.13	10.25	15.03	15.64	9.56
Nizhny Novgorod region	23.14	59.47	18.91	23.44	23.72	19.05	35.23	16.89	22.65	23.61
Kamchatka Territoty	42.35	57.15	16.96	42.26	5.07	9.69	10.22	6.87	19.04	17.87
Amur region	20.16	58.47	16.24	20.78	11.45	5.34	2.01	42.49	34.35	12.54

Source: Calculated by the authors of this study

We used value of coefficient of variation in the Table 1 to divide the income tax revenues between the Federal and regional budgets. If the coefficient of variation is less than 33.3%, we accept that the time-series is stable, otherwise the sequence is considered to be mixed, volatile. The more regular income is in relation to a particular computational basis, the more it is important for specific regional budget and its replenishment is more effective. Homogeneity means for us an opportunity to consolidate the tax for the regional level, the lack of homogeneity means tax consolidation for Federal budget. From the Table 2 it can be seen that coefficient of variation for different criteria can be homogenous or non-homogenous, that is, the same tax can be classified according to different reasons for different levels of budget. For example, analyzing the Moscow region, we find that when considering coefficient of variation for the time series of indicators of mobility and self-sufficiency (33.3%) it is worth it to attribute income tax to the Federal level. If we consider coefficient of variation for other series indicators (values less than 33.3%), this tax must be reported to the regional budget. In order to determine the final averaging and (uniquely) tax distribution we used weight theory. We calculated the weight of each indicator. Weighting system is constructed in the following way:

$$\sum_{i=1}^n a_i = 1, a_i \geq 0, i = \overline{1, n} \quad (11),$$

where a_i - the i -th indicator weight, i -the number of indicator for a specific region, n - is the number of indicators.

All indicators rank in importance-descending order. For us, importance-descending order means removing from a threshold in 33.3%. Taking into account, that the lower the coefficient of variation, the more stable the system is, we will have enough to arrange the values of the coefficients for each subject in ascending order. For example, we made a calculation for Nizhny Novgorod region:

We located the coefficients of variation in terms of the criteria for the allocation of income tax according to levels of the budgetary system of the Russian Federation, obtained from Table 1 in ascending order and assigned serial number to them.

We calculated the weight for each coefficient (we calculated 10 coefficients for every region for 5 years as defined in the legislation), and presented results in Table 2. We have identified weights using Fishburn's rule:

$$a_i = \frac{2 \times (n - i + 1)}{n \times (n + 1)} \quad (12).$$

So, for the Tax Base Efficiency Indicator (TBEI) formula takes the form: $a_i = \frac{2 \times (10 - 1 + 1)}{10 \times (10 + 1)} \times 100\% = 18.18\%$

We compared the value of coefficients of variation with the expected level of budget income tax distribution. As we mentioned earlier, if the coefficient is less than 33.3%, the tax can be attributed to the regional budget (RB), if more – then to the federal level (FB) (Table 2).

Table 2 The Value of the Weights Coefficients of Variation for Nizhny Novgorod Region. Match the Value of Indicators and Budget Levels for the Nizhniy Novgorod Region

The coefficients in ascending order	The coefficients of variation	Weight of the coefficient	Recommended level of budget
$C_{TBM1_{ij}}$	18.91%	16.63%	Budget of the region
$C_{TBM2_{ij}}$	59.47%	1.81%	Federal budget
$C_{TBM3_{ij}}$	23.14%	9.09%	Budget of the region
$C_{TBII_{ij}}$	23.44%	7.27%	Budget of the region
$C_{TBEQI_{ij}}$	23.72%	10.9%	Budget of the region
$C_{TBDI_{ij}}$	19.05%	14.50%	Budget of the region
$C_{TBSI_{ij}}$	35.23%	3.63%	Federal budget
$C_{TBEI_{ij}}$	16.89%	18.00%	Budget of the region
$C_{RSSI_{ij}}$	22.65%	12.72%	Budget of the region
$C_{WBI_{ij}}$	23.61%	5.45%	Budget of the region

Source: Calculated by the authors of this study

1) In order to distribute income tax between Federal and regional budgets according to weights of each criterion we propose to summarize the weight of those coefficients that relate to federal or regional levels projected budgets. Revenue share: In regional budget is $16.63\% + 9.09\% + 7.27\% + 10.9\% + 14.50\% + 18.00\% + 12.72\% + 5.45\% = 94.56\%$; In Federal Budget is $1.81\% + 3.63\% = 5.44\%$. So, for Nizhny Novgorod region, we recommend to distribute the income tax revenue between regional and Federal budgets in the ratio of 95% to 5%.

2) Similar actions were made to all other regions and the data obtained were accumulated in the Table. 3.

Table 3 Distribution of Income Tax between the Federal and Regional Levels of the Budget (Fragment)

Region	The share of income	
	To the budget of the region	To the Federal budget
Moscow region	91.00%	9.00%
City of Moscow	84.80%	15.20%
Leningrad region	84.80%	15.20%
City of Sankt-Petersburg	77.30%	22.70%
Nenets Autonomy Area	95.50%	4.50%
Republic of Kalmikia	57.60%	42.40%
Republic of Mordovia	45.50%	54.50%
Sakhalin region	77.30%	22.70%
Chukotka Autonomus Area	15.20%	84.80%

Source: Calculated by the authors of this study

We made a similar study for the Value Added Tax (VAT), excise tax and personal income tax. It allows us to make their distribution between the regional and federal levels.

3 Results and Discussion

According to the Table 3 only in 6 regions of Russian Federation (Chukotka Autonomous Area, Republic of Mordovia et al.) the income tax is worth it to be attributed to Federal budgetary level. In those regions the total weight of the potential revenues to the Federal budget is more than 50%. Taking into account that the calculation was carried out on the basis of the coefficient of variation, we can say that in those regions of Russian Federation the income tax revenues substantially depend on various factors, and therefore must be administered at the Federal level. In other regions the income tax revenue is relatively stable and therefore can be redistributed in favor of the regional budget. Talking about indirect taxes, which in Russian Federation, as in most developed countries are transferred to Federal budget, we identified the need for redistribution in favor of territorial budgets. According to our research, personal income tax in Russia should also be redistributed in favor of budgets at the regional level. In order to categorize regions by size of tax revenues, we need to identify groups with most comparable values. The optimal number of groups we identified according to the Sturges formula:

$$n_{opt} = 1 + 3,322 \ln N = 7.56 \quad (13),$$

where n_{opt} - the optimal number of intervals (groups); $N=83$ - the number of analyzed regions of Russian Federation.

Hence, the optimal number of groups for 83 subjects as well, using the rounding rule - 8. The width of each interval (that is, the number of regions in one group) is determined by the formula:

$$\Delta X_u = \frac{R}{n_{opt}} \quad (14),$$

$$R = a_{max} - a_{min} \quad (15),$$

where R - the magnitude of variation, a - total weight of the income tax revenue in the budget (regional or Federal); a_{max} - the maximum value of revenue from the regions of Russian federation; a_{min} - the minimum value of revenue from the regions of Russian federation.

In our case, the magnitude of variation for income tax is: $R = 84.8\% - 4.5 = 80.3\%$, $\Delta X = \frac{80.3\%}{8} = 10.0375\%$. As a result of calculation we got 8 groups of regions of the Russian Federation with intervals of income revenues, presented in Table 4.

Table 4 Groups of Regions of Russian Federation according to the Share of Income Tax Revenues to the Federal Budget and Regional Budgets

Group	The recommended share of revenues to the Federal budget	Recommended share of the revenue to the regional budgets	Regions	The current ratio of revenues to the Federal budget and regional budgets
1	4.5% 14.54%	85.46% 95.5%	Regions: Vladimir, Voronezh, Bryansk, Moscow, Orel, Tambov, Smolensk, Tver, Ryazan', Yaroslavl', Archangelsk, Murmansk, Vologda, Rostov, Nizhny Novgorod, Samara, Saratov, Ul'yanovsk, Kurgan, Tumen', Novosibirsk, Omsk, Tomsk, Chita Autonomous areas: Nenets, Khanty-Mansiisk Republics: Agigeya, Dagestan, Kabardino-Balkariya, Severnaya Osetiya, Bashkortostan, Mariy-El, Udmurtiya, Chuvashiya, Buryatiya, Tyva, Khakassia, Saha Territories: Krasnodar, Stavropol', Altay, Primorskiy, Khabarovskiy	
2	14.54% 24.58%	75.42% 85.46%	Regions: Ivanovo, Kaluga, Kostroma, Belgorod, Kursk, Kaliningrad, Leningrad, Novgorod, Pskov, Orenburg, Sverdlovsk, Irkutsk, Amur, Magadan, Sakhalin, Evreiskaya Cities: Moscow, Sankt-Petersburg Autonomous areas: Yamalo-Nenets Territories: Krasnoyarsk, Kamchatka Republics: Komy, Chechnya, Tatarstan	10% to the Federal budget, 90% to the regional budgets (except for some types of activities)
3	24.58% 34.62%	65.38% 75.42%	Regions: Tula, Kemerovo Republics: Karachaevo-Cherkessia	
4	34.62% 44.66%	56.34% 65.38%	Regions: Lipetsk, Vologda, Astrakhan', Kirov, Chelyabinsk Republics: Ingushetiya, Kalmykiya	
5	44.66% 54.69%	45.31% 56.34%	Regions: Penza Republics: Kareliya, Mordoviya, Altay Territories: Perm	
6	54.69% 64.73%	36.27% 45.31%	-	
7	64.73% 74.77%	25.23% 36.27%	-	
8	74.77% 84.81%	15.19% 25.23%	Autonomous area: Chukotka	

Source: Calculated by the authors of this study

As it can be seen from the Table 4, in the majority of regions of Russian Federation (Group 1) income tax should be redistributed mostly in favor of regional budgets. So, 90% of revenues should be directed to the regional budgets and 10% to the Federal budget. For slightly fewer regions (Group 2) we recommend to reduce the percentage of income tax coming into the regional budget by redistribution in favor of the Federal budget (approximately 80% on 20%). Less than 10% of the total number of regions is in Groups from 3 to 5. In these groups 50-70% of income tax revenues direct to the regional budget. And only one region of the Russian Federation from Group 8 requires income tax drastic alteration in favor of Federal budget.

4 Conclusions

According to our results of the calculations for income tax and data analysis, we can make the following conclusions: redistribution of taxes on the basis of proposed algorithm takes into consideration social, economic features of the regions and their fiscal capacity; the existing income tax distribution in some regions coincides with our results; in some regions, this arrangement could be reviewed. In general, our study confirmed

our hypothesis that the distribution of income tax revenues in regional and Federal budgets should be produced by calculation method based on the analysis of statistical indicators, which can improve performance (i.e., tax collection) and stability (i.e., self-sufficiency) of each part of the budgetary system. That is consistent with the results obtained Boren (1976), Vorlice (1989), Frank (1982), Greene (2014), Roper and Arena (2009). Sharing the opinion of Graham and Shackelford (2012), Jimenez and Reckers (2012), Hatfield (2015), Machines (1998), Stroev (1998), we also believe that consideration of socio-economic characteristics of regions of the country leads to more rational and fair distribution of the tax revenues in accordance with generally accepted principles of building fiscal and budgetary systems. We believe that the calculation mechanism, we proposed can be applied to other types of taxes, as well as in other countries, as the basis of it is the standard analysis of tax items. However, taking into account the views of Frank (1982), Graham (2008), Benatar and Ashcroft (2015), we recognize the existence of a number of problems in the application of our algorithm. They are as follows: for each territory and the country it is necessary to determine, how often is it necessary to assess the income tax redistribution between levels of budgetary system? Which of the time series is the most appropriate for consideration when implementing this algorithm? Also, there might be a possible increase in territorial tensions in case of uneven distribution of taxes between administrative units. The solution to these problems, we plan to find in our further researches.

References

- Agranov, M., Palfrey, T. R. (2015). Equilibrium tax rates and income redistribution: A laboratory study. *Journal of Public Economics*, vol.130, pp. 45-58.
- Arena, M. P., Roper, A. H. (2010). The effect of taxes on multinational debt location. *Journal of Corporate Finance*, vol. 16, Issue 5, pp. 637-654.
- Benatar, S. R., Ashcroft, R., (2015). International Perspectives on Resource Allocation. Reference Module in Biomedical Sciences, vol.12.
- Boren, C. (1976). Equitable apportionment – administrative discretion and uniformity in division of corporate income for state-tax purposes. *Southern California Law Review*, vol.49, Issue 5, pp. 991-1078.
- Cordano, A. V., Balistreri, E. J. (2010). The marginal cost of public funds of mineral and energy taxes in Peru. *Resources Policy*, vol. 35, Issue 4, pp. 257-264.
- Dexter, W. D. (1978). Business versus non-business distinction under uniform division of income for tax purpose act. *Urban lawyer*, vol.10, Issue 10, pp. 243-265.
- Dixit, A., Londregan, J. (1998). Fiscal federalism and redistributive politics. *Journal of Public Economics*, vol. 68, Issue 2, pp. 153-180.
- Froment-Meurice, H. (2005). Contrel'idée d'un "axe". *Politique mondiale*, vol. 28, Iss. 111, pp. 679-682.
- Graham, J. R., Raedy, J. S., Douglas, A. (2012). Research in accounting for income taxes. *Journal of Accounting and Economics*, vol. 53, Issues 1–2, February–April, pp. 412-434.
- Ginzburg, M., Yashina, N., Emelyanova, O., Litovsky, I. (2016) Small and medium enterprise development in Russia: public expenses – are they effective? Proceedings of the 20th Scientific Conference *Current Trends in Public Sector Research*, Brno: Masaryk University, Faculty of Economics and Administration, Department of Public Economics, pp. 359-368.
- Graham, J. R. (2008). Taxes and Corporate Finance. *Handbook of Empirical Corporate Finance*, vol. 2, pp. 59-133.

- Greene, J. L., Butler, B. J., Catanzano, P. F., Hewes, J. H., Kilgore, M. A., Kittredge, D. B., Zhao, Ma, Typrell, M. L. (2014). Family forest owners and federal taxes. *Forest Policy and Economics*, vol. 38, pp. 219-226.
- Hatfield, J. W., (2015). Federalism, taxation, and economic growth. *Journal of Urban Economics*, vol. 87, pp. 114-125.
- Jimenez, P., Reckers, M. S. (2012). Comparing the top and the bottom income earners. Distribution of income and taxes in the US. *Journal of Accounting and Public Policy*, vol.31, Issue 2, pp.226-234.
- Kashina, O., Petrov, S. (2015) Fundamentals as indicators of crisis phenomena in financial market. *Young scientist*, vol. 22 (102), pp. 397-399. (in Rus.).
- Kotsogiannis, C., Martinez, D. (2008). Ad valorem and the fiscal gap taxes in federations. *Economics Letters*, vol. 99, Issue 3, pp. 431-434.
- Krasnova, L., Ginzburg, M., Sadykova, R. (2016) *Enterprise economy*. Moscow: Infra-M, 374 p. (in Rus.).
- Laopodis T., Merikaa A., Triantafilloua M., (2016). Unraveling the political budget cycle nexus in Greece. *Research in International Business and Finance*. Vol.36, pp. 13-27.
- Neyapti, B., Bulut-Cevik, Z. B. (2014). Fiscal efficiency, redistribution and welfare. *Economic Modelling*, vol. 41. pp. 375-382.
- Ramirez, C. Z., Rojas, J. Z., Torres, J. A., (2014). Contabilidad del impuesto sobre beneficios y resultado global: relevancia valorativa en el Mercado financier espanol. *Revista de Contabilidad*, vol. 17, Issue 2, pp. 174-182.
- Shmelev, V., (1998). A new stage of Russian reforms: limits and possibilities. *Economics Questions*, vol.1.
- Smith, M., Revell, K. D. (2016). Micro-Incentives and Municipal Behavior: Political Decentralization and Fiscal Federalism in Argentina and Mexico. *World Development*, vol. 77, January 2016, pp. 231-248.
- Stroev, E. (1998). On new orientation of economic policy. *Economics Questions*, vol. 5.
- Vorlicek, P., Satellite, M. C. (1989). Procurement strategy cost and risk considerations. *Acta Astronautica*, vol. 19, Issue 3, March, pp. 259-268.
- Wood, G., Ong, R. (2012). Local Government Property Taxes. *International Encyclopedia of Housing and Home*, vol.6, pp. 174-179.
- Yashina, N., Ginzburg, M., Pronchatova-Rubtcova, N. (2015) Socio-economic situation of the countries and their Public Debt: Perspective 2015. Proceedings of the 12th Scientific Conference "European Financial System 2015", Brno: Masaryk University, Faculty of Economics and Administration, Department of Finance and Institute for Financial Market, pp. 664-671.

Cross-generational Investment Behavior and the Impact on Personal Finance

Alexander Zureck¹, Julius Reiter², Martin Svoboda³

¹ Masaryk University / FOM University of Applied Sciences
Department of Finance at Faculty of Economics and Administration
Leimkugelstraße 6, 45141 Essen, Germany
Email: alexander.zureck@fom.de

² FOM University of Applied Sciences
Department of Finance at Faculty of Economics and Administration
Leimkugelstraße 6, 45141 Essen, Germany
Email: julius.reiter@fom.de

³ Masaryk University
Department of Finance at Faculty of Economics and Administration
Lipova 41a, 60200 Brno, Czech Republic
E-mail: svoboda@econ.muni.cz

Abstract: *Money is an important topic for all generations. Young people are often stressed about money. They worry about not having enough money to retire or just to make it until the end of the month. In contrast to young people, old people often have a full understanding of the gravity of their financial situation. This paper analyzes the financial decision making in relation to the age in Germany. Within the paper we concentrate on the investment behavior in general and give an outlook to the retirement situation. The analysis is based on a logistic regression with data from an online survey in 2015. It includes data from 1,489 participants. The results of this analysis show that young people prefer secure financial investments like call money, fixed deposit, savings book, or building loan contract. In total, the participants save between 400 EUR and 500 EUR. Between 100 EUR and 200 EUR the save monthly for retirement.*

Keywords: Personal finance, investment behavior, young people, retirement

JEL Codes: D14

1 Introduction

The German government has changed the pension system some years ago. Today, people are stronger forced to deal with their own personal finances. In the past, the state pension was enough to have an acceptable life in retirement age and an income from the personal finances was a bonus. In recent times, the German government shifts the responsibility for retirement more and more onto the individuals (Svoboda & Zureck, 2015).

Parallel to other countries, like the United States, consumers are more and more confronted with financial decisions. Most financial decisions have to be made in early life. On the one hand, younger people have to finance their educations and on the other hand, young people have to make financial decision due to their retirements (Lusardi, Mitchell, & Curto, 2010). Internationally, the level of debt is high in younger society. This has effects on major labor decisions and on retirement (Lusardi u. a., 2010). At the end, the chance to become insolvent is higher if the level of debt is high (Roberts & Jones, 2001). Repaying the outstanding debts leads to the problem that people are not able to save money in special financial products for retirement like employer-provided pensions (Lusardi u. a., 2010).

There are several studies that illustrate that young people have a lack due to financial knowledge. The situation in Germany is comparable to the situation in the United States (NCEE, 2005; Reiter, Frère, Zureck, & Bensch, 2015). Low financial literacy has impact on the level of debt. People with low financial literacy tend to have higher debts than others (Lusardi & Tufano, 2015). Furthermore, they do not invest in the stock market

(van Rooij, Lusardi, & Alessie, 2011), pay higher fees for unsuitable financial products (Hastings & Tejada-Ashton, 2008), and they do not have a plan for retirement (Lusardi & Mitchell, 2011, 2007).

Whether the financial literacy is high or low depends on several aspects. One important factor is the parental home. Parents pass their financial literacy to their children. If the parents invest in the stock market, the chance is higher that their children invest in the stock market, too (Chiteji & Stafford, 1999). In addition, education in financial issues has influences on financial literacy. For example, the Czech Republic has a national strategy on financial literacy. The situation in Germany is different. Each federal state is responsible for the topics in school and university, also for financial literacy (Zureck & Svoboda, 2015). People with low financial literacy are not able to handle their own financial decisions due to retirement planning. Those people are not able to see the advantages and disadvantages of the existing financial products and a critical comparison of the alternatives is not possible (Lusardi u. a., 2010).

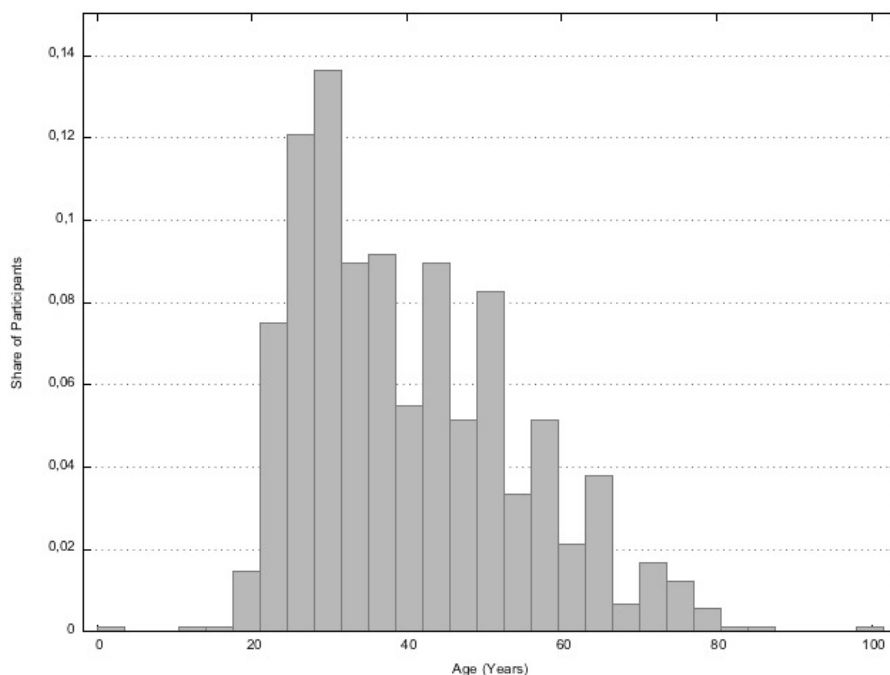
The aim of this paper is to analyze the investment behavior of young people in contrast to older ones. It should give an outlook to consequences of the current investment behavior on to retirement and social wealth of the young generation.

2 Methodology and Data

The analysis is based on an online survey. The data were collected in 2015 between June and August. The survey was placed on www.handelsblatt.com and www.auxmoney.com. Furthermore, the link to the online survey was distributed to students from the FOM Hochschule as well as to some further people via personal emails.

In total, 1,489 people participated in the online survey. All participants live in Germany. 88.5 percent of the participants are male. On average, the participants are between 24 and 31 years old. The marital status is mixed: One third are singles, another third are in a relationship, and the last third are married. Around 60 percent of the participants have no children and around 30 percent have one or two children. More than 90 percent of the participants have an employment.

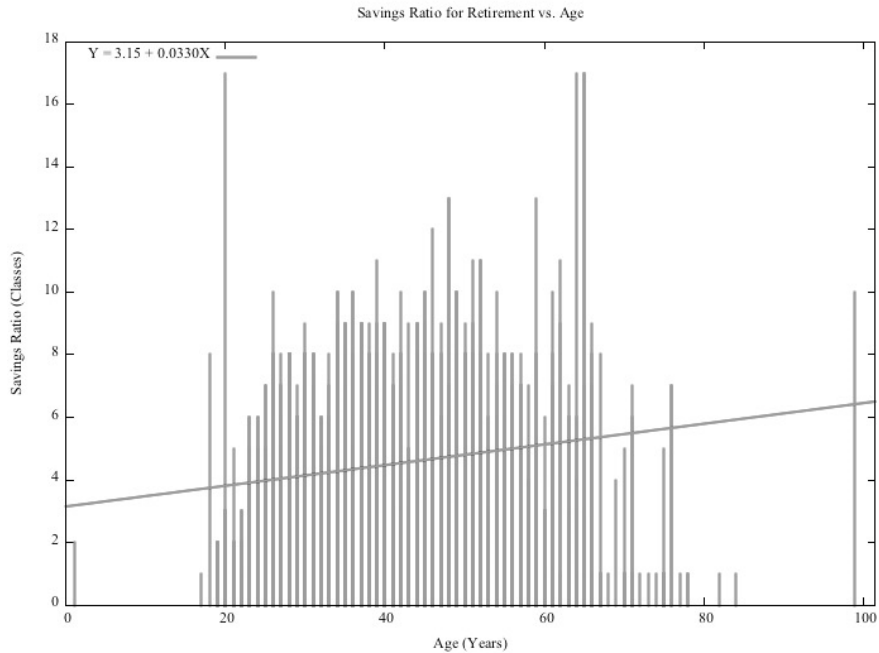
Figure 1 Participants by Age



Source: Calculated by the authors of this study

In total, participants' monthly savings ratio is between 400 EUR and 500 EUR. The participants save monthly on average between 100 EUR and 200 EUR for retirement. Figure 2 shows that most people save money for retirement and the total amount increases by age.

Figure 2 Monthly Savings Ratio for Retirement



Source: Calculated by the authors of this study

A logistic regression permitted us to assess which factors are linked to investment behavior. We examine different specifications. These specifications allow us to identify more influencing variables. We consider the case where the response SFI_i is binary. It is defined as follows:

Formula 1 Definition of Secure Financial Investment

$$SFI_i = \begin{cases} 1 & \text{if a participant is invested secure financial investments} \\ 0 & \text{else.} \end{cases}$$

In this paper, secure financial investments are call money, fixed deposit, savings book, or building loan contract. The regression model is as follows:

Formula 2 Regression model

$$SFI^* = a + b(\text{age}) + c(\text{male}) + d(\text{partnership}),$$

where SFI^* is the dependent variable: an investor's propensity to invest in a secure financial investment. Age, male, and partnerships are observable independent variables. A is the constant. B, c, and d are parameters that have to be estimated.

We tried to take into consideration some other variables. The professional qualification, university degree, children, and the type of employment have not improved the model. The explanatory power of other models with more independent variables is weaker.

3 Results and Discussion

The following part includes the results from the beforehand described logit regression.

Table 1 below represents the logit regression model where SFI^* is the dependent binary variable:

Table 1 Results for the Logit Regression Model

Logit regression, using observations 3-1489 (n = 875)
Missing or incomplete observations dropped: 612
Dependent variable: SFI
Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>z</i>	<i>p-value</i>	
const	3.75363	0.534481	7.0229	<0.0001	***
age	-0.0373969	0.00691457	-5.4084	<0.0001	***
male	-1.24899	0.476042	-2.6237	0.0087	***
partnership	1.02869	0.203682	5.0505	<0.0001	***
Mean dependent var	0.840000	S.D. dependent var		0.366816	
McFadden R-squared	0.073702	Adjusted R-squared		0.063304	
Log-likelihood	-356.3572	Akaike criterion		720.7144	
Schwarz criterion	739.8113	Hannan-Quinn		728.0194	

Number of cases 'correctly predicted' = 736 (84.1%)

f(beta'x) at mean of independent vars = 0.367

Source: Calculated by the authors of this study

Table 1 shows that the investment behavior depends on investor's age, sex, and marital status. Other specifications of the model with more including variables have no more results. For example, we took into consideration the subjective financial knowledge. It has no influence on the investment behavior concentrating on secure financial investments. This is the reason why we are not able to confirm the importance of high financial literacy for the field of secure financial investments.

The coefficient of the variable age demonstrate that younger people prefer secure financial investments. Absolutely, the effect is weak but the tendency is clear. Therefore, we are able to add an important aspect to the general statement by Lusardi, Mitchell, and Curto: "[...] financial mistakes made early in life can be costly" (Lusardi u. a., 2010). Secure financial investments are normally low-return investments. German young people are risk averse and therefore they have financial disadvantage about a long period because of missed returns from e.g. stocks or bonds.

Moreover, the results illustrate that especially women prefer secure financial investments. With a coefficient of 1.24899 the effect is strong. Additionally, the coefficient for the variable partnership emphasizes the effect. Because people living in a partnership tend to invest in secure financial investments. A question for future research can be how sex's investment behavior is influenced by the partner. So, it is possible to improve the understand of household's investment behavior in addition to past results for the fact that financial literacy is passed from the parents to their children (Chiteji & Stafford, 1999).

Young people prefer to invest in secure financial investments like call money, fixed deposit, savings book, or building loan contract. Parallel, the level of debt is higher than in older generations (Lusardi u. a., 2010). Younger people have to accept lower returns because of their investment behavior as well as the low-interest level. Furthermore, they have to repay their debts. Both aspects lead to the situation that there is latent risk that young people haven't got enough money in retirement age. The state has to deal with this situation in its own interest. The state has to take care that young people learn to manage their own financial situation. Otherwise, the state has to offer social protection in the event of retirement. That is the reason why the state has to improve financial literacy. High financial literacy leads to better financial decisions and a better social wealth in general."

4 Conclusions

Secure financial investments are popular for young people. That has influence on the generated returns of young people. The risk averse investment behavior leads to the problem that returns do not improve the wealth situation of young people. If the young investors will not change their investment behavior, there is the latent risk that they do not have enough in retirement age. This fact is more actual than ever because of the low-interest phase. The level of debt in the younger generation strengthens the situation.

It is the interest of the state that everybody has social protection in the event of retirement. Therefore, the state has to improve financial education or the pension system. An improved financial literacy leads to the advantage that people concentrate more on risky investments like stocks etc. as investment alternative. Without these investment alternatives people are not able to get an acceptable return that guarantee social protection in retirement age.

At the end, the paper shows that younger people like investing in secure financial investments. Additionally, women and people living in a partnership prefer this kind of financial products. The trend to invest in low-interest financial products can have negative impacts on retirement plans. There is the risk that these people will not have enough money in retirement age.

References

- Chiteji, N. S., Stafford, F. P. (1999). Portfolio Choices of Parents and Their Children as Young Adults: Asset Accumulation by African-American Families. *American Economic Review*, 89(2), 377–380.
- Hastings, J., Tejada-Ashton, L. (2008). *Financial Literacy, Information, and Demand Elasticity: Survey and Experimental Evidence from Mexico*. Cambridge, MA.
- Lusardi, A., Mitchell, O. (2011). Financial Literacy and Planning: Implications for Retirement Wellbeing. *Financial Literacy: Implications for Retirement Security and the Financial Marketplace*. Cambridge, MA: Oxford University Press.
- Lusardi, A., Mitchell, O. S. (2007). Baby Boomer retirement security: The roles of planning, financial literacy, and housing wealth. *Journal of Monetary Economics*, 54(1), 205–224.
- Lusardi, A., Tufano, P. (2015). Debt literacy, financial experiences, and overindebtedness. *Journal of Pension Economics and Finance*, 14(04), 332–368.
- NCEE. (2005). *What American Teens & Adults Know About Economics*. The National Council on Economic Education.
- Reiter, J., Frère, E., Zureck, A., Bensch, T. (2015). *Finanzberatung: Eine empirische Analyse bei Young Professionals* (4. Aufl.). Essen.
- Roberts, J. A., Jones, E. (2001). Money Attitudes, Credit Card Use, and Compulsive Buying among American College Students. *Journal of Consumer Affairs*, 35(2), 213–240.
- Svoboda, M., Zureck, A. (2015). Kritische Analyse der Financial Literacy im internationalen Vergleich. In E. Frère & S. Reuse (Hrsg.), *Risk- und Investmanagement am Finanz- und Kapitalmarkt (Finance)* (S. 19–31). Essen: MA Akademie Verlags- und Druck-Gesellschaft.
- Van Rooij, M., Lusardi, A., Alessie, R. (2011). Financial literacy and stock market participation. *Journal of Financial Economics*, vol. 101(2), pp. 449–472.
- Zureck, A., Svoboda, M. (2015). Financial Literacy: An International Comparison between Germany and the Czech Republic. In V. Kajurová & J. Krajíček (Hrsg.), *European Financial Systems 2015. 12th International Scientific Conference* (pp. 704–709). Brno: Masaryk University.

Masaryk University
Faculty of Economics and Administration
Department of Finance
and Institute for Financial Market

European Financial Systems 2016

Proceedings of the 13th International Scientific Conference

Edited by Jan Krajíček, Josef Nešleha, Karel Urbanovský

Editorial Board: Petr Pirožek, Ladislav Blažek, Eva Hýblová, Jaroslav Maryáš,
Martin Kvizda, Jaroslav Nekuda, Daniel Němec, Vladimír Hyánek

Published by Masaryk University, Brno 2016
1st edition, 2016, number of copies 150

Printed by: Tiskárna KNOPP s.r.o., Nádražní 219, 549 01 Nové Město nad Metují

ISBN 978-80-210-8308-0; ISBN 978-80-210-8309-7 (online : pdf)

MASARYK UNIVERSITY DEPARTMENT OF FINANCE

Lipová 507/41a, 602 00 Brno, Czech Republic



www.efs.econ.muni.cz

muni
PRESS

ISBN 978-80-210-8308-0



9 788021 083080