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PREFACE

Dear readers,

It is my pleasure to introduce you a collection of papers from the 14th annual international scientific conference The European Financial Systems 2017 organized annually by Department of Finance of the Faculty of Economics and Administration, Masaryk University in Brno, Czech Republic. This year's conference was focused especially on the current issues related to accounting, banking sector, insurance, new regulations of financial markets, different tax systems, corporate finance, public finance, financing of non-profit organizations and financial literacy.

Because the collection of papers presents the latest scientific knowledge in this area, I believe you will get a number of new insights usable both for your scientific, and educational or practical activities. I would also like to express my conviction that we meet each other in occasion of the 15th year of this conference held in 2018.

I wish you pleasant reading

Petr Valouch

Chairman of the Program Committee

CONTENTS

The impact of financial market imperfections on the investment – cash flow sensitivity in Slovak companies

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Abstract: *A company usually has get at least part of financing for investment projects from financial markets. If financial markets are perfect, the choice of the sources of finance does not influence investment decisions. Since financial markets are imperfect, companies find that external finance is costly or rationed. Especially small and medium – sized companies (SMEs) have difficulties in getting external financial sources. As a result, corporate investment is sensitive to the amount of internal funds. The aim of the article is to survey the impact of financial market imperfections on firm investment on the sample of 53 automotive companies in the SR. The survey was carried out during the year 2011. Using augmented accelerator model, we find supportive evidence for the fact that companies which are supposed to be more financially constrained exhibit greater investment – cash flow sensitivity. Our findings support the results of Fazzari et al. (1988) who also find that investment spending of firms with high levels of financial constraints is more sensitive to the availability of cash flow.*

Keywords: investment – cash flow sensitivity, capital market imperfections, financial constraint

JEL codes: G14, G31

1 Introduction

Companies need finance to operate and undertake investment projects. It is obvious that if finance is inadequate, they will not invest. A company can finance its investment projects by the use of internal and/or external funds. It usually has to get at least part of its financing from financial markets. When firms find that external finance is costly or rationed, they face financing constraints in their investment decisions. The accessibility to external finance of companies has become more interesting after the financial crisis from 2007.

The body of empirical research which explores the connection between investment and finance has developed with the theme that financial structure is relevant to a firm`s investment decisions when capital markets are imperfect. This is in contrast to Modigliani and Miller`s (1958) irrelevance theorem. Modigliani and Miller have argued that in a perfect capital market, a firm`s investment decisions are independent of its financing decisions because the financial structure would not affect the costs of investing. Under such assumption, they conclude that a firm`s financial structure is irrelevant to its value. For example, Myers and Majluf (1984), Greenwald et al. (1984), and Myers (1984) provide strong support of the fact that external funds are not a perfect substitute for internal capital. As a result, the cost of external finance may differ substantially from internal capital. According to this view, investment expenditures may depend on financial factors such as the availability of internal capital (Fazzari et al., 1988). According to them, firm`s internal cash flow may impact investment because of a financing hierarchy (Pecking Order Theory), in which internal capital has a cost advantage over external capital. A large number of empirical studies have provided strong support for the financing hierarchy hypothesis. The standard approach of this research is to categorize firms according to a variety of firm – level financial variables (dividend payout, size, leverage, etc.) before measuring the investment – cash flow sensitivity. The main results of these papers suggest that investment is more sensitive to cash flow for firms with high

levels of financial constraints. For instance, Fazzari et al. (1988) consider firms with high dividend payout ratios as unconstrained and firms with low ratios as financially constrained. They show that investment is less sensitive to internal funds for firms with high dividend payout ratio.

Kaplan and Zingales (1977) challenged the seminal study of Fazzari et al. (1988) extensively. They questioned the validity of the measure of financial constraints. Based on the same database complemented with firms' annual reports, Kaplan and Zingales (1997) proved that the investment – cash flow sensitivity is the highest for firms which seem to be the least financially constrained.

As we can see, researchers devoted much attention to the influence of internal finance on investment. However, literature is ambiguous whether this influence has a positive or a negative effect on the relationship. Studies comparable with Fazzari et al. (1988) – for example Chirinko and Schaller (1995); Hubbard et al. (1995); Bond, Harhof and Van Reenen (1999); Carpenter, Fazzari and Petersen (1994); Nickel and Nicolitsas (1999); Marhfor et al. (2012) conclude that investment – cash flow sensitivity for financially constrained firms is higher compared to lower financially constrained firms. However, studies comparable with Kaplan and Zingales (1997) – for example Chang, Tan, Wong and Zhang (2007); Erickson and Whited (2000) and Cleary (1999) conclude the contrary, lower constrained firms displayed a higher sensitivity of cash flow to investment than higher constrained firms.

According to Clearly et al. (2007), the cause of these contradictory conclusions is the lack of a precise empirical proxy for financial constraints.

The aim of the article is to survey the impact of financial market imperfections on firm investment on the sample of 53 automotive companies in the SR.

From the text we can conclude that the recognition of the effect of financial market imperfections on firm investment suggests that internal funds should be accounted for when estimating firm investment.

2 Methodology and Data

In the year 2011, we carried out a survey among automotive companies in the SR. All information on the variables used in our study was obtained through the financial statements of the companies. The data received from the survey allow us to investigate the sensitivity of corporate investments to internal funds. The dataset used in the empirical analysis contains 53 companies.

There are two main approaches in the empirical literature regarding the issue of finance constraint. The most popular and widely use dis the reduced form regression. It employs Tobin`s Q, defined as the stock market valusation of firms vis – à – vis its replacement cost (capital stock at historical prices adjusted for inflation and depreciation). The other approach is structural model estimation, using the Euler equation. There are also some modified versions of the reduced form approach.

By adding an internal – funds variable to the standard accelerator model, we use the augmented accelerator model for testing the argument that if financial markets are imperfect, firm investment may be sensitive to internal funds. Although there are some criticisms regarding this model, its advantage is that it consists of variables that are observable.

Model Specification

We use the following model specification:

$$I_i = \alpha_1 + \alpha_2 SAL_{i,2010} + \alpha_3 PRO_{i,2010} + \varepsilon_i$$

where:

I_i is total planned (gross) investment divided by total fixed assets in 2010;

SAL_{2010} is total sales in 2010 divided by total fixed assets in 2010 and reflects the accelerator model of investment, we expect α_2 to be positive;

PRO_{2010} is total profit in 2010 divided by total fixed assets in 2010 and measures the existence of financial constraints with which automotive companies may be confronted; we expect α_3 to be positive reflecting the importance of the availabilityof internal funds in determining investment decisions.

i the individual firm index; and

ε is an error term.

As stated, when coefficient α_3 is positive and statistically significant, investment is positively sensitive to internal funds. If financial markets are perfect or financial constraints are absent, the coefficient should be zero. Kaplan and Zingales (1997) also derive an equation that helps to explain this argument. In addition, since the degree of financial constraints may vary across firms of different characteristics, coefficient α_3 may also be found to vary across different groups of a priori classified firms according to the degree of financial constraints they face.

3 Results and Discussion

This section presents the results of the empirical test of the link between financial market imperfections and firm investment using the data on automotive companies in the SR. Table 1 shows the outcomes of the OLS estimations of equation.

Table 1 Determinants of investment of automotive companies: entire sample

Constant	0.033 (1.1338)
PRO_{t-1}	0.166* (0.7181)
SAL_t	0.49** (2.4045)
N	53
R^2	0.132

Source: own survey

Note ☐ significant at the 10 per cent level; ☐ ☐ significant at the 5 per cent level

The positive sign of PRO_{2010} indicates the existence of financing constraints for the automotive companies. Yet, it is possible that the degree of financing constraints differs across companies that have different characteristics. Unfortunately, the data we have gathered for this study do not permit analysis of these issues.

4 Conclusions

The paper is devoted to an empirical study on the effect of financial market imperfections on investment of automotive companies in the SR. Despite the theoretical plausibility of a relationship between capital market imperfections and real investments, the empirical literature has found it difficult to identify this channel. Overall, more research is needed to identify a method that will not be subject to criticisms related to the use of cash-flow in the investment equation and will be based on the data that are relatively available across countries and over time.

The empirical study lends support to the view that companies surveyed have faced financing constraints. More specifically, we estimate an augmented investment equation using the data obtained from the questionnaire on automotive companies in the SR. The

results show that the availability of internal funds has a positive and statistically significant effect on investment of the entire sample, suggesting that automotive companies face financing constraints.

Our findings support the results of Fazzari et al. (1988) who also find that investment spending of firms with high levels of financial constraints is more sensitive to the availability of cash flow.

Acknowledgments

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The Development of Gross Premiums Written in Life Insurance in the Czech Republic

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Abstract: *Life insurance industry over the last decade has changed greatly, not only in the offer of products. Originally this type of insurance resulted to cover the consequences of the risk of death and survival. Products of life insurance covering the risk of death should provide family of in case of death of the breadwinner, products aimed at the risk of life expectancy were mainly-saving products which should primarily secure the individual in old age. It was also possible to arrange a product called mixed life insurance. It is worth mentioning that there are various modern variations and possibilities of arranging the different kinds of insurance within the life insurance of people. The product development is escalated in investment life insurance product, which has its strengths, but also weaknesses. The main objective of this paper is to capture the main trends of gross life insurance premium, focusing on changes in gross premiums written by individual types of life insurance products including the analysis of selected parameters (number of insurance contracts, insurance penetration and other selected indicators). The software STATGRAPHICS Centurion will be used for this analysis.*

Keywords: life insurance, development, gross premium written

JEL codes: G18, G22

1 Introduction

The main roles of life insurance in the financial services system are gradually changing. According Ducháčková (2016) 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, according Ducháčková (2016) arise from the form of life insurance products, from regulatory approaches in life insurance, from approaches to selling life insurance contracts. However, life insurance is a standard tool of the insurance (financial) market (Ducháčková, 2015). Its role, significance and form are changing throughout its development in relation to changing conditions of life insurance. It is characteristic for the recent period that life insurance has been going through modifications, in particular the typical increase in the share of unit linked life insurance which is representing in particular the product of the investment life insurance. Life insurance and especially unit linked life insurance have been recently facing a few challenges. Some of them resulted from changing financial markets and others were connected with the conclusion of life insurance policies.

The aim of the paper is to analyze the development of the gross premium written of life insurance in the Czech Republic and the basic groups of life insurance products by analyzing selected indicators.

In the following part will be characterized research methods and data for 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 indicators (Hindls, et al, 2000):

- the first difference (1)
$$\Delta_t^{(1)} = \Delta_t - \Delta_{t-1}. \quad (1)$$
- the second difference (2)
$$\Delta_t^{(2)} = \Delta_t^{(1)} - \Delta_{t-1}^{(1)} \quad (2)$$
- the growth coefficient (3)
$$k_t = \frac{y_t}{y_{t-1}} \quad (3)$$
- the growth rate (4)
$$\delta_{y_t} = T_{y_t} - 100 \quad (4)$$
- the increase rate (5)
$$T_{y_t} = k_t \cdot 100 \quad (5)$$
- the average absolute gain (6) and
$${}_1\bar{\Delta} = \frac{\sum_{t=2}^{n} {}_1\Delta_t}{n-1} = \frac{y_n - y_1}{n-1}, \quad (6)$$
- the average growth coefficient (7)
$$\bar{k} = \sqrt[n-1]{\frac{y_n}{y_1}} \quad (7)$$

where *n* is the number of values (in this paper *n* = 22).

For regression analysis was used software STATGRAPHICS Centurion XVI. For the analysis was used secondary data from Czech National Bank (2017).

According to the results of an elementary statistical analysis will be chosen a suitable model for trend analysis. The results of trend analysis will be evaluated based on their individual indices:

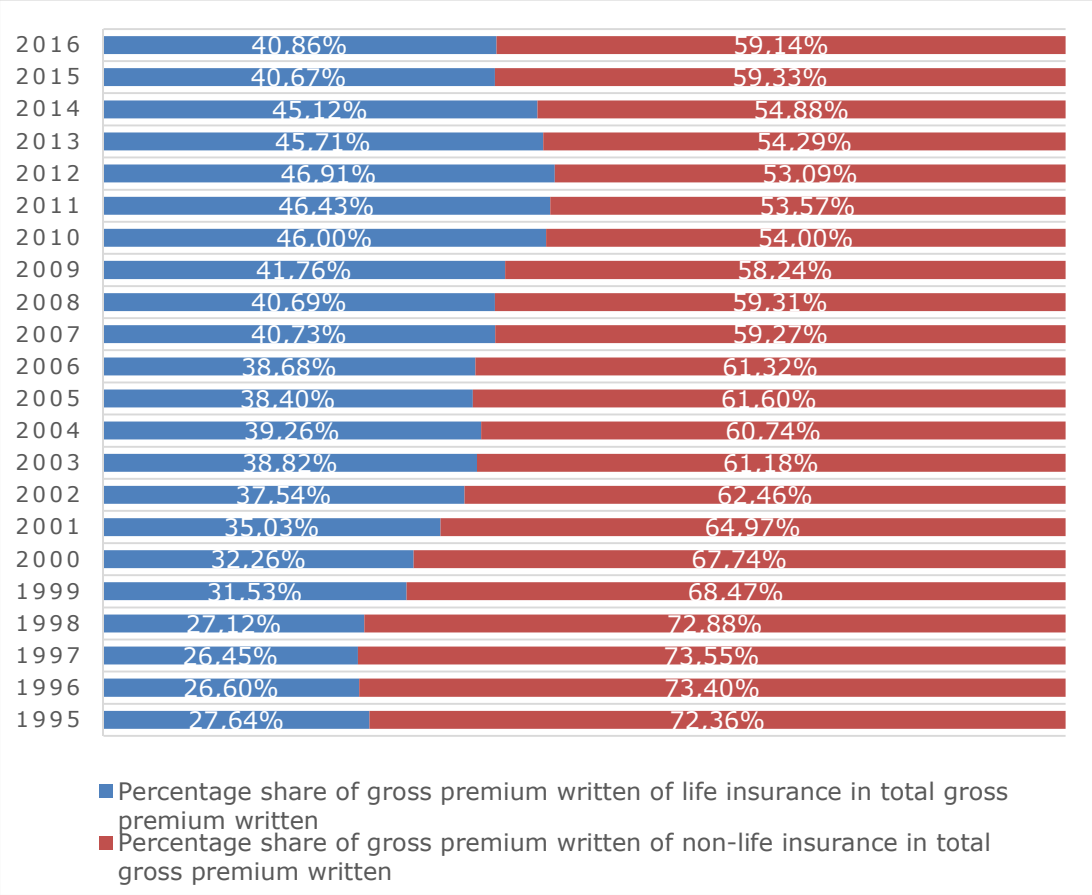
- RMSE (root mean squared error);
- R_M^2 modified index of determination;
- p-value (of parameters and model) of significance, according to which the robustness of a particular model is evaluated at the 5% significance level;
- t-test,
- F-ratio of model.

Other indicators that will assess the development of life insurance in the Czech Republic will include, in particular: development of number of insurance contracts, insurance penetration, gross premium written in life insurance per capita and the ratio of the individual life insurance groups (insurance relate to an investment fund, wedding insurance or child-care insurance, accident insurance or sickness insurance, retirement insurance, death and survival insurance) to the total prescribed life insurance in the Czech Republic.

3 Results and Discussion

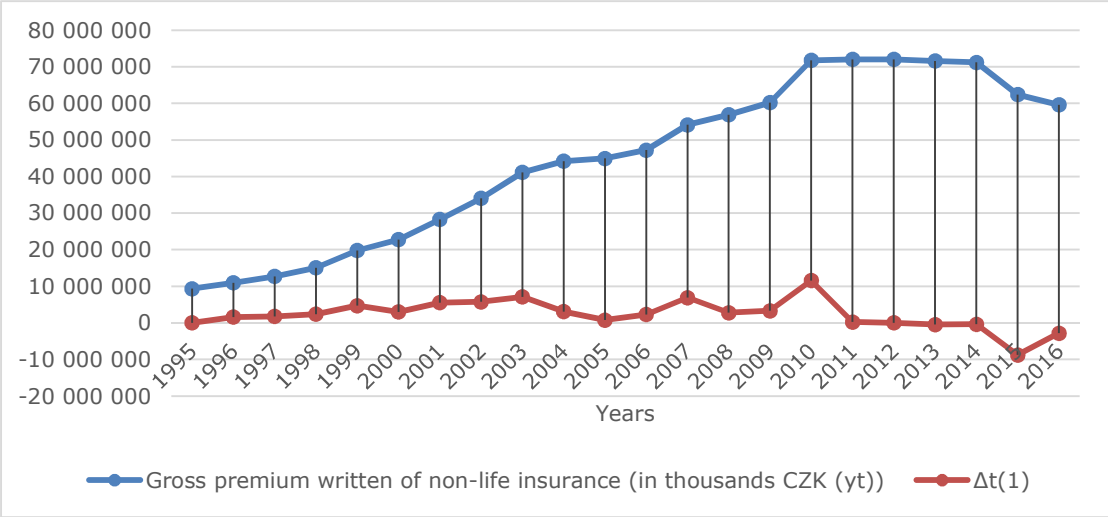
The results of elementary statistical analysis, by selected characteristics, of development of gross premium written in life insurance are given below. The development of the percentage ratio of gross premium written in life insurance versus non-life insurance is illustrated in Figure 1. This figure shows the importance of life insurance on the Czech insurance market. It should be added that this ratio is reversed on average across the EU (see Eurostat data). The basic development of gross premium written in life insurance of its first difference illustrated Figure 2 and Table 1.

Figure 1 Development of The Percentage Ratio of Gross Premium Written in Life Insurance Versus Non-life Insurance



Source: own from Czech National Bank (2017)

Figure 2 Development of Premium Written in Life Insurance with Development of its First Difference



Source: own from Czech National Bank (2017)

According to the development of the values specified in Figure 1 can be deduced that the observed characteristics recorded growth till 2014. 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 gross premium written in life insurance CZK 2 392 810 520.

The result of average growth coefficient is for gross premium written in life insurance 1.092248 (which corresponds to 9.23 %).

Table 1 Elementary Characteristic Development of Gross Premium Written in Life Insurance

Years (t)	Gross premium written of non-life insurance (in thousands CZK (y_t))	$\Delta_t^{(1)}$	$\Delta_t^{(2)}$	k_t	T_{yt}	δ_{yt}
1995	9 341 715	×	×	×	×	×
1996	10 937 216	1 595 501	×	1.170793157	0.170793157	17.08%
1997	12 692 286	1 755 070	159 569	1.16046771	0.16046771	16.05%
1998	15 089 372	2 397 086	642 016	1.188861644	0.188861644	18.89%
1999	19 793 331	4 703 959	2 306 873	1.311739879	0.311739879	31.17%
2000	22 770 132	2 976 801	-1 727 158	1.15039414	0.15039414	15.04%
2001	28 281 966	5 511 834	2 535 033	1.242064209	0.242064209	24.21%
2002	34 036 346	5 754 380	242 546	1.203464639	0.203464639	20.35%
2003	41 128 802	7 092 456	1 338 076	1.20837889	0.20837889	20.84%
2004	44 201 009	3 072 207	-4 020 249	1.074697216	0.074697216	7.47%

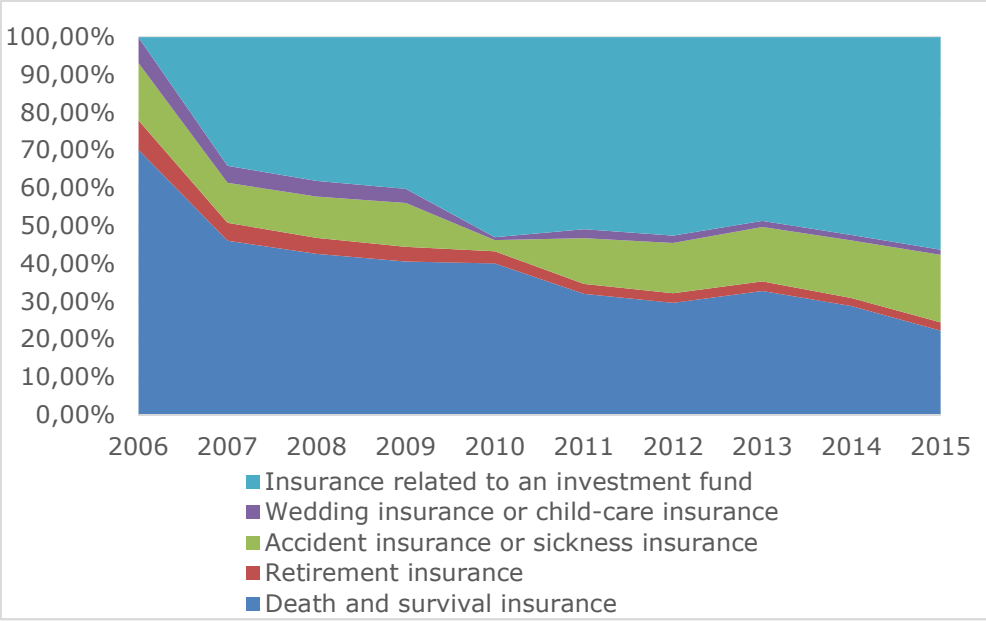
2005	44 954 269	753 260	-2 318 947	1.017041692	0.017041692	1.70%
2006	47 233 389	2 279 120	1 525 860	1.050698633	0.050698633	5.07%
2007	54 128 225	6 894 836	4 615 716	1.145973773	0.145973773	14.60%
2008	56 909 094	2 780 869	-4 113 967	1.051375581	0.051375581	5.14%
2009	60 209 323	3 300 229	519 360	1.057991241	0.057991241	5.80%
2010	71 764 862	11 555 539	8 255 310	1.191922753	0.191922753	19.19%
2011	72 009 104	244 242	-11 311 297	1.003403365	0.003403365	0.34%
2012	72 049 292	40 188	-204 054	1.000558096	0.000558096	0.06%
2013	71 577 033	-472 259	-512 447	0.993445335	-0.006554665	-0.66%
2014	71 186 464	-390 569	81 690	0.994543375	-0.005456625	-0.55%
2015	62 415 277	-8 771 187	-8 380 618	0.876785747	-0.123214253	-12.32%
2016	59 590 736	-2 824 541	5 946 646	0.954745999	-0.045254001	-4.53%

Source: own elaboration Czech National Bank (2017)

From Table 1 it is clear, that the largest increase was recorded in the surveyed quantity in 2010, on the contrary, the largest decline in 2015. The question is which life insurance group this increase / decrease was caused. This will be the focus below.

The results of the ratio of the individual life insurance groups (insurance relate to an investment fund, wedding insurance or child-care insurance, accident insurance or sickness insurance, retirement insurance, death and survival insurance) to the total prescribed life insurance in the Czech Republic are shown in the Figure 3.

Figure 3 The Development of the Ratio of the Individual Life Insurance Groups to the Total Premium Written in Life Insurance in the Czech Republic



Source: own elaboration from Czech National Bank (2017)

From Figure 3 it is clear that the increase in the total life insurance premium written in 2010 was driven by an increase in subscribed life insurance premiums linked to the investment fund. On the other hand, the decline in total life insurance premiums written

in 2015 was due to a decline in written life insurance premiums in the event of death and survival, as well as a partial decline in gross written premium written linked to the investment fund.

The results of development of number of insurance contracts, insurance penetration and gross premium written in life insurance per capita see in Table 2.

The number of the insurance contract has a decreasing trend over the reference period, except 2012. However, the gross premium written per insurance contract has a volatility development period. This means that with the decreasing number of contracts, the gross premiums written not decreases. Premium per capita increases in the period 2006 to 2011, and in the following year, since 2012, it has declined. In the case of this indicator, it is highly desirable for its value to have a growth tendency. The decreasing trend of this indicator indicates the low use of the product by the population of that country. Insurance penetration a growing tendency in 2006 to 2010, with a downward trend in the following period since 2006, indicating the unfavorable development of the indicator.

Another research question is how to develop gross premiums written in life insurance in the future this will be used to analyze time series and software STATGRAPHICS Centurion XVI. The trend in time series can be described by trend functions unless the development of time series corresponds to a particular function of time (for example: linear, quadratic and exponential).

Table 2 The Results of Selected Indicators

	2006	**2007**	**2008**	**2009**	**2010**
Number of insurance contracts	10 010 546	10 119 438	10 104 445	9 349 600	8 919 070
Gross premium written per insurance contract	4 718	5 349	5 631	6 442	8 046
Premium per capita	4 601	5 243	5 456	5 741	6 824
Insurance penetration	1.35%	1.41%	1.42%	1.54%	1.82%
	2011	**2012**	**2013**	**2014**	**2015**
Number of insurance contracts	8 675 566	9 357 769	8 060 735	7 740 318	7 392 770
Gross premium written per insurance contract	8 300	7 699	8 880	9 197	8 443
Premium per capita	6 860	6 856	6 810	6 764	5 920
Insurance penetration	1.79%	1.77%	1.75%	1.65%	1.37%

Source: own elaboration from (Czech Statistical Office, 2017a and 2017b), (Czech National Bank, 2017)

Linear trend function (line) has the following form (8), (Artl et al, 2002):

$$T_t = \beta_0 + \beta_1 t \tag{8}$$

Quadratic trend function (parabola) has the following form (9), (Artl et al, 2002):

$$T_t = \beta_0 + \beta_1 t + \beta_2 t^2 \tag{9}$$

Exponential trend function has the following form (10), (Artl et al, 2002):

$$T_t = \beta_0 \beta_1^t \tag{10}$$

To evaluate the suitability of the trend have been identified and assessed values of trend function forecast, values of the root mean squared error (RMSE) and values of modified index of determination (R_M^2).

RMSE (11), (Artl et al, 2002):

$$\text{RMSE} = \sqrt{\frac{1}{T}\sum_{t=1}^{T}(y_t - \hat{y}_t)^2} \quad (11)$$

where $\hat{y}_t$ is modeled values at time t.

Determination modified index (R_M^2) (12), (Artl et al, 2002):

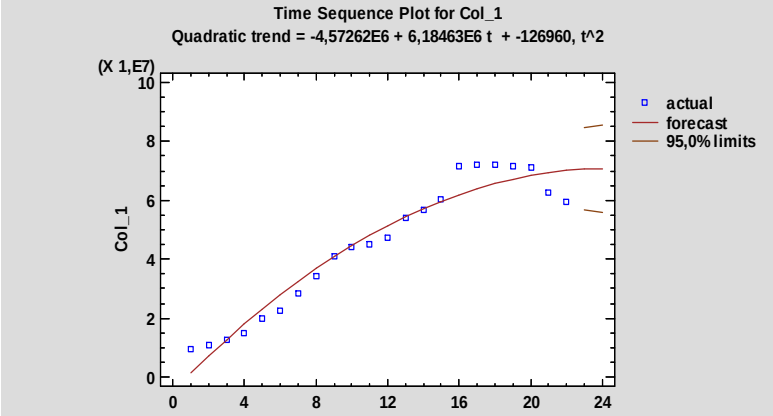
$$R_M^2 = R^2 - \frac{(1-R^2)(k-1)}{T-k} \quad (12)$$

Other indicators used for trend analysis include: p-value, t-test and F-ratio. Based on the results of these indicators, using the software STATGRAPHICS Centurion XVI was selected the best model – quadratic trend.

Trend function forecast is: $\widehat{T}_t = -4\,572\,620\,000 + 6\,184\,630\,000t - 126\,960\,000t^2$.

Forecast for next two periods is – point for year 2017 CZK 70 511 000 000 (interval CZK: 56 552 400 000 – 84 471 300 000) and point for year 2018 CZK 70 729 300 000 (interval CZK: 55 850 200 000 – 85 608 400 000).

Figure 4 Time Series Equalization by Quadratic Trend and Forecast of Development for Next Two Years



Source: own elaboration

The predicted development of the gross premiums written in life insurance according to the selected time series model for the following two periods – 2017 and 2018 – has a growing tendency. If the model prediction would be fulfilled, it would indicate a positive development in the use of life insurance products. However, it is questionable whether declining trends in the use of traditional life insurance products, death and survival insurance, rather than suggesting a change in clients' interest in other products – such as the life insurance product linked to the investment fund. On the contrary, the increase in the use of life insurance products that are linked to the investment fund does not necessarily imply a positive development in the use of life insurance products, as the investment life insurance products are not the classic investment products but rather the investment instrument (when the reasonable amount for the risk of death not met). This could be a basic research question for further research.

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Volatility and Correlations in Stock Markets: The case of US S&P 500, Japan Nikkei 225 and DAX indices

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Abstract: *Movements on the global financial markets are nowadays interconnected and influenced by both fundamental and behavioural or psychological effects. During the last couple of years, besides of standard corporate results and predictions, the market volatility is significantly trigger by monetary policies of central banks and policy makers. Nevertheless, many investors find stock market indices as an appropriate way for their investments, especially at time of low bond yields. The objective of this paper is to analyse the time-varying nature of selected world stock market indices by using a correlation model as well as to evaluate the influence of behavioural effects of market participants on the volatility. The output from the model confirmed the negative correlation among selected stock indices and volatility, while real effective exchange rates effect differs. The paper highlights key aspect having weight on stock markets mainly the central bank monetary policies, public debts, currency pair fluctuations, as well as inflation levels.*

Keywords: stock price indices, market and exchange rate volatility, price correlations, monetary policy, behavioural effects.

JEL codes: F34, G15, G18.

1 Introduction

The stock markets as well as financial instruments which are offered there, have recently drawn the attention of investors, policy makers and academics across the world. Several studies have focused on the correlation between the markets, the main factors influencing the trend movements, contagion between the spot and future markets, the short and mid-term volatility reasons and reactions to different shock scenarios. Such information is crucial not only for fund managers, portfolio risks analysts but for individual investors as well. It enables them to timely address and diversify their investments in order to reduce the underlying risk. Conceptual views on stock market indices correlations differ and point out striking differences in outputs and model interpretations.

Morana and Beltratti (2008) analyse linkage and monthly stock market returns for the USA, the UK, Germany and Japan over the period 1973-2004. Results point to a progressive integration of the four stock markets, leading to increasing co-movements in prices, returns, volatility and correlation. Evidence of a positive and non-spurious linkage between volatility and correlation, and an increasing trend in correlation coefficients over time, were also found. Similar research studies about transmission of stock returns, volatility and international stock market correlations were published by Pan and Hsueh (1998), Forbes and Rigobon (2002), Rua a Nunes (2009) and Ranta (2013).

In a more recent study of Connor and Suurlaht (2013) analyzed the relationship between macroeconomic variables and time-varying correlations between Eurozone markets. They find that Eurozone markets seem to be more correlated when recent cumulative returns are on average lower within the region. The correlation magnitude positively varies with Eurozone GDP growth measures. More specifically the correlation magnitude is higher during quarters when the cross-country average quarterly GDP growth rate is higher. Cappiello et al. (2006) proposed an asymmetric approach called Asymmetric Dynamic

Conditional Correlation (ADCC) model. The main reason was to analyze the behavior of international equities and government bonds. While equity returns show a strong evidence of asymmetries in conditional volatility, little is found for bond returns. However, both equities and bonds exhibit asymmetries in conditional correlations, with equities responding stronger than bonds to joint bad news. The article also found that during periods of financial turmoil, equity market volatilities show important linkage and conditional equity correlations among regional groups increase dramatically.

The most significant effects on stock markets during the last couple of years occurred due to variety of standard and non-standard measures adopted by major central banks. Purchase of financial assets financed from money of central bank, increased liquidity and pushed up asset prices. Those who sold assets to the central bank rebalanced their portfolios into riskier assets. According to Gerlach-Kristen et al. (2016), announcements of large-scale bond purchases pushed down bond yields across a wide swatch of bond markets, as well as in Japan. They point to a global portfolio balance effect that reflects the global integration of many bond markets. The study of Rogers (2014) analyzed the effects of unconventional monetary policy by the Federal Reserve, Bank of England, European Central Bank and Bank of Japan on bond yields, stock prices and exchange rates.

A sizeable percentage of investors are using social media to obtain information about companies. As a consequence, social media content about firms may have an impact on stock prices. Various studies utilize social media content to forecast stock market-related factors such as returns, volatility, or trading volume. Pieter de Jong et. all (2017) investigate whether a bidirectional intraday relationship between stock returns and volatility and tweets exists. Findings indicate that 87% of stock returns are influenced by lagged innovations of the tweets data, but there is little evidence to support that the direction is reciprocal, with only 7% of tweets being influenced by lagged innovations of the stock returns.

Nooijen and Broda (2016) examine the predictive capabilities of online investor sentiment for the returns and volatility of MSCI U.S. Equity Sector Indices by including exogenous variables in the mean and volatility specifications of a Markov-switching model. They find that the Thomson Reuters Marketpsych Indices (TRMI) predict volatility to a greater extent than they do returns. In the two-regime setting, there is evidence supporting the hypothesis of emotions playing a more important role during stressed markets compared to calm periods. The authors also find differences in sentiment sensitivity between different industries: it is greatest for financials, whereas the energy and information technology sectors are scarcely affected by sentiment.

Another economic indicator that measures the degree of optimism that consumers feel about the overall state of the economy as well as their personal financial situation represent the consumer confidence. Several authors (Shiller, 1984, Fisher and Statman, 2003, Baker and Wurgler, 2007, and Reed 2016) measure consumer sentiment via analysis of social networks and show that such sentiment affects stock prices; specifically, the S&P 500 and the Dow Jones Industrial Average. The authors implemented lexicographic analysis of Twitter data over a three-month period and found that talk intensity of economic issues not only causes shifts in the daily stock market prices, but also has a significant negative effect.

The paper deals with the analyses and predictions of both fundamental and behavioural effects on stock market movements. The objective of this paper is to analyse the time-varying nature of selected world stock market indices by using a dynamic correlation model as well as to evaluate the influence of behavioural effects of market participants on the volatility.

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 daily data and our time series range from 2000 to 2017 (4243 observations). While similar studies generally use quarterly data, we decided to work on a daily frequency in order to capture the more precise outputs. It were used the time series from the QUANDL DataStream. To capture the dynamics of our model, it was used as a dependant variable indices (DAX, S&P 500 and Nikkei 225), as a measure of stock price movement and as a remark of economies. Further, the real effective exchange rates (USD/EUR, USD/ JPY and EUR/PJY) were used to incorporate the currency depreciation/appreciation into our framework. Last, we incorporated into model the historical volatility of selected world stock indices to analyse the influence on the stock price movements. 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 all., 2010):

$$Y = a + \ b_1 x_1 + \ b_2 x_2 + \cdots \ + b_x x_x \qquad (1)$$

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 first independent variable that is explaining the variance in Y, and so on. The computations were completed in Eviews. Figure 1 reports the data, mnemonics, descriptions, sources and specifications.

Figure 1 World stock price indices movement since 2000

Source: Quandl, 2017.

3 Results and Discussion

In this section, the multiple regression estimates for the selected stock price indices DAX, S&P 500 and Nikkei 225 and chosen independent variables – real effective exchange rates USD/EUR, USD/JPY and EUR/JPY and historical volatility of selected world stock indices. The output from the model confirmed the negative correlation among selected stock indices and volatility, while real effective exchange rates effect differs. The volatility significantly grows in time of negative mood on the market, higher geopolitical risks or

monetary policy changes. In a such situations, market tend to make corrections from previous rallies, and statistically ones a year there are a massive sell offs. This happened for example in summer

2015 (China currency devaluation) or in February 2016 (market fears over the European banking system, oil price fall). And vice versa, the volatility declines in times of bull market moods. As an example could serve the last stock rally from Dec. 2016 up to March 2017 (Trump economic effect). The last example was characteristic by extremely low volatility and simultaneously several historical stock markets records, especially in US market. The next table below summarises the model output for DAX (similar output were calculated for S&P 500 and Nikkei 225 indices, could be delivered upon request).

Table 1 Model output

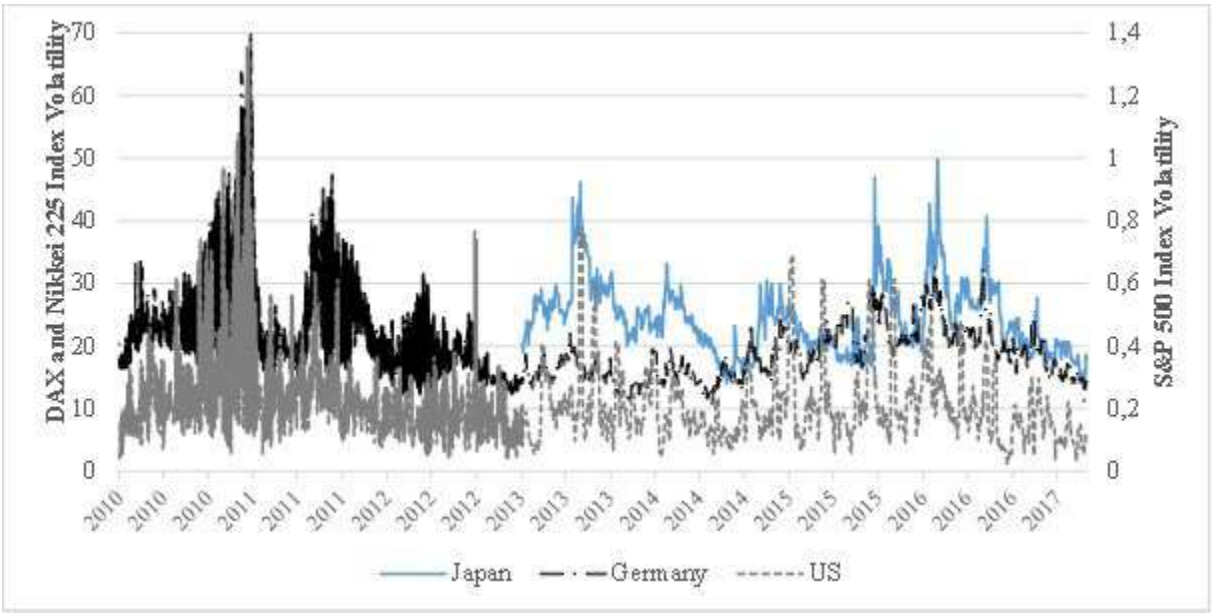
Dependent Variable: DAX
Method: Least Squares
Date: 06/24/17 Time: 11:49
Sample (adjusted): 4/27/2010 3/31/2017
Included observations: 1772 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EUR_JPY	-16.61796	1.675051	-9.920869	0.0000
EUR_USD	0.000471	5.56E-05	8.468616	0.0000
GERMANY	-34.73515	2.391942	-14.52174	0.0000
JAPAN	-5.957127	1.738761	-3.426077	0.0006
NIKKEI_225	0.137846	0.010030	13.74362	0.0000
S_P_500	2.820317	0.081273	34.70162	0.0000
US	-239.1736	97.42216	-2.455022	0.0142
USD_JPY	28.94847	2.861030	10.11820	0.0000
C	1887.464	165.5598	11.40050	0.0000

R-squared	0.953396	Mean dependent var	8583.351
Adjusted R-squared	0.953184	S.D. dependent var	1868.848
S.E. of regression	404.3608	Akaike info criterion	14.84756
Sum squared resid	2.88E+08	Schwarz criterion	14.87539
Log likelihood	-13145.94	Hannan-Quinn crit.	14.85784
F-statistic	4508.288	Durbin-Watson stat	0.156175

Source: own calculation (Eviews), 2017

Figure 2 Historical Volatility of selected world stock indices



Source: Quandl, 2017.

The reaction of the real effective exchange rates on the stock markets differs. While EUR and USD appreciations does have a negative, but small correlation on stock price movements, JPY effect is much stronger. Generally stronger currency leads to more expensive exports, what is reflected in decline of exporter's stock prices. This is visible in case of japan yen. The appreciation of JPY, especially in time of risk appetite mood on the markets, leads immediately to stock price decline and lower level of Nikkei 225 index. This situation happened in April 2017, an appreciation of USD/JPY from 112.5 to 108.5 lead to Nikkei 225 index decline from 19.500 to 18.350 (US health care act disapproval, Syria attack, Korea fears).

Second we analyse cross correlation matrix among chosen stock indices. There are positive relations among all of them, but DAX and S&P 500 dispose of quite high correlation. This is caused by similar economic cycles of European and US economies and their interconnections. The positive investor mode from one economy is strongly reflected in another one and reverse. The positive correlation between Nikkei 225 and S&P 500 is lower compare the previous one, what is influenced by different industry structure of Japan and US economy. Japan economy is heavily dependent on row material imports and higher share of export on GDP. Those facts are reflected in NIKKEI 225 index development. In addition the exchange rate of Japanese yen play an important role in index price trends. The lowest positive correlation shows DAX and NIKKEI 225 indices.

Table 3 Cross Correlation Matrix

	DAX	**S&P 500**	**NIKKEI 225**
DAX	-	0,8966	0,4815
S&P 500	0,8966	-	0,5581
NIKKEI 225	0,4815	0,5581	-

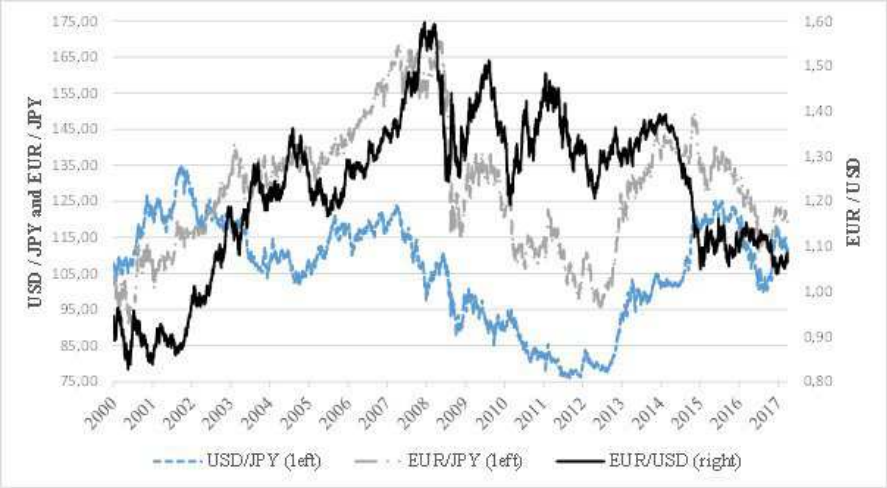
Source: own calculation (Eviews), 2017

Further aspect, which we analyse, was the influence of applied monetary policy to change in stock prices. An expansionary monetary policy applied by major central banks after 2001 was reflected in a massive asset reallocations, mainly from less risky assets (government bonds) toward riskier equities. These trend caused significant equity prices

increases, what could be seen in figure 1. The policy of law interest rates have helped governments to consolidate their debts and contributed to stabile economic environment. Since 2016, the general labour market conditions improved and inflation levels increased, what lead Federal Open Market Committee (FOMC) to raise the target for the federal funds rate by 0.25 % percentage point to a range of 0.5-0.75 %, and in March 2017 by further 0.25%. The FOMC expects that economic activity will expand at a moderate pace, labor market conditions will strengthen somewhat further, and inflation will rise to 2 % over the medium term. This change of interest rate was partially reflected in stock price movements, but the major trend came for the Trump policy actions.

In September 2016, the Bank of Japan committed to expanding the monetary base until inflation exceeds 2 % in a stable manner and adopted a new policy framework aimed at controlling the yield curve by targeting short and long-term interest rates. In December, the European Central Bank announced an extension of the intended duration of its asset purchases through at least December 2017, albeit with a slight reduction in those purchases beginning in April 2017. In a mid-term view, the increase of interest rate would come in Europe in 2018, while the Japan situation is difficult to predict. Nevertheless, the positive correlation of analyzed markets would not change and the interest rate changes would have a higher impact on bond markets.

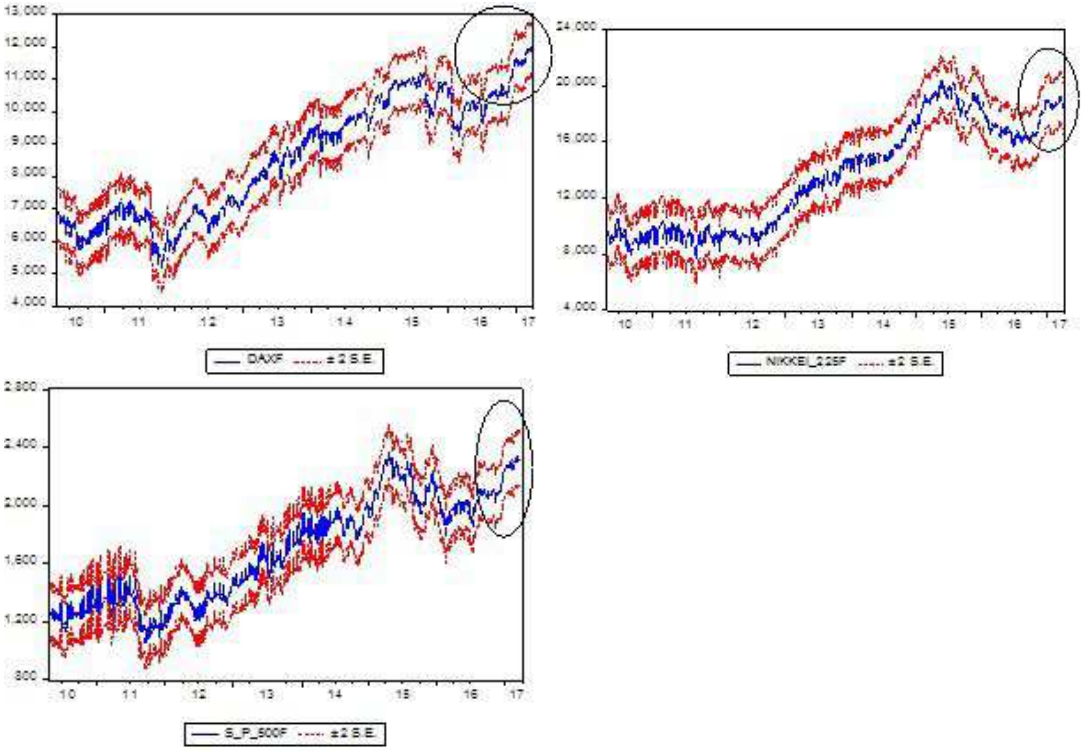
Figure 3 Major exchange rate pairs development



Source: Quandl, 2017.

Further we try to forecast the price development of selected world indices for the next two years, while taking into account the past volatility and cross currency exchange rate movements since 2000 as an independent variables. There are negative relations among stock price indices and volatility and negative correlations among exchange rate movements and stock price indices. For example, an appreciation of the japan JPY leads to downturn trend of Nikkei 225 index, as stronger JPY means more expensive export, what is immediately expressed in lower prices of japan export companies. The results confirmed the strong correlations of analysed word stock indices. R-squared coefficient amounts 0.9533 by DAX, 0.9457 by Nikkei 225 and 0.9419 by S&P 500 index. The next figure below summarises the model output for the stock indices forecasting.

Figure 4 Model output – Stock indices forecasting



Source: Own calculation (Eviews), 2017.

The results confirmed the strong correlations of analysed word stock indices. R-squared coefficient amounts 0.9533 by DAX, 0.9457 by Nikkei 225 and 0.9419 by S&P 500 index. Aggregate real stock prices are fairly highly correlated over time with aggregate real dividends. As confirmed by the study of Shiller (1984), the simple correlation coefficient between the annual real Standard and Poor's composite stock price index and the corresponding annual real dividend series between 1926 and 1983 is 0.91. The correlation coefficient between the real stock price index and a linear time trend over the same sample is only 0.60. Thus, the price of the aggregate stock market is importantly linked to its dividends, and much of the movements of the stock market that we often regard as inexplicable can be traced to movements in dividends.

Looking in a development since last year, U.S. equity markets were volatile around the Brexit vote in the United Kingdom but operated without disruptions. Broad equity price indexes have increased notably since late June, with a sizable portion of the gain occurring after the U.S. elections in November 2016. Reportedly, equity prices have been supported in part by the perception that corporate tax rates may be reduced. Moreover, market participants pointed to expectations of changes in the regulatory environment as a factor contributing to the outperformance of bank stocks. By contrast, stock prices of firms that tend to benefit from lower interest rates, such as utilities, declined moderately on net. The implied volatility of the S&P 500 index—the VIX— fell, ending the period close to the bottom of its historical range.

Financial market conditions in both the advanced foreign economies (AFEs) and the emerging market economies have generally improved since June 2016. In the AFEs, increasing distance from the Brexit vote, better-than-expected economic data for Europe, and the continuation of accommodative monetary policies by advanced-economy central banks have contributed to improved risk sentiment.

Except of the fundamental aspect of the economies, the financial markets are significantly influenced by behavioral, or psychological effects (Fenzl, 2016). The key

question is, what facts about financial decisions and what cognitive and neural processes influence people by taking financial decisions. Because of cognitive constraints and a low average level of financial literacy, many household decisions violate sound financial principles. Households typically have under diversified stock holdings and low retirement savings rates. Investors over extrapolate from past returns and trade too often. Even top corporate managers, who are typically highly educated, make decisions that are affected by overconfidence and personal history. Many of these behaviors can be explained by well-known principles from cognitive science.

The literature in behavioral finance has forcefully demonstrated that these robust decision anomalies have important consequences for individual investor wealth, stock market prices, and regulatory policy (Frydman and Camerer, 2016). What is less clear, from a cognitive science perspective, is the psychology that generates the observed patterns of saving, investing, and trading behavior. There is a large number of trading patterns that are inconsistent with the rational use of information and the ideal balance of risk and return. A useful next step in organizing this set of facts is to understand the correlation structure among the various biases. Many of these seemingly distinct biases could be generated by a common neural and psychological mechanism.

Some emerging evidence for this conjecture has already been found, as the same brain areas encode signals that generate the disposition effect and repurchase effect. This neural overlap fits with a strong correlation between these effects at the behavioral level. Most of the research use longstanding folk psychological constructs such as limited attention, emotion, salience, and the value of simplicity that psychological limits imply. Being able to measure the psychological influence on stock market movements, there will be needed a broader interdisciplinary study of financial decision making, as a collaboration using the ideal combination of mathematical modeling, cognitive and neural measures, and observed behavior.

4 Conclusions

This paper investigated the link between the German DAX, Japan Nikkei 225 and US S&P 500 index, and chosen macroenomic variables government bond yields and exchange rate. We relied on the correlation method to establish whether the correlations between markets and macroeconomic variables has evolved over time and were affected by unconventional monetary policy pursued by central banks.

The output from the model confirmed the negative correlation among selected stock indices and volatility, while real effective exchange rates effect differs. The volatility significantly grows in time of negative mood on the market, higher geopolitical risks or monetary policy changes. The quantitative monetary policy adopted by major central banks caused rapid decline of government bond prices, while stock indices went up significantly. This movement of stock market participants toward potential high yields could be seen in US, Europe and Japan markets as well. Second we analyse cross correlation matrix among chosen stock indices. There are positive relations among all of them, but DAX and S&P 500 dispose of quite high correlation. This is caused by similar economic cycles of European and US economies and their interconnections.

Next we try to forecast the price development of selected world indices for the next two years, while taking into account the past volatility and cross currency exchange rate movements since 2000 as an independent variables. The model outputs predict further grow of all analysed indices. In case of Europe and Japan, this is in line with market analyst predictions. Regarding the US equities, both trends could be confirmed. Some analyst predict a 5-10 % correction, while other see further increase thanks to Trump economy policy. Further we analyse the psychological effect on stock market movements. Stock prices are likely to be among the prices that are relatively vulnerable to purely social movements because there is no accepted theory by which to understand the worth of stocks and no clearly predictable consequences to changing one's

investments. Ordinary investors have no model or at best a very incomplete model of the behavior of prices, dividends, or earnings of speculative assets.

Since investors lack any clear sense of objective evidence regarding prices of speculative assets, the process by which their opinions are derived may be especially social. There is an extensive literature in social psychology on individual suggestibility and group pressure. Much of this literature seeks to quantify, by well-chosen experiments, how individual opinions are influenced by the opinions of others. The research shows evidence of flagrant decision errors under social pressure but not of abandonment of rational individual judgment. Behavioral Finance has identified contagion as one of the underlying mechanisms of booms and panics in financial markets, where contagious entities such as rumors, profit expectations, trading rules and others are transmitted via social interactions.

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Linkages between Brexit and European Equity Markets Evidence from Quantile Regression Approach

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Abstract: *The aim of this paper is to give a comprehensive description of the risk dependence and interdependence between selected European stock markets and Brexit equity in the period spanning from* January, 7, 2000 to February, 3, 2017*. We have studied behavior of extreme quantiles using quantile regression approach. This approach is robust because it is based on the use of various measures of central tendency and dispersion statistics for a detailed analysis of the relationship between variables. We have found evidence of significant interdependence/independence between financial markets and Brexit. The analysis of upper and lower quantiles allows to observe that the interdependence is positive asymmetric and higher for bear markets compared to bear or normal markets conditions.*

Keywords: risk, quantile regression, stock market, Brexit

JEL codes: G15, G17

1 Introduction

The changes of interdependence of financial markets often show asymmetric dependence of assets or markets. The literature which concentrates on analysis of changes of financial market dependencies compares financial markets during normal period and during crisis period. Many authors use a linear dependence measure such as OLS methods (Bae et al. 2003), (Baur, Schulze, 2005), or Markow-switching model (Hu, 2006) or copulas (Baur, 2012).

In the recent time, policy uncertainty in Europe has intensified due to the Global Financial Crisis, serial crises in the Eurozone, etc. Economic policy uncertainty increased after the start of the recession during 2007-2009 due to businesses and household uncertainty about future tax, spending, regulatory, health-care and monetary policies. Baker et al. (Baker et al., 2015) have investigated the role of policy uncertainty, and they have developed an index of economic uncertainty (EPU) for the United States.

New uncertainty is caused due to Brexit. Brexit is an abbreviation for "British exit," referring to the UK's decision in a June 23, 2016 referendum to leave the European Union (EU). The vote's result shook global markets, causing the British pound to fall to its lowest level against the dollar in 30 years. There is inconsistency of opinion about the influence of this vote on financial markets. Some authors (Ringe, 2017) argue that, in reality, the impact of Brexit for financial services will be minuscule, if not irrelevant. (Raddant, 2016) analyzed response of selected European stock markets to Brexit. He analyzed the correlation of market indices, stock volatility and the special role of stocks from the financial sector.

Bloomberg gives us an opportunity to analyze economic policy uncertainty for Europe, the United Kingdom and for Brexit in index EPUCBREX. The construction of these indices is based on newspaper articles regarding policy uncertainty about economy, uncertainty

and information about spending, deficit, regulation, budget, tax, policy, or the Bank of England, or ECB. We have taken EPUCBREX index as risk factor for analyzing six European markets – the DAX, Germany market, CAC40, French market, WIG20, Poland market, ISEQ, Irish stock market, IBEX Spain stock market and XU100, Turkey stock market.

This paper contributes to the existing literature by using a quantile regression approach to investigate how Brexit uncertainty expressed in EPUCBREX index affects returns of the mentioned market indices. We have analyzed the dynamics of selected stocks indices across selected quantiles. Our findings could provide a new insight into the behavior of European stock markets, thus leading to meaningful implications for policy makers, investors and risk managers dealing with this market.

We have used linear quantile regression approach. While OLS regression model estimates the expected value of the dependent variable, linear quantile regression approach provides essentially the same estimates as sample quantiles. Quantile regression has been used in many papers concerning the risk analysis (Engle and Manganelli, 2004), (Alexander, 2008), (Baur, 2013) (Birău, Antonescu, 2014), (Naifar, 2016), (Aymen, Mongi, 2016), etc.

The aim of this paper is to find the linkage between the selected stock markets and the uncertainty expressed in EPUCBREX index. Is there an asymmetric or symmetric dependence? Which market has been influenced the most by Brexit? Which market has been stable? The paper gives answers to these questions in our empirical study. The data used in our empirical study are based on daily data for the period from January, 7, 2000 to February, 3, 2017 are expressed in EUR.

Our findings may have implications for portfolio risk managers, policymakers, international investors in terms of risk management which should vary per changes in economy.

The remainder of the paper is organized as follows: Next section describes the quantile regression methodology and data. Our empirical analysis with results is presented in the following section. Conclusions and discussions are presented in the last section.

2 Methodology and Data

Quantile regression was developed by Koenker and Bassett in 1978 (Koenker, Bassett, 1978) as an extension of the traditional least squares estimation of the conditional mean. Quantile regression is a distribution-free technique to estimate the effect of a regressor on the quantiles of the response distribution. Let Y be a linearly dependent variable on variable X. The quantile regression expresses the conditional quantiles of dependent variable *Y* for given independent variable *X*, based on an arbitrary joint distribution. It is assumed that the errors of the quantile regression are *i.i.d* with the specific error distribution function F_ε. We take the q-th conditional quantile function $Q_y(q|X)$ of Y specified by regression model (Mensi, 2014)

$$Q_y(q|X) = inf\{b|F_y(b|X) \geq q\} = \sum_k \beta_k(q)X_k, \quad (1)$$

where $F_y(b|X)$ is a conditional distribution function of Y for given X. Quantile regression coefficient $\beta_k(q)$ determines the dependence between vector *X* and the q-th conditional quantile of Y. The values of $\beta_k(q)$ for $q \in [0,1]$ determine the whole dependence structure of Y. The dependence of Y based on an explanatory variable in vector X could be either *constant* where the values of $\beta_k(q)$ do not change for different values of q or *monotonically increasing* (*decreasing*) when $\beta_k(q)$ increases (decreases) with the value of

q or *symmetric* (*asymmetric*) where the value of $\beta_k(q)$ is similar (dissimilar) for low and high quantiles (Aymen and Mongi, 2016). The coefficients of $\beta_k(q)$ for a given q are estimated by minimizing the weighted absolute deviations between Y and X

$$\hat{\beta}(q) = \min_{\alpha,\beta} \sum_{t=1}^{T} \left(q - 1_{Y_t \le \alpha + \beta X_t} \right) \left| Y_t - (\alpha + \beta X_t) \right| , \quad (2)$$

where

$$1_{Y_t \le \alpha + \beta X_t} = \begin{cases} 1 & \text{if} \quad Y_t \le \alpha + \beta X_t \\ 0 & otherwise \end{cases} . \quad (3)$$

Model Specification

In order to investigate different effects that the conditioning variables have on the quantile function we have used the quantile regression model that explains the relationship between the stock market Y (developed or emerging markets) and Brexit uncertainty as an independent variable. This dependency can be presented by equation

$$Q_Y(q|X) = \alpha(q) + \beta(q)\, EPUCBREX + \varepsilon. \quad (4)$$

Equation (4) enables us to examine what kind of dependence structure exists in the selected European stock markets and how the dependence structure is affected by X.

Data

In this paper, we have shown the effect of Brexit on selected developed and emerging European markets. Developed European markets are represented by the Germany DAX index, French CAC40, Ireland ISEQ and Spain IBEX stock market index. Emerging European stock market is represented by Poland WIG20 and Turkey XU100 stock market indices. The choice of the markets has been based on the fact that Germany is the strongest member of the EU, France, the second strongest pillar of the European Union, the development during the recent period just before the election has been quite uncertain and therefore interesting to analyze. We have chosen Turkey and Poland because these countries are comparable in size to Germany or France, and Ireland and Spain were chosen as the countries that could be in our opinion influenced the most by Brexit.

The daily data were collected from January, 7 2000 to February, 3, 2017. Data provider is Bloomberg Ltd. All data are expressed in EUR. The closing prices of analyzed time series are nonstationary, therefore we have used logarithmic returns (log returns are obtained by formula: $r_t = ln\ P_t\ /ln\ P_{t-1}$, $t = 1,\ldots, T$, where P_t is the closing price in time t excluding account dividends).

3 Results and Discussion

Table 1 provides the results obtained using IBM SPSS software. We have estimated quantile regressions with intercept for next nine quantiles q = {0.01, 0.05, 0.1, 0.25, 0.5, 0.75, 0.90, 0.95, 0.99} according to equation (4). The table shows the quantile regression estimates for each market index return per the empirical model defined by Eq. (4). The asterisk "*" denotes statistical insignificance at the 5% level.

We have found a significant positive effect of Brexit on each stock market. The strongest and symmetric dependence of the DAX log returns on Brexit is in 5% and 95% quantile, then for 25% and 99% quantile the dependence is slightly lower and finally for 50% and 90% quantiles. The lowest significant dependence was for 1% quantile. The effect of Brexit on French market is slightly higher as on Germany market. The effect is positive and significant for all quantiles. We see the strongest and the same effect for 5% and 10% quantile. For other quantiles, the influence of Brexit is lower in 25% and 1%

quantile. From the median to 90% quantile, the effect is stable. Brexit has the lowest impact in 99% quantile.

The dependency of the Poland market on Brexit is oscillating, positive and significant. We can find a symmetric influence in several quantiles. The highest impact of Brexit has appeared in 5% and 95% quantile, and then in 90% a 99% quantile. Comparable effect can be observed also in lower and upper quartiles. Then follows the median and the lowest influence is in bear markets in 1% quantile.

Brexit had the strongest influence on the Irish market, mainly in bear markets. The influence has been positive gradually decreasing from 1% to 90% quantile. In bull markets (in 95% and 99%), the influence of Brexit has again increased, but it has been lower compared to bear markets.

Table 1 Quantile regression estimates of the coefficients

		0.010	**0.050**	**0.100**	**0.250**	**0.500**	**0.750**	**0.900**	**0.950**	**0.990**
DAX	$\alpha(q)$	-0.03	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.03
	t-stat	-38.64	-34.87	-35.17	-28.88	2.77	33.66	33.69	41.10	26.37
	$\beta(q)$	0.87	0.94	0.91	0.92	0.91	0.90	0.91	0.94	0.92
	t-stat	17.06	28.76	40.63	77.16	88.83	78.88	38.43	34.95	12.18
CAC40	$\alpha(q)$	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.01	0.01	0.02
	t-stat	-29.06	-32.52	-42.34	-32.18	0.92*	35.25	42.97	40.87	28.92
	$\beta(q)$	0.95	0.98	0.98	0.96	0.93	0.93	0.93	0.92	0.89
	t-stat	16.40	32.68	61.08	94.10	106.76	99.21	58.08	39.88	14.49
WIG20	$\alpha(q)$	-0.04	-0.02	-0.02	-0.01	0.00	0.01	0.02	0.02	0.04
	t-stat	-24.14	-34.93	-39.30	-29.96	0.85*	31.46	44.72	34.32	24.79
	$\beta(q)$	0.66	0.79	0.73	0.72	0.68	0.72	0.78	0.79	0.78
	t-stat	4.96	14.96	21.58	35.11	36.02	34.45	25.93	14.99	6.14
ISEQ	$\alpha(q)$	-0.03	-0.02	-0.01	0.00	0.00	0.01	0.01	0.02	0.03
	t-stat	-17.01	-35.64	-30.23	-30.34	2.64	34.59	43.61	35.16	24.97
	$\beta(q)$	0.77	0.77	0.75	0.69	0.67	0.65	0.65	0.68	0.76
	t-stat	5.78	21.42	27.17	55.62	60.65	54.14	34.14	20.48	9.13
IBEX	$\alpha(q)$	-0.03	-0.02	-0.01	-0.01	0.00	0.01	0.01	0.02	0.03
	t-stat	-27.24	-31.28	-47.33	-29.47	1.14	33.74	36.79	35.42	24.97
	$\beta(q)$	0.99	0.87	0.87	0.84	0.82	0.83	0.83	0.83	0.82
	t-stat	12.38	22.24	47.57	63.26	73.81	68.30	36.77	25.16	10.13
XU100	$\alpha(q)$	-0.07	-0.04	-0.03	-0.01	0.00	0.01	0.02	0.04	0.07
	t-stat	-22.09	-42.49	-46.74	-28.40	1.27*	29.67	43.12	32.85	24.48
	$\beta(q)$	0.79	0.83	0.82	0.77	0.74	0.82	0.80	0.73	0.64
	t-stat	3.17	12.16	18.99	25.93	30.03	26.54	18.39	8.80	3.04

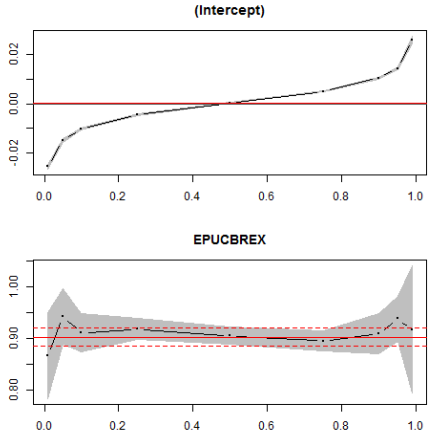
Source: author's calculations based on data from Bloomberg

The Spanish stock market has been relatively affected the most positively by Brexit. The dependence has been the highest for 1% quantile, gradually declining and moderately stabilized over the median.

The Turkish market has been slightly oscillating influenced by Brexit, with the highest positive impact for 5% quantile. Brexit had the lowest impact in bull markets (99% quantile) (see Table 1).

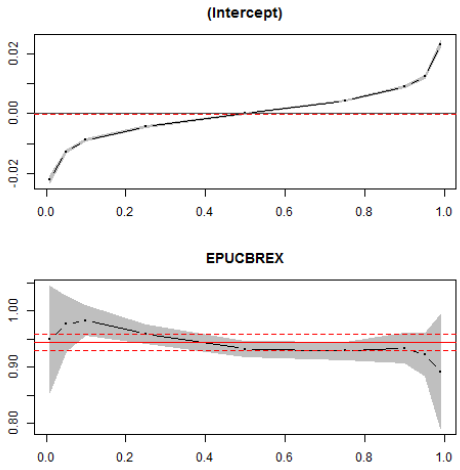
Quantile regression estimates of the regression parameters are shown in Figure 1 – Figure 6. Note that the dashed line shows the quantile regression estimates of the regression parameters across the quantile ranging from 0.01 to 0.99. Gray band depicts 95% confidence intervals for the quantile regression parameter estimates. Figure 7 compares the impact of Brexit on individual markets. We see that in bear markets, Brexit had the greatest impact on the Spanish stock market, followed by the French and German markets, followed by the Turkish, Irish stock market. Brexit had the least impact on the Polish stock market. During the bull markets, Brexit had the greatest influence on German, French, Spanish, Polish, Irish and the lowest on the Turkish stock market. Under standard business conditions expressed by the median, the French, then German, Spanish, Turkish, Polish, and finally Irish, stock markets were most affected.

Figure 1 Quantile regression estimates of the regression parameters for DAX



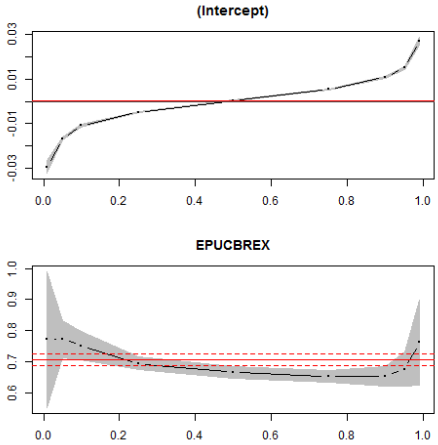
Source: Author's illustrations

Figure 2 Quantile regression estimates of the regression parameters for CAC40



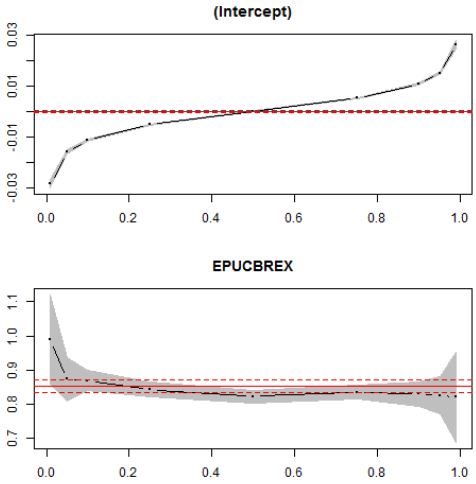
Source: Author's illustrations

Figure 3 Quantile regression estimates of the regression parameters for IRELAND



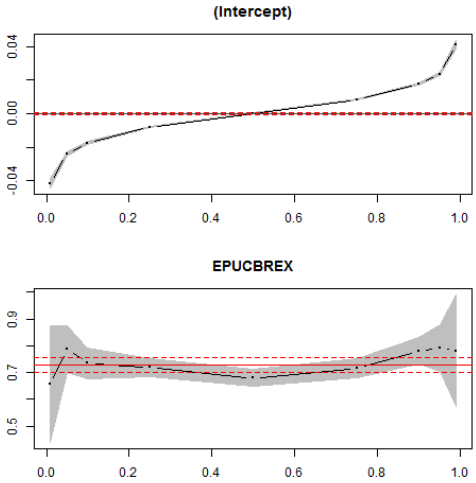
Source: Author's illustrations

Figure 4 Quantile regression estimates of the regression parameters for IBEX



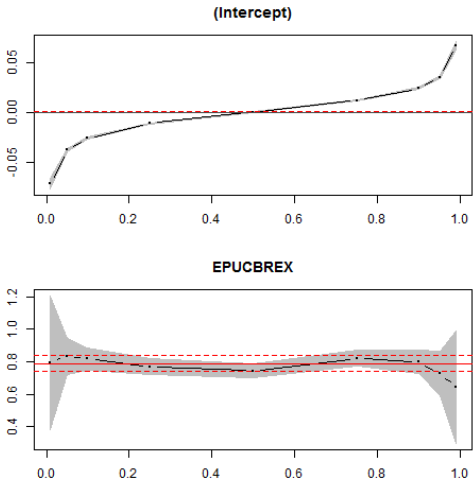
Source: Author's illustrations

Figure 5 Quantile regression estimates of the regression parameters for WIG20



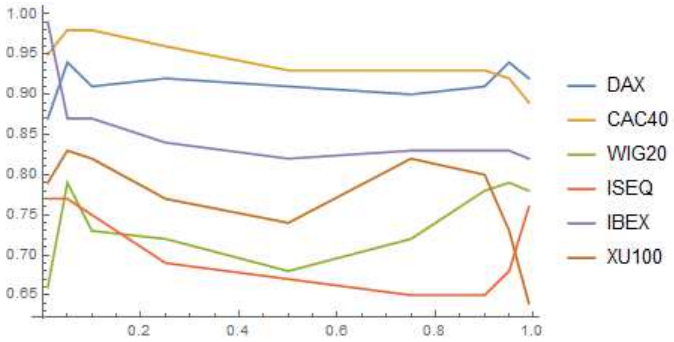
Source: Author's illustrations

Figure 6 Quantile regression estimates of the regression parameters for XU100



Source: Author's illustrations

Figure 7 Comparison of the Quantile regression estimates



Source: Author's illustrations

4 Conclusions

Our paper contributes to the existing literature by assessing the impact of Brexit uncertainty on selected developed and emerging European stock markets across different quantiles of the return distributions. Our empirical evidence for the daily data from January, 7 2000 to February, 3, 2017 indicates positive significant dependence between the EU stock markets and Brexit. Brexit has had an asymmetric influence on individual stock markets. It has more influence during bear rather than bull markets. Our findings are similar to (Raddant, 2016) findings that wrote the Brexit vote had similar effects in Germany, France, Spain and Italy, but our results precisely describe the impact of Brexit on the analyzed stock markets. Mapping the impact of Brexit is helpful for international investors, portfolio risk managers, traders, policymakers to avoid the downside risk in their investments. Uncertainty about future agreements between the UK and the EU and changes in the future EU financial infrastructure still remains, and the two year period to finalize the process of leaving the EU can therefore bring some interesting developments.

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Bankruptcy Model IN05 and Private Slovak Civil Engineering Companies

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Abstract: *The aim of the paper is to analyze bankruptcy model IN05 to determine its usability for private civil engineering companies in Slovakia. The analysis has been carried out using a sample of companies obtained from a Slovak database called FinStat. In this paper, we have analyzed data from a static point of view when we have used one year data, and from a dynamic point of view when we have analyzed samples of companies that have been bankrupt for the last 4 years. The reporting ability of the selected indicator IN05 is judged by the number of correct and incorrect predictions. We have found that the IN05 index is an appropriate model, the validity of which has been verified by logistic regression. We have found out the predictive power of the IN05 model is not reduced unless we consider the EBIT/interest expense and current assets/short-term liabilities indicators. We have found that the index IN05 is a reliable model for civil engineering industry in Slovakia.*

Keywords: Index IN05, bankruptcy model, logistic regression

JEL codes: G32, M10, C35

1 Introduction

Civil engineering sector makes a significant contribution to Slovakia's GDP despite the declining construction production in recent years (Yearbook of Construction in SR 2016). The situation in civil engineering sector has slightly improved because of state contracts that were obtained, especially by large construction companies. However, the financial situation of the large construction companies is not completely without problems. Medium, small and micro construction businesses in the civil engineering sector can have some financial problems, they can default by failing to pay at a specified time an obligation. Default is a specific event, when a company fails to meet obligation. Bankruptcy is a legal process, where creditors work with legal authorities to oversee the finances of an entity which is in default or insolvent. Bankrupt is the process through which creditors collect the debts owed to them. The fact that Slovak civil engineering sector is in a crisis proves, compared to other sectors, a higher number of companies that are bankrupt or possibly facing the bankruptcy. These facts have led us to analyze a sample of companies from the construction sector the data from accounts database FinStat.

All around the world there are known numerous bankruptcy models, but most of them were created based on surveys of economic conditions that are very different from the economic reality in Slovakia. The added value of these models can be misleading for a Slovak company.

Due to similar economic conditions of the Czech and Slovak Republic, it is appropriate to use the same model developed for the conditions in the Czech Republic for Slovak companies. The advantage of the Czech model is based on the fact Slovak companies

have comparable or identical items of financial statements (Diheneščíková and Hičák, 2011).

The best-known Czech model is Neumaier's husband model Index IN (Neumaierová and Neumaier, 2005). The prediction possibilities of the financial situation of the Slovak companies were also mentioned in (Zalai et al., 2016). An analysis of the usefulness of Altman's functions for predicting the financial development of Slovak companies was carried out by Kabát's team (Zalai et al., 2016).

Many experts try to create reliable indicators for detecting creditworthiness or bankruptcy in Slovakia. The most common used method for creating a bankruptcy model is multidimensional discriminatory analysis or logistic regression. At present, either new models arise or experts deal with the usability of the already established credit and bankruptcy models in the selected economy.

The aim of the paper is to analyze and validate the IN05 model for Slovak civil engineering companies. The paper contains four sections. The first and the second section provides theoretical background for the practical processing of the topic. The third section includes a more detailed description of the objectives set, used methodology and the methods of investigation. The fourth section presents our results and findings for the bankruptcy model IN05 for Slovak civil engineering sector and model IN05 adjusted by logistics regression.

2 Methodology and Data

The first Neumaier's model originated in 1995. It was based on mathematical and statistical rating models and practical experience in analyzing the financial health of companies (Knápková et al., 2013). Insolvency was frequent in Czech companies at that time. Therefore, this model includes the ratio of the reflected insolvency of the companies expressed in relation to the liabilities over the maturity divided by incomes. Similarly, Slovak companies had similar problems, so the model can be used in Slovakia as well (Zalai et al., 2016). This model considers more creditors than ownership (Růčková, 2015). Ownership model was created in 1999. Combining both models, a new model IN01 was created in 2001, linking creditworthy and bankruptcy insight. In 2005, Neumaiers created IN05 model that upgrades the IN01 model from the point of view of enterprise's ability to create value. Compared to the model IN01, the weights in the *EBIT/Total Assets* and bandwidth indicators have been changed (Zalai et. al, 2016). The IN05 model is

$$IN05=0{,}13(A/L)+0{,}04(EBIT/IE)+3{,}97(EBIT/TA)+0{,}21(TR/TA)+0{,}09(CA/(STL+STBL)) \quad (1)$$

where A/L - Assets/Liabilities or Financial Leverage,

$EBIT/IE$ – EBIT/Interest Expense or Interest Coverage,

$EBIT/TA$ – EBIT/Total Assets or Ability to Create Profits or Production force

TR/TA – Total returns/Total Assets

$CA/(STL+STBL)$ – Current Assets / (Short-term Liabilities + Short-term Bank Loans and Borrowings) or 3rd grade liquidity.

Enterprise rating and the assignment of the future status is based on the next bands:

IN05 > 1.6 – enterprise creates worthiness with probability 67% (good financial situation of the company)

0.9 < IN05 < 1.6 – gray zone (Area of unmatched results)

IN05 < 0.9 – enterprise is at risk of bankruptcy with probability 86%.

To avoid problems in the indicator $EBIT/IE$ in the case of loans approaching zero, Neumaiers recommended to reduce the value of the indicator $EBIT/IE$ to value 9. This

eliminates any case when the impact indicator *EBIT/IE* outweighs the other effects, and the index value is approaching to infinity (Neumaierová and Neumaier, 2005).

Our analysis of the IN05 model has been carried out using a sample of companies obtained from the Slovak FinStat database. Data were filtered, refilled and merged as needed. The resulting databases were continuously controlled for instance on data duplicity or randomly on the correctness of the data associated with the company's ID (company registration number). We have created two data samples. The first contains 1360 Slovak private civil engineering companies. The second sample contains information about 35 bankrupted and restructuring Slovak private civil enginnering companies during 4 years before the bankruptcy.

In this paper, we have analyzed data from a static point of view when we have used one year data using crosstabs. Static analysis was carried out for 1360 private Slovak civil engineering companies. From a dynamic point of view, we have analyzed the predictive value of the IN05 model for bankrupt companies over four full consecutive calendar years immediately prior to their bankruptcy (dynamic point of view) (Klempaiová, 2017). The number of bankrupt companies was 35. In the last analysis, we verify the performance of the IN05 model using logistic regression. We have used IBM SPSS software (Verma, 2013).

3 Results and Discussion

Crosstabs have been used to test goodness of the fit of the observed frequency of bankrupt and restructured companies in private civil engineering Slovak sector and IN05 model and to test the significance of association between these two attributes.

Table 1 Bankruptcy and Restructuring vs IN05 category

			IN05 finstat			
			Bankruptcy	Gray zone	Prosperity	Total
Bankruptcy and Restructuring	No	Count	409	271	523	1203
		% within Bankruptcy and Restructuring	34,0%	22,5%	43,5%	100,0%
		% within IN05 finstat	74,6%	97,8%	97,8%	88,5%
		% of Total	30,1%	19,9%	38,5%	88,5%
	Yes	Count	139	6	12	157
		% within Bankruptcy and Restructuring	88,5%	3,8%	7,6%	100,0%
		% within IN05 finstat	25,4%	2,2%	2,2%	11,5%
		% of Total	10,2%	0,4%	0,9%	11,5%
Total		Count	548	277	535	1360
		% within Bankruptcy and Restructuring	40,3%	20,4%	39,3%	100,0%
		% within IN05 finstat	100,0%	100,0%	100,0%	100,0%
		% of Total	40,3%	20,4%	39,3%	100,0%

Source: own processed based on data www.finstat.sk

Table 1 shows results of the static analysis that was performed on 1 360 companies. 157 companies (11.5%) were bankrupt or in restructuring. IN05 model identified 548 companies as bankrupt (40.3%). 139 companies out of 548 companies i.e. 25.4% were correctly identified as nonperforming. The model correctly classified 88.5% of true nonperforming companies. Chi-square test confirmed the dependence between bankruptcy and restructuring frequency and the model IN05 at the 99% confidence level (sig=0.000). Cramer's V and Contingency Coefficient were significant and equal to 0.335.

Using the simple sum of the totally rated companies or of the total error rate (error α + error β), we reached the results summarized in Table 2. The wrong type 1 (error α) represents the incorrect classification of insolvent companies as solvent (prosperous) and wrong type 2 (error β) evaluates solvent companies as insolvent. The simple sum method did not show reality in a real sample of companies. The success rate of the IN05 model in the individual categories studied (success structure) has been considered together with their location throughout the sample. In such a way of assessment, IN05 model appeared to be successful, unlike the simple sum method.

Table 2 Correctness of the IN05 model

Model IN05	Correct evaluation		Wrong evaluation		Number of companies
	Frequency	%	frequency	%	
Type 1	139	88.5	18	11.5	157
Type 2	794	66	409	34	1203
Total	933	68.6	427	31.4	1360

Source: own processed based on data www.finstat.sk

Dynamic analysis has been performed for a sample that contained 35 bankrupt companies. Correctness of the model IN05 during four consecutive calendar years just before the known bankruptcy is given in Table 3. We can see the model IN05 has the highest success one year before bankruptcy. With an increasing number of years, the ability to accurately predict bankruptcy decreases.

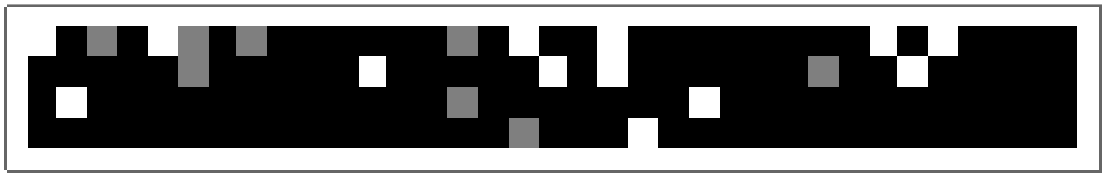
Table 3 Correctness of the IN05 model

	1 Year	***2 Years***	***3 Years***	***4 Years***
Bankruptcy	33	32	29	25
	94%	91%	83%	71%
Gray zone	1	1	2	4
	3%	3%	6%	11%
Prosperity	1	2	4	6
	3%	6%	11%	17%

Source: own processed based on data www.finstat.sk

The financial situation of all 35 companies, as assessed by IN05 over four years, is shown in Figure 1. The top row is the situation four years before the bankruptcy, the lowest row is the situation one year before bankruptcy. The black square in the chart means the company is located in the border zone bankruptcy, gray square - gray zone, white square - prosperity.

Figure 1: The informative value of IN05 within 35 companies bankrupt



Source: Own processed based on data www.finstat.sk

Verification of IN05 for Slovak civil engineering companies using logistic regression

To validate the IN05 using logistic regression, we have modified the data sample of 1390 companies as follows: we ignored extreme values such as assets over EUR 1,000,000, interest expense over EUR 1,000,000, and liabilities over EUR 10,000,000. We considered EBIT values greater than EUR -1,000,000, sales over EUR 7,500,000, current assets that are less than EUR 5,000,000, short-term liabilities lower than EUR

10,000,000 and short-term bank loans of less than EUR 5,000,000. Missing data were omitted. Validation of the IN05 model took place on a sample of 322 companies from total 1360 companies. We will consider the following logistics model for verifying bankruptcy forecasting:

$$Log\ p/(1\text{-}p) = a + b(A/L) + c(EBIT/IE) + d(EBIT/TA) + e(TR/A) + f(CA/(\ STL+STBL)) \quad (2)$$

Independent variables were the ratios (see equation (1)) that enter the IN05 model calculation and *p* is the probability of bankrupcty. The dependent variable indicates whether an enterprise is in bankruptcy or restructuring (value equals to 1) or not (value equals to 0). We have used the Forward: LR (likelihood-ratio) method to estimate the logistics regression model, by which we have gradually analyzed the logistic model for model IN05. Our results of the logistic regression will be discussed in two steps. In the first step, the logistic regression model will be developed using the constant without using any of the independent variables. This model can be used to compare the utility of the model developed in step 2 by using the identified independent variables. Constant model captures the fact that 88.8% of companies were not bankrupt.

Table 4 shows that if nothing is known about the independent variables and one simply guesses that a company would not be bankrupt, we would be correct 88.8% of the time. The probability of bankruptcy is 0.126 (see Table 5). Significance of Wald's statistics is low (less than 1%), the estimated chance is significant with significance value 0.01.

Table 4 Classification table

Observed			Predicted		
			Bankruptcy and Restructuring		Percentage Correct
			No	Yes	
Step 0	Bankruptcy and Restructuring	No	286	0	100.0
		Yes	36	0	0.0
	Overall Percentage				88.8

Source: own processed based on data www.finstat.sk

Table 5 Variables in equation (2)

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0[b]	Constant	-2,072	0,177	137,338	1	0,000	0,126

Source: own processed based on data www.finstat.sk

Table 6 shows whether each independent variable improves the model or not. We can see that the ratios *A/L*, and *CA*/(*STL+STBL*) may improve the model as they are significant with *EBIT/IE* and *A/L* slightly better than *CA*/(*STL+STBL*). Inclusion of these variables would add to the predictive power of the model.

Table 6 Variables not in equation (2)

		Score	df	Sig.
Step 0	*A/L*	8.467	1	.004
	EBIT/IE	12.972	1	.000
	EBIT/TA	.427	1	.513
	TR/A	2.728	1	.099
	CA/(*STL+STBL*)	6.033	1	.014
	Overall Statistics	24.748	5	.000

Source: own processed based on data www.finstat.sk

Table 7 shows the value of -2 log likelihood (-2LL), which is a deviance statistic between the observed and predicated values of the dependent variable. All deviance statistics are insignificant, which indicates that the model is suitable. Nagelkerke's R^2 explains 42.8% variability of the dependent variable by the independent variables in the model.

Table 7 Model summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	218.428[b]	.022	.044
2	168.033[c]	.164	.325
3	170.000[c]	.159	.315
4	151.395[c]	.206	.408
5	147.454[d]	.215	.428

Source: own processed based on data www.finstat.sk

To find whether the deviance statistic -2LL is insignificant or not, Hosmer and Lemeshow tests were executed. The results are shown in Table 8. Since the *p* values associated with Chi-square in Table 8 are greater than 0.05 started from the second to the fifth model, models are efficient.

Table 8 Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	47.432	8	.000
2	1.965	8	.982
3	2.125	8	.977
4	5.914	8	.657
5	13.136	8	.107

Source: own processed based on data www.finstat.sk

Table 9 is a classification table, it shows the observed and the predicted values of the dependent variable in each model, when we add some ratio into the model. When we add ratio *EBIT/IE*, the model correctly classifies 89.4% companies. The model with ratios *EBIT/IE* and *A/L* classifies correctly 90.1% companies. If the independent variable is the ratio *A/L* then the log linear model correctly classifies 89.1% companies. When model uses ratios *A/L* and *TR/TA*, its capability to correctly classify bancrupty is 92.2%. If the model uses ratios such as *A/L*, *EBIT/TA* and *TR/TA*, then model's ability to properly evaluate the bancrupty is 92.5%.

Table 9 Classification table

			Predicted		
			Bankruptcy and Restructuring		
	Observed		No	Yes	Percentage Correct
Step 1	Bankruptcy and Restructuring	No	286	0	100.0
		Yes	34	2	5.6
	Overall Percentage				**89.4**
Step	Bankruptcy and	No	281	5	98.3

2	Restructuring	Yes	27	9	25.0
	Overall Percentage				**90.1**
Step 3	Bankruptcy and Restructuring	No	279	7	97.6
		Yes	28	8	22.2
	Overall Percentage				**89.1**
Step 4	Bankruptcy and Restructuring	No	282	4	98.6
		Yes	21	15	41.7
	Overall Percentage				**92.2**
Step 5	Bankruptcy and Restructuring	No	283	3	99.0
		Yes	21	15	41.7
	Overall Percentage				**92.5**

Source: own processed based on data www.finstat.sk

Table 10 shows the value of regression coefficients B, Wald statistics, its significance and odds ratio *exp*(*B*) for each variable in each model. Note that all coefficients are in log-odds units. The logistics regression equation for predicting the bancrupty in the fifth model is given by equation (3). By increasing the financial leverage, the *A/L* ratio, the chance of bankruptcy of the company decreases in the odds by 97.6%. With increasing the *EBIT/TA* ratio, the chance of bankruptcy of the company grows by 31.8% and when increasing the *TR/TA* ratio, the chance of bankruptcy will be reduced by 40.18% when other ratios are kept and all other predictors are constant.

$$\log \frac{p}{1-p} = 2,829 - 3,762A/L + 0,276EBIT/TA - 0,514TR/TA. \qquad (3)$$

Table 10 Variables in the equation (Forward LR (likelihood-ratio) method)

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[b]	*EBIT/IE*	.000	.000	3.193	1	.074	1.000
	Constant	-2.122	.181	137.395	1	.000	.120
Step 2[c]	*A/L*	-2.607	.455	32.785	1	.000	.074
	EBIT/IE	.000	.000	.936	1	.333	1.000
	Constant	.770	.466	2.739	1	.098	2.161
Step 3[c]	*A/L*	-2.689	.453	35.169	1	.000	.068
	Constant	.876	.460	3.637	1	.057	2.402
Step 4[d]	*A/L*	-3.447	.547	39.754	1	.000	.032
	TR/TA	-.409	.149	7.587	1	.006	.664
	Constant	2.324	.627	13.726	1	.000	10.215
Step 5[e]	*A/L*	-3.762	.591	40.528	1	.000	.023
	EBIT/TA	.276	.147	3.529	1	.060	1.318
	TR/TA	-.514	.158	10.591	1	.001	.598
	Constant	2.829	.717	15.577	1	.000	16.927

Source: own processed based on data www.finstat.sk

Now we estimate IN05 log linear model using "Enter" method. Hosmer and Lemeshow test rejects the suitability of the model (sig=004) at confidence level 1%. The individual coefficients (see Table 11) of this model say: increasing the financial leverage of the *A/L* ratio, the chance of bankruptcy of the company will be reduced by 96.3%. The *EBIT/IE* indicator does not affect the bankruptcy, increasing the *EBIT/TA* of the company, the chance of bankruptcy increases by 38.3%, by increasing the *TR/TA* ratio the chance of bankruptcy will be reduced by 39.5%. Increasing the *CA/(STL+STBL)* indicator, the bankruptcy will be reduced by 38.2% keeping the other indicators unchanged.

$$\log\frac{p}{1-p} = 2,758 - 3,297A/L + 0,0EBIT/IE + 0,324EBIT/TA - 0,503TR/TA - 0,482CA/(STL+STBL) \quad (4)$$

Table 11 Variables in the equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[b]	*A/L*	-3.297	.726	20.639	1	.000	.037
	EBIT/IE	.000	.000	.545	1	.460	1.000
	EBIT/TA	.324	.168	3.736	1	.053	1.383
	TR/TA	-.503	.162	9.608	1	.002	.605
	CA/(STL+STBL)	-.482	.579	.693	1	.405	.618
	Constant	2.758	.733	14.147	1	.000	15.767

Source: own processed based on data www.finstat.sk

The informative value of the full model log linear IN05 model (4) to correctly predict the bankruptcy is 92.5% (Table 12). If we do not consider IN05 model indicators *EBIT/IE* and *CA/(STL+STBL)* (model (4)) its expressiveness ability would be impaired. The model (3) without these indicators, unlike the IN05, is statistically significant, with the leverage of both models being the same for Slovak private construction companies.

Table 12 Classification table

Observed			Predicted		
			Bankruptcy and Restructuring		Percentage Correct
			No	Yes	
Step 1	Bankruptcy and Restructuring	No	283	3	99.0
		Yes	21	15	41.7
	Overall Percentage				92.5

Source: own processed based on data www.finstat.sk

4 Conclusions

This paper aims to analyze the bankruptcy and creditworthiness model IN05 from a static point of view on a real sample of companies and from a dynamic perspective on a sample of real estate businesses. Subsequently, IN05 has been verified for private construction companies in Slovakia. We have found out that the predictive power of the IN05 model is not reduced unless we consider the *EBIT/IE* and *CA/(STL+STBL)* indicators. Although the model without these indicators is statistically significant, unlike the IN05 model, with the leverage of both models being the same for Slovak private companies in the construction sector.

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Factors that affect the market prices of flat renting

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Abstract: *This paper aims to investigate the factors influencing the level of market prices of flat renting in the Czech Republic, more precisely on big cities such as Prague or Brno. Firstly, it analyzes the development of market rent prices over the last 7 years and examines the specific factors which influenced this period. The subject of the research is also the relation of the difference in the development of the market prices rental according to flat size. In the paper we also focus on the influence of non-standard real estate price development behavior in cooperation with a significant decrease in interest rates on mortgage loans. An integral part of the comparison is the development of market rent prices with other markets bringing regular dividends, especially capital markets, or dependence on the development of alternative investments such as precious metals. On the basis of the achieved results, the conclusion predicts the future development of the market rentals in the Czech Republic.*

Keywords: financial system, interest rate, prices of flat renting, central banks, inflation

JEL codes: E42, E43, E58, G15

1 INTRODUCTION

In the case of a decision to save or to postpone the current consumption for later consumption, it is necessary to decide responsibly both on the amount of the deposit, so that it makes sense as well as on the way we will create the savings. That needs to take place both in case of decision making of households or businesses. In general, it is the same approach for all as they are potential investors.

There exist an option and it is the easiest one to save into the box. This saving method, in addition to the risk associated with the theft has one certainty that the future value converted to the current value of the amount saved will be lower than the real current value. In other words if we do not value these savings anymore their interest rate will gradually decrease. Therefore, investors who want to keep their value of their savings or better to increase this value need to go to the financial market. Especially they look at the capital market or the precious metals market and the real estate market and search for options to secure the value of their savings.

However, in the event that we go to these markets we should be aware that we must always consider the three main factors influencing our decision. It is namely risk, profitability and liquidity. However, the prices in these markets are interdependent and incidentally regulated by various interventions. These interventions can also have side effects such as when consumers are forced by various interventions to keep their assets for later consumption, not invest them into financial markets while seeking alternatives for their use.

Great alternative appears in the purchase of real estate, both for the purpose of own housing and also for the depositing of free financial capital. Real estate investment is also

great advantage over other alternatives, and it has also the ability to be funded through a mortgage. That is actually one of the cheapest financing alternatives on the market. Therefore, in the case of so called "saving" into the real estate it is not necessary to possess initial investment because real estate can be covered by nearly 100% with usage of different combinations of loans.

2 Methods and Data

Mainly secondary data from the database of the Czech Statistical Office and the Czech National Bank were used in order to analyze the problem. These data were subjected to the study of interdependencies and links.

The results of the secondary data analysis determine the factors that can influence the development of rental prices and which are the output of primary research.

Examined secondary data are e.g.:

- property prices
- the development of interest rates on mortgage loans
- the development of interest rates on savings accounts
- the developments in capital markets
- the development of precious metal prices

The results of the analysis then predict the possible future development of rental prices on the real estate market.

Since the article deals with rent in the form of savings, research has focused only on the most liquid and stable position of real estate in large cities, especially Prague and Brno. From the point of view of size, focuses on the flats where their values are converted into m2 or divided according to their layout as 1 + k, 2 + k, 3 + k, 4 + k. To determine the psychological value of the investment (real estate) for the subsequent lease, the modified Gordon dividend discount model was used, namely:

$$\mathbf{VH = (D \cdot (1 + g)) / (rd - g)} \qquad [1]$$

where:

VH - internal (current) property value
d - expected rent
g - expected annual growth rate of rent
rd - required (constant) rate of return (discount rate)

Data was processed in MS Excel 2007. The data was reviewed for the period from year 2009 until the beginning of year 2017.

The methodology used is a combination of qualitative and quantitative analysis. The qualitative component of the research is represented by the findings of economic theory, which are then compared with the current way of managing the most important world economies. In terms of economics, the following theoretical approaches are used: "Classical Interest Theory", "Theory of Interest Rate Liquidity Preference", "Loan Capital Theory" and "Rational Expectations of Interest Rates", and represented by the monetary economy, namely Fisher Quantitative theory of money. As far as the quantitative component is concerned, it is based on economic data taken from the Eurostat database, the US Department of the Treasury and the Trading Economist.

3 Results and discussions

In the event that we decide for investment in real estate instead of consumption of financial capital we must realize that in most cases it may be a long-term form of financial capital deposit.

Since, there is a need to transfer a larger amount of financial capital to invest in real estate, bank credit is largely used. It stands for a commitment on the part of the investor that if the investment does not bear the expected income he or she must be able to cover the loan from their own resources. Additionally, their creditworthiness is affected when extra loans are needed.

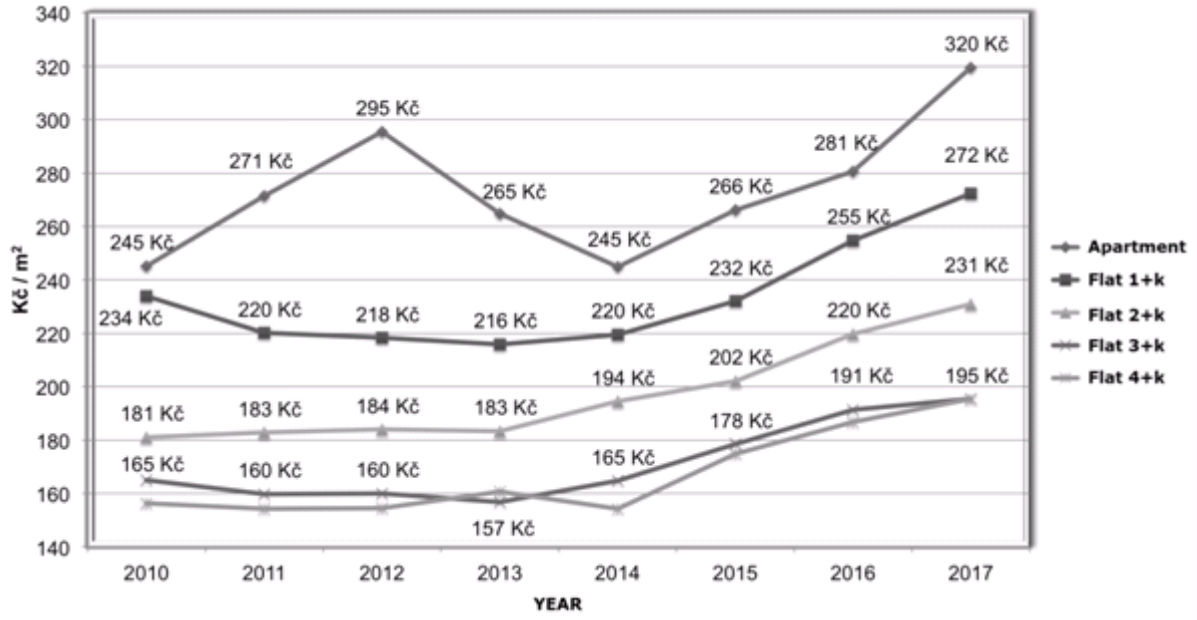
Many people carry out this form of investment only a few times in their lifetime so it is appropriate to consider the parameters that affect its variables.

In analyzing the factors influencing the value of the investment income in the form of rents on the real estate market, we analyze the relationships between the values of the rent charged on the real estate market and the development of other factors. Variables that affect them most are: real estate prices, inflation, interbank interest rates announced by the Czech National PRIBOR. These variables affect the interest rates of commercial mortgage banks and the interest rates on savings accounts or alternatively, the development of prices on other markets such as the capital markets and the precious metals markets.

Analysis of the development of rental prices in Prague and Brno

As we deal with the analysis of real estate investments, for their stability, the research was carried out for flats in Prague and Brno where their value was always converted to m2.

Figure 1 Rental prices of flats



Source: Remax rental price index

As seen from chart 1, in reviewed period from year 2010, rental prices in all sized flats have grown apart from a non-standard small apartment. Furthermore, it is clear from chart 1 that the most profitable group is a group of small apartments due to the layout of the size of the flat per m2. [6] It is necessary to say that other housing costs are linked to general housing costs but not all of them are being converted per m2 but per unit. It can´t be clearly stated that the smaller the flat the more economically advantageous it is. Therefore, it is good to choose a certain average with regard to the possible use or to target onto certain groups of usability. Those might be apartments 1 + k and 2 + k with an area of 40-60 m2. In the following years there is a trend of moderate decline in 2011 to 2013 and thereafter the growth from 2014 calls with the development of other factors in order to determine possible effects on rental price growth.

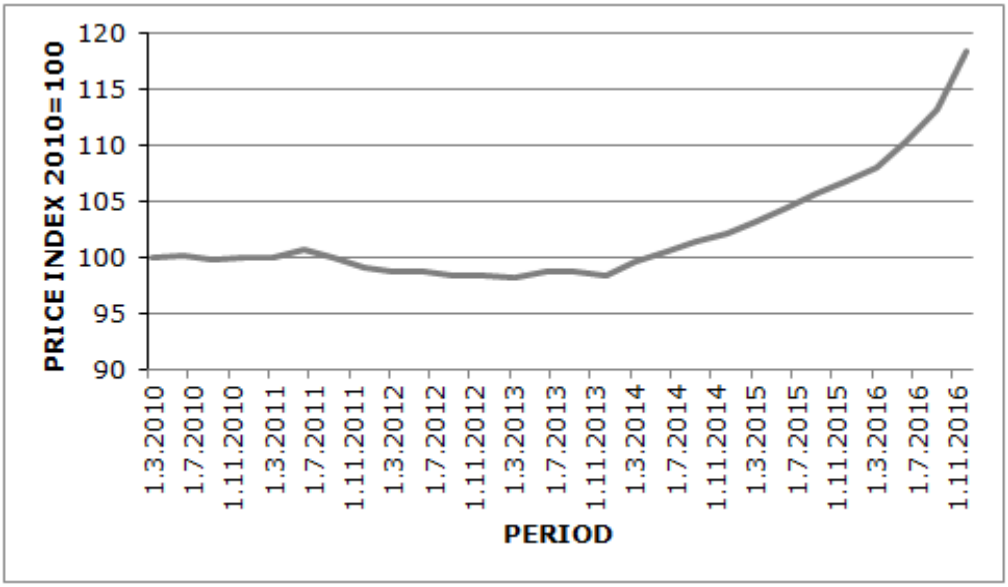
Thereinafter, the focus needed to be on analyzing the overall development of property prices over the period in general.

In the first place, it is necessary to think about who is doing these investments in particular. Real estate investing is carried out by a wide range of subjects. On one hand it can be end users or households that buy real estate for their own housing needs, or on the other hand small to medium and large investors or businesses that store their assets for their preservation or as way of generating income from rents.

Analysis of factors affecting rents

Real estate investment is one of the long-term stable investments. However, even in this segment large and sometimes unexpected fluctuations can be experienced in terms of their immediate value.

Figure 2 Price index of real estate 2010=100



Source: Czech national bank

In chart 2, we can see that if we omit the extreme situation that has been occurring since 2014 the value of real estate is almost constant. This trend which is shown by the two charts can be determined as identical. However, in the case of rental prices, it is not as significant as in case of property prices. Therefore, by examining or following these changes we can then predict if such stable situation will or will not move into different

levels than it is now. Question remains whenever this wave will change downwards again or remains on the original level. [2]

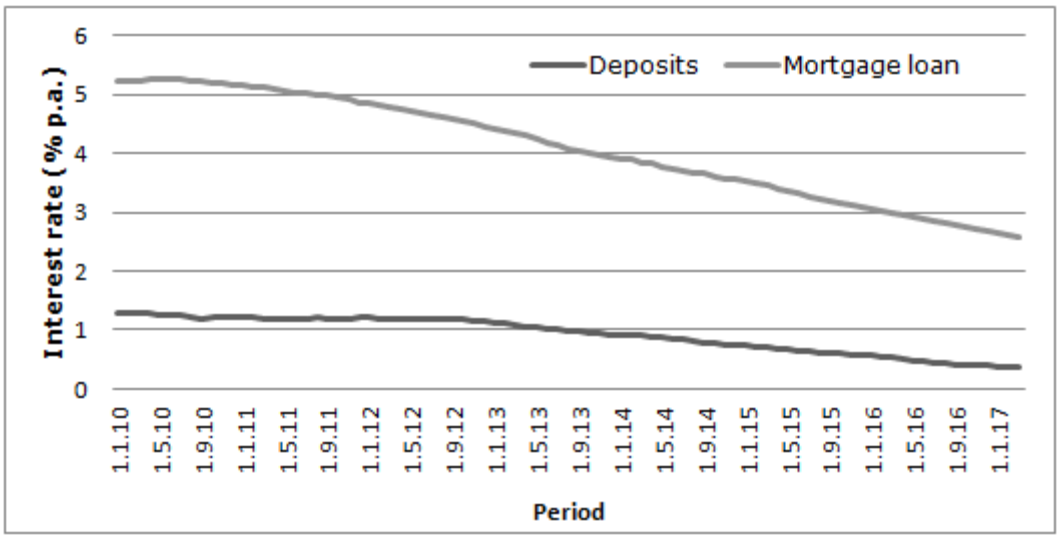
After a non-standard period in the years following year 2008 when the world struck the economic crisis, the real estate market stabilized slightly and gradually declined until the beginning of 2014. Since 2014, real estate prices have been steadily rising and starting to align with the situation between 2007 and 2008. Nonetheless this increase is not so significant but continues to last and has been going for three years on.

What is affecting these prices on the real estate market is in particular the demand that has been growing steadily in recent times as well. As has been said, the purchase of real estate is accompanied by a significant investment so for the most part these operations are realized through loans, especially mortgages. Therefore, interest rates are one of the major factors influencing the mood in the real estate market.

These interest rates, especially mortgage loans, are largely influenced by the PRIBOR interbank reference rate announced by the Czech National Bank.

The interbank interest rate is one of the key factors influencing the interest rates of commercial banks providing both mortgage loans and the possibility of depositing surpluses e.g. on saving and term accounts. This is the reason why this downward trend also influenced the rates.

Figure 3 Development interest rates



Source: Czech national bank

This trend, which began in 2010 namely the gradual reduction of interest rates on savings accounts, resulted in the consumer looking at possible alternatives of forms of saving or depositing surplus capital. These alternative instruments are investments in financial markets, in particular capital markets and precious metal markets and possibly real estate markets, both in the form of funds and direct purchase of real estate [3].

Real estate investment is largely influenced by interest rates on mortgage loans. And this can be observed in the period when interest rates have fallen to an average interest rate sometimes below 2% pa. More and more clients are going to banks for mortgage loans, where the volume only in September 2016 was 19.607 billion crowns of mortgages. This increase can be seen in comparison with the three quarters of 2016 where the total

amount of 81 996 mortgages was negotiated in a total amount of CZK 159.676 billion. For comparison, for the whole year 2015 CZK 190.42 billion was provided in mortgage loans. Subsequently, this border has been overcome in 2016.

Table 1 Comparison of mortgages in particular years

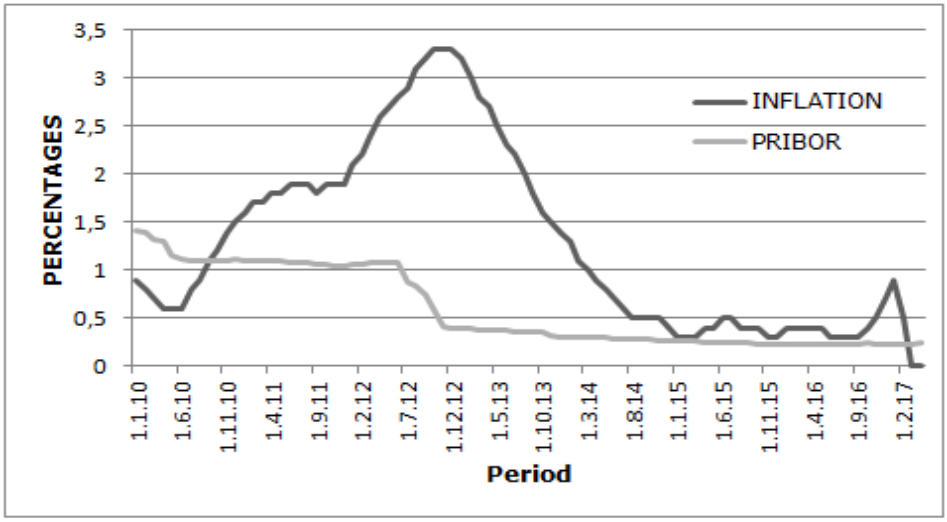
YEAR	Amount in August	Amount in September	Volume in August in billions CZK	Volume in September in billions CZK
2010	4 046	4 800	6,757	8,011
2011	5 891	6 219	9,865	10,379
2012	6 164	5 302	9,143	8,698
2013	7 661	8 730	12,424	14,221
2014	6 515	8 302	11,187	13,831
2015	8 493	8 600	15,637	15,931
2016	9 290	9 825	18,139	19,607

Source: own processing (data form NSI)

Another intervention in the real estate market and possibly also in the mortgage lending market is the recommendation of the CNB that from the 1st of October 2016 banks can´t provide so-called 100% mortgages. The client must finance at least five percent of its own resources. This bank regulation did not affect the bank's offer yet, but major changes still await as there was amendment to a consumer credit act in December 2016. The regulator's concerns about the development of the real estate market are appropriate, the average amount of the mortgage loan for the third quarter increased year-on-year by 8.6%, from the beginning of the interventions by over 20%, which is the rapid growth of real estate prices.

Another factor influencing the future value of both property prices and their subsequent income in the form of rent is inflation. The interbank referential interest rate PRIBOR is used as a price source for determining the interest rates and returns of various financial products such as bonds, financial derivatives, mortgage loans, etc. and also is used as a tool for regulating the inflation rate. Therefore the analyzed area focuses on the relationship between inflation and its responsive interest rate adjustments.

Figure 3 Development Inflation and PRIBOR of period 2010-2017



Source: Czech national bank

The Czech National Bank has set the level of inflation between 2-4% as a safe inflation target. If this limit is exceeded it will begin to use the available methods to offset it. In 2008, inflation started to rise disproportionately. It surpassed all forecasts from both domestic and foreign analysts. This growth was due to several factors such as the expected increase in value added tax from 5% to 9%. Traders "included" this tax rise in the prices before its introduction. Above all, the direct and indirect effects of the previous sharp rise in world energy and food prices had its impact on this growth. In addition, growth in wage costs accelerated in recent quarters, although labor productivity growth slowed down at the same time, leading to a sharp rise in unit wage costs. [8]

At the end of 2008, the Czech National Bank responded to this growth by one of the most used instruments therefore by lowering interest rates. With this regulator, the CNB wants to make it possible for all entities to increase their consumption and thus raise the level of inflation. After this intervention, the expected level was reached at the end of 2012 but the trend turned again and inflation fell to an even lower level than it was before these interventions.

The Czech National Bank responded to this development by making use of its main monetary policy tool when lowered interest rates to the technical zero rate (0.05%) at the end of 2012. In addition, the CNB has committed itself to maintaining interest rates at this record low level as long as needed. However, for the regulation of such a low inflation further measures had to be taken. So on November 7, 2013, the CNB Bank Board decided to start using the exchange rate as another instrument for the release of monetary conditions. Only the announcement of the CNB that it is ready to use the exchange rate led to a weakening of the koruna's exchange rate in late 2012 and early 2013, which helped to hinder the disinflationary tendencies and helped the economy to breathe a little. The CNB expected the inflation to decline to zero at the beginning of 2014 and that even after adjusting for excise duties on cigarettes the overall price level has fallen. Prices for many consumer basket items (especially consumer goods prices) have fallen for a long time.

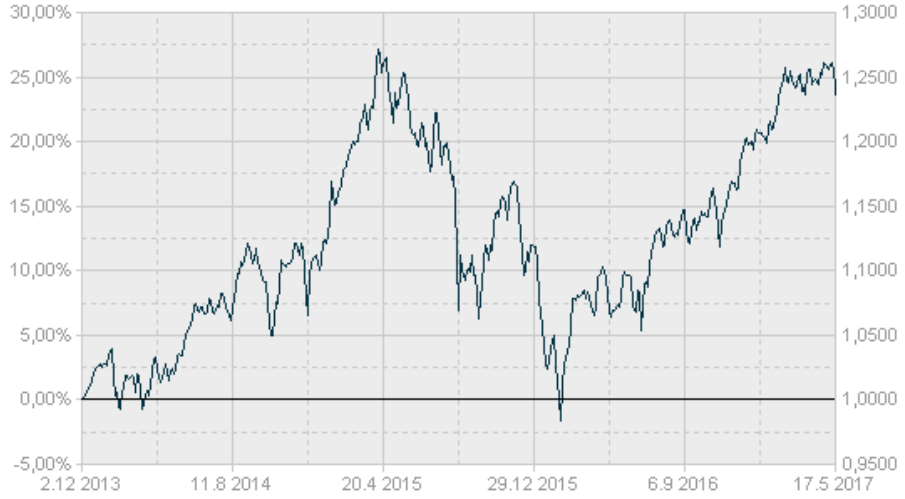
This CNB's exchange rate commitment was only adopted unilaterally, preventing the koruna's exchange rate appreciation above set up level by intervention of selling and buying foreign currencies. In the opposite direction, weakening above this level leaves CNB to the development of supply and demand on the foreign exchange market.

This decision resulted in a rapid depreciation of the koruna's exchange rate at a desired level, then slightly above it, reaching the 27 CZK / EUR border only in July 2015. Therefore, during this period, the CNB did not directly intervene in the development of the exchange rate.

At its extraordinary meeting on April 6, 2017, the Bank Board of the Czech National Bank decided to end the use of the koruna exchange rate as another instrument for the release of monetary conditions. This decision was immediately applicable. With this step, the CNB has returned to the standard monetary policy regime in which the main instrument is interest rates. The exchange rate of the koruna may fluctuate in both directions depending on the development of demand and supply. Nevertheless, the CNB is prepared to mitigate potential excessive exchange rate fluctuations with its instruments.

Other possibilities for consumers to keep their capital funds are capital markets, especially equity and bond funds, possibly other types of funds.

Figure 4 Development of the fond



Source: Conseq – Active invest dynamic

Above hereinafter, there are also significant fluctuations in the period under review where extreme situation occurred around year 2008. As follows, there was a gradual growth that reached the values from between 2007 until August 2014 when the stock and bond markets again began to experience significant weaknesses. These markets are, however, influenced by events from around the world. [4]

There are many factors that affect the demand for real estate and hence influence the prices on the real estate market. However, the most prominent are the development of prices of capital markets and precious metals markets and the level of interest rates influenced to a large extent by the Czech National Bank by its interventions in support of the growth of the economy. [7]

Internal property value

All above mentioned factors are the decision-making agents of an investor who is considering how to dispose of their funds. Therefore, another and crucial factor is the art of determining the intrinsic value of the property at its own discretion. In order to determine the intrinsic value the so-called "one-stage profit model with constant growth" can be used. Such models are used to determine the intrinsic value of an enterprise's share.

One-step models with constant growth are the most commonly used profit models in investment practice. This is due to the fact that the (net) profit on the rents is divided into two parts: the part from which the dividends are paid and the part which goes to the net investment. This is also related to the assumption of a constant growth rate of the company's profit. At the same time it is obvious that as the dividend payout ratio is decreasing, so the future profit growth rate is expected to be increasing and also higher growth rate of dividend is expected and vice versa.

Therefore, we can use the so-called Gordon Dividend Discount Model to use the determination of the intrinsic value of the property, which represents a truncated version of a time-unbound single-rate dividend discount model with constant growth. [1]The equation for the calculation needs to be modified only in terms of parameters for the use of internal values of an investment properties.

$$VH = (D \cdot (1 + g)) / (rd - g) \text{ [1]}$$

We calculate the internal value (VH) as a dividend, in our example, the rent (D) divided by the required rate of return (rd) from which the expected rental growth rate is deducted.

Although Gordon's model of investment practice is the most widely used one-step dividend discount model, it is only applicable if the expected growth rate of rent (g) is not only constant but also below the required rate of return (rd). At the same time, it should be remembered that the growth rate of rental property valued should not be higher than the growth rate of the whole economy.

For example, if we were considering buying a real estate of a size of 2 + k and 62m it would be possible to consider according to chart no. 1 that the monthly rent of such property will be around CZK 14,000 including all services. If we further consider that the operating costs are about CZK 3,500, we have remaining 10,500 CZK or 126,000 CZK per year as net profit on the real estate (without deducting the repayment of the mortgage loan) which can be considered as a dividend (D).

Furthermore, we have to include the discount rate (rd), which is composed of the cost of capital expenditures (we will consider the average value of the mortgage loan which we can fix for a longer period for rate of 2.5% pa) and the liquidity of the investment (which will be determined using the so-called opportunistic costs, for example of 3.5% pa) and as a constant rate of growth in rent (g) we will use the value of the expected inflation rate at 2% pa. From these parameters we can now calculate our psychological limit, which we should not exceed when buying real estate.

$$VH = (126000 \cdot (1 + 0{,}02)) / ((0{,}025 + 0{,}035) - 0{,}02) = \text{CZK } 3{,}213{,}000$$

In the above example, it would be possible to realize the investment if the possibly purchased investment property had a lower purchase value than CZK 3,213,000. However, under what specific assumptions the investor must determine by himself. Today, this value for such a large apartment and given location is real but at the limit of market opportunities.

4 Conclusions

While analyzing the factors of investment in real estate, it is necessary to include the influence of emotional decision making of an investor. Because, unlike other alternatives for example in the form of investment into the funds where the investor only sees a sheet of paper signed and the money is largely allocated to the world, the property relates both to the place of storage and to the visual side and different investor taste.

After analysis of the examined factors, we can say that the rental prices of investment properties are influenced to a large extent by their purchase price which is influenced by the combination of interest rates, purchasing power of businesses and the population, inflation and developments on financial markets, especially capital markets and precious metal markets. However, it should be noted that these investments can be very dangerous because such investment goes on in larger financial volumes, so the positive state during positive times may turn into a nightmare in times of crisis as interest rates can rise above the bearable rate of the investor. The value of the property may also notice a significant decrease at this time, and any sale may not cover all the obligations arising from the acquisition

If we consider investment property as a long-term investment, no matter how the price of the property is going to develop, it is necessary to free itself from the emotional point of view, and in the realization of such a project, to calculate "only" the economic profitability and performance of the whole investment. Therefore, if the factors of positive economic growth, low interest rates, and the declining trend of financial markets, especially equity, come together, it is very likely that demand for real estate will grow and hence its price, which will also support rental growth. It is obvious that in the surveyed areas, which are the big cities, the amount of people interested in renting is still increasing. And in the case of more expensive real estate there is also a pressure to sell own properties with a subsequent demand for rents.

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The effect of premium framing on life insurance demand

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Abstract: *In behavioral economics, framing effect represents a cognitive bias, in which the choice of the decision-maker is influenced by presentation of the decision problem. The specific formulation of the decision frame can thus incite individuals to choose a certain alternative. In the paper, we report preliminary results on the effect of price framing on the life insurance demand. Using the sample of 200 respondents, we test the differences in the attractiveness and demand for life insurance under different premium framing. In the between-subject setting, we identify statistically significant difference in the rating of the life insurance under various price formulations, controlling for socio-economics characteristics. We do not observe the effect on the life insurance demand.*

Keywords: framing, premium, insurance demand, survey

JEL codes: G02, G22

1 Introduction

In the economic theory, insurance demand is considered the purest example of economic behavior under uncertainty, where individuals act rationally with the aim to maximize their expected utility (Schlesinger, 1999). Economic models conclude that the main factors, affecting insurance purchase, include the likelihood and extent of losses, the risk aversion of the buyer and the premium (Mossin 1968; Padmanabhan and Rao, 1993; Schlesinger, 1999). The premium represents the driver that could be influenced by the insurers in attracting clients at competitive insurance market. However, in the many situations, it was observed that not only the amount but also a presentation of the premium could affect the attractiveness of the product from the client's point of view. Even thought that according to standard economic theory, price formulation should not be included into the decision-making process of the utility maximizing economic agent, this effect was observed the market. This phenomenon is studied in behavioural economics and it is known as price framing.

In the paper, we reported preliminary results of the pilot study focusing on the effect of price framing on the life insurance demand. Using the sample of 200 respondents, we test the differences in the attractiveness and demand for life insurance under different premium framing. In the between-subject setting, we identify statistically significant difference in the rating of the life insurance under various price formulations, controlling for socio-economics characteristics. We do not observe the effect on the life insurance demand.

Theoretical definition of framing effect

In standard microeconomic framework, economic agents are purely rational and they try to maximize their expected utility. Individuals are price takers constrained by their financial resources and the price that they face when they make their choices (Nechyba, 2015). In their decisions, the price as an absolute (or in some cases relative) value is taking into the consideration. However, economic agents do not behave strictly according to these predictions and the consumer decision-making model provided a lack of description of human behavior in particular issues. People experience deviations from

rationality - errors in judgments and procedures - defined patterns of judgment and behavior that differ from rational individuals. As a reaction, behavioral economics was introduced as a new stream of economics that implement elements of psychology into economic decisions. We can define them as systematic errors of economic agents in collecting, analysing and evaluating information and in making economic decisions.

Framing effect represents a cognitive bias, in which the choice of the decision-maker is influenced by presentation of the problem. Therefore, formulating or presenting a problem affects the behavior of individuals. This contradicts the theory of rational choice, which assumes that preferences should not change between two choices, and one should choose, always the most beneficial alternative. Kaheman and Tversky (1981) described this phenomenon. In their seminal paper, they tested the consistency of students' choices in the famous "disease problem". Two groups of students were presented two problems. In each of these problems, they had to choose one of two alternatives. Presented problems and alternatives were as follows:

Problem 1: Imagine the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequence of the programs are as follows:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is a 1/3 probability that 600 people will be saved and 2/3 the probability that no people will be saved.

Which of the two programs would you favour?

Problem 2: Imagine the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequence of the programs are as follows:

If Program C is adopted, 400 people will die.

If Program D is adopted, there is a 1/3 probability that nobody will die and 2/3 the likelihood that 600 people will die.

Kahneman and Tversky observed that in the first problem, 72% of students opted for alternative A and 28% of students for B. Students chose 200 survivors, which seemed more attractive to them than the second alternative, which assumed a chance of 1/3 to survive 600 people. In the second problem, the C option was chosen by 22% of the students and the D alternative choose 88% of the students. The expected value of program A and program C are the same, as well as the expected value in program B and D. Rational individuals should be consistent. However, changing the formulation of alternatives in these two programs - the first program talks about the living and the second about the dead people - changed student behavior from risk averse to loss averse. By this observation, authors concluded that the way in which the options are presented in the framework could influence how an individual is making their decision. The effect of the framing may occur randomly without the individual being aware of its impact on the final decision. Declared discrepancy reflects two psychological traits of individual agents: risk aversion (in the decision-making problem in terms of profit) and loss aversion (in the decision-making problem in terms of loss). This pioneer study was followed by many verifications of the results and proves of the effect of framing in the decision-making process. For example, Puto (1985) found that individuals who are less involved in the problem are more vulnerable to framing and therefore their decision is easier to be influenced. Knowledge and previous experience within the problem frame is crucial for evaluating and making decisions and it could prevent biased decisions.

Framing effect in insurance theory

In the insurance theory, framing was studied in different aspects including the framing of the insurance policy as well as price formulation. Wiener et al. (1986) examined the impact of framing of insurance policy in flood insurance. The authors used two types of frames: asset framing and loss framing. Asset framing means presenting the problem from a profit perspective, i.e. the insurance offer was formulated in the way that something is acquired by buying insurance, e.g. protection, paid insurance, etc. Loss framing means presenting the problem from a loss perspective, i.e. the insurance offer was formulated in the way that something is losing, e.g. loss of the property if they do not buy insurance, etc. In the asset framing, the standard expected utility theory was applied while the loss framing was based on prospect theory. The subjects were presented an insurance offer with a scenario that they bought the house and they had to decide whether they are buying flood insurance. They received supplemental information about the area where they would live. The impact of framing (asset or loss) was significant over the control group, i.e. authors concluded that framing is affecting the decision to buy insurance, but their assumptions regarding the effect of asset framing over the loss framing were not observed.

Brown et al. (2008) supported the effect of framing in insurance purchase decision-making in the annuity market. In this study, subjects were asked to choose among annuity programs framed in a consumption or investment way. If the offer was framed as consumption, 72% of respondents preferred the annuity program, while only 21% preferred the annuity program, if the alternative was presented as an investment.

Framing effect in insurance was also studied by the Huber et al. (2015) who examined the effect of price bundling and price optics on insurance. Price bundling is a price strategy that combines multiple products or components at a single set price (Eppen et al., 1991). As insulation of profits and losses affects product evaluation and selection, the price bundling should result in more positive consumer ratings than price presentation across multiple folders because price information is perceived as a relative loss (Johnson et al. 1999). On the other hand, price optics is the consumer's response to the price in various forms, if the expected value of the proposal is the same. The price may be presented as one payment in advance (up-front payment), monthly payments, or percentage of the annual payment. Authors assumed that both price optics as well as price bundling have an impact on consumer behaviour, namely the decision to buy unit-linked life insurance, as paid premium are perceived as a loss rather than as a saving. Empirical analysis revealed that neither price bundling nor the price optics had any impact on consumer ratings or the intention to purchase insurance.

2 Methodology and Data

Data for our analysis were obtained by the questionnaires distributed in the Slovak Republic as a part of diploma thesis in February 2017. In general, we collected 200 responses in four different treatments. In each treatment, in all questionnaires, there was following term life insurance policy offer described:

Insurance company XY offer you a term life insurance for 10 years period with guaranteed insurance sum 12 000 € that will be paid conditionally in the case of client's death or in the case of client's survivor of the end of life insurance policy. The guaranteed interest rate is 1,68% p. a.

The framing of the premium varied in treatments. In the Treatment 1 - Baseline, we formulated the bundled price as a monthly payment of 105 €, the usual formulation used in the Slovak insurance market. In the Treatment 2, we introduced the up-front payment and the premium was formulated as 684 € payed in the first month followed by the 100 € monthly payment. In the Treatment 3, we applied price optic and we isolate three components of the monthly premium: 1 € for risk coverage, 91 € for saving, 13 € for

administrative fee. In the Treatment 4, we added up-front payment to price optic introduced in Treatment 2 and the premium was defined as follows: 1 € for risk coverage, 91 € for saving, 13 € for administrative fee, 584 € for administrative fee payed in the first month and followed by the 8 € month administrative fee.

It is necessary to emphasize that time value of the premiums in all four treatments are equal that means that rational economic agents should be indifferent between all offers.

We applied between-subject design, which means that every respondent responded to only one offer and then we compared the responses across the groups of respondents. The life insurance calculations were based on Huber et al. (2015). In all questionnaires, respondents should rate their satisfaction with the life insurance offer and their willingness to recommend this insurance to their friends and family on the Likert scale with values from 1 to 5, where 1 represented total dissatisfaction/dissuade and 5 represented total satisfaction/ recommendation. In addition, respondents were asked about their interest in purchase of offered insurance policy and we also recorded socio-demographic variables (age, gender, education level, income level, previous experience with insurance). We control for these socio-demographic variables as they were identified as important drivers of life insurance demand by the previous research.

From the socio-economic characteristics, 63,5% of our respondents are females, 55% of the respondents are younger than 40 years of age, 31,5% of our respondents have university education, 52% of respondents have household income lower than 1 500 €. In addition, 83% of our respondents have previous experience with insurance.

Descriptive statistics of the dataset are available in the Table 1.

Table 1 Descriptive statistics

Variable	N	Minimum	Maximum	Mean	Std. Dev.
Satisfaction with the offer	200	1	5	2,71	1,2465
Recommendation to friends and family	200	1	5	2,54	1,2675
Demand for offered insurance	200	0	1	0,28	0,4501
Previous experience with insurance	200	0	1	0,83	0,3766
University education	200	0	1	0,315	0,4657
Female respondent	200	0	1	0,635	0,4826
Age category	200	1	4	2,22	0,9142
Income category	200	1	4	1,765	0,9770

Source: authors' own calculations

We formulated two hypotheses:

Hypothesis 1: Price optic will increase the satisfaction with the insurance policy compare to baseline bundled price formulation.

Hypothesis 2: Price optic will increase the demand for insurance policy compare to baseline bundled price formulation.

Based on the categorical character of our data, we use binary logistic regression for the analysis of the insurance policy demand as the demand was defined as binary variable (1 if individuals would like to purchase such insurance and 0 otherwise). In the analysis of the satisfaction with the insurance policy and willingness to recommend this policy to family and friends, we applied ordered logistic regression as these dependent variables were measured on the Likert scale. Logistic regression models predict the probability of occurring a desired event and represent a technique applicable for categorical dependent variable analysis (Field, 2014).

3 Results and Discussion

The simple comparison of observed data shown in Table 2, reveal that satisfaction with the offered life insurance policy and its recommendation to family and friends do not varied substantially across different treatments.

Table 2 Mean values of analysed variables in different treatments

Variable	Treatment 1 Baseline	Treatment 2	Treatment 3	Treatment 4
Satisfaction with the insurance	2,5686	2,5273	2,4694	3,3556
Recommendation to friends and family	2,4902	2,4364	2,2449	3,0444
Demand for offered insurance	0,2745	0,20	0,5102	0,1333
Number of observations	51	55	49	45

Source: authors' own calculations

In Treatment 1 – Baseline, where the price is bundled, the average satisfaction (*M=2,57, SD=1,02*) is very similar to the value in Treatment 2 (*M=2,53, SD=1,37*) and 3 (*M=2,47, SD=1,25*). Different level of satisfaction was evoked in Treatment 4 (*M=3,36, SD=1,11*), where the combination of price optic with up-front payment is introduced. In this price formulation, subjects rate the life insurance policy more positive compare to baseline and the other treatments as well. Recommendation to friends and family follow the same pattern and subjects are more prone recommended the life insurance policy in Treatment 4. However, while the satisfaction and recommendation are strongly correlated (r=0,8726, p<0,000), willingness to purchase offered life insurance policy do not correlate with the satisfaction (r=-0,0785, p=0,2695) and recommendation (r=-0,0814, p=0,2519). The average value of subjects interested in purchase vary around 20% in Treatment 1 and 2, 51,02% of subjects were interested in purchase in Treatment 3 and only 13,33% in Treatment 4. Subjects were substantially more interested in the purchase of insurance in Treatment 3 where the price was decomposed to its components.

These results are confirmed by logistic regression analysis reported in Table 3. Based on the character of dependent variables, models 1-2 are binary logistic regression models and models 3-6 are ordered logistic regression models. In the case of satisfaction with offered insurance policy, decomposition of the premium with up-front payment in Treatment 4 significantly increased the value of the satisfaction. This result is confirmed also with the controlling for the socio-demographic characteristics of respondents. We do not reject our first hypothesis that *price optic will increase the satisfaction with the insurance policy compare to baseline bundled price formulation* in the price decomposition with up-front payment. Regarding recommendation to the friends and family, the effect is significant in the model without controls but disappeared if the controls are included. The effect of price formulation on life insurance demand is not statistically significant and instead of formulation of the price the demand is driven by the income and previous experience with life insurance. Based on these outcomes, we reject our second hypothesis that *Price optic will increase the demand for insurance policy compare to baseline bundled price formulation.* These results are in line with the conclusions of Huber et al. (2015).

Table 3 Regression results

Dependent variables	Demand for insurance		Satisfaction with the insurance		Recommendation to friends and family	
Independent variables	(1)	(2)	(3)	(4)	(5)	(6)
Treatment 2	-0,242	-0,391	-0,040	-0,088	-0,070	-0,147
	0,269	0,363	0,207	0,269	0,207	0,269
Treatment 3	0,625**	0,319	-0,086	-0,234	-0,219	-0,40
	0,259	0,339	0,211	0,259	0,213	0,261
Treatment 4	-0,512*	-0,469	0,680**	0,60**	0,451**	0,340
	0,301	0,352	0,217	0,244	0,216	0,243
Constant	-0,599***	0,350	-	-	-	-
	0,187	0,463	-	-	-	-
N	200	200	200	200	200	200
Controls	No	Yes	No	Yes	No	Yes
Pseudo R-squared	0,0799	0,1602	,0265	0,0371	0,0169	0,0279
Prob > chi2	0,0003	0,0000	,0010	0,0038	0,0165	0,0309

Note: *, ** and *** denote significance at the 10%, 5% and 1% level, respectively. Standard errors are in parentheses.

Source: Authors' own calculations

4 Conclusions

The paper reports preliminary results of the pilot study focusing on the effect of price framing on the demand for life insurance. Using the sample of 200 respondents, we tested the differences in the satisfaction and demand for life insurance with different price framing. Based on our results, we conclude that the price optic influences attractiveness of the life insurance policy and economic agents are more satisfied with the decomposed price with up-front payment. Consumers in our research, on the contrary, rated the currently used price bundled model more negatively than the premium presentation by its components with up-front payment. On the other hand, price framing has no effect on the demand for life insurance. Based on our results, we conclude that price decomposition increases the rating of the life insurance policy.

The inconsistency in our results represents a field for further research. Reported dataset represent a pilot study. In the next step, we would like to increase the sample to assure robustness of our results. In addition, we also would like to analyse the missing correlation between satisfaction/recommendation and demand for life insurance. The formulation of the price represents an easy and cheap way that insurers could increase the interest for their policies. Our results supported current trends in financial regulation where supervisors try to bring transparency into price in the insurance industry and push insurers to declare all fees and other invisible components to the potential clients before the insurance purchase. Currently, average client is usually not informed about the different components of the premium.

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Application of selected financial performance methods to chosen industry in the Czech Republic

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Abstract: *This paper is dedicated to financial performance evaluation of selected industry of the Czech Republic. Financial performance of the industry or company is a random process, which can be decomposed into the particular indicators. Very important is to find and to quantify main factors which influence financial performance of the industry the most. One of the possible ways is to apply the method of pyramidal decomposition to financial indicators. The aim of this paper is to evaluate financial performance of selected industry in the Czech Republic in the period 2007 to 2015 according to the methods of analysis of deviation and to find main value drivers of this selected industry. Annual data from the period 2007 to 2015 will be used for the analysis. The data for the analysis will be taken from the web site of Ministry of industry and trade of the Czech Republic. Firstly, financial ratios will be determined. Secondly, the method of pyramidal decomposition will be applied to selected financial indicators, such as profitability ratios, liquidity ratios and activity and debt ratios. Analysis of deviation will be then applied to particular financial ratios and dynamic analysis of selected industry financial performance will be performed. Evaluation of selected industry in the Czech Republic according to economic value added indicator will be included in the conclusion of the paper and also value drivers of this industry will be determined in the analyzed period.*

Keywords: financial performance, financial ratios, analysis of deviations, pyramidal decomposition, economic value added,

JEL codes: C2, C5, C58, G3, G30, G32

1 Introduction

Financial performance of an industry or a company is very important for the management. It is a random process, which can be decomposed into the particular indicators. Financial performance has been analyzed by traditional indicators in the past, while nowadays modern indicators are more used, such as economic value added. Methods used for financial performing of an industry or a company were presented e.g. Ehrbar (1998), Dluhošová (2010) or Mařík (2005).

It is very important to find the main factors, which have the main influence of the industry´s financial performance. One way, how to find main influencing factors is pyramidal decomposition of financial performance indicators. If this method is proposed to analyze financial performance of an industry, it is possible to find relations among the component indicators, Zmeškal (2013).

The aim of this paper is to evaluate financial performance of automotive industry in the Czech Republic in the period 2007 to 2015 according to the methods of analysis of deviation and to find main value drivers of this selected industry.

2 Methodology of financial performance

Financial performance of an industry or a company can be evaluated according to accounting indicators, economic or market indicators. In this paper for financial performance of an automotive industry will be used financial ratios analysis, pyramidal decomposition of selected financial ratio and analysis of deviation.

Financial ratio analysis

One of the commonly used tools for analysis of the industry´s financial performance is the usage of financial ratio analysis together with the pyramidal decomposition. Financial ratios analysis is the quantitative analysis of financial information from industry´s financial statements.

Financial ratios can be divided into different categories according to the parameter, which is being measured. It is possible to distinguish profitability ratios, liquidity ratios, activity or efficiency ratios and solvency ratios, Dluhošová (2004). In Table 1 there are financial ratios, which will be used for the analysis of automotive industry in the Czech Republic.

Table 1 Financial ratios

Ratio	Abbreviation	Formula
Return on Equity	ROE	EAT/Equity
Return on Assets	ROA	EBIT/Assets
Return on Capital Employed	ROCE	EBIT/Capital Employed
Return on Revenues	ROR	EBIT/Revenues
Number of Days of Receivable	NDR	Inventory/Receivable·360
Number of Days of Payable	NDP	Inventory/Payable·360
Number of Days of inventory	NDI	Inventory/Revenues·360
Current Liquidity	CL	Current Assets/Short-Term Liabilities
Quick Liquidity	QL	(Current Assets- Inventory)/Short-Term Liabilities
Cash Liquidity	CASH L	(Cash+Short-Term Securities)/Short-Term Liabilities
Debt Ratio	DR	Debt/Assets
Financial Leverage	FL	Assets/Equity

Source: Richtarová, Čulík, Gurný, Ratmanová (2013)

Economic value added

Traditional performance measures such as NOPAT, ROI or ROE have been criticized due to their inability to incorporate full cost of capital and therefore accounting revenue is not a consistent predictor of firm value and cannot be used to measure company performance, Vernimmen (2005). One such innovation in the field of internal and external performance measurement is Economic value added. This indicator is based on the concept of the economic profit. When the economic profit is positive, it means that company earns more than the weighted average costs of capital, which also means that some wealth for the shareholders is created.

There are many ways how economic value added can be expressed. It can be distinguished EVA – equity, EVA – entity or relative economic value added.

Financial performance of an automotive industry will be analyzed according to EVA – equity in this paper. EVA – equity is expressed as

$$EVA = (ROE - R_e) \cdot E, \tag{1}$$

where ROE is return on equity, E is equity and R_e are costs of equity. By using building model of Ministry of industry and trade of the Czech Republic it is possible to express costs of equity as

$$R_e = R_F + RP_1 + RP_2 + RP_3 + RP_4, \tag{2}$$

where R_F is risk free rate, $RP_{1,2,3,4}$ are risk premiums which are determined according to methodology of Ministry of industry and trade of the Czech Republic, mpo.cz.

If economic value is expressed in this way, the difference between ROE and R_e is called spread. If this spread is positive, it means that industry or company earns more than the costs of equity are.

Method of pyramidal decomposition and analysis of deviation

Method of pyramidal decomposition is usually used for quantification of the impact of component ratios on the change in the base ratio. This method also allows to determine the interactions and relationships among the component ratios.

The pyramidal decomposition together with the analysis of deviation helps to identify the relationships between the financial ratios and also quantify the impact of selected ratios on the base ratio, Dluhošová (2010).

It is useful to apply the analysis of deviations for in-depth analysis of the impact of component ratios on the base ratio. It is possible to quantify the impact of the changes in the component ratios on the base ratio according to this analysis, Zmeškal (2013). It is possible distinguish two operations according to this analysis - additive relationship and multiplicative relationship, Zmeškal (2013).

Quantification of the impact under the additive relationship is generally applicable and the total impact is divided in proportion to the changes in the component ratios, Zmeškal (2013).

According the way in which the multiplicative relationship is handled, five basic methods can be distinguished: a method of gradual changes, a decomposition method with surplus, a logarithmic method or functional method or the integral method, their description including derivation can be found in Dluhošová (2004).

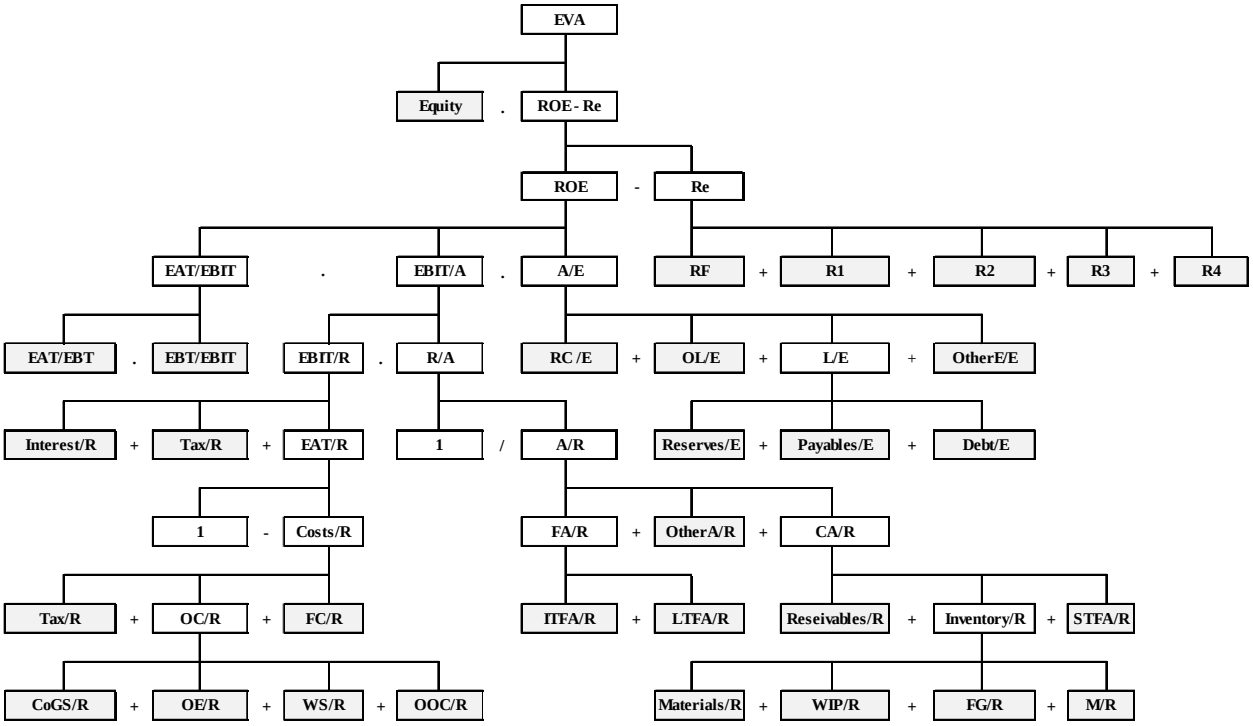
Integral method will be used for the deeper analysis of financial performance of automotive industry. Quantification of the influences according to integral method is similar to logarithmic method or functional method. The only difference is that only the linear component of the Taylor series approximation is applied, Gurný, Richtarová, Čulík (2014). Resulted influence quantification for any component ratio is expressed as

$$\Delta x_{a_i} = \frac{R_{a_i}}{R_{x'}} \cdot \Delta y_x \tag{3}$$

where $R_{a_i} = \frac{\Delta a_i}{a_{i,0}}$ and $R_{x'} = \sum_{i=1}^{N} R_{a_i}$.

In the Figure 1 proposed pyramidal decomposition of economic value added is possible to see. Economic value added is decomposed to component ratios.

Figure 1 Pyramidal decomposition of Economic value added



Source: own calculation

where *E* is equity, *ROE* is return on Equity, *EAT* is earnings after taxes, *EBT* is earnings before taxes, *EBIT* is earnings before interests and taxes, *RC* is registered capital, *OL* is other liabilities, *R* is revenues, *T* is tax income, *ITFA* is intangible and tangible fixed Assets, *LTFA* is Long –term Financial Assets, *OA* is Other Assets, *STFA* is Shot-term financial assets, *WIP* is work in progress, *FG* is finished goods, *M* is merchandise, *FC* is financial costs, *CoGS*are costs of goods sold, *OE* is operating expenses, *OOC* is other operating costs, *WS* is wages and salaries.

In the Figure 1 it is clear, that economic value added is influenced by the equity and spread, while spread is the main influencing factor. The impact of profitability, debt and determination of costs of equity is figured in other levels of decomposition.

Data

Financial statements should be completed to evaluate the financial performance of an automotive industry. Input data were taken from the website of Ministry of industry and trade of the Czech Republic from the period 2007 to 2015. Financial ratios analysis was provided according to a Table 1 according to completed financial statements.

3 Application

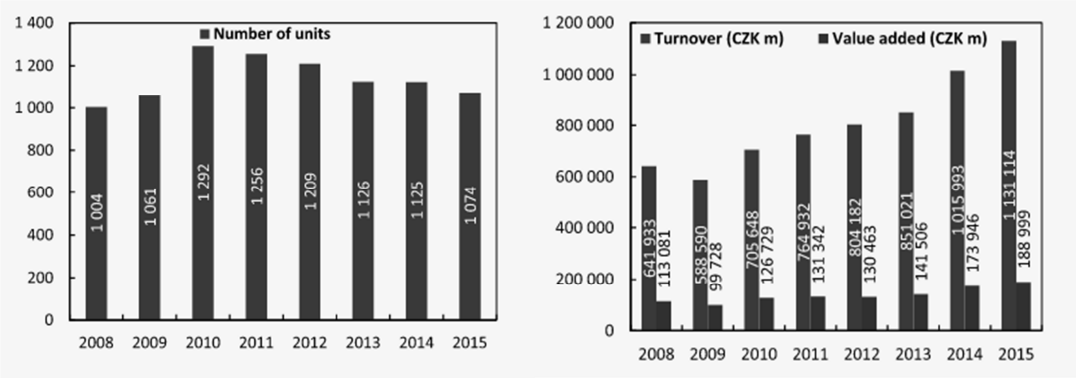
Automotive industry in the Czech Republic

Automotive industry of the Czech Republic was chosen for evaluation of financial performance. Automotive industry is one of the main parts of the manufacturing industry in the Czech Republic.

Automotive industry of the Czech Republic significantly contributes to the gross domestic product. Czech automotive industry belongs to one of the most developed automotive industries in the European Union. According to CZ – NACE automotive industry includes:

personal, light utility and freight vehicles, buses and trolleybuses, snowmobiles, golf carts, amphibious vehicles, fire trucks, trailers and semi-trailers, and the manufacture of their parts.

Figure 2 Financial ratios



Source: mpo.cz

Companies in the automotive sector and related suppliers regularly rank in the CZECH TOP 100, but not all of them do. Škoda auto, a.s., Hyunday and TPCA can be placed among the most important companies in the automotive sector.

Data

In the Table 2 there are the values of chosen financial ratios. These ratios were set according to an input data from the financial statements of an automotive industry.

Table 2 Financial ratios analysis

Ratio/Year	2007	2008	2009	2010	2011	2012	2013	2014	2015
Return on Equity	0,176	0,148	0,070	0,142	0,173	0,144	0,125	0,175	0,219
Return on Assets	0,131	0,108	0,042	0,076	0,085	0,082	0,080	0,112	0,137
Return on Capital Empolyed	0,186	0,165	0,065	0,113	0,128	0,124	0,117	0,168	0,202
Return on Revenues	0,073	0,068	0,028	0,049	0,052	0,050	0,049	0,063	0,075
Number of Days of Receivable	61,828	62,237	62,928	77,593	57,584	52,350	56,481	49,903	49,595
Number of Days of Payable	63,185	74,628	83,252	96,206	97,715	94,702	89,816	84,257	73,651
Number of Days of inventory	19,713	23,665	21,022	20,410	20,663	20,802	21,678	19,590	20,384
Current Liquidity	1,570	1,262	1,423	1,535	1,575	1,471	1,682	1,707	1,844
Quick Liquidity	1,232	0,956	1,164	1,252	1,288	1,177	1,365	1,408	1,513
Cash Liquidity	0,174	0,153	0,387	0,174	0,489	0,436	0,540	0,646	0,708
Debt Ratio	0,473	0,491	0,523	0,543	0,575	0,549	0,519	0,542	0,511
Financial Leverage	1,923	1,984	2,146	2,245	2,417	2,264	2,130	2,236	2,087

Source: own calculation

Profitability ratios are influenced by the amount of the profit. In the analyzed period automotive industry didn't generate a loss. ROE was higher than ROA in all analyzed years, which means that the invested capital was valued more than the total capital. From the proposed pyramidal decomposition of Economic value added generation of profit is clarified.

Solvency rule was met in all years. It means that companies in the automotive industry had previously received payments from customers before paying their debts. Turnover of receivables has a positive trend. The average inventory turnover is stable (20days).

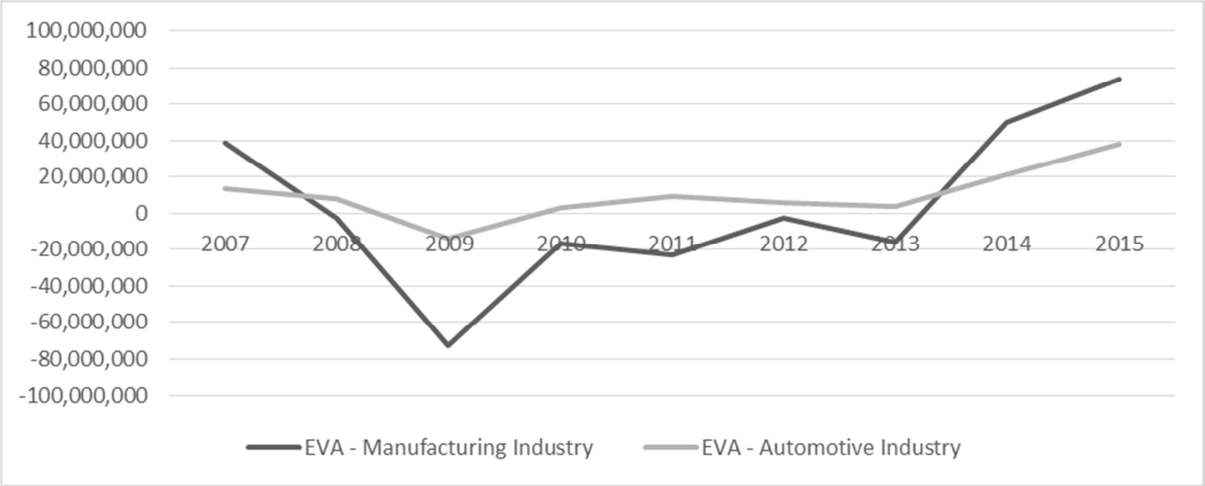
There is no problem with liquidity in automotive industry in Czech Republic in the whole analyzed period. All liquidity ratios testify to solvency at all levels.

Low debt ratio is typical in analyzed period for automotive industry. Foreign resources are consisted of liabilities, especially short-term liabilities, namely trade payables.

Economic value added

Economic value added of the automotive industry of the Czech Republic was evaluated according to a formula (1). Automotive industry of the Czech Republic is one of the main parts of the manufacturing industry in the Czech Republic. Figure 2 is illustrating the evolution of economic value added of automotive industry compared to the economic value added of the whole manufacturing industry.

Figure 2 Economic value added (thousand CZK)



Source: own calculation

From the Figure 2 it is clear that the trend of economic value added of automotive industry corresponds to the development of economic value added of manufacturing industry. Only between the years 2010 and 2012 economic value added of automotive industry had inverse trend to the economic value added of manufacturing industry.

Analysis of deviations

Method of pyramidal decomposition was applied for deeper analysis of the factors affecting economic value added of automotive industry evolution. Integral method was used for influence quantification according to formula (3). In the 2007 economic value added was negative (-5 664 144 thousand CZK.), but in the 2015 economic value added of automotive industry of the Czech Republic was positive (16 960 840 thousand CZK.). It means, that economic value added increased by 24 868 096 thousand CZK in the analyzed period.

Table 3 First level of decomposition of Economic value added

Ratio	Influence
EVA	**24 868 093**
Equity	**7 121 313**
Spread (ROE – R_E)	**17 746 781**

Source: own calculation

From the first level of decomposition of economic value added it is clear that the spread is the most influential factor. To determine the value drivers of Economic value added of automotive industry in the period 2007 to 2015 other levels of decomposition are applied. In the Table 4 there are shown impacts of other component ratios.

Table 4 Other levels of decomposition of Economic value added

Ratio	**Influence**
Equity	7 121 313
R_F	8 871 236
R_1	-165 781
R_2	-4 630 683
R_3	2 559 831
R_4	734 447
EAT/EBT	4 195 886
EBT/EBIT	28 487
RC/E	-2 802 288
OL/E	157 092
Interests/R	51 158
T/R	-2 728 383
ITFA/R	3 031 096
LTFA/R	3 374 784
OA/R	-370 529
Receivables//R	2 838 351
STFA/R	-7 762 717
Materials/R	-95 780
WIP/R	-40 148
FG/R	138 027
M/R	-157 839
Reserves/E	1 924 374
Payables/E	4 138 676
Debt/E	-2 347 738
T/R	2 728 383
FC/R	-51 158
CoGS/R	-9 711 270
OE/R	-16 810 906
OOC/R	22 688 453
OtherE/E	2 802 288
WS/R	5 159 436
Summary	**24 868 093**

Source: own calculation

Economic value added of automotive industry increased by 24 868 093 thousand CZK during the analyzed period. For a deeper analysis of all years of the analyzed period should be done.

After applying method of pyramidal decomposition to economic value added positive and negative effects of component ratios were found. Three ratios with the highest positive effect and three ratios with the highest negative effect were selected for explanation in this paper. These ratios are shown in the Table 5.

Table 5 Selected ratios with positive and negative effects

	Positive effects		
	1+	**2+**	**3+**
2007_08	Other operating costs/Revenues	Payables/Equity	Interests/Revenues
2008_09	Tax/Revenues	EAT/EBT	Financial costs/Revenues
2009_10	Other operating costs/Revenues	Wages and Salaries/Revenues	R_3
2010_11	Costs of goods sold/Revenues	Receivables/Revenues	Intangible, Tangible, Fixed assets/Revenues
2011_12	EAT/EBT	Other operating costs/Revenues	Tax/Revenues
2012_13	Interests/Revenues	R_1	Operating expenses / Revenues
2013_14	Wages and Salaries/Revenues	Interests/Revenues	Operating expenses / Revenues
2014_15	Other operating costs/Revenues	Equity	R_F

	Negative effects		
	1-	**2-**	**3-**
2007_08	Wages and Salaries/Revenues	Costs of goods sold/Revenues	Operating expenses / revenues
2008_09	Other operating costs/revenues	Operating expenses / Revenues	R_2
2009_10	Equity	Debt/Equity	Receivables/Revenues
2010_11	Operating expenses / revenues	Short-term Financial Assets / Revenues	Other operating costs/revenues
2011_12	EBT/EBIT	Costs of goods sold/Revenues	Tax/Revenues
2012_13	Other operating costs/revenues	Tax/Revenues	R_3
2013_14	Financial costs/Revenues	EBT/EBIT	Tax/Revenues
2014_15	Payables/equity	Interests/Revenues	Tax/Revenues

Source: own calculation

Share of costs items on revenues is one of the ratios, which has the largest positive effect to economic value added in all analyzed years. Only between the year 2011 and 2012 EAT/EBT ratio was the most significant.

The largest negative impact was observed in the proportion of selected costs on revenues (for example wages and salaries, other operating costs). In 2009 – 2010 equity was significantly reduced and this had the largest negative impact on economic value added.

In the analyzed period costs of equity determined economic value added. Cost of equity we evaluated according to a methodology of Ministry of industry and trade of the Czech Republic, mpo.cz. Risk premiums had in the analyzed period as positive as negative impact. Order of impact of component indicators to economic value added had changed during the analyzed period.

4 Conclusions

This paper was dedicated to a financial performance analysis of automotive industry of the Czech Republic in the period 2007 to 2015. Automotive industry is one of the main parts of the manufacturing industry in the Czech Republic.

The aim of this paper was to evaluate financial performance of automotive industry in the Czech Republic in the period 2007 to 2015 according to the methods of analysis of deviation and to find main value drivers of financial performance of this selected industry.

Selected financial ratios had positive trends. There is no problem with liquidity, profitability, solvency, activity and efficiency.

Financial performance of automotive industry was analyzed according to economic value added. Economic value added had significantly increased during the analyzed period.

Analysis of deviation was applied to find the main indicators influencing economic value added of automotive industry in the Czech Republic. According to integral method, indicators with positive and negative effect were found. Share of selected costs on revenues had the largest impact to economic value added of automotive industry of the Czech Republic in the analyzed period 2007 to 2015.

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Causes of the Foreclosure Crisis – Irrational or Rational Decisions?

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Abstract: *The aim of this paper is to show non-traditional approach to the causes of foreclosure crisis in 2008. Most often used story is based on idea that the crisis was result of the finance market industry where market insiders betrayed uninformed mortgage borrowers and investors. But non-traditional approach argues that borrowers and investors made decisions that were rational and logical given their ex post overly optimistic beliefs about house prices. They expected situation would have been much different than it was, but they knew theoretical risks. This can show limits of our understanding of asset price bubbles and help to design policies and help us in crisis prediction system.*

Keywords: Financial crisis, Behaviour, Consumer behaviour, Rationality, Irrationality

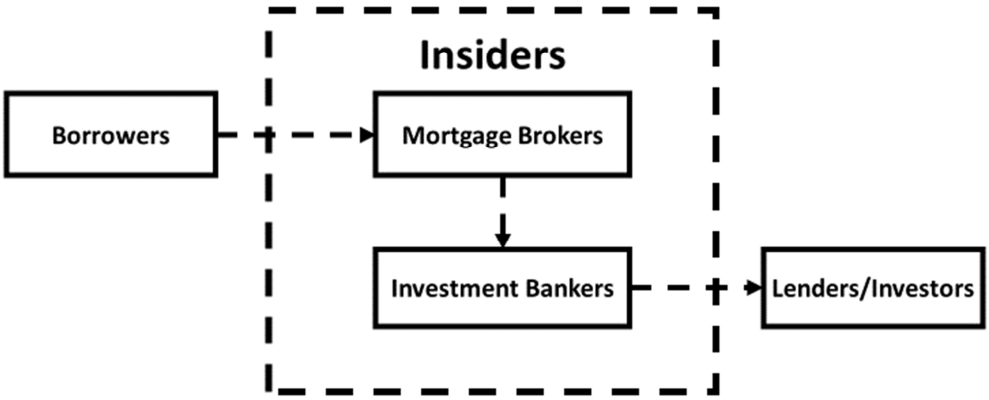
JEL codes: D14, D18, D53, D82, G01, G02

1 Introduction

Few years after the beginning of the U.S. mortgage crisis there is still a crucial question regarding its origin – why did so many people—including homebuyers and the purchasers of mortgage-backed securities—make so many decisions that turned out to be disastrous in their consequences?

The dominant explanation that can be called conventional wisdom claims that well-informed mortgage insiders used the securitization process to take advantage of uninformed outsiders (e.g. Foote, 2015). The process is explained as a loan from a mortgage broker through a series of Wall Street intermediaries to an ultimate investor. According to this point of view, betray starts with a mortgage broker, who convinces a borrower to take out a mortgage that appeared at the beginning affordable. Process is displayed in Figure 1. Unbeknownst to the borrower, the interest rate on the mortgage will reset to a higher level after a few years, and the higher monthly payment will force the borrower into default.

Figure 1 Conventional Wisdom



Source: Foote (2015)

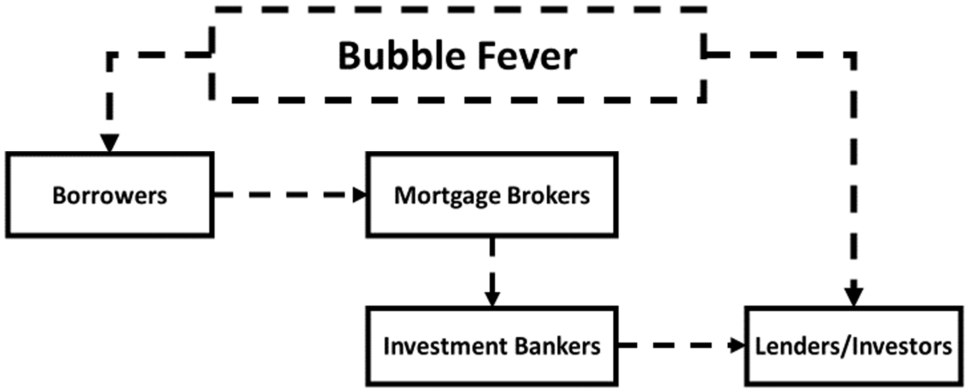
The broker knows that the mortgage is firmly connected to explode, but it does not matter because the securitization process means that it will pass on the mortgage to someone else. The investment bank buys a loan for inclusion in a mortgage-backed security.

An investment banker knows that the investor is likely to lose money, but it does not matter because it's not his money. When the loan explodes, the borrower loses his home and the investor loses his money.

Both borrowers and lenders believe home prices will grow rapidly soon, not surprising that they find borrowers who pull out to buy the largest houses they could and investors who would give them money. Rising house prices create large capital gains for home buyers. They also increase the value of mortgage pledges and thus reduce or eliminate credit losses for creditors.

Higher expectations in house prices streamline the decisions of debtors, investors and intermediaries - their acceptance of high leverage in home purchase or financing of mortgage investments, their inability to demand a rigorous documentation of income or assets before lending, and their extension of loans to debtors' history of debt repayment (e.g. Foote, 2015). The process is clearly displayed in the Figure 2.

Figure 2 Bubble Theory



Source: Foote (2015)

Many borrowers got mortgages that they would never have bound up before. If this alternative theory is true, securitization was not the cause of the crisis. The securitization rather facilitated the transactions the borrowers and investors had yet to do.

According to bubble theory is foreclosure crisis seen because of distorted beliefs rather than distorted incentives. Growing literature in economics seeks to accurately identify how financial market participants shape their beliefs and what can happen when these beliefs are distorted.

Bubbles do not need securitization, government Involvement or non-traditional credit products. Bubbles in many other activities have appeared without these things (e.g. Tulips in Holland from the 17th century). Expectations of higher real estate prices have made investors more willing to use both securitized and non-traditional mortgage products.

2 Methodology and Data

Theories of asymmetric information argue that mortgage originators failed to adequately screen loans and passed them on to unsuspecting investors in mortgage-backed investments. The resulting expansion in credit then drove prices higher. Some of our

facts have argued directly against this line of reasoning; in this section, we show that explanations based on asymmetric information fail on theoretical grounds as well. A second group of explanations claims that mortgage market developments related to financial innovation allowed credit to expand and prices to rise. We show that these explanations also have theoretical and empirical problems. Finally, we discuss the only set of theories left standing. These theories claim that the U.S. housing market was a classic asset bubble, just like previous bubbles in tulips and tech stocks.

Explanations based on asymmetric information

The theory of asymmetric information argues that mortgage brokers have been unable adequately to project loans and hand them over to shameless investors in mortgage investment. The resulting credit expansion then led to higher prices. The second group of explanations argues that mortgage market developments related to financial innovation have allowed credit growth and price growth. Other theories claim that the US housing market was a classic bubble of assets, just like the previous bubbles in the tulips and technological supplies.

Theories based on financial innovation

A second group of theories argue that the source of rising house prices was some fundamental change in mortgage market institutions. These loans were uniquely labelled as loans with those assets, so investors knew what they were getting. In particular, investors knew that the borrowers were likely to inflate their income and assets. Nevertheless, investors bought loans because they expected these loans to be profitable. Investors were willing to take advantage of their chances with risky loans because they thought higher real estate prices would mean that this risk is worth not because of the inconsistent stimulus in the securitization process. They argue that the source of real estate price growth was a major change in mortgage market institutions, although this change may not be the result of asymmetric information. E.g. Decrease in requested payments from potential domestic buyers.

The lesson of financial innovation models is that it is not possible to explain the dynamics of housing prices in the US in 2000 with a dynamic forward-looking model of overall balance. Researchers should draw attention to less conventional approaches, for example, based on distorted beliefs.

Theories based on bubbles and distorted beliefs

Economists are fascinated by bubbles and have been for a long time. Speculative fervour captured some of the asset, which led to prices that surpassed any realistic estimate of the future income that this asset could cause. When no more buyers of this asset are available - when music stops - prices fall.

The models were developed to explain why bubbles may take a long time, but as Brunnermeier (2008) states, they do not have many convincing models that explain when and why the bubbles begin. The link between financial innovations and bubbles also does not support a historical record. In the 1930s, many blamed the US bubble on securities exchanges in the 1920s for financial innovations, which allowed companies and individuals to raise leverage positions in stocks. However, this regulation did not hinder the technological bubble of the 1990s, though it probably prevented the collapse of stock prices from causing a financial crisis. The US housing market was in a bubble from the beginning to the middle of 2000, then debtors and creditors are understandable.

Higher price expectations may also explain why so many mortgage loans have been allocated to low-income households and why this allocation was via securitization. Expectations of higher prices will encourage all households to increase their exposure to the housing market, but wealthy households can finance this growth by lowering their investment in bonds. Households with little or no wealth can finance growth only through increased loans. Expectations of high prices dramatically reduced the expected losses on

loans at risk, but had little impact on the expected losses on primary loans, which due to their much higher credit quality were minimal. High prices can explain the growth of mortgage securitization.

Since the characteristics of the borrower no longer affect loss estimates, if the underlying collateral is expected to be evaluated quickly, it is not sufficient for the originator to obtain information on these characteristics or equivalent to the investor requesting. As a result, the developer will end up with less private information in an environment where the expected growth in prices is lower. Rather than depositing money in a financial institution that had a decision on where to borrow, the securitization of investors could directly focus their money on a particular market place in this case. Normally, it's a good thing. But in the middle of 2000, securitization worked the same way as Othello - not wisely, but too well.

The inefficiency of a more traditional financial system could be a blessing now, as it could prevent too optimistic borrowers and investors from finding each other.

3 Results and Discussion

If borrowers and investors made bad decisions because of the collective belief that housing prices would grow rapidly and could never fall, better information, simplified products and improved incentives for intermediaries would not have a big impact. But this does not mean that this policy is always ineffective. Although scientists can not predict earthquakes or prevent them, robust building laws still prevent millions of deaths. Many procurement rules are designed to make the financial system more robust. When evaluating future policy designs there should be answered two basic questions:

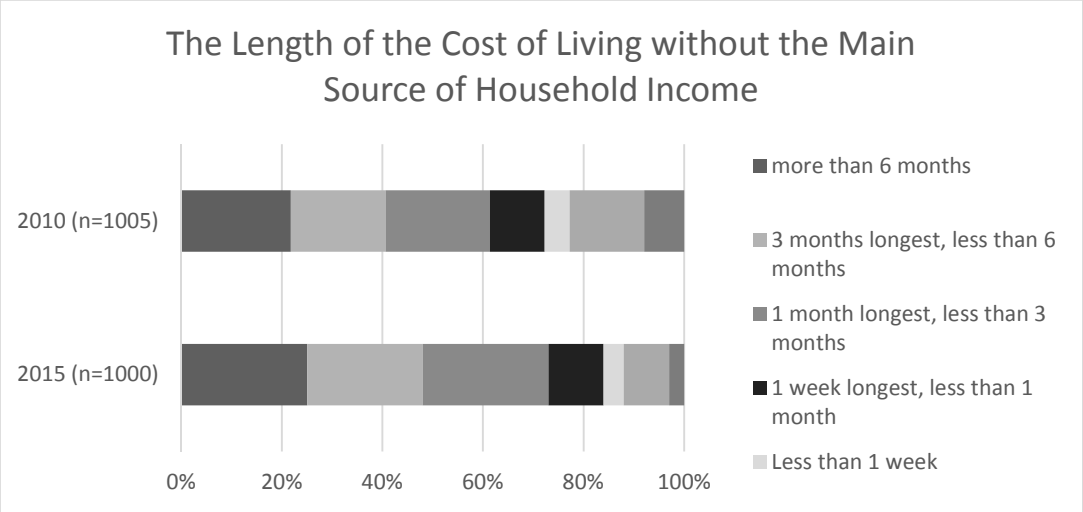
- Can financial institutions resist severe price shock?
- Can borrowers withstand a substantial decline in property prices?

We can use for illustrative answer speech in Shanghai Symposium on OTC Derivatives made by Evans in spring 2017. He stated that political actions that increase public confidence in the ability of institutions to withstand financial shocks will tend to offset the destructive behavior of liquidity. The international community has taken many such measures since the crisis. Particularly noteworthy are changes in bank capital regulation, including higher capital requirements; the beginnings of a truly anti-cyclical capital regime; regular stress tests; and minimum Standards for Balance Sheet Liquidity. These developments reduce the likelihood that a large systemically important bank will be vulnerable to further shocks that have hit the financial system (Evans, 2017).

Very useful in predicting of ability of down payment is the concept of stress test. Warren (2010) argued that families could practice a "financial explosion against fire" to ask how they would get if someone had won the job. A fire drill could also include a scenario in which the cost of parachuting houses would prevent a family from selling their home more than owed a mortgage. Such a drill would be like the so-called Load Tests that regulators perform in financial institutions.

We can use the data from Ministry of Finance judging these abilities of the Czech Republic inhabitants. In 2010 and in 2015, the Ministry of Finance carried out a measurement of the level of financial literacy of the adult population of the Czech Republic. This survey has become part of the global measurement together with the other dozens of countries of the Organization for Economic Co-operation and Development (OECD). In Figure 3 is displayed specific part of this financial literacy measurenment - the length of the cost of Living without the main source of household income

Figure 3 Measuring the Level of Financial Literacy in 2010 and 2015



Source: Ministry of Finance

48% of households cover their cost of living at the loss of main income for at least three months (41% of households in 2010), 15% of households would not even cover them for one month (16% of households in 2010). This research showed Czechs are getting better and their stress tests results would be better too.

Speaking back to financial crisis origin, everyone - from first class houses to the director of Wall Street - must realize that asset prices are moving in a way that we do not understand yet. Unfortunately, none of the new mortgage-backed forms proposed by the regulators contains critical information the borrowers need to know: there is a chance that the house they buy will soon be considerably lower than the remaining balance of the mortgage. If this occurs and the borrower does not have sufficient preventive savings, then the debtor is a job loser or serious illness that has not been touched.

Politicians and regulators have little or no ability to identify or trigger bubbles in real time. Policy makers should not try to stop bubbles that are not easily identifiable but should clean up the damage that was left in their explosion (much like A. Greenspan). This strategy works only if the financial system is robust against unfavorable shocks.

Determining the origin of the financial crisis is not just an inactivity of academic entertainment, because alternative explanations require different political responses. If borrowers and investors made bad decisions because of the collective belief that housing prices would grow rapidly and could never fall, better information, simplified products and improved incentives for intermediaries would not have a big impact. But this does not mean that this policy is always ineffective. Although scientists can not predict earthquakes or prevent them, robust building laws still prevent millions of deaths. How can we create a bubble-resistant financial system? Many new regulations are designed to make the financial system more robust. We propose two questions that may be raised in the evaluation of future policy proposals.

Critics may say that dealing with bubbles, such as the earthquake, recalls the doctrine often associated with Alan Greenspan: political politicians should not try to stop the bubbles that are not easily identifiable but should instead clean up the damage that remains when they burst. To some extent, we agree with this doctrine because we believe that policy makers and regulators have little or no ability to identify or tear bubbles in real time. This strategy works only if the financial system is resistant to adverse shocks. As we have already mentioned, the reforms of the 1930s failed to prevent the emergence of a bubble in the stock market in the late 1990s. Stock market collapse, however, did not lead to the economic crisis or to the large financial problems

of households. Why not? One possible explanation is that the 1930s reforms have made the financial system "bubble-proof", at least for the stock. Our hope lies in the fact that in the future we can achieve a similar result to housing. However, housing policy must be based on facts.

4 Conclusions

During last big financial crisis, foreclosure crisis, borrowers and investors made decisions that were rational and logical regarding ex post too optimistic beliefs about real estate prices. Reforms of the 1930s could not prevent the emergence of a bubble at the end of the 1990s. Stock market collapse, however, did not lead to the economic crisis or to the large financial problems of households. Why not? One possible explanation is that the 1930s reforms have made the financial system "bubble-proof", at least for the stock. Could we get something similar in the future in the future? Prognosis, valuation, and analysis must be modest and sincere about how little we know about the future. This will allow decision makers to seriously consider extreme and unfavorable scenarios, even though they seem unlikely. In many cases, it is the right decision about risk management and the recognition of what we do not know. Therefore, we need consider what are people´s beliefs like and what are they based on. Just knowing that we can make some relevant predictions about future crises.

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The dynamics of linkages between European currencies: How does it change according to the time of day?

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Abstract: *The aim of the paper is to document how the dynamics of linkages between European currencies changes during a trading day according to the activity of different groups of traders, and show the impact of important events and news on the dependence structures. We analyze conditional dependencies between the Czech koruna, Hungarian forint, Polish zloty and the major European currencies (the euro, British pound and Swiss franc). The analysis is performed for the exchange rates against the US dollar. We consider daily returns calculated using the exchange rates quoted at different times of day. The dynamics of the dependencies is modeled by means of Markov regime switching copula models, and the strength of the linkages is described using dynamic Spearman's rho coefficients and the dynamic coefficients of tail dependence. The approach used allows to scrutinize changes in the dynamics of the conditional dependence structure according to the time of day, which can be useful in recognizing diversification possibilities.*

Keywords: exchange rates, European currencies, linkages, copula, Markov regime switching, tail dependence

JEL codes: G15, F31, C58, C32

1 Introduction

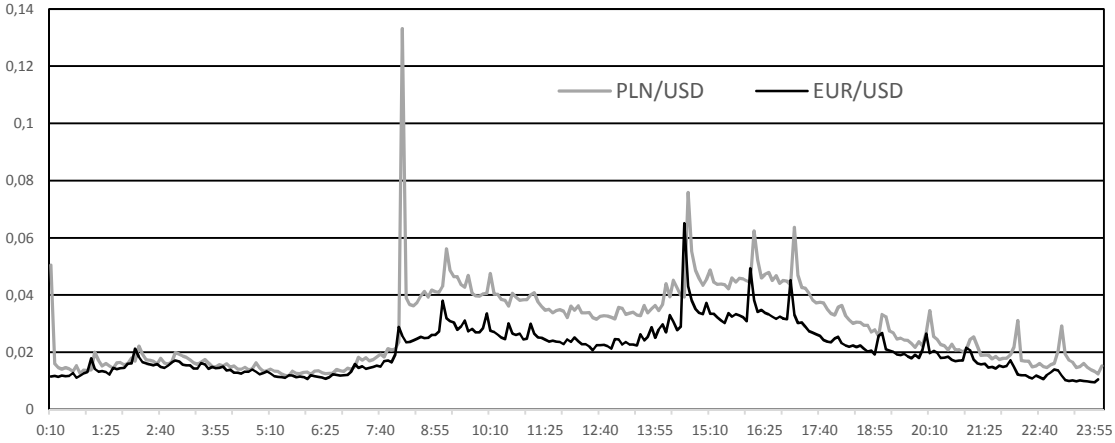
In the paper we show that the strength and dynamics of linkages between European currencies change depending on the time of day. The analysis is based on daily returns on the exchange rates of selected currencies (EUR, GBP, CHF, CZK, HUF, PLN) against the US dollar that are calculated at 4 fixed times each trading day. To describe changes in a pattern of the dependence, we apply 3-regime Markov regime switching copula models, which allows to measure the strength of the dependence by means of dynamic Spearman's rho coefficients and some coefficients of dependence in tails.

The FOREX market is open 24 hours a day during 5 days of a week, but activity of traders from different parts of the world changes according to trading hours of their regional markets. The prices observed in this market are thus heterogeneous since at different times of a day they are formed by different groups of traders. Moreover, the intensity of a FOREX trade changes during a day. In Figure 1, we show diverse daily periodic patterns in 5-minute returns on EUR/USD and PLN/USD, which depict differences in activity of trading the currencies in regional markets. The maxima visible in plots indicate the periods of the highest activity of traders. A general observation is that three global currencies, i.e. EUR, CHF and GBP, show similar behavior as they are actively traded during all the day, though with changing trade intensity. For the considered Central-European currencies, we observed an explosion of volatility at 8:05 (all times in the paper are CET), i.e. immediately after the regional markets are opened.

Taking into account the common maxima, we decided to analyze the linkages between the considered exchange rates at 8:05, 9:05 (the beginning of the trading day in

continental Europe and the UK), 14.35 (the most significant US announcements) and at 17:00 (the end of the trading day in Europe).

Figure 1 EUR/USD and PLN/USD. The daily periodic patterns in 5-minute returns (Central European Time). Based on averages of absolute returns over the period: November 11, 2011 – March 24, 2017



Source: authors

We have drawn inspiration for seeking evidence of time-of-day effects in the structure of dependence in the FX market from the papers by Ranaldo (2009) and Breedon and Ranaldo (2013). These authors do not investigate the dependence structure but present evidence of time-of-day effects in foreign exchange returns showing that currencies depreciate during local trading hours and appreciate during the working hours of the foreign counterpart. This can be partly explained by the observation that there is the convention of closing or reducing open positions on exchange rates out of the liquidity clustering during the main working hours (Ranaldo, 2009). Our earlier analysis of intraday changes in the dependence structure in the currency market (Doman and Doman, 2014) we took up, however, without knowing the papers by Ranaldo and Breedon.

The results of our research are as follows. First we show how the dynamics of linkages depends on the time of day and on the changes in activity of different groups of FOREX traders. The next part of our results deals with the impact of important market events and information on dynamics of the linkages, and shows differences in the ways a news impacts them depending on the time of day. The presented analysis is thus performed from the point of view of a US dollar investor owning a portfolio of European currencies and the results show that diversification of such a portfolio and the portfolio risk depend on the time of day.

2 Methodology and Data

Modeling the conditional distribution of multivariate daily financial returns is not an easy task. Asymmetries in one-dimensional marginal distributions as well as in the dependence structure imply that such distributions mostly do not belong to a well-studied class of elliptical distributions, which include multivariate normal and Student's *t* distributions (see e.g. McNeil *et al*., 2005). Moreover, the conditional dependence structure of the returns can significantly change in time. Because of non-ellipticity, modeling the returns using standard multivariate GARCH models (Bauwens *et al*., 2006) should be avoided. Instead, an approach employing copulas, which allow to model dependence structure separately from univariate marginal distributions, should be applied.

A bivariate copula is a function $C:[0,1]\times[01]\to[0,1]$ from the unit square to the unit interval that is a distribution function whose marginal distributions are standard uniform. If X_1 and X_2 are random variables with joint distribution function F and marginal distributions F_1 and F_2 then, by a theorem by Sklar (1959), the following holds

$$F(x,y)=C(F_1(x), F_2(y)). \tag{1}$$

Given that F_1 and F_2 are continuous, the function C is uniquely given by the formula

$$C(u_1,u_2)=F(F_1^{\leftarrow}(u_1), F_2^{\leftarrow}(u_2)), \tag{2}$$

for $u,v\in[0,1]$, where $G^{\leftarrow}(u)=\inf\{x: G(x)\geq u\}$. In such a situation, C is called the copula of X_1 and X_2 or of F.

The simplest copula, which corresponds to independence of marginal distributions, is defined by

$$C^{\Pi}(u,v)=uv. \tag{3}$$

In this paper we also apply the Gaussian (normal), Student, and Joe-Clayton copulas. They are defined by the following formulas:

$$C_{\rho}^{Gauss}(u_1,u_2)=\Phi_{\rho}(\Phi^{-1}(u_1),\Phi^{-1}(u_2)), \tag{4}$$

$$C_{\rho,\nu}^{Student}(u_1,u_2)=t_{\rho,\nu}(t_{\nu}^{-1}(u_1),t_{\nu}^{-1}(u_2)), \tag{5}$$

$$C_{\kappa,\gamma}^{Joe-Clayton}(u_1,u_2)=1-\left(1-([1-(1-u_1)^{\kappa}]^{-\gamma}+[1-(1-u_2)^{\kappa}]^{-\gamma}-1)^{-1/\gamma}\right)^{1/\kappa}, \tag{6}$$

where in (4) Φ_{ρ} denotes the distribution function of a bivariate standardized Gaussian vector with the correlation coefficient ρ, and Φ stands for the distribution function of the standard normal distribution. Similarly, $t_{\rho,\nu}$ in (5) denotes the bivariate Student *t* distribution function with ν degrees of freedom and the correlation coefficient ρ, and t_{ν} stands for the univariate Student *t* distribution function with ν degrees of freedom. The parameters in the Joe-Clayton copula (6) satisfy the conditions: $\kappa\geq1$, $\gamma>0$. For $\kappa=1$, the Joe-Clayton copula becomes the Clayton copula $C_{\gamma}^{Clayton}$. In the limit case, $\gamma=0$, the Clayton copula approaches the independence copula C^{Π} (Nelsen, 2006).

If a copula C has the density c, then

$$c(u_1,u_2)=\frac{\partial^2 C(u_1,u_2)}{\partial u_1\partial u_2}, \tag{7}$$

and for any variables X_1 and X_2 with marginal distribution functions F_1 and F_2, marginal densities f_1 and f_2, joint density f, and copula C the following relation holds:

$$f(x_1,x_2)=c(F_1(x_1),F_2(x_2))f_1(x_1)f_2(x_2). \tag{8}$$

Spearman's rho for variables X_1 and X_2 with marginal distribution functions F_1 and F_2 can be defined as

$$\rho_S(X_1,X_2)=\rho(F_1(X_1),F_2(X_2)), \tag{9}$$

where ρ denotes the usual Pearson correlation. Spearman's rho is a dependence measure, which is a copula invariant. When C is the copula linking X_1 and X_2, then

$$\rho_S(X_1, X_2) = \rho_C = 12 \iint_{[0,1]^2} C(u_1, u_2) du_1 du_2 - 3 \tag{10}$$

(Nelsen, 2006). From (10) it follows, in particular, that if for some copulas C_1 and C_2, and $0 \le \alpha \le 1$, $C = \alpha C_1 + (1-\alpha) C_2$, then

$$\rho_C = \alpha \rho_{C_1} + (1-\alpha) \rho_{C_2} . \tag{11}$$

In this paper, the strength of lower tail dependence of variables X_1 and X_2 with distribution functions F_1 and F_2 and copula *C* is measured by the function

$$\lambda_L(q) = P(X_2 \le F_2^{\leftarrow}(q) \mid X_1 \le F_1^{\leftarrow}(q)) = C(q,q)/q . \tag{12}$$

If a limit $\lambda_L = \lim_{q \to 0^+} \lambda_L(q)$ exists and $\lambda_L \in (0,1]$, then *C* is said to show extremal dependence in the lower tail. This property is possessed by the Student and Joe-Clayton copulas, but not the Gaussian.

We model the joint conditional distribution of bivariate returns assuming that there can be three regimes in each of which a fixed copula describes dependence structure, and the regime switching is driven by some Markov chain (cf. Garcia and Tsafack, 2011). Thus, in the applied Markov switching copula (MSC) model the conditional distribution of the vector $\mathbf{r}_t = (r_{1,t}, r_{2,t})$ has the following form

$$\mathbf{r}_t \mid \Omega_{t-1} \sim C_{S_t}(F_{1,t}(\cdot), F_{2,t}(\cdot) \mid \Omega_{t-1}), \tag{13}$$

where Ω_t denotes the up to time *t* information set, $r_{i,t} \mid \Omega_{t-1} \sim F_{i,t}$, $i = 1,2$, and S_t is a homogeneous Markov Chain with state space $\{1,2,3\}$. The parameters of the MSC model (i.e. those of the univariate ARMA-GARCH models for the marginal distributions, of the copulas C_1, C_2 and C_3, and the transition probabilities $p_{ij} = P(S_t = j \mid S_{t-1} = i)$) are estimated by the maximum likelihood method. The main by-products of the estimation, which are used to construct time-varying conditional dependence measures, are the conditional probabilities $P(S_t = j \mid \Omega_{t-1})$, $P(S_t = j \mid \Omega_t)$ and $P(S_t = j \mid \Omega_T)$ (Hamilton, 1994).

We investigate the exchange rates EUR/USD, CHF/USD, GBP/USD, CZK/USD, HUF/USD and PLN/USD. According to the established practice of FX markets, the symbol X/Y means the price of a unit of currency X in units of currency Y. The analysis is performed for the daily percentage logarithmic returns, which are separately calculated based on exchange rates quoted at 8:05, 9:05, 14:35 and 17:00. The period under scrutiny is from November 11, 2011 to March 24, 2017 (1394 daily observations for each of the selected times). The exchange rate series were obtained from the service Stooq.

Prior to modeling the dynamics of dependence we calculated empirical Spearman's rho coefficients for each pair of the considered returns. They turned out not to be very sensitive on the time of day. Their values change from 0.4674 (GBP/USD-HUF/USD at 9:05) to 0.9017 (EUR/USD-CZK/USD at 8:05). The analysis presented in the next section shows that the pattern changes when considering the conditional Spearman's rho coefficients, which take into account the information flow.

3 Results and Discussion

We investigate the dynamics of dependence between the analyzed exchange rates by means of 3-regime Markov switching copula (MSC) models. This allows us to describe

different types of dependence and capture temporal changes in the linkages. The analysis is performed for pairs of the exchange rates, so we use bivariate copulas. As in many financial applications, we used a two-stage estimation procedure of model fitting. In the first step, a univariate ARMA-GARCH model was fitted to each of the investigated return series. Among the best fitted models, standard GARCH, GJR, and EGARCH models with Student's *t* (symmetric or skewed) distribution for the innovations (Tsay, 2010) appeared. The standardized residuals from the models were tested for serial independence and consistency with the assumed distributional properties. They were then transformed by means of the theoretical cumulative distribution functions into the series of uniformly distributed pseudo-observations, based on which the copula and regime-switching parameters were estimated in the second step. We tried a variety of copulas, and in final choice of the models decisive were the results of information criteria, and the likelihood ratio tests, where applicable. The estimation was performed using G@RCH 7.0 package (Laurent, 2013) and the MATLAB software.

Although the considered currencies have been subject to different exchange rate regimes, their exchange rates against the US dollar indicate the level of volatility that justifies applying the above modeling procedure. This is due to invariance of a copula under strictly increasing transformations of the marginals. Our analysis focuses on the dynamics of the conditional Spearman's rho coefficients and the lower tail dependence coefficients defined in (12) and evaluated at $q = 0{,}01$, which is the most frequently used tolerance level in Value at Risk calculations. Presented below estimates for the dynamic Spearman's rho coefficients were calculated by the formula

$$\rho_t = \sum_{i=1}^{3} \rho(i) P(S_t = i \mid \Omega_T) , \tag{14}$$

where $\rho(i)$ is Spearman's rho for a copula prevailing in regime *i*, and $P(S_t = i \mid \Omega_T)$ is the smoothed probability of regime *i*, defined in (16). Estimates for the dynamic left tail dependence coefficients were calculated by a similar formula.

Table 1 Parameter estimates for MSC models fitted to daily returns calculated for the pair CZK/USD-HUF/USD

8:05	**Regime 1**	**Regime 2**		**9:05**	**Regime 1**	**Regime 2**	**Regime 3**
Copula	C_{ρ}^{Gauss}	$C_{\rho}^{Student}$		**Copula**	C_{ρ}^{Gauss}	C_{ρ}^{Gauss}	$C_{\kappa,\gamma}^{Joe-Claytont}$
ρ	0.5653 (0.0418)	0.8464 (0.0152)		ρ	0.4193 (0.0736)	0.8528 (0.0109)	
ν		8.5615 (3.1710)		κ			2.0431 (0.1598)
				γ			1.2175 (0.1533)
14:35	**Regime 1**	**Regime 2**	**Regime 3**	**17:35**	**Regime 1**	**Regime 2**	
Copula	C_{ρ}^{Gauss}	C_{ρ}^{Gauss}	$C_{\kappa,\gamma}^{Joe-Clayton}$	**Copula**	$C_{\rho}^{Student}$	$C_{\kappa,\gamma}^{Joe-Clayton}$	
ρ	0.2601 (0.1277)	0.8299 (0.0105)		ρ	0.7193 (0.0191)		
κ			1.6926 (0.1426)	κ		3.8467 (0.0001)	
γ			1.0137 (0.1306)	γ		2.4799 (0.0001)	

Source: authors

In Table 1 we show parameter estimates for the MSC models in the case of CZK/USD and HUF/USD. For returns computed at 9:05 and 14:35, the fitted models are 3-regime MSC with the Gaussian copula in regimes 1 and 2, and the Joe-Clayton copula in regime 3. In the two remaining cases, 2-regime MSC models were the best: with the Gaussian and Student copulas for returns computed at 8:05, and the Gaussian and Joe-Clayton copulas for returns computed at 17:00. Thus at each of the considered times there exists a

regime described by a copula exhibiting extremal dependence in the lower tail. In Table 2 we present all types of models fitted to the considered pairs of exchange rate returns. The most often occurring are 2-regime MSC models with two Gaussian copulas which differ in the value of correlation coefficient, and 2-regime MSC models with regimes described by the Gaussian and Student copulas.

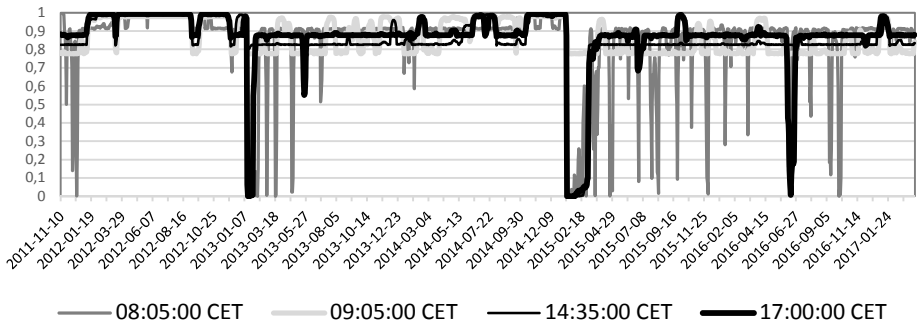
Table 2 The types of MSC models fitted to daily returns calculated from data quoted at the selected times (copulas: N-normal, t-Student, JC-Joe-Clayton, PI-independence)

	EUR-GBP	EUR-CHF	EUR-PLN	EUR-CZK	EUR-HUF	GBP-CHF	PLN-CZK	PLN-HUF	CZK-HUF
8:05	N-N	N-N-PI	N-t	N-N	N-t	N-N	N-t	N-t	N-t
9:05	N-t	N-N	N-N	N-t	N-N	N-N	N-t	N-t	N-N-JC
14:35	N-t	N-N	N-N	N-N-PI	N-t	N-N	N-t	t-JC	N-N-JC
17:00	N-N	N-N-PI	N-N	N-t	N-t	N-N	N-N	N-t	t-JC

Source: authors

Due to the limitation on the file size, we are able to present here only two figures showing examples of the obtained results. Figure 2 shows a comparison of the dynamic Spearman's rho coefficients (for EUR/USD and CHF/USD) and Figure 3 depicts the dynamics of the lower tail dependence coefficients (for CZK/USD and HUF/USD) for the considered times.

Figure 2 Dynamic Spearman's rho coefficients for (EUR/USD, CHF/USD)



Source: authors

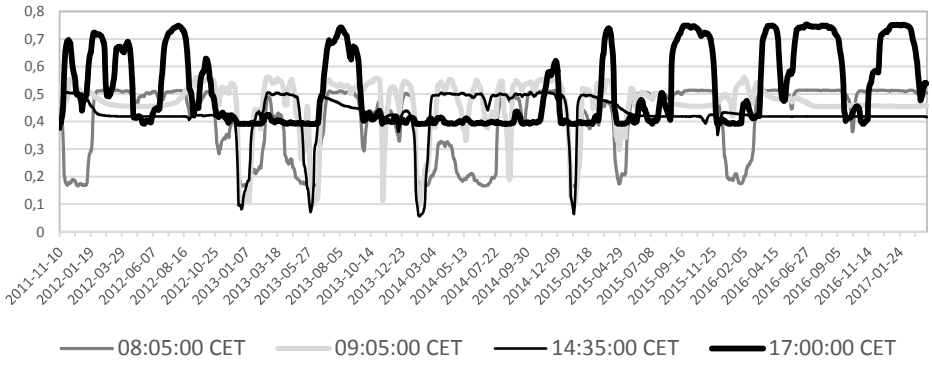
The unconditional Spearman's rho for (EUR/USD, CHF/USD) is about 0.86 for all the considered times, but the plots in Figure 2 indicate that the dynamics of linkages between EUR and CHF is very strong and clearly depends on the time of day. In September 2011 the Swiss National Bank (SNB) introduced the exchange-rate peg and a minimum exchange rate of CHF 1.20 per euro was applied. On January 15, 2015 the SNB suddenly announced that it would no longer hold the Swiss franc at a fixed exchange rate with the euro. Thus we expected that our analysis would show strong dependence between EUR/USD and CHF/USD during the period 2011-2015 and some drop in the strength of linkages after 2015. This turned out to be true for returns calculated at 9:05 and 14:35. However, at the beginning (8:05) and end (17:00) of the trading day in Europe the dependence process is much more complicated. There occur quite long periods of very weak linkages. Investors consider the Swiss franc as a "safe haven" asset, so during the periods of uncertainty caused by problems of the Eurozone their behavior generates opposite movements of EUR/USD and CHF/USD. Periods where the returns are independent are observed, for instance, after the Brexit referendum and after unpegging the franc. It is worth mentioning that the first clear drop in the strength of dependence, observed in January 2013, was due to the risk decline on financial markets (Swiss National Bank, 2013).

In the case of EUR/USD and GBP/USD, the empirical Spearman's rho coefficients calculated for returns corresponding to the considered times vary from 0.5373 to 0.555.

However, the results obtained by means of MSC models show much more wide range for the conditional Spearman's rho coefficients: from 0.3 to almost 0.8. The dependence is stable at 14:35 and 17:00 except for a drop in its strength at the beginning of 2013, which can be explained by a change of investors' sentiment caused by an improvement in the UK economy (https://www.fx-mm.com/article/29770/a-change-of-season-a-change-of-sentiment/). This result suggests that the US news and the end of the stock market trading in Europe are not important for the dependence between returns on EUR/USD and GBP/USD. The linkages between these two exchange rate at 8:05 and 9:05 show strong dynamics indicating their sensitiveness on the information flow at the beginning of the trading day in Europe. The dynamic coefficients of dependence in the lower tail for (EUR/USD, GBP/USD) are low (0.06-0.35) for all the selected times, which means that the risk of simultaneous large movements down of these two exchange rates is low.

In Figure 3, we present an example of estimates of the conditional lower tail dependence coefficients. The chosen pair is (CZK/USD, HUF/USD) and the value of q is 0.01. The results are quite spectacular. The tail dependence coefficients vary from 0.05 to even 0.77 with the dynamics strongly dependent on the time of day. The highest values are observed in turmoil periods and are achieved for returns calculated at 17:00, which is connected with closing risky positions at the end of the trading day. The pattern for the strength of linkages measured by means of the conditional Spearman's rho strongly depends on the time of day too. The dynamics is the stablest for returns calculated at 17:00 and the most sensitive on the information flow for returns calculated at 14:35 (US news). The unconditional Spearman's rho coefficients are about 0.75, but the conditional ones are changing from 0.26 to almost 0.9.

Figure 3 Dynamics of lower tail dependence coefficients for (CZK/USD, HUF/USD)



Source: authors

The linkages of the Czech koruna and Polish zloty with the euro show strong dynamics, very sensitive on the information flow. The empirical Spearman's rho coefficients are, respectively, about 0.9 and 0.8 and the conditional Spearman's rhos vary from 0 (occasionally for 14:35) to almost 1 in the case of CZK and EUR, and from 0.6 to 0.9 for PLN and EUR. In the case of HUF and the euro, the dynamics of linkages is less wild, the unconditional Spearman's rho coefficients are about 0.76, and the conditional ones are between 0.53 and 0.87. The tail dependence coefficients show the strongest dynamics for Czech koruna (vary from 0.05 to 0.82). The observed dramatic movements reveal the difficulties in keeping the koruna pegged to the euro (from 2013 to April 6, 2017). For the pairs (EUR/USD, PLN/USD) and (EUR/USD, HUF/USD) the results are more common – in both cases the dynamic tail dependence coefficients vary from 0.15 to 0.55 and their dynamics is similar to that of observed for main European currencies.

Finally, let us consider the structures of dependence between the exchange rates against the US dollar of the Polish zloty and the other two Central European currencies.

For the pair (PLN/USD, HUF/USD) the impact of the time of a day does not exist. All the dynamic Spearman's rho estimates show the same reaction on market events and quite stable level (0.63-0.88), and the unconditional values are about 0.81. The dynamics of tail dependence coefficients is similar with values from 0.3 to 0.6.

In the case of (PLN/USD, CZK/USD), the dynamics of linkages exhibit much more interesting pattern. Their strength is higher at 9:05 and 17:00 and clearly weaker after opening national markets (8:05) and after releasing the US news (at 14:35). These differences are probably caused by the behavior of local traders.

4 Conclusions

In the presented analysis we aimed to describe the dynamics of linkages between exchange rates of six European currencies against the US dollar. Our first question was about the differences in the structure of the linkages observed at different times of day. Moreover, we investigated the changes in the structure of the conditional dependence that could be caused by the most important market events. As a tool to model the dependence we used 3-regime Markov regime switching copula models, which are a tool flexible enough to capture qualitative and/or quantitative changes of the linkages in currency markets. Thanks to the taken approach, we got information about the dynamics of linkages measured using the dynamic conditional Spearman's rho coefficients as well as the probability of simultaneous extreme movements down described by the dynamic tail dependence coefficients. The analysis was performed from the point of view of a US dollar investor who owns a portfolio of European currencies and analyzes the risk and diversification possibilities. We have shown that, in general, the dependence in currency market changes according to the time of day, which is a result of activities of different groups of traders with different preferences and investment strategies. Even for currencies temporarily pegged to the euro, the dynamics of linkages is quite strong, revealing difficulties to keep them pegged.

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Closet Indexing in Czechia: An Extended Analysis

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Abstract: *All active equity funds levy significant charges in exchange for an opportunity to outperform respective benchmark. However, many of these funds fail to implement active management in practice and resort to closet indexing. Evidence from abroad has shown that closet indexing has been widespread among funds offered on world's most developed markets. The aim of this paper is a complete assessment of presence of closet indexing on Czech financial market through a deeper analysis of wide scope of funds offered to domestic retail investors. We found out that closet indexing is an issue of more than one third of the overall amount, but there is still sufficient number of truly active funds and certain signals where to expect closet indexer have been identified.*

Keywords: closet indexing, active investing, mutual funds, benchmark, Czechia

JEL codes: G11, G23

1 Introduction

Closet indexing is a term known for at least 20 years, firstly quoted by Laderman (1997) to the author's knowledge, it has rarely been used or investigated for another 12 years, though. It was not until 2009 when Petajisto and Cremers published their paper that shaped a cornerstone of methodology of closet indexing research. Closet indexing is based on a distinction between active and passive portfolio management. As generally known, active management is characterized by an effort to outperform market return and reach an excessive return. On the contrary, passive management seeks to achieve market return. Active investing carries a chance for investor to reach an excessive return in exchange for the risk of underperformance. Passive investing can never lead by definition to lower than market return (Dráb, 2015: 100).

Much has been written about active and passive investing, mainly on their mutual comparison in terms of performance and costs. We do not intend to widen that vast list, but instead to focus on an issue similarly pervasive, but incomparably less penetrating the scientific literature so far. Closet indexing is to some extent self-explanatory, an exact rigorous definition of closet indexing does not exist, though (Dráb, Florianová, 2016: 180). Broadly speaking, closet indexing is a phenomenon when an actively managed fund that claims to be maintaining active investment strategy considerably resembles some benchmark. Such a fund can then be called "closet indexer", "closet index fund", or "index hugger". In case a passive fund resembles a benchmark there is nothing to dispute. The real problem emerges, when an active fund claims that it strives to outperform a benchmark or in whatever words to bring investors the opportunity to reach an excessive return, charges hefty fees, but fails to attempt to outperform market return in practice and instead pursue a passive strategy of at least partial resembling a benchmark.

Apart from this, fees can be questioned even if they are not charged by a closet indexer. As analyzed by Miller (2010), fees have been successfully disputed at court as outrageous by an individual investor who sued an investment company, despite his case had nothing to do with the fund's investment strategy. The whole matter of closet indexing came to broader awareness in the early 2016 following the publishing of the Supervisory work on potential closet index tracking by The European Securities and Markets Authority (ESMA). ESMA defines closet indexing rather vaguely: "…*according to their fund rules and investor information documentation, to manage their funds in an*

active manner while the funds are, in fact, staying very close to a benchmark and therefore implementing an investment strategy which requires less input from the investment manager (ESMA, 2016: 1, see Dráb, Florianová, 2016 for broader discussion)."

As noted above, closet indexing is still not much covered across existing literature despite its practical significance. Besides Laderman there has only been a few papers targeted exclusively on closet indexing. Braham (2004) published a list of top index huggers among American funds investing in U.S. equity. Taylor (2004) brought certainly one of the first scientific insights into closet indexing. Based on an analysis of trading opportunities he concluded that closet indexing was not a widespread phenomenon in the American mutual funds industry during the 1990s. Petajisto (2013) extended his previously mentioned research with Cremers from 2009, which will be discussed further in the text, and confirmed their findings on closet index funds underperforming their benchmarks while genuinely active funds exhibiting excessive return over their benchmarks fit to financial crisis era too. Cremers et al. (2016) also extended the research and found out that about 20 % of worldwide mutual fund assets are managed by closet indexers. The only analysis of presence of closet index funds in Czechia known to the author is that of Mikeš (2015). He compared 44 active funds investing in European stocks and found only 4 closet indexers. However, this sample is rather small and only partially covers Czech financial market, since it does not actually include any domestic fund.

We already analyzed closet indexing on domestic financial market back in 2016. Although we came to certain conclusive results and a significant part of this paper is based on our previous findings, some issues left unanswered. This paper is intended as an extension of our introductory analysis. Its aim is a complete assessment of presence of closet indexing on Czech financial market through a deeper analysis of wide scope of funds offered to domestic retail investors.

2 Methodology and Data

Methodology of investigating closet indexing is based on a concept of active share (AS), which, in the meaning we are using, was first introduced by Petajisto and Cremers in 2009. Active share represents the share of portfolio holdings that differ from the benchmark index holdings. AS thus has to lie between 0 and 1 (usually expressed in %). A fund with AS equal to zero has identical portfolio (i.e. actual stocks including their weightings) to selected index. On the other hand, a fund with AS 100 % does not hold a single share that would be a part of a benchmark in its portfolio. Closet index fund is claimed to resemble its benchmark from at least 40 %, which means that AS is up to 60 % but no less than 20 %, which is a frontier of an index fund (Cremers, Petajisto 2009: 3341-3342). An alternative view of active share was provided by Miller (2007), who calculated R^2 from a regression model with fund performance as a dependent variable and benchmark performance as an explanatory variable. Such approach does not lack validity, but only the former, as Smith noted, provides us with high specificity which active bets a fund manager is making and how large they are (Smith 2014: 7-8).

Despite being introduced less than nine years ago, active share has already spread among scholars and financial industry to a certain extent, and anyone who attempts to analyze closet indexing is forced to cope with this concept whether he acknowledges or disapproves it. Active share measure has been utilized by several scholars so far. Hirschel and Krige (2010) used AS for an analysis of South African unit trusts and more or less confirmed previous findings of Petajisto and Cremers that low active share funds showed lower benchmark adjusted performance, while high AS funds showed higher benchmark adjusted performance. Active share has also penetrated fund factsheets of several significant asset managers, i.e. Threadneedle, Bailie Gifford, Sparinvest or SEB. We can therefore say that AS has started establishing a position of a possible future

standardized benchmark which may once become an inseparable part of funds' key figures.

However, the relevance of active share has recently been challenged by Frazzini, Friedman and Pomorski (2016: 20). They cast doubts upon reliability of performance prediction based on active share as they found no evidence that high AS funds earn higher returns than their low AS counterparts. Nevertheless, their conclusions are oversimplified as proofed by Petajisto (2016: 11-12) and do not challenge the actual concept, only some of its features we are not going to utilize in this analysis anyway.

Closet indexing can in principle relate to any fund that has a benchmark set or at least there exists an appropriate benchmark that can be set. However, practical application of the concept has been limited to equity funds, which are most prone to closet index tracking. Table 1 shows the amount of mutual funds offered in Czechia according to data provided by Czech National Bank (ČNB).

Table 1 Number of funds offered in Czechia as at 01/08/2016

Fund type	Count
Domesic mutual funds	197
of that standard and special open-ended	132
of that closed-ended	7
of that funds of funds	11
of that qualified investors funds (QIF)	47
Foreign investment funds	1 399
of that standard open-ended	1 232
of that others	167
Total domestic and foreign funds	1 596

Source: ČNB, own calculation

These numbers do not change significantly over the short term, so we may proceed from last year's figures. Moreover, recently launched funds cannot be analyzed either way, since there is no available holdings data for them yet. According to the above shown there was 1 596 funds altogether offered to domestic investors. Out of 197 domestic mutual funds 132 were standard or special open-ended funds (OPF). Standard fund is a fund that has to meet criteria of the European law, namely the UCITS directive, unlike special fund that does not have to. The rest was consisted of closed-ended funds, funds of funds, and QIF. These are particular types of special funds that do not count to the previous group. Out of 1 399 foreign investment funds 1 232 was deemed standard according to ČNB. We included only standard and special domestic OPF and standard foreign OPF in the analysis, since they are generally aimed at retail customers, are mutually comparable, standardized, and should all have a similar degree of transparency necessary to acquiring data.

Besides focusing on equity funds, we imposed several other conditions on what funds include in scope for analysis. A major problem of selection, which has to be overcome, stems primarily from the overall number of eligible funds that lies beyond capabilities of an individual to be fully covered. First, we excluded every fund that is not designated for retail customers or its official documents (especially KIID, Annual and Semi-annual reports with full portfolio holdings) are not freely available. Second, we took into account only those funds managed by a member institution of Czech Capital Market Association (AKAT). This condition excluded a considerable amount of funds of several well-known asset managers and financial conglomerates, i.e. Aberdeen, Allianz, Blackrock, BNP Paribas, Fidelity, Franklin Templeton, JPMorgan, and Parvest. However, great portion of these funds has already been decently investigated within the US market or in Mikeš (2015). Third, as we targeted on retail Czech financial market, we strove to cover all domestic (i.e. Czech domiciled) funds and a majority of funds offering a CZK share class both of which are most available and common to local customers. Therefore, we set

multiple restrictions on minimum fund size as a general distinctive feature to include a fund in scope - no minimum limit for domestic funds, 2 bil. CZK in assets for foreign funds offered in CZK, and finally 10 bil. CZK for foreign funds offered in foreign currency only. This condition, however, does not apply generally, since we also included many funds that do not comply with the restriction but are attracting a significant amount of domestic capital according to data from AKAT.

Not every fund having a majority of stocks in its portfolio and meeting the above conditions is suitable for analysis based on active share. First example are structured funds that are much more structured products than genuine funds and are not actively managed. Another example, but a lot more complex one, are funds of funds (FoF) we have marginally been dealing with in our previous analysis. Despite stating a benchmark in some cases, FoF's AS cannot be calculated directly, since these funds neither hold stocks directly, but only through other mutual funds. This puts extraordinary demands on actual holdings acquisition, since it is necessary to gain portfolio data for all funds in an FoF portfolio. Moreover, benchmark, when set, is mostly artificial and it proves difficult to select one in case it is not set. Another obstacle - how to assess ETF holdings - definitively lead us to a conclusion that funds of funds are not suitable for the concept of active share. On the other hand, feeder funds (FF) are not such case as they are investing predominantly in a single master fund. Index funds - despite being eligible for AS calculation, were not a subject of analysis, because they are not a subject of closet indexing issue. We only included a few index funds for purely referential purpose.

Active share which we calculated over the course of analysis is based on stocks holdings only. Other fund assets, i.e. derivatives, rights, receivables, or cash do not show on the calculated figure, although they are not a part of benchmark holdings.

3 Results and Discussion

Based on the above criteria we identified a total of 104 funds eligible for analysis plus 4 index fund added for reference. They are ordered by fund size and divided according to domicile and currency into three distinct tables below.

Table 2 Active share of foreign funds not offered in CZK

Fund Name	D	C	NAV	Focus	B	Benchmark	AS
Pioneer U.S. Fundamental Growth	LU	$	64 715	USA	Y	Russell 1000 Growth	N/A
Pioneer Euroland Equity	LU	€	51 155	EU	Y	MSCI EMU	71,20*
KBC Equity Fund Strategic Cyclicals	BE	€	49 008	all world cyclical	N	N/A	N/A
HSBC Indian Equity	LU	$	41 154	India	Y	S&P / IFCI India Gross	N/A
KBC Equity Fund Eurozone	BE	€	31 950	EU	N	MSCI EMU	56,43
KBC Equity Fund Strategic Finance	BE	€	31 030	global finance	N	MSCI World Financials	51,16
Pioneer Global Ecology	LU	€	28 686	global eco	Y	MSCI World	95,50
Pioneer European Potential	LU	€	27 976	Europe small cap	Y	MSCI Europe Small Cap	86,20*
Pioneer Global Select	LU	€	24 287	global	Y	MSCI World	81,31
Pioneer U.S. Research	LU	$	24 250	USA	Y	S&P 500	72,72
NN (L) Euro High Dividend	LU	€	23 849	EU dividend	Y	MSCI EMU	63,70*
KBC Equity Fund High Dividend	BE	€	22 477	global dividend	N	MSCI World High Dividend Yield	77,83
KBC Equity Fund Buyback America	BE	$	19 781	US thematic	N	N/A	N/A
Pioneer European Equity Value	LU	€	18 126	Europe	Y	MSCI Europe Value	74,40*
KBC Index Fund Euroland	BE	€	18 054	index	Y	EURO STOXX 50	0,60*

Pioneer North American Basic Value	LU	$ 17 193	USA	Y	Russell 1000 Value	N/A
Pioneer European Research	LU	€ 17 066	Europe	Y	MSCI Europe	73,30*
KBC Equity Fund New Markets	BE	€ 16 876	EM	N	MSCI Emerging Markets	57,79
NN (L) US High Dividend	LU	$ 14 390	US dividend	Y	S&P 500	68,50
KBC Equity Fund High Dividend Eurozone	BE	€ 14 097	EMU dividend	N	MSCI EMU High Dividend Yield	79,24
Raiffeisen Global Aktien	AT	€ 13 260	global	N	MSCI World	82,77
Pioneer U.S. Midcap Value	LU	$ 13 144	US mid cap	Y	Russell Mid Cap Value	N/A
NN (L) Euro Equity	LU	€ 12 552	EMU	Y	MSCI EMU	49,70*
Raiffeisen Eurasien Aktien	AT	€ 12 058	Asia, RF, TR	N	N/A	N/A
Raiffeisen Europa Aktien	AT	€ 11 513	Europe	N	MSCI Europe	70,17
Pioneer Emerging Markets Equity	LU	€ 11 334	EM	Y	MSCI Emerging Markets	86,03
KBC Equity Fund Strategic Satellites	BE	€ 10 959	various thematic	N	N/A	N/A
KBC Equity Fund Japan	BE	¥ 10 713	Japan	N	MSCI Japan	61,63
NN (L) European High Dividend	LU	€ 10 294	Europe dividend	Y	MSCI Europe	69,63
Credit Suisse (Lux) European Dividend Plus	LU	€ 10 066	Europe dividend	Y	MSCI Europe	64,76
Raiffeisen US Aktien	AT	€ 10 053	USA	N	MSCI USA	80,17
Pioneer Japanese Equity	LU	€ 9 979	Japan	Y	MSCI Japan	74,10
NN (L) Food & Beverages	LU	$ 9 589	global sector	Y	MSCI World Consumer Staples	48,49
Credit Suisse (Lux) USA Growth Opportunities	LU	$ 9 431	US M&L cap	Y	MSCI USA	79,91
HSBC GIF Brazil Equity	LU	$ 9 363	Brazil	Y	MSCI Brazil 10/40	42,07
Credit Suisse (Lux) Small and Mid Cap Germany	LU	€ 8 800	Germany S&M cap	Y	Midcap Market Index	27,63
KBC Equity Fund Pharma	BE	€ 8 413	global sector	N	MSCI World Pharmacy BioLife	42,81
KBC Index Fund United States	BE	$ 7 632	index	Y	MSCI USA	5,71
HSBC GIF Euroland Equity Smaller Companies	LU	€ 7 126	EU S&M cap	Y	MSCI EMU SMID	N/A
Raiffeisen Emerging Markets Aktien	AT	€ 6 660	EM	N	MSCI Emerging Markets	81,15
KBC Equity Fund New Asia	BE	€ 6 220	EM Asia	N	MSCI Emerging Markets Asia	56,38
KBC ECO Fund Water	BE	€ 6 114	global sector	N	N/A	N/A
Credit Suisse (Lux) Global Security	LU	$ 5 222	global	Y	MSCI World	96,84
KBC Equity Fund Oil	BE	€ 4 997	global oil&gas	N	MSCI World Energy	27,59
Raiffeisen Pazifik Aktien	AT	€ 4 644	Asia-Pacific	N	MSCI Asia Pacific	45,60
Raiffeisen TopDividende Aktien	AT	€ 4 283	global dividend	N	MSCI World High Dividend Yield	84,47
KBC ECO Fund World	BE	€ 3 545	global CSR	N	MSCI World SRI	81,64

Source: own calculations based on asset managers, index providers, AKAT, and Bloomberg data

Table 3 Active share of foreign funds offered in CZK

Fund Name	D	NAV	Focus	B	Benchmark	AS
Pioneer European Equity Target Income	LU	70 513	EU/Europe	N	MSCI Europe	55,60
Pioneer Global Equity Target Income	LU	50 350	global dividend	N	MSCI World	74,03
Pioneer U.S. Pioneer Fund	LU	38 986	USA	Y	S&P 500	69,62
Pioneer Top European Players	LU	34 674	Europe M&L cap	Y	MSCI Europe	80,66
KBC Equity Fund America	BE	27 703	North America	N	MSCI North America	77,30
Amundi Equity Emerging World	LU	24 937	EM	Y	MSCI Emerging Markets Free	N/A
NN (L) Global Sustainable Equity	LU	24 377	global CSR	Y	MSCI World	87,60
NN (L) Global High Dividend	LU	21 640	global dividend	Y	MSCI World	75,92
NN (L) US Enhanced Core Concentrated Equity	LU	12 665	USA	Y	S&P 500	51,76
Amundi Equity US Relative Value	LU	12 403	US value	Y	S&P 500	79,32
NN (L) Emerging Markets High Dividend	LU	9 324	EM dividend	Y	MSCI Emerging Markets	74,80
NN (L) International Czech Equity	LU	8 893	CZ,SK,R,BG,LT,LV,EE,HR,SLO	Y	composite[1]	26,42
NN (L) Global Equity	LU	8 034	global	Y	MSCI World	79,53
NN (L) Japan Equity	LU	7 891	Japan	Y	MSCI Japan	62,28
NN (L) European Real Estate	LU	7 402	Europe sector	Y	10/40 GPR 250 Europe 20% UK	N/A
NN (L) Global Equity Impact Opportunities	LU	7 285	all world	Y	MSCI ACWI	87,30
NN (L) European Equity	LU	6 753	Europe	Y	MSCI Europe	61,50*
ESPA Stock Global	AT	6 193	global	N	MSCI World	77,35
Amundi Equity Global Luxury and Lifestyle	LU	5 929	global sector	Y	MSCI World Consumer Discretionary	60,57
ESPA Stock Biotec	AT	5 543	global sector	N	MSCI World Pharmacy BioLife	76,88
ESPA Stock Europe	AT	5 460	Europe	N	MSCI Europe	58,76
Pioneer Emerging Europe and Mediterranean Equity	LU	5 231	EM Europe & Middle East	Y	MSCI EM Europe and Middle East 10/40	N/A
Credit Suisse (Lux) Global Value	LU	4 258	global value	Y	MSCI World	99,54
ESPA Stock Global - Emerging Markets	AT	4 220	EM	N	MSCI Emerging Markets	48,93
KBC Multi Track Germany	BE	4 189	index	Y	MSCI Germany	11,17
KBC Equity Fund Europe	BE	4 144	Europe	N	MSCI Europe	46,28
Amundi Equity Europe Concentrated	LU	3 379	Europe	Y	MSCI Europe	73,95
CPR Invest - Global Silver Age [FF]	LU	3 173	all world thematic	Y	MSCI World	87,33
Amundi Equity Japan Value	LU	3 093	Japan value	Y	Topix Tokyo SE	76,26
Erste WWF Stock Environment	AT	2 836	global eco	N	N/A	N/A
Conseq Invest Akciový	IE	2 729	CEE	Y	composite[2]	50,05
ESPA Stock Europe Emerging	AT	1 818	various EM	N	N/A	N/A
Generali Fond východoevropských akcií	IE	1 663	CEE	N	MSCI EM Europe	71,70
ČSOB Akciový dividendových firem	BE	1 611	global dividend	N	MSCI World High Dividend Yield	79,23

ESPA Stock Europe Property	AT	1 541	Europe sector	N	MSCI Europe Real Estate	42,93
ČSOB Akciový dlouhodobé spotřeby	BE	1 349	all world sector	N	N/A	N/A
ESPA Stock Japan	AT	1 316	Japan	N	MSCI Japan	26,26
Erste Responsible Stock America	AT	1 213	North America	N	MSCI North America	71,90
ČSOB Akciový vodního bohatství	BE	727	global sector	N	N/A	N/A
Generali Fond světových akcií	IE	260	global	N	MSCI World	55,65
ČSOB Akciový fond - BRIC	BE	226	BRIC	N	MSCI BRIC	16,80
ČSOB Český Akciový (PX)	BE	176	index	Y	PX	13,44

Source: own calculations based on asset managers, index providers, AKAT, and Bloomberg data

Table 4 Active share of domestic funds

Fund Name	D	NAV	Focus	B	Benchmark	AS
ČS Top Stocks	CZ	11 261	global	N	MSCI World	96,99
KB privátní správa aktiv 5D	CZ	6 617	global dividend	N	MSCI World High Dividend Yield	69,56
Generali Fond globálních značek	CZ	2 525	global	N	MSCI World	61,95
ČS Sporotrend	CZ	2 099	CEE	Y	composite[3]	46,00
AXA CEE Akciový fond	CZ	1 990	Visegrád 4	Y	composite[4]	29,82
ČSOB Akciový	CZ	1 716	global	N	MSCI World	59,59
Generali Fond nemovitost. akcií	CZ	1 651	global sector	N	MSCI World Real Est.	73,46
Pioneer akciový fond	CZ	1 253	OECD	N	MSCI World	86,24
Generali Fond farmacie a biotechnologie	CZ	1 218	global sector	N	MSCI World Pharmacy BioLife	43,18
Generali Fond ropy a energetiky	CZ	1 176	global sector	N	MSCI World Energy	59,10
AXA Realitní fond	CZ	1 108	global sector	N	MSCI World Real Estate	77,89
Generali Fond nových ekonomik	CZ	524	EM	N	MSCI Emerging Mkts.	74,93
ČSOB Akciový realitní	CZ	504	Europe&US sector	N	MSCI World Real Estate	48,50
IKS Akciový - střední a východní Evropa	CZ	429	CEE	N	MSCI Eastern Europe	44,92
Generali Fond živé planety	CZ	353	global eco	N	N/A	N/A
AKRO globální akciový fond	CZ	350	various all world	N	MSCI ACWI	15,97
ČSOB Akciový střední a východní Evropa	CZ	233	CEE	N	MSCI Eastern Europe	66,73
AKRO akciový fond nových ekonomik	CZ	228	EM	N	MSCI Emerging Markets	94,23
AKRO fond progresívních spol.	CZ	160	global small cap	N	MSCI World Small Cap	17,96

Source: own calculations based on asset managers, index providers, AKAT, and Bloomberg data

- D stands for domicile of the fund.
- C stands for fund currency. CZK is preferred whenever possible, whatever the fund master currency. All funds in Table 2 and 3 are in CZK.
- NAV stands for fund net asset value in mil. CZK.
- Focus stands for investment focus of a fund as per KIID or portfolio composition.
- B stands for presence/absence (Y/N) of a fund's benchmark according to KIID. If no benchmark was stated, we selected a benchmark most appropriate to fund's focus and portfolio. We used N/A (not available) in case it was impossible to set a benchmark which members' weightings would be available. N/A at AS implies that benchmark members' weightings were unavailable.
- EM stands for Emerging Markets, CSR stands for Corporate Social Responsibility, S&M and M&L cap stands for small and mid and mid and large cap.

- 1 - composite index of PX (52%), WIG30 (28%), BUX (10%), BET (10%)
- 2 - WIG30 (38%), PX (28%), BUX (28%), SBITOP (6%)
- 3 - MSCI Russia (30%), PX (17,5%), BUX (17,5%), MSCI Turkey (17,5%), MSCI Poland (17,5%)
- 4 - PX (40%), WIG20 (28%), BUX (20%), SAX (2%), PRIBID 6M (10%)
- * - adopted from Mikeš 2015.

It has to be noted that AS is never an exact figure. This is caused by a time inconsistency between effective dates of fund and benchmark holdings. Fund holdings are in most cases disclosed in annual and semi-annual reports only, while benchmark holdings are mostly disclosed without an exact date, if at all. Holdings figures are nonetheless not changing at such a pace that would render calculated figures useless. This has also been proved by a time consistency in AS that allowed us to adopt few figures from Mikeš in this analysis. We summarized key findings based on the above data in Table 5.

Table 5 Key findings on closet indexing among funds in scope (excl. index funds)

	Foreign funds	**Foreign funds in CZK**	**Domestic funds**
Average AS	67,5 %	65,6 %	59,3 %
Overall average AS		65 %	
AS not available	10/45	7/40	1/19
Closet indexers	24,4 %	27,5 %	47,4 %
Overall closet indexers		31/108 (28,7 %)	
Overall closet indexers excl. AS N/A		31/86 (36 %)	
Benchmark (Y)	53,3 %	52,5 %	10,5 %
Average AS of funds with benchmarks	69,8/64,8 %	71,4/58,6 %	37,9/62 %
Overall average AS of funds with/without benchmark		68,9/61,9 %	
Funds with broad/narrow focus	23/22	26/14	9/10
Average AS of broad/narrow focused funds	72,6/61,4 %	68,8/58,1 %	64,2/54,4 %
Overall average AS of broad/narrow focused funds		69,8/57,8 %	

Source: own calculations

The most important figure from the above is the overall number of closet indexers out of all funds with calculated AS. This 36 % confirmed our previous findings in. We identified several interesting trends that surfaced along with funds division into three separate groups. Foreign funds showed the highest AS, tightly followed by foreign funds available in CZK. Domestic funds falls into closet indexers set on average as their AS being slightly below 60 %. A share of closet indexers confirms AS figures, specifically domestic funds showed worryingly high amount of closet index funds. However, relatively small amount of domestic funds has to be taken into account as it might distort the result. We found sharp differences at benchmark presence between foreign and domestic funds. While foreign funds with benchmark prove to be less prone to closet indexing, we can see pretty much the opposite at domestic funds. The latter figure lacks statistical significance, since there were only two domestic funds having benchmarks. Paradoxical as it may seem, funds with benchmarks have much higher AS than their counterparts that do not state any. Absence of benchmark can thus serve as a warning indicator for an investor trying to avoid index huggers. Setting a benchmark seems to be a matter of particular asset manager. While some assign benchmarks to all equity funds or at least their overwhelming majority, others do not assign any. The former group consists of Amundi, Credit Suisse, NN and Pioneer, which all reached higher AS on average than the latter group of KBC (ČSOB), Generali, or ESPA (Erste, ČS). Raiffeisen funds, despite not having benchmarks reached surprisingly high AS. It is sometimes claimed that AS is

suffering from an investment focus tilt. Our analysis shows that funds with wider focus tend to have ca. 10 % higher AS than funds with narrow focus. It may turn out more difficult to pick stocks on narrowly defined market, it is not impossible as several funds in above tables prove, though.

4 Conclusions

Yet around one third of funds we analyzed could be accused of closet indexing, there is still sufficient amount of equity funds with high active share that an individual investor can invest in, even in Czech Koruna. A combination least prone to closet indexing is a foreign fund of whatever currency that has a benchmark and a broad investment focus, like US stocks or global dividend stocks. On the side are domestic funds, especially that which are narrowly focused. Supply of Czech equity funds is very limited indeed. We tried to provide a complete analysis of retail Czech financial market and answer some issues which left unanswered in our previous research. Some questions newly emerged, though. It has already been mentioned that active share suffers from certain imperfection stemming from data shortage. What is equally important is also the actual benchmark selection. We observed that some funds have a benchmark that does not reflect their investment focus or true holdings. It is then tempting to test these funds against appropriate benchmark despite not being officially stated. This brings us to a conclusion of aggregate testing of these funds against alternative benchmarks, which is certainly worth further investigation.

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Implementation of cost model for effective planning of foreign military operations

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Abstract: *Current Military of Defense accounting system is based on expenditure base, thus this state is not suitable for planning or evaluation of each activities of military operation, because there are no sufficient accounting outputs. In accordance with this unsatisfactory state of accounting, this paper focuses on finding some measures that help to improve current system of planning and budgeting foreign operation in the whole life cycle period. The life cycle is divided into three separate time subperiods – preparation, foreign operation and evaluation. Pursuant this conditions, system of cost reporting, which calculate with cost assignment, is designed. This measure help to identify and determine real amount of all costs, relating with foreign acting. Most information come from used papers of Military of Defense, but most materials are used from countries abroad, where similar measures were implemented. In the paper is used method of description, analysis, synthesis, comparison, statistical methods or method of data modelling.*

Keywords: cost model, public administration, accounting, life cycle of foreign operation, planning process

JEL codes: H56, H72, H83

1 Introduction

This paper focuses on implementation of cost accounting model for effective planning of foreign operation. The paper is divided into four separated parts. The first part involve some basic information about the topic and general situation that help to introduce readers into the issue. The second part focus on methodology and data source, where the logical succession and progress throughout the work is explained. The third part includes analyses of current state of monitoring costs and expenses in foreign operation, measurement
the effectiveness in the conditions of foreign operations and definition of life cycle of foreign operation. Practical application of cost model is also a part of the third part.

Public sector is an important part of national economy that is responsible for securing public goods for inhabitants on a non-profit basis and is therefore financed from funds concentrated in the budgetary system, especially in the public budget system (Peková, Pilný, Jetmar, 2012).From economical view defense is purely public good. Defense as a public good is also realized in the form of military missions. Military missions contribute to the implementation of the state´s economic policy (Krč, 2016). Economic control
in the field of public sector of the Czech Republic fall behind private sector for a long time. One reason for this delay could be not using any economic tools that helps representatives of subjects of public sector in their decision-making and planning process or seemingly non-existent factor of output, apart from subjects of private sector, where some measurable factor of output are stated (e.g. price). All subjects of public sector

must comply Act No. 320/2001 Coll. on financial control in public administration and Act No. 218/2000 Coll. on budget rules. These two acts by the way treat of the principle of economy, effectiveness and efficiency. As described below, representatives of military unit are unable to fulfill these principles because of inadequate inputs of decision-making process.

Ministry of Defense of the Czech Republic decided to implement controlling. This commitment was firstly captured in White paper on Defense (2011). At present, an essence of this implementation is a flat-rate monitoring of costs throughout the sector, but only the place of cost rise, rather than the purpose, is being tracked, which greatly limits its own use of cost accounting for next purposes. There are some NATO countries, where cost accounting was implemented (Krč, Golik, 2015). In German army has been accepted many measures, that caused, economic control is closer to economic control
of civil firms. It´s important to mention, that there is cost capturing and their evaluation on high level, although there is still a difference between economic theory and economic practice (Krč, 2010). In United Kingdom, cost accounting is also used for many years and accrual accounting is introduced and its benefits are being exploited (Krč, Golik, Vodáková, 2016).

The main goal of implementation of cost accounting is to provide to representatives of military units economical outputs based on cost monitoring. These outputs are able to use for improvement planning process, process of control or decision-making. In case of full implementation of cost accounting it is possible to accept other, more difficult economical tools and measures. According to Král (2012), the main goal of cost accounting is to provide source materials for control of reproductive process in conditions, when the basic parameters have been decided.

2 Methodology and Data

In the section of introduction is used a method of analysis, because it is needed to provide readers sufficient information to an appropriate extend about the topic. In the part
of practical application of cost model is used a method of observation and analysis to track each activity relating with the observed object (foreign operation). These observed activities are captured by using method of description. Other method is synthesis used for identification each kind of cost on the first side and for grouping identified cost into calculation formula on the other side. Also it is necessary to mention method of modelling used throughout the part practical application. It is not possible to describe each activity involved in the military training, therefore it is used a method of abstraction and incremental costs are involved in mentioned activities. Because of stated maximum length of this paper, some calculation and operations doesn´t include all items, but they are represented by at least one example.

As main date source similar some published scientific papers and published book aiming these topic, were used for the part of introduction. The part of practical application of cost model is based on concrete papers and discussion with the employees of the economic section of Ministry of Defense.

In the field of dividing cost must be distinguished direct costs and indirect costs. Direct cost are easily identified and are easily to relate them to concrete activity or purpose. Direct costs correspond with variable cost expended in dependence of capacity of performance. Indirect costs correspond with fixed costs are single expended for certain time period (Fibírová, Šoljaková, Wagner, 2011).

3 Results and Discussion

This section involves a description of current situation in the field of expenses and cost monitoring in the foreign operation, measurement the rate of effectiveness in the conditions of foreign operations and definition of life cycle of foreign operation and practical application of cost model.

Current situation of costs and expenditures measurement

A basic problem of an economical control in the field of Ministry of Defense is reporting a budgeting system based on expenditures. Pursuant this fact, any economical control is not possible, because expenditures don´t capture every real economical operation (e.g. material consumption), thus economic outputs aren´t credible, so representatives of military units has no relevant information for planning and decision-making process.

Definition of the effectiveness and life cycle of foreign operations

Because there is not a profit category, in the conditions of public sector, outputs must be determined for each activity or each process. This determination is possible to carry out through two basic ways. First way is to determine so called shadow price. Wherever possible, calculation of the shadow price by evaluating the state produced in the public sector either by the price at which these goods are produced in the market sector or by the costs incurred to which average profit achieved in the production of the same goods produced by the private sector (Strecková, 1998). In some cases it´s not possible to use shadow prices, mainly because of specific outputs, that are produced by army in conditions of public sector. In this case it is needed to use different way to determine output of public sector, which is determination the quality elements of the target state against which the costs can be related. It is therefore appropriate to use, for example, a direct point assessment. For example, in the case of shooting training, you can determine the score as a result of the number of 10 shots. Pursuant this two ways it is possible to identify output and this output quantify express.

Costs of foreign operations do not arise only during acting soldiers abroad, but they arise during the whole life cycle of a foreign operation. Given the fact that this term does not exist under the terms of the Ministry of Defense's economic governance, this paper focuses, among other things, on explanation of this term. From the logic of things and the reflection on the problem of the costs in relation to the foreign operation, the life cycle needs to be defined in time. It is possible to define this term as a time period from the approval of the foreign operation's intent, to the return from foreign and the settlement of all obligations. In terms of timing, the life cycle of the foreign operation can be divided into 3 individual periods.

First period can be defined from the moment of approval of the deployment of units of the Czech Army into a foreign operation by the Parliament of the Czech Republic, or by the Government, until the time of departure to a foreign operation. In this phase, the army is preparing to operate abroad, which entails a number of military exercises, medical preventive measures (e.g. vaccinations), education and training courses, and other activities that are spectrally very extensive and diverse. Given the specific conditions of each foreign operation, it is necessary to purchase the materials and services that are necessary for the actual operation in a specific operation. Transport itself generates large costs because the transportation of containers with the material is ensured by coalition partners (the Czech Army does not have the necessary tools of transport), provided that the costs incurred are paid. All of these activities, which are being carried out in the first phase, carry a large amount of costs to be allocated to the foreign operation in question. Because of large number of participating subjects at this stage, it is necessary to cooperate with the economic bodies of several public administration subjects so that the costs incurred can be assigned in a form that is as close as possible to the real situation.

Second phase of the life cycle of the foreign operation is the operation of soldiers abroad. The first cost to be mentioned is the transport of soldiers to a place of action, which is mainly carried out by aircraft of the Czech Armed Forces. The actual operation of soldiers abroad is probably the simplest phase of the entire life cycle of a foreign operation, as most of the costs incurred during this phase are directly related to the procurement of materials and services abroad. Here is a place for an analogous cost allocation procedure, as is the case with the normal organization of the Ministry of Defense, which is deployed on the territory of the Czech Republic. However, as mentioned in previous text, cost sharing itself takes place in a different way.

The last phase of the life cycle is the period from the return of the members of the foreign operation to the completion of the material restoration (repair of damaged material, purchase of destroyed or lost material), after payment of all obligations (payment of invoices associated with the cost of living - food, accommodation, waste etc.) to umbrella organizations (coalition partner or supranational organization), settlement of personal expenses (compensation of injuries or other reimbursements to employees, provision of preventive rehabilitation, etc.) Activities that relate to this stage must be related to the actual operation because the costs incurred at this stage arise only because of the existence of a foreign operation and in the absence of a foreign operation, these costs would not arise at all.

Practical application of cost model

Every incurred cost analyzed during acting of model military unit has to be assign to one of stated activity in appropriate time phase. This principle expresses the essence of cost accounting, because it is necessary as much as possible assign to cost certain activity. For purpose of this paper, there is a military training that is a part of preparation of soldiers, who are supposed to operate in foreign operation. Every element operating abroad, acts externally as a separate accounting entity and is identified by u unique designation (military unit XY). Military unit, soldiers will be part of, is marked as a Military unit 1125. Suggested process of cost determination have to be the same in the whole cycle of foreign operation process and in case of every activity.

Pursuant previous theoretical definitions a model cost calculation of the first phase of foreign operation´s life cycle is designed. Detailed description of cost calculation is shown on the example of shooting training as a necessary part of soldier´s preparation.

Firstly, it is necessary to identify all activities, to which costs are related in the whole cycle of foreign operation. Each activities relating with the main goal and structure of model situation of acting abroad is depicted in Table 1.

Table 1 Activities of foreign operation

Military unit	Phase	Calculation unit
1125	1	1 tactical training
		2 medical training
		3 shooting training
		4 other training
		5 domestic courses
		6 foreign courses
		7 other costs
	2	1 main goal of foreign operation
		2 support activities (transport)
		3 cost of living (food, accommodation etc.)
		4 other costs

3	1	material recovery (damage, loss)
	2	personal cost (injury /death compensation)
	3	spa care
	4	other costs

Source: by author

As shown on Table 1, model Military unit 1125 activities are divided according to listed three time subperiods of the foreign operation´s life cycle. Particular activities are set to be comfortable to assigned occur costs. Form and structure of all activities depends on managerial decisions.

Together with range of monitored activities determination it is necessary to define structure and form of calculation formula. For model situation calculation formula includes these groups of direct costs:

- Direct wages,
- Direct material,
- Other direct expenses.

Further, calculation formula involves these groups of indirect costs:

- Productive overheads,
- Support overheads,
- Staff overheads.

To fulfil the essence of cost accounting, it is necessary to assign incurred cost to concrete activities according to listed activities. Capturing of every cost is done by accounting record. Account record without analytical form is expressed as a record of debit side and credit side, but there is no detailed information. Due to listed calculation unit is possible to create accounting record capturing these activities – analytical accounts. For the purpose of this article, concrete numerical expression of debit side and credit side is expressed verbally because of different designation of one account operation in different countries. Due to setting rules of in-house accounting can be reached, each analytical account record express more information, concretely purpose of account record. Record form with analytical account looks like this: wages/112513. Pursuant this enrollment it is clear, this analytical account express wages in relations with shooting training.

In connection with shooting training relating with foreign operation´s preparation, following direct cost were identified as costs directly relating with shooting training that relates with preparation for foreign operation. According to calculation unit is possible to relate analyzed cost directly to the activity of shooting training of the first phase of foreign operation.

Figure 1 Direct cost relating with shooting training

wages/112513	material/112513	other direct costs/112513
9 650	5 108	2 510

Source: by author

These costs directly relates with shooting training and thus it is not difficult to identify them and describe them by analytical account record. In relations with this activities it is possible to identify indirect costs, it means such costs, that are not easily identified in relation with monitored activity and thus it is necessary to determine them. These costs are determined by using cost allocation base. That means, cost allocation base extension leads to increase of indirect costs.

Process of recalculation of indirect cost is represented by example of planning the exercise. Written preparation and all administration activities leading to successful fulfilling recommended exercises is covered by the chief of training department. Monthly salary of this soldier is 40 000 CZK (annual salary 480 000CZK), thus one hour salary is 227,30CZK. Time necessary to creating all of preparation activities is calculated for 7 hours. Other costs relating with planning of shooting exercise is enumerated in the amount of 4 CZK. Total cost per one hour chief of training department is calculated for 231,30CZK.

Table 2 Determination of costs of planning shooting exercise

Activity	Cost per activity	Total annual range of activities	Cost per unit of activity	Relation value	Number of monitored activities	Cost of monitored activity
Planning training	40 000 CZK	7 hrs.	231,30 CZK	Value of planned exercise	1	1 619,10 CZK

Source: by author

Pursuant calculation formula, this type of cost is a part of productive overhead that includes, among other things for example command and administration costs. The same way for determination of indirect cost is needed to use in every case of any cost, those amount is not impossible to determinate directly and those relate to foreign operation of Military unit 1125. It is very important to specify cost allocation base correctly, because there are cost of high values in the overheads, thus specify of cost allocation base has a major influence on a cost rate of each calculation unit.

Finally due to carried out analysis of all direct and indirect cost relating with monitored foreign operation, final form of calculation formula is captured on the table 3:

Table 3 Final form of calculation formula

Direct wages	9 650CZK
Direct material	5 108 CZK
Other direct costs	2 510 CZK
Productive overheads	4 627 CZK
Support overheads	2 364 CZK
Staff overheads	4 825 CZK
Total	**29 084 CZK**

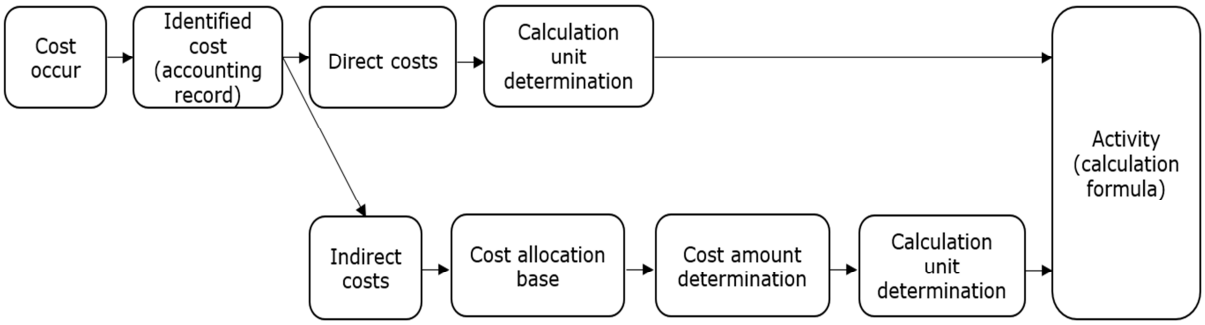
Source: by author

Calculation formula consist of direct and indirect costs. There is no big problem to explain origin and contend of direct cost, i.e. direct wages (wages of soldiers directly participating shooting training), direct material (ammunition, grenades, camouflage colors, depreciation of weapons and carried equipment) or other direct costs (weapons and equipment maintaining). Problem of clear explanation of every single item of calculation formula arise in case of indirect costs. This model calculation formula is designed in such a way, that productive overhead include all cost relating with planning, administration secure, services of command, etc. Support overhead involve occurred cost connecting with support activity, such as transportation, medical treatment, repair shops, etc. Staff overhead involves staff wages costs, health and social insurance for all employees, buildings depreciations, energy charges etc. Choose of suitable cost allocation base must be defined according to specific conditions of every case of recalculation cost overhead. The calculation formula capture all incurred cost in relation with shooting training. Therefore this analysis is created after ending this activity. Hence similar calculation is created before starting each activity. Individual values of calculation

formula are added based on experience from the same or similar activities carried out in the past. By comparing these two calculations it is possible looking for reasons of different cost values. At the same time, these finding enable improvement of planning the same or similar activity in the future.

Pursuant the carried out analysis, the whole process of capturing costs relating with model military unit acting in foreign operation is shown on Figure 2. This figure describes each single activity and milestones in the process of cost analysis. As listed previously, particular range and structure of calculation unit or calculation formula can be modified for every military unit.

Figure 2 Process of cost capture



Source: by author

4 Conclusions

The main goal of the paper is stated to finding measures helping improve current system of planning and budgeting foreign operations in the whole life cycle period. Pursuant assessment of theoretical base, describing primarily current state of investigated issue and definition main weaknesses, it is able to proceed to create an appropriate measure. Firstly, definition of rate of effectiveness determination and life cycle of foreign operation is created. Secondly, practical application of cost model lies in creation calculation activities, parts of calculation formula, system of account records and recalculation identified cost throughout cost allocation base. As a monitored calculation unit a shooting training as a part of preparation for foreign operation is stated. Through assembly of concrete calculation formula total costs of monitored activity are pictured.

Specific use of cost model outputs is clear, because by using this model it is able to evaluate the costs of any activity. Source planning becomes more accurate because some activities are the same in case of every foreign operation. Degree of accuracy depends primarily on number of evaluated activities. Due to cost model is also improved a level of decision-making on the use of resources and cost rationalization. Using this tool can be also improved degree of decision-making in the field such as outsourcing. Pursuant knowledge of cost commanders can easily decide, if any service abroad is better secure by own sources, or by any external subject.

Pursuant the identified reality, implementation of cost model is a very suitable tool for improvement of planning process of foreign operations. Due to cost model outputs commander of single military unit is able to plan a foreign operations with higher rate of effectivity.

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Allocation of environmental taxes in the context of general government expenditures on environmental protection in the European Union Member States

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Abstract: *Since many years in the European Union more attention has been paid to environmental taxes (also fees and other charges) as an important source of public revenues. It is argued that the increase in environmental taxes should raise the quality of the environment while at the same time ensuring budgetary implications. Despite the existence of non-assignment rule in the public finance there is no doubt that in the case of environmental taxes, fiscal targets are related to non-fiscal objectives. Consequently, the state demand for this source of revenues should stem from the necessity for environmental protection. The objective of the paper is to examine to what extent revenues from environmental taxes are allocated to finance environmental protection in the EU countries. The research is based on the Eurostat data on environmental tax revenues and environmental protection expenditures of the general government sector and covers the period 2006 to 2015. In most EU countries less than a half of environmental tax revenues has been spent on environmental protection. The average ratio of environmental protection expenditures to environmental tax revenues in the particular EU countries varies from 10.1% to 55.4%. In order to test the linear relationship between environmental taxes and expenditures it has been conducted the Pearson correlation analysis. A statistically significant, strong and positive relationship between these variables has been observed. The result could be interpreted in two ways:*
- more environmentally related taxes imply greater spending on environmental issues or
- the growing need to comply with the EU obligations concerning environmental protection entails an increase in environmentally related tax burden.

Keywords: environmental taxes, tax earmarking, public revenues, environmental protection public expenditures, general government

JEL codes: F64, H10, H23, H50, Q58

1 Introduction

Environmental taxes (also called ecological taxes, environmentally related taxes or green taxes) are a core economic instrument of pollution control and resource management. They force externalities to be internalized thus enhancing environmental protection and provide a source of additional government revenues (Patterson III, 2000, p. 133).

In the European Union, in addition to taxes and charges that are part of environmental policy, other economic tools, both national and EU could be mentioned like: greenhouse gas emission trading system, subsidies, fines, grants from the EU budget and other kinds of incentives like tax deductions or tax exemptions. All instruments could be treated as incentives or disincentives for specific behaviour towards environment, but it should be stressed that environmental policy disposes wider range of tools needed to fulfill a government strategy (including public investments in environmental protection, legal acts or information campaigns) (European Environment Agency, 1996, p. 17). National

environmental actions are part of the EU's environmental strategy mainly with the following documents Europe 2020 Strategy and the 7th Environmental Action Programme to 2020 setting objectives concerning reduction of greenhouse gas emissions, natural resources efficiency and creating living conditions based on healthy and wellbeing society.

According to the Regulation (EU) No 691/2011 environmental taxes are the taxes "whose tax base is a physical unit (or a proxy of a physical unit) of something that has a proven, specific negative impact on the environment, and which is identified in ESA (the European system of national and regional accounts in the European Union) as a tax". This definition stresses that a tax base with an environmentally destructive result is the core for identification this type of taxes on the European Union Member States level. Additionally "a tax that can be expected to increase (directly or indirectly) the cost of a product or activity deemed to be harmful to the environment relative to other (less harmful) activities or products should be considered to be environmental" (Eurostat/European Commission, 2013, p. 9 and 18). In some cases environmental taxes could be identified by earmarking perspective i.e. that once collected they are spent on the environmental purposes but it is only supplementary information mainly to divide environmental taxes into specific categories.

The distinction between different categories of environmental taxes is not unequivocal if every group is interpreted according to the different meanings such as: name, tax base, purpose included in the legal act, policy objectives or the question of earmarking (Eurostat/European Commission, 2013, p. 11-14, 20-22). In consequence for international comparison it was chosen a tax base as only basis for identification. It could be enumerated four main types of environmental taxes such as: energy taxes, transport taxes, taxes on pollution and resources taxes. Energy taxes (including CO_2 taxes but following different interpretations, so-called CO_2 taxes could be categorized also as transport taxes or pollution taxes) concern levies on energy products for transport and stationary purposes (e.g. petrol, natural gas, coal and electricity) and emissions of greenhouse gases. Transport taxes (excluding fuel) are related to the sale, import, ownership and use of motor vehicles, but also to flight tickets, insurance of motor vehicles or motorway charges. Pollution and resource taxes focus mainly on the measured and estimated emissions to air (e.g. NO_x and SO_x) and water, on noise, on the management of waste, extraction of raw materials, conversion of landscapes and harvesting of biological resources.

It exists an interesting division of environmental levies which is not used in international statistics but could be observed in different analysis. It concerns the role of such payments (European Environment Agency, 1996, p. 21):

- incentive taxes stimulating positive behaviour and discouraging negative actions,
- fiscal taxes creating additional important source of revenue for central, regional or local budgets in case of lack of fiscal consolidation,
- cost-covering charges (according to the polluter pays principle) paid by a user in return for a specific service or designed for some services but not specifically used by a charge-payer.

The aim of the paper is to examine to what extent revenues from environmental taxes are allocated to finance environmental protection in the EU countries.

Environmental taxes are a source of public revenues therefore a question arises how to allocate these revenues. There is an opinion that revenues form environmental taxes should be treated as general government revenues and used to maintain spending in other, non-environmental areas, reduce debt or other taxes (OECD, 2011, p.8). Using environmental taxes for non-environmental purposes may however „invite significant political backlash" (Patterson III, 2000, p. 137) and gain less public acceptance than general budget appropriation (Cottrell et al., 2016).

Earmarking is often associated with environmental taxes. Earmarking is the process of pre-assigning revenue to particular agencies or allocating it to meet certain expenditure needs (Patterson III, 2000, p. 137). Earmarking may be perceived as a negative casus because it is "an additional constraint to the management of fiscal policy" (Marsiliani, Renström, 2000, p. 123) and results in under-funding or over-funding environmental programmes (OECD, 2011). There are arguments for earmarking as well. It can compensate those facing environmental externalities, reduce externalities (Brink, Mazza, 2013, p.5) and makes the link between environmental taxes and environmental improvement more clear (Cottrell et al., 2016).

2 Methodology and Data

The authors of the study have followed the definition of environmental taxes provided by the Regulation (EU) No 691/2011, presented in the introduction of the paper. General government is treated as a specific part of public sector where public units are non-market producers "financed, directly or indirectly, by taxes and/or compulsory social contributions" (Pitzer and Dupuis, 2006). Government units produce mainly non-market output, however, it is possible to create market output as a side activity. In the Regulation (EU) No 549/2013 it could be found almost the same definition but with two additional information concerning a purpose of activity i.e. "(…) institutional units (…) whose output is intended for individual and collective consumption, and are financed by compulsory payments made by units belonging to other sectors, and institutional units principally engaged in the redistribution of national income and wealth". In our research on general government expenditures the Classification of the Functions of Government (COFOG) was used where government expenditures are defined (Eurostat/European Commission, 2011, p. 23) as "a particular set of transactions undertaken by units in the general government sector as defined and recorded in national accounts under ESA". For purpose of this work it was analysed category no 05 – environmental protection – as one of ten main categories of expenditures (division level). The detailed division of each category into groups was not used.

The analysis is based on the Eurostat data on environmental tax revenues and environmental protection expenditures of the general government sector for the period 2006 - 2015. It has been examined the linear relationship between environmental taxes and expenditures by means of the Pearson correlation coefficient. The significance of difference between means of environmental protection expenditures to environmental taxes ratios for "old" and "new" EU countries has been tested using the Student's t-test.

3 Results and Discussion

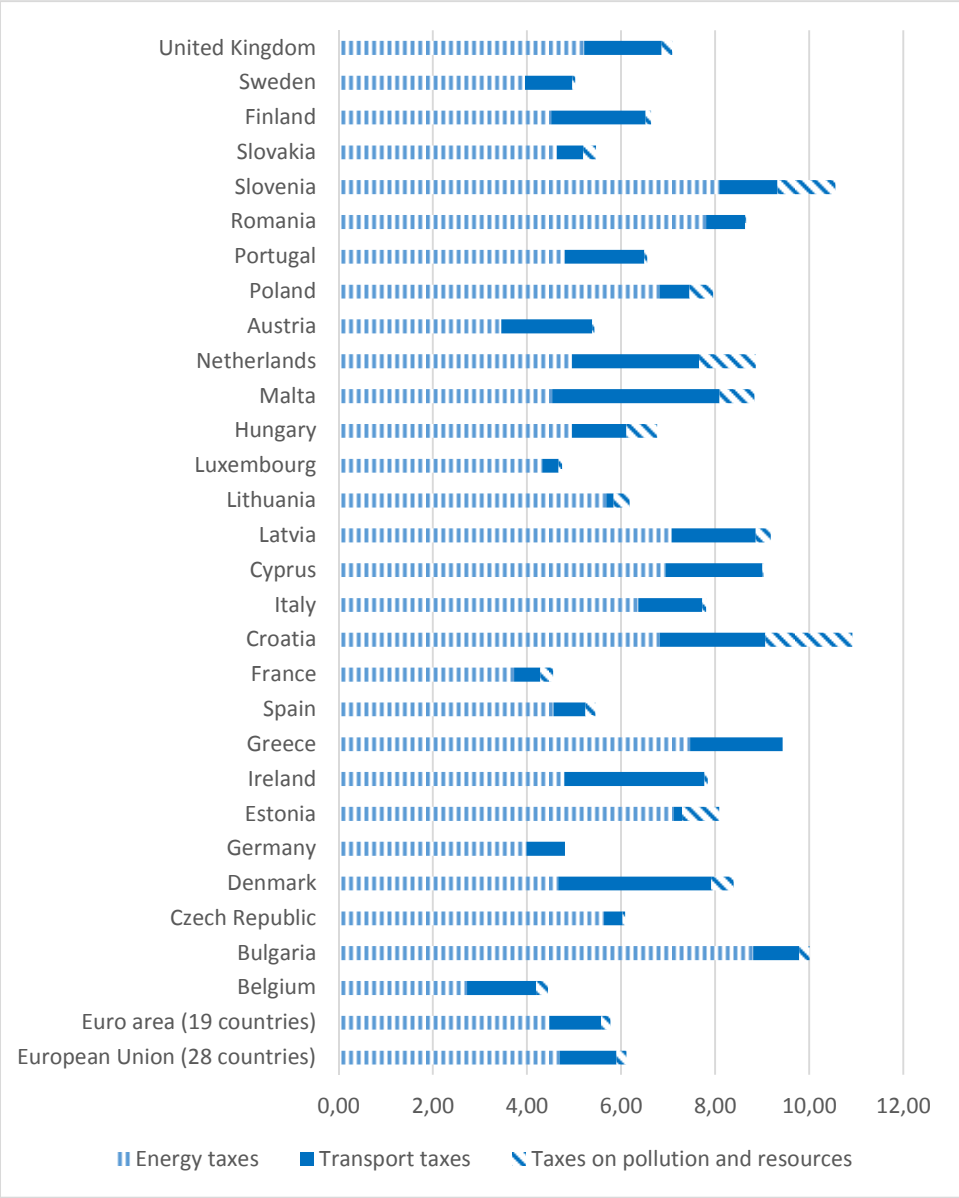
According to the Eurostat data, revenues from environmental taxes in the EU equaled to EUR 359.3 billion in 2015 (in absolute terms). A share of environmental tax revenues in total revenues from taxes and social security contributions amounted to 6.11% in the whole European Union in 2015 (cf. Figure 1). Nineteen countries exceeded the EU average and three of them reached 10% and more (Croatia, Slovenia and Bulgaria).

In all Member States the most important group within the environmental taxes in 2015 were energy taxes (76.65%, more than 90% - the Czech Republic, Lithuania, Luxembourg and Romania), followed by transport taxes (19.84%, over 38% - Malta, Denmark and Ireland) and finally pollution and resources taxes (3.52%, more than 11% - Croatia, the Netherlands and Slovenia). In the period 2006-2015, revenues from environmental taxes systematically increased except for 2009, which should be combined with the effects of the financial and economic crisis. The growing influence of environmental taxes cannot, however, be unequivocally explained without additional information, as a growth can be a consequence of the emergence of new taxes, raising tax rates, or increasing the tax base. As a result, the growth may be a result of the

effectiveness of fiscal authorities and vice versa - greater environmental pollution by businesses and households.

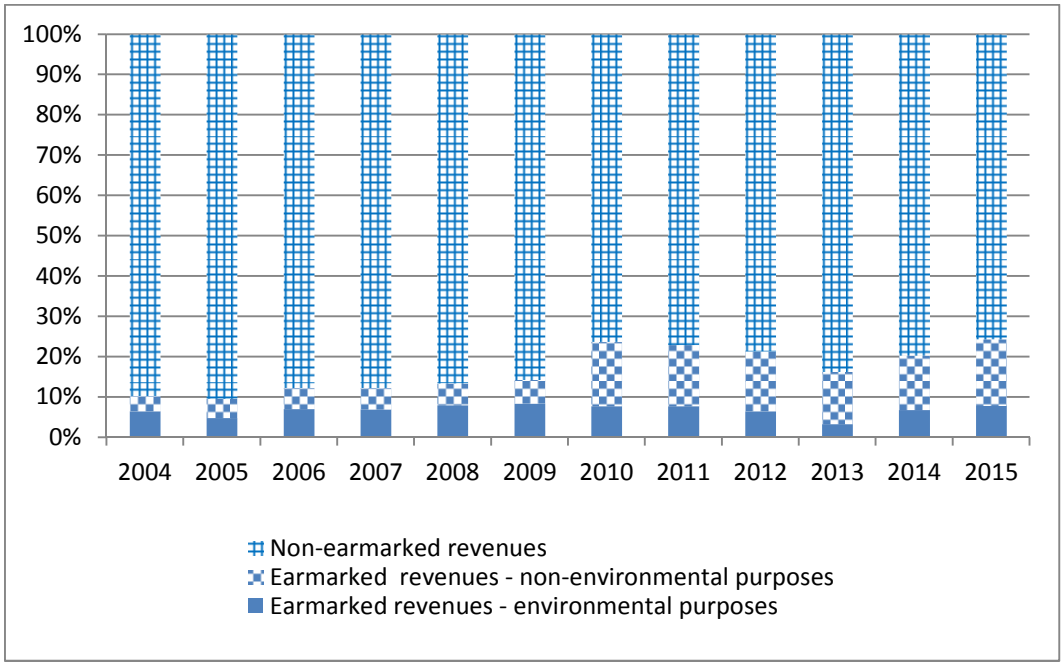
Although environmental tax earmarking is a controversial issue, in practice it is applied not only in the EU Member States but also among others in the U.S., Canada, Japan (Marsiliani, Renström, 2000), Costa Rica and Thailand (Cottrell et al., 2016). The extent of earmarking of environmental taxes for environmental protection depends on specific tax regulations in particular countries. E.g. in France and Italy earmarking is mostly used with the respect to water pollution charges (Marsiliani, Renström, 2000, p. 123). It should be noticed that environmental tax revenues may be earmarked not only for environmental protection but for other objectives as well. For example, in recent years in Poland even more environmental tax revenues have been legally binding to non-environmental expenditures (among others to a construction of motorways and a compensation for power plants due to premature cancellation of their long-term contracts) than to environmental ones (cf. Figure 2). However, overall most of environmental tax revenues in Poland flow into the general budget. This is the case in other Member States as well.

Figure 1 Environmental taxes by tax category as a percentage of total revenues from taxes and social contributions, 2015



Source: Eurostat data

Figure 2 Earmarked environmental tax revenues in Poland



Source: authors' calculation based on Eurostat data and analysis of Polish tax law

Table 1 presents environmental protection expenditures of the general government sector to environmental taxes ratios in the EU countries. It shows to what extent revenues from these taxes are allocated to finance environmental protection. In most EU countries less than a half of environmental tax revenues has been allocated to finance environmental protection. At the EU level about 32-38% of the environmental tax revenues in 2006-2015 was spent on environmental protection.

The average ratios of environmental protection expenditures to environmental tax revenues in the particular EU countries in the analysed period (presented in Table 2) vary from 10.1% (Finland) to 55.4% (Spain). The difference between means of these ratios for "old" and "new" EU countries is not statistically significant.

Table 1 Share of environmental protection expenditures of the general government sector in environmental taxes (%)

State	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
EU-28	32.2	33.3	34.4	37.8	36.1	34.6	33.9	33.8	33.3	33.0
AT	20.2	19.5	20.0	23.5	24.9	20.3	21.0	21.2	19.6	18.6
BE	31.9	31.2	37.8	42.5	45.4	52.2	55.4	56.4	46.6	41.2
BG	41.7	37.9	20.6	38.6	24.2	25.6	25.8	32.7	25.3	27.2
CY	8.7	8.5	9.0	10.5	10.9	11.1	10.8	16.4	8.5	12.0
CZ	44.4	40.9	39.9	29.4	43.3	54.7	59.3	47.5	49.6	52.4
DE	23.5	23.3	23.9	31.9	28.1	26.9	28.4	30.3	30.6	31.7
DK	12.3	10.9	10.9	11.0	10.2	9.5	10.1	11.4	11.6	11.2
EE	35.7	38.6	45.3	33.5	n.a.	n.a.	30.3	24.2	23.1	25.1
EL	39.2	39.3	47.5	45.2	30.5	30.5	34.6	48.0	40.3	39.7
ES	53.4	56.3	59.9	66.5	64.3	60.3	56.9	43.9	47.0	45.8
FI	10.8	12.0	11.8	13.5	10.4	8.1	8.3	8.8	8.7	8.2
FR	45.8	46.3	48.5	53.1	52.6	51.5	51.3	50.5	50.5	46.1
HR	8.4	9.5	10.3	11.4	9.9	10.7	11.6	12.1	9.6	11.0
HU	25.2	22.0	24.1	21.7	21.4	27.2	25.7	35.3	45.7	46.4
IE	42.3	44.9	51.2	49.9	41.6	31.5	32.4	24.8	22.8	20.8

IT	25.4	28.3	31.6	31.6	30.8	28.9	25.9	28.0	26.3	28.5
LT	41.9	50.3	51.5	58.8	73.4	44.0	49.2	28.6	33.2	29.7
LU	38.6	42.2	43.9	51.0	48.1	46.1	48.1	51.2	54.5	58.7
LV	30.6	45.6	45.0	8.1	12.3	27.7	29.9	27.2	25.5	25.6
MT	47.7	45.4	47.0	49.5	66.7	41.2	48.6	50.0	52.5	69.5
NL	42.6	45.9	44.7	48.7	46.1	46.3	47.5	46.7	43.9	42.2
PL	24.9	22.1	24.8	28.0	27.2	26.2	22.8	25.9	24.2	23.0
PT	22.9	22.2	25.3	24.0	26.1	22.4	19.8	21.0	17.1	15.9
RO	18.9	20.9	28.2	30.7	36.3	48.2	41.9	39.4	33.9	41.4
SI	27.5	25.4	26.2	25.5	18.5	23.0	19.9	19.1	25.1	25.8
SK	36.9	35.9	39.6	50.5	49.1	42.8	48.2	46.7	47.5	58.5
SE	14.4	13.8	13.0	13.1	12.6	13.5	14.1	14.0	14.2	13.1
UK	38.8	40.1	38.0	40.9	39.1	36.0	33.9	31.4	33.0	31.9

Source: authors' calculation based on Eurostat data

Table 2 Average share of environmental protection expenditures of the general government sector in environmental taxes in 2006-2015 (%)

Old EU countries	Expenditures to taxes ratio	New EU countries	Expenditures to taxes ratio
Austria	20.9	Bulgaria	30.0
Belgium	44.0	Croatia	10.4
Cyprus	10.6	Czech Republic	46.1
Denmark	10.9	Estonia	32.0
Finland	10.1	Hungary	29.5
France	49.6	Latvia	27.7
Germany	27.9	Lithuania	46.1
Greece	39.5	Poland	24.9
Ireland	36.2	Romania	34.0
Italy	28.5	Slovakia	45.6
Luxembourg	48.2	Slovenia	23.6
Malta	51.8		
Netherlands	45.5		
Portugal	21.7		
Spain	55.4		
Sweden	13.6		
UK	36.3		
Mean	32.4		31.8
Standard deviation	15.2		10.5
p-value (t-test)	0.831		

Source: authors' calculation based on Eurostat data

A statistically significant, strong and positive linear relationship between environmental taxes and environmental protection expenditures in the EU Member States has been observed (the Pearson correlation coefficient exceeds 0.9, cf. Table 3). Because of the fact that the Pearson correlation cannot determine a cause-and-effect relationship the result could be interpreted in two ways:

- more environmentally related taxes imply greater spending on environmental issues or

- the growing need to comply with the EU obligations concerning environmental protection entails an increase in environmentally related tax burden.

Table 3 Data description and Pearson correlation

Variable	Environmental taxes	Environmental protection expenditures
Mean	11406.8	3898.5
Minimum	171.9	34.8
Maximum	63690.3	21984.0
Standard deviation	16499.1	5965.9
Pearson correlation coefficient	0.944	
p-value	<0.001	

Source: authors' calculation based on Eurostat data

4 Conclusions

Despite the existence of non-assignment rule in the public finances, i.e. the prohibition of binding specific revenues to designated categories of expenditures, there is no doubt that in the case of environmental taxes, fiscal targets are related to some extent to non-fiscal objectives. In effect beside the fiscal role it could be enumerated other functions of taxes such as:

- allocation – which entities and how should benefit from reduction of negative externalities treating environment as a public good,
- redistribution – by imposing taxes public authorities increase burden of companies and households who contribute to environmental pollution in direct or indirect way, as a result, funds raised cover environmental friendly activities of government or other kinds of public expenditures,
- stabilization – creating sustainable growth by reducing environmentally harmful effects and by incentives towards innovations on the environmental field (leading to international competitiveness),
- stimulation – influence and create positive behaviour of producers and consumers towards environmental protection.

Consequently, the state demand for this source of revenue should stem from the necessity for environmental protection (treated as supply of infrastructure and creation of ecological behaviour of households and public and private companies). To some extent environmentally related taxes (as well as fines) constitute a repressive form for entities creating negative external effects (internalization of externalities) and not complying with legal obligations (Hyman, 2010, p. 106-109). Moreover, since the financial and economic crisis, more attention has been paid to environmental taxes as an important source of revenues. It is argued that the increase in environmental taxes should improve the quality of the environment while at the same time ensuring budgetary implications.

The results show that from the public authorities perspective the environmental taxes are the instrument used both for fiscal and environmental policies purposes with emphasis on fiscal ones. Due to possible difficulties in estimating and finding a tax rate that would offset negative externalities, multiple in many cases (Heine, Norregaard, Parry, 2012), caused by a specific category of taxpayers it is presumed that all elements of environmental taxation are so defined to achieve the two purposes mentioned above.

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Regulation of Insurance Market in Slovak republic

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Abstract: *In contribution, we deal with insurance market as part of the financial market. We will examine financial market from an economic and legal point of view, stating its segmentation as economic-legal category. As the insurance market is regulated by different laws and legal norms, we will deal closer with regulation of the insurance market and supervision of the insurance market. The contribution will also focus on the assessment of the level of the insurance market through selected indicators. In the contribution, traditional methods of analysis and synthesis will be used as well as analytical and statistical methods to characterize main selected indicators of the insurance market. At the end, we list the options for improving the regulation of the insurance market and supervision of the insurance market. The activity of commercial insurance companies in the Slovak insurance market will in the future be influenced by the development of information technologies, which must be used also for investment activity. Very important is the interconnection - Information highway between commercial insurance companies as well as between insurance companies and their clients. Qualified use of these information technologies will lead in the future to a reduction in service and thus to a competitive advantage.Clients of commercial insurance companies are inadequately informed, for example, about the residual value of life insurance claims. They do not have enough information on the disposable value of the indemnity in case of early termination of the insurance contract and are not informed of the disadvantage of early termination of the life insurance contract.The main objective of the regulation should be stability, security, credibility in the insurance market for clients of commercial insurance companies. Only an efficiently functioning insurance market can ensure the performance and development of the economy.*

Keywords: insurance, insurance market, insurance market regulation, supervision of the insurance market, regulatory tools

JEL codes: G22

1 Introduction

The insurance market is to be understood as an important part of the financial market, with insurance being an important sector of the market economy and its function is irreplaceable. The financial market is a place where the supply and demand for capital meet. The insurance market is an inherent part of it. Insurance market can be classified by several criteria, the decisive criterion being the business direction of the entity (subject of the insurer's activity). The insurance policy is closely related to its regulation, regulatory instruments and relevant insurance market supervision standards. Slovak Republic as an EU Member State is part of the single European insurance market, based on the basic approaches to regulating the insurance market from EU legislation. Problems related to the competencies of regulators and supervisors were also affected by the activities of foreign banks and commercial insurers.

Insurance market regulation and insurance market supervision are based on international agreements. The Slovak insurance market opens a new space for development. The

Slovak insurance market is dynamically developing, so the regulation and supervision of the insurance market requires more attention from professionals and supervisors. The insurance market and the assessment of its regulation in the Slovak Republic in relation to the European Union is very important and this aspect was also the reason for choosing the subject and content of our contribution.

2 Methodology and Data

The paper will deal with insurance market as part of the financial market. We also deal with regulation and supervision of the insurance market. The methods of description, analysis, synthesis, deduction and comparison will be applied. The conclusion will include the current problems and trends and options for improving the regulation and supervision of the insurance market.

We will examine financial market from an economic and legal point of view, stating its segmentation as economic-legal category. As the insurance market is regulated by different laws and legal norms, we will deal closer with regulation of the insurance market and supervision of the insurance market. The contribution will also focus on the assessment of the level of the insurance market through selected indicators. In the contribution, traditional methods of analysis and synthesis will be used as well as analytical and statistical methods to characterize main selected indicators of the insurance market. At the end, we list the options for improving the regulation of the insurance market and supervision of the insurance market.

Based on data from Slovak Insurance Association on the development of prescribed premiums (as the most important indicator) in 2011-2015 in the Slovak Republic we analyse the changes in lofe and non-life insurance. According the data we can see the rise of premiums in life insurance and decrease in non-life insurance premiums.

3 Results and Discussion

Insurance market and its segmentation

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. (Grmanová and Hošták, 2016).

We understand that insurance market as a part of the financial market and its segmentation as an economic-legal category, it is therefore necessary to recognize the importance of the issue. Economic theory defines the market as a mechanism by which buyers and sellers influence each other to determine prices and quantities of goods. (Grmanova and Čejková, 2016)

Financial market is characterized by various aspects. In the market-oriented economy, the financial market is at the top of other markets; it is a universal market. In developed economies, it is one of the most effective markets. With continued globalization, its importance is constantly growing. "Financial markets are the heart of the financial system." (Čejková and Nečas, 2008) The financial market, which is part of the financial system, contains various entities, instruments, institutions and transactions. (Grmanova and Čejková, 2016) This enables savings to those who need more funds for their consumption.

The insurance market has been developing very dynamically in recent years thanks to the huge capital it has and thus becomes a very important and essential segment of the financial market. It can be characterized as a "system of various market instruments and regulatory measures of the state, the observance and control of which is ensured by the state supervision institution." (Grmanova and Čejková, 2016) Globalization is also marked by the fact that most commercial insurance and reinsurance companies are

linked to transnational and international financial markets, enabling them to carry out their business in the most important and most important financial world centers.

The insurance market operates on a similar principle as the financial market - i.e. collection and redistribution of funds. It specifies the reserves that are created from the client's money. Reserves have a very important role in the insurance market and are, of course, much more important than money funds in other segments of the financial market. Since the insurance market operates based on provisioning, it means that commercial insurance companies also use free cash to carry out their own investment activity. Investing these temporary free funds by commercial insurance companies also contributes to a more favorable tax system in advanced economies, which is designed to enable commercial insurers to provide their clients with insurance cover as well as risks that are sometimes disadvantageous in their view.

One of the major tasks of commercial insurance companies in the insurance market is to focus and adapt their activities to achieve the best possible results in their core roles. This role can also gain a certain very good position in the insurance market in the respective economy. This is their position and position in the insurance market and therefore they are trying to offer many new insurance products or innovate older insurance products and insurance. (Cejková et al., 2016)

The insurance market is a place (buyer market, affected by state interventions more than other markets), where supply and demand for insurance cover meets with insurance and reinsurance. (Čejková and Nečas, 2008) We can define insurance and reinsurance as a kind of service that has a fictional character. This service is offered on the insurance market; at the same time, it sells and the buyer must pay for it. The insurance market is a market where the supply predominates. The type of market in question is specific to the market, because, unlike other markets, it does not concentrate on a place, its trades are mainly realized in commercial insurance companies, insurance intermediaries, reinsurance companies and elsewhere. About its clients - insured are traveled by commercial insurance companies and their intermediaries.

The insurance market operates and largely affects it:

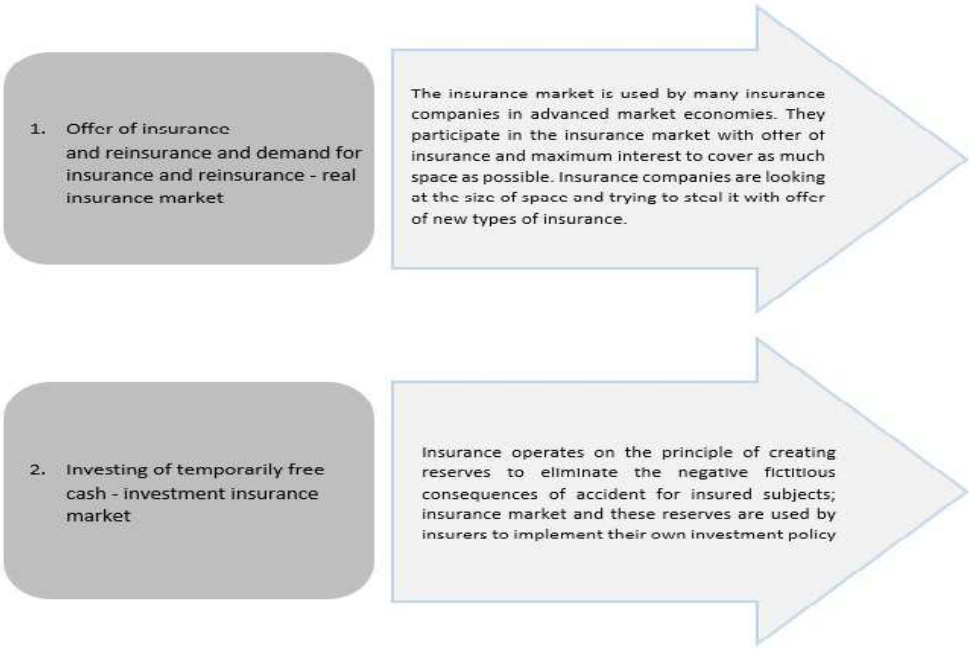
- "the State through legal standards;
- supervision of insurance undertakings;
- insurers;
- policyholders and insurances;
- insurance intermediaries;
- reinsurers;
- various consulting companies. "(Čejková and Nečas, 2008)

In a market economy, each insurer must behave as an entrepreneur, must operate under conditions of competition. The business of a commercial insurance company should be an insurance business, and a temporary investment of free cash.

The insurance market can be classified per several criteria. Here is a basic classification, the decisive segmentation criterion is the business direction of an entity (subject of the insurer's activity), where the activity can be divided into two headings.

This breakdown can be classified as a basic segment of the insurance market:

Figure 1 Basic segmentation of the insurance market



Source: Own processing according (Čejková et al., 2011)

This segmentation of the insurance market is often used in many publications and theories of well-known authors, Čejková, Martinovičová (Čejková et al., 2011) but there is no mention in economic practice.

Indicators of the level of the insurance market

The insurance market has a significant position with specific roles, principles and meanings. However, it can not be evaluated without its assessment of the development of its level indicators. "(Čejková et al., 2011) In general, we can say that market-level indicators assess the efficiency of the use of resources and spent money.

The insurance market and its significance can be characterized by indicators, among which are the main indicators and supplementary indicators. The main indicators include:

- *Premiums written* - includes the entire amount of money earned in the form of premiums in each commercial insurance company for one year in question. It is one of the most important performance indicators of each commercial insurance company, and it is possible to compile the order of commercial insurance companies and their share in the insurance market in the respective year. (See data in Table 1)
- *Insurance Performance* - Denounces the amount of insurance premiums paid by the relevant commercial insurance company to the client that was characterized in the insurance contract.
- *Damage* - Expresses the ratio between the amount of premium received and the amount of insurance benefits provided in the relevant commercial insurance company for a certain period, which is set, for example, in one calendar year. The damage to the insurance market is expressed in percentages and should never exceed 100%.
- *Insurance* - this indicator has been used for a very long time, especially in advanced economies. It evaluates the overall level of the insurance market and at the same time serves to compare the level of the insurance market of different economies. It represents the ratio of the premium written to the gross domestic product at current prices.

- *Concentration of the insurance market* - informs about the concentrated insurance market in the relevant economy. (Cejková and Nečas, 2008)

The most important indicator, valid at international level in insurance, is insurance premiums. In each country, the prescribed total premiums and premiums written in life and non-life insurance are determined. In most European countries, life insurance accounts for a larger proportion of the premiums than non-life insurance. In some European countries, life insurance accounts for 80% of the premiums. (Grmanová, 2015).

In Table 1, we provide data on the development of prescribed premiums in 2011-2015 in the Slovak Republic.

Table 1 Premiums written in commercial insurance companies in the Slovak Republic (in thousands of EUR)

	Life insurance	**Non-life insurance**	**Total**
2011	1,14	0,97	2,11
2012	1,17	0,94	2,11
2013	1,23	0,94	2,17
2014	1,22	0,96	2,18
2015	1,21	1,0	2,21
Change 2015/2011 (v %)	106	97	104

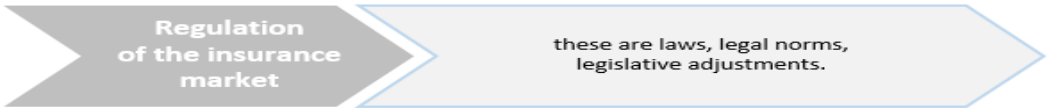
Source: own processing by the Slovak Insurance Association (www.slaspo.sk)

The insurance market and its regulation

The insurance market requires state regulation, which is discussed in the next section. The regulation of insurance market regulation is implemented gradually, depending on the development of the insurance market and on the real possibilities of state supervision.

The insurance market largely affects the quality and scope of insurance services and, above all, their cost. Compatibility in the provision of insurance products is partly influenced and to a certain extent limited by state interference. In each economy, the insurance market is regulated by special regulations. The state regulates the insurance market by means of laws and various legal standards or legislative adjustments. Regulation is in most cases carried out by the state administration body - a special body called the " State supervision or oversight supervising compliance with the Insurance Act. (Cejková and Nečas, 2008)

Figure 2 Insurance market regulation



Source: Own processing by authors (Čejková and Nečas, 2008, Ducháčková and Daňhel, 2010)

In the Slovak Republic, the insurance legislation is based on two basic legal norms, namely Act No. 39/2015 Coll. on Insurance and Civil Code No. 40/1964, and other legislation. The new phase of insurance opened in 1991. New commercial insurance companies were created and new insurance products and services were offered.

Act No. 39/2015 Coll. on insurance in the Slovak Republic, which is currently in force, fulfills the objectives which have been given also in the framework of EU directives and directives, namely the following objectives: (Čejková et al., 2016)

- to create a standard, internationally accepted legal environment for the development of the insurance market, in line with OECD and EU requirements: to regulate the conditions for authorization for entities wishing to undertake insurance business;
- ensure further liberalization of insurance services;
- strengthened the supervisory authority in insurance, its instruments by which it can influence developments in the insurance market and intervene in the event of maladministration and its misconduct;
- create a legal framework for the application of consolidated supervision of insurance companies in the group;
- improve the level of protection of the rights and interests of insured and investors in the insurance market.

Act no. 39/2015 Coll. the insurance sector shall furthermore provide for:

- certain relationships relating to the activities of insurance and reinsurance undertakings;
- valuation of liabilities and assets;
- reorganization and relationships related to the disappearance of insurance and reinsurance undertakings;
- relationships related to the operation of foreign insurance companies;
- relationships governing insurance supervision. (Cejková et al., 2011)

The basic legal regulation is the Act of the National Council of the Slovak Republic No.39/2015 Coll. on Insurance and on amendments to certain acts. Supervision in the Insurance Act is more specifically specified as oversight of the activities of an insurance company, a reinsurance undertaking, a branch of a foreign insurance company, a foreign reinsurance company and the Slovak Insurance Office, etc. where the supervision of the supervised entities (which is carried out by the National Bank of Slovakia in the Slovak Republic) Evaluation of information and documents relating to their business or other activities.

Supervision over the insurance market in the Slovak Republic

Since the accession of the Slovak Republic to the EU, efforts have been made to integrate and unify the supervision of the financial market. In several countries, integrated unified oversight is already in place, and supervision of the insurance market is already in place. In the Slovak Republic, the supervision of the insurance market is integrated in the supervision of the financial market and implemented by the central bank - the National Bank of Slovakia. Since 1st January 2006, the National Bank of Slovakia has implemented integrated supervision of the financial market. (Cejková et al., 2011)

Figure 3 Supervision over the insurance market

Source: Own processing by authors (Čejková and Nečas, 2008, Ducháčková and Daňhel, 2010)

Regulation and supervision represent an interference with the economic life of insurers. "The higher the powers of the supervisory authority, the more it restricts the business activities of the insurance company concerned" (Čejková and Nečas, 2008)

On the other hand, it must be remembered that it ensures a high degree of protection of the rights and interests of policyholders and policyholders. Insurers and policyholders are confident that their interests will be secure even if they have limited powers. Therefore, in any market economy, it is in the interest of regulating the supervision to find a

compromise solution to ensure protection and interests or insurers as well as commercial insurers.

Insurance market supervision is subject to compliance with the Insurance Act, other laws and other binding laws and conditions specified in the permits issued under applicable legal standards.

Possibilities of improving the insurance market regulation in Slovakia

The insurance market in Europe represents all European insurance markets. Central and Eastern European countries experienced a significant recovery in the mid-1990s in the insurance market. Some of them achieve relatively good results in the development of the insurance market, but they are still lagging in comparison with the EU average. Worldwide, in the past few years, the position of life insurance within the insurance market has been strengthened. Europe is not an exception, but there are quite significant differences between countries. "It can be said that the higher share of life insurance on the national market is an indicator of its maturity." (Čejková and Nečas, 2008)

Growth and prosperity in the insurance market is closely linked to the overall economic development of individual states and continents. The results of insurance market activities are monitored and presented in each economy as well as internationally. There are currently several international organizations that record and evaluate activity in the insurance market. (Paulik et al., 2012)

Since several countries, including of course the Slovak Republic, have entered the European Economic Area, some principles and guidelines have been adopted to improve the conditions of the common EU single insurance market. The basic principles of oversight function, which are binding on all EU Member States, have also been laid down. One of the most important is the concession obligation, which means that any insurance undertaking wishing to pursue its business on the insurance market must be authorized to do so by the supervisory authority of the country in question. If this commercial insurance company also wants to operate abroad, it can only be in the area where it has been authorized in the parent country. There is also the possibility of transferring insurance classes from one insurance undertaking to another, but all the conditions laid down by the country concerned must be respected. As the most important principle, we must mention the cooperation of the supervisory and supervisory authorities of individual EU Member States.

The primary objective of EU legislation is to achieve integration, globalization and the functioning of the single insurance market in the Member States. The main aim is therefore to remove all obstacles, particularly in national law, which restrict the creation and functioning of this single market, unify the business rules and ensure maximum protection for commercial clients.

The activity of commercial insurance companies in the Slovak insurance market will in the future be influenced by the development of information technologies, which must be used also for investment activity. Very important is the interconnection - Information highway between commercial insurance companies as well as between insurance companies and their clients. Qualified use of these information technologies will lead in the future to a reduction in service and thus to a competitive advantage. The facts will significantly affect the whole financial market in Slovakia as well. It is important to clarify to the public and the clients the purpose and functioning of the insurance and insurance market, its regulation and the supervision of insurance. Also, to improve the communication possibilities of clients with commercial insurance companies, clients are unaware of the existence of these instruments of insurance market regulation. Therefore, we propose to introduce insurance training already at secondary schools.

Clients of commercial insurance companies are inadequately informed, for example, about the residual value of life insurance claims. They do not have enough information on the disposable value of the indemnity in case of early termination of the insurance

contract and are not informed of the disadvantage of early termination of the life insurance contract. Our suggestion is to improve the functioning and gain of greater confidence of our clients by creating an information highway between a commercial insurance company and its clients on the website of a commercial insurance company, the opportunity to see and check the account of each client. Upon signing into this account, the client would see the status of their funds, their value, and in case of early termination of the insurance contract and their interest through the investment of a commercial insurance company. The client must believe that a commercial insurance company will be able to pay the insurance benefit at the agreed time after the expiration of a longer period.

4 Conclusions

The subject of this paper was the characteristics and issues of the insurance market and its regulation, as well as its regulation, namely the supervision of the insurance market in the Slovak Republic. Finally, we can state that the current regulation of insurance market regulation is of higher quality (than before the accession of the Slovak Republic to the EU) and offers extensive opportunities for the operation of entities in the insurance market and beyond the borders of the Slovak Republic. The activity of commercial insurance companies in the Slovak insurance market will in the future be influenced by the development of information technologies, which must be used also for investment activity. Very important is the interconnection - Information highway between commercial insurance companies as well as between insurance companies and their clients. Qualified use of these information technologies will lead in the future to a reduction in service and thus to a competitive advantage. Clients of commercial insurance companies are inadequately informed, for example, about the residual value of life insurance claims. They do not have enough information on the disposable value of the indemnity in case of early termination of the insurance contract and are not informed of the disadvantage of early termination of the life insurance contract. The main objective of the regulation should be stability, security, credibility in the insurance market for clients of commercial insurance companies. Only an efficiently functioning insurance market can ensure the performance and development of the economy. The insurance market regulation is based on the overall regulation of the financial market, with the implementation of certain specificities that arise from the fact that in the insurance market we encounter different types of risks of clients and commercial insurers.

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To gamble or not to gamble – comparison of decisions made under risk and under uncertainty

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Abstract: *It's been noticed that people estimating the probability of occurrence of some events underestimate large probabilities and overestimate small ones (Burns et al, 2010), which in the case of lotteries, where the probability of winning is very low, should effect increased willingness to play when the probabilities are not known. That is why we put forward a hypothesis that in the case of choice made under uncertainty people are more willing to buy lottery tickets than in the case of choice under risk (while the expected value of a gamble is smaller than the price of the lottery ticket). Two experiments with real (but not monetary) payoffs were organized. In both experiments participants were divided in two groups - informed and not informed about the probability of winning (different across experiments). Results of the Experiment I confirm our hypothesis. On average, the number of lottery tickets bought was higher in a group that didn't know the probability of winning. However, when we lowered the pool in Experiment II this difference disappeared.*

Keywords: *decision under uncertainty, lottery, expected value*

JEL codes: D120, D800

1 Introduction

One could venture a statement that every decision made by people is a decision made under risk or uncertainty. The consequences of those decisions may have more or less significant implications from the economic, health and social perspective. The determinants of daily decisions may be seen to lie in both personal character traits (a different level of knowledge, different propensity to risk, etc.) and external conditions relating to the consequences of potential decisions, access to information, etc.

The draws now being offered where one can win a substantial amount of money by sending a chargeable text message provided the inspiration to conduct the study. One person is drawn randomly from all the people who have texted and thus wins the lottery. The person entering the lottery has no information as to the number of participants, which is what determines the probability of winning. Moreover, games such as lotto have been operating for years where you can bet on numbers after having paid a certain price, and the person who bets on the numbers drawn by the lottery organizer wins. In this case, however, it is possible to calculate the probability of winning the jack pot (although one cannot always be sure as to its value). One might also ask whether the games in which players do not know the probability of winning provide organizers with higher lottery ticket sale than the games for which this probability is known (ceteris paribus).

The aim of the article is to compare decisions made under uncertainty with those made under risk. The hypothesis to be verified is that in the case of choice made under uncertainty people are more willing to buy lottery tickets than in the case of choice under risk (while the expected value of a gamble is smaller than the price of a lottery ticket).

It is central to our considerations to specify, distinguish and interpret the concepts of risk and uncertainty, and to show the difference between these two terms. In literature on the subject, the views on this issue regarded as classic are those of F.H. Knight which he presented in his dissertation essay "Risk, Uncertainty and Profit" (1921). His belief is that risk refers to cases that can be calculated and expressed in quantities, whereas uncertainty does not provide this possibility. Elaborating further on his idea, Knight suggests that in referring to risk we can talk about "objective" probability, while for uncertainty it is "subjective" probability. A similar view in this respect takes Gough, (1988) asserting that a risky situation is such in which a set of possible outcomes is well known and the probability distribution for those outcomes is either known or can be estimated. An uncertain situation, on the other hand, occurs when the set of outcomes is unknown (uncertainty as to the conditions in which the decision is being made) or when the probability distribution for those outcomes is not known.

In this paper it was assumed that decisions are made under risk if there is a possibility to calculate the probability of occurrence of an event while if the probability is neither known, nor can it be estimated based on the past, decisions are made under uncertainty.

Taking a decision under risk the correct way to assess a certain equivalent of a gamble is to calculate its expected value; yet many scientists indicate that the valuation of a gamble by a person is often affected by other factors (Kahneman, Tversky, 1979). Long ago Bernoulli (1738)[1] observed that the expected utility of the prize won in a game is more important than the expected value of this game. In his view, the same game can have different values of utility for different players. Many years later, his theory was named Expected utility theory (EUT) and was formalized by von Neumann and Morgenstern (1944). Since then, in the theory of decision-making under risk, the assumption has been that people try to maximize the expected utility and not the expected value. Nevertheless, a number of scholars rejects the EUT as the proper theory for explaining decision-making under risk (see e.g. Markowitz, 1952).

While applying the traditional approach, people are believed to use tools in their judgments offered by the theory of probability and statistics, and they are also capable of automatically updating information on probability along with acquiring information. In this case their actions are rational, in line with the definition of rational human being – homo economicus, that is, people are consistent in their actions and seek to maximize their wealth (Cieślak, 2003). Herbert Simon (1957) was against this perception of human behavior, arguing that the occurrence of bounded rationality was caused by temporary and technological constraints. Likewise, D. Kahneman and A. Tversky (1974) do not agree with the traditional concept of rationality and, supported by their research, they argue that bounded rationality is the result of the time pressure and complexity of information. They believe that people assess the reality intuitively rather than apply complex estimation processes of probability and prediction. The effect is that people make decisions based on:

- information easily accessible through one's memory
- conclusions made on the basis of similarities,
- information about the originally suggested value which is adjusted in order to estimate the real value.

A rationally thinking scientist may wonder why people even buy lottery tickets, since they must be aware of how low the probability of winning is. One of the psychological reasons may be so called "peanuts effect" – people are more willing to take risk dealing with smaller stakes (although unequivocal results were obtained only for gains, see Mitchell and Wilson, 2010; Hogarth and Einhorn, 1990). With small amounts at stake no one thinks about the expected value, losing small amount of your wealth is not important

[1] His work "Specumen theoriae novae de monsura sortis" was translated in 1954 and published in Econometrica with the title Exposition of a New Theory on the Measurement of Risk"

when you can win quite big money. Also, some researches have proven that the probability of winning has no significant influence on the number of lottery tickets sold (Beenstock, Haitovsky, 2001), and that if not for a very big jackpot, few people would take part in a lottery (Shapira, Venezia 1992). The availability bias probably plays an important role (Tversky, Kahneman, 1973) - stories about people who have won are widely broadcasted and thus easily brought to mind.

In the case of choice under uncertainty, the estimation of probability seems an important factor. It's been noticed that people overestimate small probabilities (Erev, Wallsten, 1993), which may cause the increased belief in winning. On the other hand, it has been shown that small probabilities (when known) are underweight (Weber, Blais, & Shafir, 2004), which may influence the willingness to buy lottery tickets in the case of decisions made under risk.

Camerer and Weber (1992) found that people, when having the opportunity of choosing between playing in a lottery, where the probability of occurrence is known (under risk), and playing in a lottery with unknown probability distribution (under uncertainty), will choose the first type of the lottery. This principle is known as the ambiguity effect. However, the research conducted by Rode et al (1999) showed that in the conditions created for the purpose of the experiment people did not avoid making decisions under uncertainty and thus the ambiguity effect did not occur. Charness and Gneezy (2003) found that, in fact, people prefer lotteries with known probabilities but these preferences do not affect the way "participants allocate their investment capital between an asset with a sure return and a risky asset with a higher expected rate of return" in case of choices under risk and under uncertainty.

In the experiment conducted by the authors of this paper, the objective was to compare the propensity to playing a game which was the game under risk and a game played under uncertainty. According to the research Rode et al conducted, the participants of the experiment should prefer playing under uncertainty, while in line with the findings made by Camerer and Weber (1992) the ambiguity effect should occur and the subjects examined should be more willing to participate in the game under risk.

2 Methodology and Data

In order to verify hypothesis that in the case of choice made under uncertainty people are more willing to buy lottery tickets than in the case of choice under risk and to achieve assumed purpose of the article two experiments were conducted.

Experiment I

Subjects:

137 first year students taking their course in mathematics. Around 67% were females.

Procedure:

Students were divided randomly in two groups. To each group the same proposal was made:

"Dear Ladies and Gentlemen, I'd like to offer you, as part of a certain scientific study, participation in a lottery where you can win extra points to obtain credit in my subject. The lottery is that for the points you have already obtained you can buy any number of tickets which will be then drawn in the lottery. You can win one prize, which is 50 extra points added to those already collected during the semester (of course, less the points spent on lottery tickets). Each ticket costs 0.5 point"

Additionally the second group received information about the pool, which was 400 tickets. 400 tickets in pool with 50 points to win gives the expected value of points

gained 0.125, so the price of the lottery ticket offered (0.5 point) was 4 times bigger than the expected value.

We called the first group (the one without information about pool) „uncertainty group" and the second one (that knew the pool) „risk group".

It is important to notice that every group had the same conditions for receiving credit. The maximum amount of points to be gained was 100 and to receive a positive grade, one needed to gain above 50 points. Students had to complete two tests during a semester (each giving a maximum of 40 points), the rest of points could be earned by activity during the semester. We chose a moment in the semester when students had already taken one test and could gain no more points in any other way than by the second test. That is why from the data obtained in the experiment, we decided to exclude information on decisions of the people who had at the moment of decision not more than 10 points.

Experiment II

Subjects:

97 first year students taking their course in financial mathematics. Around 75% were females.

Procedure:

The same as in Experiment I students were divided randomly in two groups and to each group the same proposal as in Experiment I was made although we adjusted the amounts of points because of different scoring. This year the maximum amount of points to be gained during a semester was 50 and to receive a positive grade, one needed to gain above 25 points. Students had to complete two tests during the semester (each giving a maximum of 20 points), the rest of the points could be earned by activity during the semester. The proposal was as follows:

"Dear Ladies and Gentlemen, I'd like to offer you, as part of a certain scientific study, participation in a lottery where you can win extra points to obtain credit in my subject. The lottery is that for the points you have already obtained you can buy any number of tickets which will be then drawn in the lottery. You can win one prize, which is 25 extra points added to those already collected during the semester (of course, less the points spent on lottery tickets). Each ticket costs 0.25 point"

This time the "risk group" was informed that the pool was 200 tickets, which meant that the expected value of the lottery equalled 0.125 point. Still, the price of a ticket remained higher than the expected value, but only two times bigger.

This time we did not have to exclude anyone's answers from our calculations because theoretically every one still had a chance to pass the subject.

3 Results and Discussion

Experiment I

After excluding the data on decisions of people who had at the moment of decision not more than 10 points 59 answers in the "uncertainty group" and 56 answers in the "risk group" were received. We then calculated descriptive statistics for each group, which can be seen in Table 1. On average, more tickets were sold in the "uncertainty group". Also the median is higher in the "uncertainty group". The most commonly bought number of tickets was 2; however, when checking the particular data, it did not appear so frequently in the "risk group" as in the "uncertainty group". In general, the number of tickets sold per person was significantly higher in the "uncertainty group" than in the "risk group" (p-value = 0.000606917), which is unequivocal to saying that on average

people not knowing the probability of winning were more willing to buy lottery tickets than those who were aware of it.

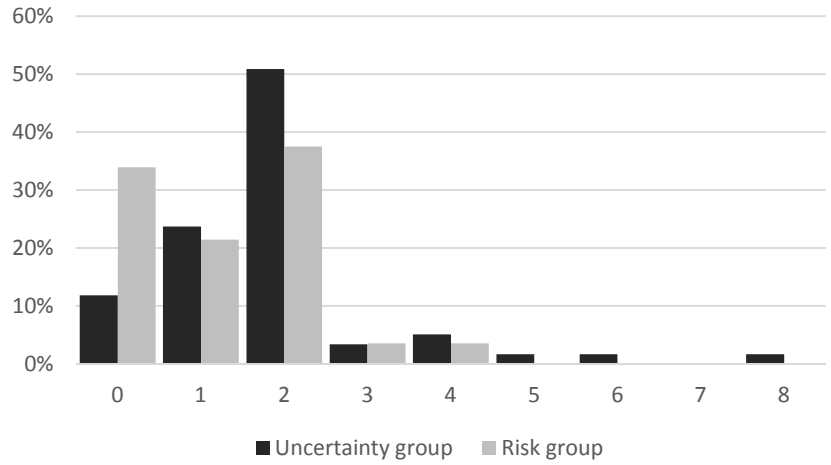
Table 1 Descriptive statistics on number of lottery tickets bought in the case of choice under uncertainty and under risk

	Uncertainty group	**Risk group**
Mean	1.88	1.21
Median	2	1
Most common answer	2	2
Standard deviation	1.40	1.06
Skewness	1.92	0.47

Source: authors' own study

Decisions about tickets bought were more skewed in the "uncertainty group". A Greater skewness can be observed in Figure 1, which shows the percentage of students buying a particular number of lottery tickets. We can also observe that in the "risk group" there were almost as many people not wanting to buy any ticket as the ones wanting to buy 2 tickets. The visible difference between distributions of answers was not, however, confirmed by chi-square test (p – value = 0.17).

Figure 1 Percentage of people buying a given number of lottery tickets



Source: Authors' own study

Experiment II

In the second experiment 47 students were assigned to the "uncertainty group" and 50 to the "risk group". In contrast to Experiment I we have found that on average the number of tickets bought was not significantly different in the two groups (p – value = 0.55). However, it seems that it is not caused by a higher (than in Experiment I) demand for lottery tickets in the "risk group" but by a lower demand in the "uncertainty group". In both groups the modal and median choice (see Table 2) was to buy no tickets, which is less than in Experiment one. We can only suppose that it was caused by the different number of points possessed before the experiment. In Experiment I the average number of points was 35.22 (with 100 maximum) and in Experiment II 10.23 (with 50 points maximum). According to Friedman and Savage (1948), low-wealth people should be attracted to gambles with small chance of large gain, in our case that would mean that in Experiment II more people should be willing to participate in the lottery. It may be

explained by other research (Guiso, Paiella 2008) that finds that "individuals who are more likely to face income uncertainty or to become liquidity constrained exhibit a higher degree of absolute risk aversion". Conducting the experiments we often heard people saying "what if I buy this ticket and then I will not pass because of missing 0.1 point". With the lower number of points this concern must have been more vivid.

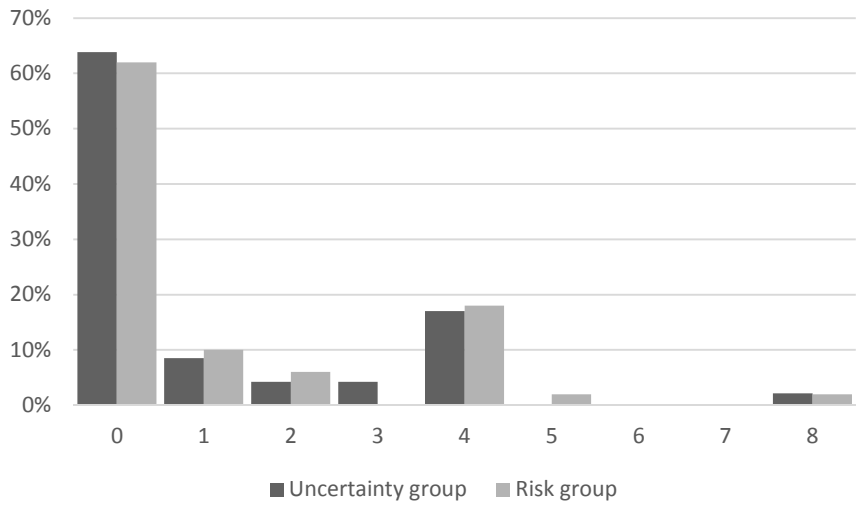
Table 2 Descriptive statistics on number of lottery tickets bought in case of choice under uncertainty and under risk

	Uncertainty group	**Risk group**
Mean	1.15	1.2
Median	0	0
Most common answer	0	0
Standard deviation	1.84	1.89
Skewness	1.66	1.58

Source: authors' own study

Figure 2 depicts distributions of number of lottery tickets bought in the "uncertainty" and "risk group". In both groups answers were distributed in almost the same way, which is confirmed by chi-square test (p – value = 0.73). When we compare Figures 1 and 2 we notice that the answers were more concentrated in Experiment II. Chi – square tests showed that there is a significant difference between distributions in the "uncertainty" groups (p – value 3.4E-08) and in the "risk" groups (p – value = 0.0001).

Figure 2 Percentage of people buying given number of lottery tickets



Source: Authors' own study

4 Conclusions

The hypothesis that in the case of choice made under uncertainty people are more willing to buy lottery tickets than in the case of choice under risk was confirmed by the Experiment I, where it was found that the average number of lottery tickets that participants bought was higher in the uncertainty group. However, when we lowered the pool in Experiment II this difference disappeared. We cannot be sure, however, if it was wiped out by the lower pool or by the fact that the samples in Experiment I and II were different in terms of points possessed at the beginning of the experiment. We did not observe the ambiguity effect in neither of the experiments, which is consistent with

results obtained by Charness and Gneezy and contradicts the results obtained by Camerer and Weber (1992). Nevertheless, it is possible that in the case of a pool that is even lower than in Experiment II, one could find more people willing to participate in a lottery with known risk. A knew hypothesis to be verified can be that the occurrence of the ambiguity effect depends on the value of known probabilities and also on the material status of a decision maker.

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Comparison of the tax burden on natural persons in the Slovak Republic and Spain

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Abstract: *Redistributive function of public finance is provided through the state budget, which is formed as a balance of revenue and expenditure side. Revenues are redistributed and provided to citizens through public services. The primary source of the state budget revenues are taxes, which represent up to 95% of total revenues, based on individual years. Tax policy is a part of the state's fiscal policy and represents a set of measures, which govern the tax system. The Slovak Republic and the Kingdom of Spain are European Union member states which use the same currency. Both countries differentiate in many areas e.g. economics, geography etc. despite some common features. The aim of the contribution is to analyze the current situation in the field of tax burden on personal entity in the Slovak Republic and Spain. Authors conduct comparison and evaluation of the tax burden on personal entity in both countries, based on the example of an employee working in selected countries. Spain, unlike the Slovak Republic, also takes into account the origin of the tax during the tax burden calculation i.e. the area in which is tax levied. It results into different tax rates for different regions of Spain.*

Keywords: taxes, income tax, public finance, tax-free income, child tax bonus

JEL codes: H21, H23, H24, H60, H71

1 Introduction

The aim of effective state policy is to achieve prosperity, abundance, sustainable development and to well manage public finances. (Toshihiro, 2013). One of the main public finances functions is to ensure a fair redistribution of fund among individual groups of citizens and to remove the main differences in their socio-economic status. (Backhaus and Wagner, 2004). The redistribution function reflects in the structure of the tax system i.e. optimal distribution of tax burden among individual entities. (Stiglitz, 2000)

The literature gives various definitions of taxes. From a formal point of view the tax is: "a mandatory, statutory, non-purpose and non-equivalent payment, which is usually repeated regularly and which taxpayers carry at a specified amount and within specified time limits to the relevant public budget". (Štofková et al., 2015)

According to economic and financial point of view, the tax is: "the financial category, represents the fiscal relationship between taxpayer and the state, governed by the law, which is used to ensure its aims, is based on the principle of inequality". (Štofková and Štofko, 2015)

Taxes are divided into direct and indirect. Direct taxes are deducted directly from the income or wealth of personal or legal entity (taxpayer). Their payment is not passed on to anyone else and personal or legal entity bears the tax liability itself, calculates it and transfers it to the paid administrators. Indirect taxes are attached to products or services. The consumer (taxpayer) is indirectly liable for the price of the goods or

provided services.Personal or legal entity which is legally required to calculate the tax, to withdraw it from the taxpayer and to pay within a certain period to the tax administrator is called the taxpayer. The taxpayer is liable for the tax levied or deducted and is present in direct and indirect taxes paid in a withholding way. (Sivák, 2007)

Taxes have become a term used every day. Taxes represents the most significant revenue item of the state budget, so it is in the state interest to monitor compliance with the tax obligations. (Sivák, 2015)

Income tax of personal entity in the Slovak Republic

The tax is governed by Act. No. 595/2003 on income tax (last amended on 23rd November 2016). The tax liability applies to every citizen who, during a taxable period – during a calendar year, has taxed income higher than € 1,901.67. The tax return for 2016 have to be submitted by 31st March 2017. The submission deadline is prolonged for the taxpayer of three months i.e. to 30th June 2017, based on the notification filed before 31st March 2017. The deadline for filling the tax return is extended by a maximum of six months (to 2nd October 2017), based on the notification submitted before 31st March 2017, but only if incomes from foreign sources are a part of total incomes of taxpayer. (Finančné riaditeľstvo SR, 2017)

Tax free income

Employee is entitled to claim a **non-taxable portion of the tax base**. If the taxpayer's tax base is equal to or less than € 19,809, the non-taxable portion is € 3,803.33. If the taxable amount exceeds € 19,809 the non-taxable amount is: the difference between € 8,775.578 and one quarter of the taxpayer's tax base. If this sum is less than zero, the non-taxable portion of the tax base on the taxpayer is equal to zero. (iSITA, 2016)

Income tax of natural entity has two levels. The tax rate for incomes below or equal to € 35,022.31 is 19%. For incomes exceeding this limit is applied 25% income tax. The basic deadline for the tax return submission is always before the end of March of the year following the tax period. Since 2013 there is also a so-called "special rate" of 5%, which is applied on selected state officials, e.g. President, Government and Members of the National Council of the Slovak Republic. (Ministerstvo financií SR, 2017)

Taxpayer can reduce the tax liability by a child tax bonus of € 21.41 per month for each dependent child living with a taxpayer.

Income tax of personal entity in Spain

The tax is governed by Act. from 28th November No. 35/2006 on income tax of personal entity and its partial adjustment (valid until 1st January 2017). The tax return have to be submitted by 6th April 2017, with a request for deadline extension and assistance in filling, submission of the tax return may be postponed until 30th June 2017. (BOE, 2017a)

In 2011, the Act. on income tax No. 35/2006 determined the basic interval with the tax rates for annual gross wages, which were changed in 2015, based on the Real Decreto – ley 9/2015. Authors therefore used these new tax rates in the calculation. The following table provides a comparison of the above mentioned rates. (El economista.es, 2014)

Table 1 Comparison of income tax rates.

Gross wage in €	Tax rate	
	2015	2016
<12,450	20%	19%
12,450 – 20,200	25%	24%
20,200 – 35,200	31%	30%
35,200 – 60,000	39%	37%
> 60,000	47%	45%

Source: own processing based on El economista.es.

The tax burden on income also depend on the origin of the tax, i.e. the area in which is income tax levied. Currently it is allocated partly to the individual autonomous regions of Spain (together 17 on the territory of the country). That is whyare individual tax rates different in each area from the basic rates determined by the law. (BOE, 2017a)

Tax quotas used from 2012 to 2014 (sum of state and autonomous rates plus complementary load in 2012, 2013 and 2014) for the autonomous region of Madrid are expressed in following table.

Table 2 Tax quotas for the autonomous region of Madrid.

Gross wage		State rate	Additional rate	Autonomous rate of Madrid	SUM
From	To				
0.00 €	17,707.20 €	12.0 %	0.8 %	11.6 %	24.4 %
17,707.21 €	33,007.20 €	14.0 %	2.0 %	13.7 %	29.7 %
33,007.21 €	53,407.20 €	18.5 %	3.0 %	18.3 %	39.8 %
53,407.21 €	120,000.20 €	21.5 %	4.0 %	21.4 %	46.9 %
120,000.21 €	175,000.20 €	22.5 %	5.0 %	21.4 %	48.9 %
175,000.21 €	300,000.20 €	23.5 %	6.0 %	21.4 %	50.9 %
300,000.21 €	More	23.5 %	7.0 %	21.4 %	51.9 %

Source: own processing based on Expansión Económica.

The currently highest rates oscillate between 51.9% (La Rioja, Madrid) and 56% (Catalonia). (Expansión Económica, 2017).

Tax free income

There exist certain types of income for which is income tax liability equal zero. Such incomes are not added do total taxable income for assessment year and thereby remain tax-free. The previous non-taxable portion of the tax base in an amount of € 2,652 was canceled by the 2015 reform and replaced by a new amount of € 2,000 per year. This amount will increase by an additional € 2,000 per year in the case of unemployed taxpayers, who accept a new job requiring a change of residence and in the case of active taxpayer with a disability, this non-taxable portion of the tax base increases from € 3,500 to € 7,750 per year depending on the degree of disability. (BOE, 2017b)

In the case of taxpayers whose net income does not exceed € 14,450 per year without any additional income exceeding € 6,500, the following tax understatements are applied:

- taxpayers with a net income equal to or less than € 11,250 - income tax is reduced by € 3,700 per year,

- taxpayer with a net income in the range from € 11,250 to € 14,450 – the tax reduction is calculated as follows: 3,700 – 1.15625 x (net income – 11,250).

These non-taxable portions of the tax base were increased by 100% for working taxpayers at age over 65. However, the reform canceled these benefits without the replacement by other deductible expenses.(Expansión Económica, 2017)

The subsistence minimum has increased from € 5,151 to € 5,550 after the reform. The reform also increases the values according to the age of the taxpayers. If is a taxpayer older than 65 years, the value of subsistence minimum increases from € 6,069 to € 6,700. If a taxpayer is older than 75 years, the value of subsistence minimum increases from € 7,191 to € 8,100. (Agencia Tributaria, 2017)

Disability tax bonus

The 2015 reform also covers tax bonus for taxpayers with disabilities. Comparison of tax bonuses before and after the 2015 reform for disabled taxpayers, their direct ancestors or offspring with disabilities is expressed in the following table.

Table 3 Disability tax bonus.

	2014			2015		
Disability degree	**Disability tax bonus**	**Assistance expenditures**	**SUM**	**Disability tax bonus**	**Assistance expenditures**	**SUM**
33%-65%	2,316 €		2,316 €	3,000 €		3,000 €
33%-65% with the assistance	2,316 €	2,316 €	4,632 €	3,000 €	3,000 €	6,000 €
≥ 65%	7,038 €	2,316 €	9,354 €	9,000 €	3,000 €	12,000 €

Source: own processing based on Agencia Tributaria.

Child tax bonus

The bonuses applicable to offspring has increased significantly, especially for the first two children, based on the reform. For third, fourth and other children, the increase is smaller, since from the third child have working taxpayer a tax relief for a large family.

Table 4 Child tax bonus.

Child	2014	2015
First	1,836 €	2,400 €
Second	2,040 €	2,700 €
Third	3,672 €	4,000 €
Fourth and next	4,182 €	4,500 €

Source: own processing based on Agencia Tributaria.

If is child younger than 3 years the minimum is increased to € 2,800 per year (before the reform € 2,244). To get the children tax bonus it is necessary to provide care for a child in a common dwelling. (Agencia Tributaria, 2017)

2 Methodology and Data

Domestic and foreign book literature, scientific publications and articles represents the base of the literature review of this contribution. Data for calculation were retrieved from official state websites and legal documents of the Slovak Republic and Spain. Authors used a number of various methods during the contribution, which lead to the achievement of its primary aim. Methods of induction, deduction, analysis and synthesis

were used to define the theoretical backgrounds of the researched issue, as well as to map the current state of tax burden of natural entities in the Slovak Republic and Spain. The authors conducted comparison of tax burden in selected countries based on the data and the model example. The MS Excel program was used to calculate the social and health insurance contributions, tax burden and net employee income.

3 Results and Discussion

For the tax burden comparison in the Slovak Republic and Spain was used the following model example: taxpayer, 30 years old, employee of the medium-sized enterprise, earned in 2016 € 25,000 from employment. Taxpayer has one child, older than 3 years, without disability. Taxpayer's incomes flow only from home state without mobility within the state. (Spain considers whether an employee has moved to another autonomous community). For the child tax bonus is important number and age of the child, from which are derived other benefits from the state.

The income tax calculation in the Slovak Republic

The gross taxpayer's income is € 25,000 per year. Our model taxpayer is 30 years old and has one child, which is over 3 years old. Social and health insurance contributions are set at 13.4%, representing € 3,350 out of € 25,000. The next step is to express the non-taxable portion of the tax base, which have to be deducted from the current tax base. Non-taxable portion of the tax base is calculated as following: 8,755.578 – ¼ * 21,650. The calculation is expressed by following table.

Table 5 Income tax calculation in the Slovak Republic

Gross wage	**25,000 €**
Social and health insurance contributions (13,4% of € 25,000)	3,350 €
Partial tax base (gross wage – insurance contributions)	21,650 €
Non-taxable portion of the tax base (8,755.578 – ¼ * 21,650)	3,343.078 €
Reduced tax base (partial tax base – non-taxable portion)	18,306.92 €
Tax liability (19% of 18,306.92)	3,478.31 €
Child tax bonus (12*21.41)	256.92 €
Income tax = tax liability – child tax bonus	**3,221.39 €**
= Net wage (gross wage – insurance contributions – income tax)	**18,428.61 €**

Source: authors

We deduced from the reduced tax base the monetary tax rate, which is set at 19% because the tax base is less than € 35,022.31. Then we need to deduct the tax bonus for a child at a rate of 12*21.41 € from tax liability. The result is the amount of income tax which has to be paid by taxpayer to the state.

The income tax calculation in Spain

Gross taxpayer's income is € 25,000 per year. The taxpayer is 30 years old and has one child older than 3 years. In addition to salary, he does not receive any other income from other activities. According to the 2015 reform, the subsistence minimum is € 5,550 per year. The child tax bonus is € 2,400 (child tax bonus are applied only to the taxpayer). The result is a family minimum of € 7,950.

In the next step we deducted all deductible expenses in order to obtain the tax base. The non-taxable portion of the tax base is set at € 2,000. In our case, we did not apply any additional deductible expenses to it, since the taxpayer in our example is not disabled and earns more than € 14,450 per year. Social insurance is in our case at € 1,587. Social insurance includes healthcare, pension and unemployment insurance contributions. We

had to choose a minimum and maximum amount according to the applicable standards depending on which category of employees our taxpayer belongs to. The basis are different for an official, a technical engineer, an engineer/master etc.. Our taxpayer was included in the group of engineers/masters, who have the highest minimum and maximum according to the social insurance. The minimum is € 1,051.50 and a maximum is € 3,642. Currently 6.35% is paid for social insurance. We applied this percent to gross income and received the total amount of social insurance contributions. In order to calculate the tax base, we deducted the social insurance contribution and non-taxable portion of the tax base from the taxpayer's gross annual income.

Table 6 Tax base calculation in Spain.

Non-taxable portion of tax base	**2,000 €**
Social insurance contribution	1,587.50 €
SUM of contributions	3,587.50 €
Tax base	21,412.50 €

Source: authors

To calculate the net annual income we need to know the percentage of total contributions deducted from the social security and income tax. The result is in our case 18.67%. Since this percentage represents the total quantity, we derive from gross income, we have to determine the remaining percentage. By deducting from 100% we get 81.33%, which we applied to gross wage. By subtracting 12 months of the year we report the monthly net income.

Table 7 Monthly net income calculation in Spain.

Total contributions %	**18.67%**
Annual net income	20,333.75 €
Monthly net income	1,694.48 €

Source: authors

The difference between the second and first deduction will lead to the total amount of income tax our taxpayer has to pay. The first deduction was calculated as a family minimum, resulting in € 1,510.50. In the second deduction we used the tax base as the basis for the calculations. The result of second deduction is € 4,589.25. The total tax statement of income tax which has our taxpayer to pay has been obtained by the difference of these two deductions, which is **€ 3,078.75**.

4 Conclusions

The data expressed in tables reflects that despite the same initial income of € 25,000 the resulting amount of income tax, which a taxpayer has to pay is different in both countries. The resulting tax is higher in the Slovak Republic, exactly **€ 142.64** more. Apart from the differences in the calculation procedure of income tax we see the largest difference in tax rates applicable according to the income amount.

Completing and submitting tax return is a lengthy and often incomprehensible process for many of us. Although we can be pretty sure that this act is not very popular regardless of where we live, somewhere the overall tax system is easier than elsewhere.

By the comparison of the basic terms and conditions of setting and submitting a tax return to the income of natural persons in the Slovak Republic and Spain we can see certain differences. We consider as the substantial difference the division of incomes in the intervals by which the income tax rates are assigned. Unlike in the Slovak Republic, the Spanish system also takes into account the origin of the tax during the tax burden calculation i.e. the area in which is tax levied. It results into different tax rates for different regions of Spain.

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Comparison of Selected Aspects of Financial Literacy and their Differences in the Conditions of University Education in Slovakia

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Abstract: *The inability to make qualified financial decisions has a very negative impact on peoples' lives. From this point of view financial literacy represents a basic and inevitable skill that is important for human existence in the 21st century. In many countries, there is a trend towards decreasing state support of individual retirement income, in result of which individuals have to manage their financial resources by themselves in order to secure sustainable retirement and to retain their financial wellbeing standard in the future. Supporting the raise of financial literacy, in particular for young generation, could contribute to better knowledgeability and readiness for household and retirement planning. The authors focus on financial habits and financial behaviour of respondents and their skills in terms of financial literacy concept. This study is aimed at comparison of levels of financial literacy of chosen economic faculties in Slovakia, as well as comparison of levels of financial literacy between the first year undergraduates and those graduates who are in the final year of their studies. The authors statistically process primary data which were collected through a survey in 2015-2016. The data were obtained from economic faculties of three different universities in Slovakia. Correlative data dependence of selected variables and their intensity is analysed using Probit model. The research line is defined by a few hypotheses, and the main goal is to explain the impact of respondents' financial literacy in terms of their sex, high school background and university study program on financial habits.*

Keywords: financial literacy, financial habits, education, retirement planning

JEL codes: I21, I22, I25

1 Introduction

The field of finance and money management have been changed over few decades in many ways with impact as on national as on the individual and household level. The inability to make qualified financial decisions has a negative impact on peoples' lives and financial literacy (FL) has became a basic and inevitable skill that is important for human existence in the 21st century. Topic of financial literacy has been increasingly brought to common people's attention and there are evident activities of policy makers from many countries of the world aimed at the support of financial education. Nowadays, young generation can learn about the financial possibilities and obtain financial habits from extensive resources, including their parents, friends, schools, out-of-school activities, as well as personal experiences such as opening a bank account. These available resources, however, provide not only different but often incomplete or outdated information to use. In this context, regarding social aspects is important and crucial the environment in which individual grows and lives. Within this context Driva et al. (2016) and Grohmann et al. (2015) confirm the existence of the gap of FL among teenagers that relates to household finance.

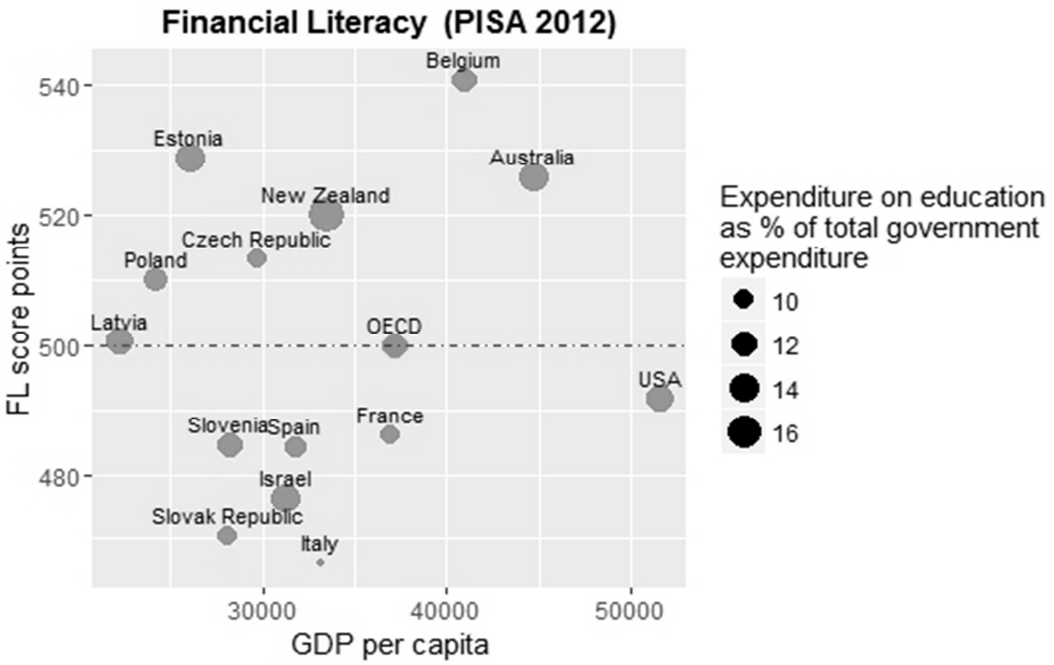
Financial education provided to young people can help to overcome the gap in financial skills due to inequality in the socio-economic status of students and improve their financial habits. Socio-economic status of an individual and consequently, family environment and education play an important role in this process (Pixley, 2010; Grohmann et al., 2015; Popescul et al., 2016). In this case, there is a strong parental and household planning influence, which can lead directly to children within their money management in the future (ČNB, 2012; Kiliyanni and Sivaraman, 2016). Without basic financial knowledge, it is not possible to make eligible decisions because they affect personal and family budgets, often with a serious impact on the next generation (Szovics, 2012). Effective money management should be a part of childcare needed for their future life. We suppose additional financial education can be effectively extended directly in the primary and secondary school environment, where young people are gathering on a daily basis and should be added to the education standards systematically with the respect of diversity in society, one that will take into account the social and economic status of the individual as well as local and regional aspects. The ability to understand and utilize financial information in way that contribute to optimal financial outcomes is a crucial element for independence and sustainable wellbeing in old age (Han et al. 2016). Increasing financial skills by individuals and making sound personal financial decisions over the course of the adult life span is one of the keys to individual self- and household sufficiency with consequences on better quality of life (Hershey et al. 2015). Level of FL around the world can be affected by many factors, which are not equally important in all participating countries and economies. Differences in FL can be associated with gender, parental background, educated system or economic status in country. Problems with insufficient financial habits and lower FL relate not only to young generations but also to elderly. One foreign study shows that FL is associated with greater functional connectivity between brain regions in old age (Han et al. 2016).

Financial literacy in relation with retirement planning

Education of FL has become a global priority (Blue et al. 2014). Level of FL significantly varies in many countries around the world. McGraw Hill Financial shows significant disparities of FL levels within the EU countries. For instance, in Romania only 22 % of its inhabitants are financially literate as opposed to 71 % of inhabitants in Denmark and Sweden. In Europe, there are 69 % of adults with academic degree whose financial literacy is significantly higher than of 54 % of adults with secondary education and of 28% of citizens with elementary education (Klapper et al. 2015). A lack of personal financial skills and habits in many cases contributes to the increase in consumer credit debt, and from the other hand over-indebtedness is positively associated with poor level of FL and self-control problems. One of the effective way to combat this growing problem is through supporting financial education (DeLaune et al. 2010).

By using available data from PISA and OECD statistics we put to the relation scores of FL of the year 2012 which were officially released on July in 2014, because findings about data of PISA 2015 will be available later in May 2017, GDP per capita as the main factor of economic growth in US Dollar since year 2015 or latest and expenditure on education as % of total government expenditure since year 2013. Indicator expenditure on education is represented by different size of points. The bigger point is, the more financial recourses given country spend on education. Figure 1 shows relationship between student's score on FL assessment, GDP per capita and expenditure on education. Living in a rich country does not seem as a strong implication on the FL scores of 15 years old students. We cannot say that higher expenditure on education will cause higher level of FL of students as well ($p > 0.05$). While higher GDP per capita is associated with higher level of FL, the plot in Figure 1 indicate that lot of countries with lower value of GDP per capita (Latvia, Poland, Czech, Estonia) perform better level of FL than countries with higher economic growth as Italy, France or United States.

Figure 1 Relation of financial literacy, GDP per capita and expenditure on education in given country.



Source: own processing according to PISA and OECD data

This implies that students and youth in countries with advanced economy do not achieve higher score of FL than students in poorer countries. This is determined by a number of socio-economic, political and cultural aspects. A detailed examination of them requires access to more structured data. Those conditions also create a platform for a subsequent research. In this context Lusardi (2015a), OECD (2014), Stauvermann and Kumar (2017) and Kočišová (2015) indicate that following independency simultaneously underscores the importance and relevance of having a well-functioning educational system or its efficiency. Results of research study of Dragoescu (2015) show positive relation between GDP per capita and the number of students with higher education and no connection between GDP per capita, size of students respondents and public education expenditure. In one of the OECD study (French et al. 2015) was found out negative impact of gender on public expenditure on education and positive effect of individualism and long-term orientation. Hence, authors emphasize relevance of cultural dimensions on education expenditure and country differences of FL (Feranecová and Krigovská, 2016; Bartosik-Purgat et al. 2017).

In many countries, there is a trend towards decreasing state support of individual retirement income, in result of which individuals have to manage their financial resources by themselves in order to secure sustainable retirement and to retain their financial wellbeing standard in the future. To meet the challenges of an ageing population, standard ages for retirement have increased and occupational pensions have become less generous. In many countries substantial part of the risk and responsibility for an adequate standard of living after retirement has been shifted from the government and employers to individuals or private households (OECD, 2013; Oehler and Werner, 2008; Prast and Soest, 2016; Lusardi 2015a, 2015b; Kočišová, 2014). Supporting the raise of financial literacy, in particular for young generation, could contribute to better knowledgeability and readiness for household and retirement planning. Greater personal responsibility toward financial decision-making is being advocated on a global basis and as abovementioned, individuals or households are encouraged to take a more active approach to personal finance (Kabók et al. 2017; Brounen et al. 2016; Krpálek and

Krpálková Krelová, 2016; Jovovic et al. 2016). World financial situation today indicate low savings rates and inadequate long-term financial planning for retirement, in this regard financial well-being has become an important topic for individuals and households as well as for societies and countries. Findings about low and different saving behavior across generations are the outcomes by other study (Brounen et al. 2016; Fachrudin and Fachrudin, 2016; Lusardi 2015a; Peng et al. 2007). According the study of McGraw Hill Financial (2015) relatively few EU adults save for old age, and even those who save often have weaker financial literacy. The savings of individuals must be adequate enough to cover longer retirement periods due to higher life expectancies (Lusardi, 2015a) and in this context FL appears to be positively strong associated with retirement planning and with management of financial resources needed for sustainable retirement (Prast and Soest, 2016). Examination of regional, national and international disparities and discrepancies in the financial literacy of special populations is in the recent years the subject of interest to many research teams, as well as polemic and debate. It is related to process of globalization and related changes in the financial markets, the increasing internationalization of economic and business processes, etc. In Slovakia, there absents complex research and expert studies within given issue in spite of their importance in strategic concepts' formation, planning of educational processes, and creating of relevant policies. The above mentioned facts have made us more interested in a close and deep examination of the level of FL and disparities at selected universities, and in the confrontation with the partial results of international research. The principal aim of this research was a comparison of levels of financial literacy and financial habits at both input and output, i.e. between the first year undergraduates and those graduates who are in the final year of their studies and a research of causal links, which provide a list of differences in horizontal (researched universities) and vertical (other categories) FL dimensions.

2 Methodology and Data

The authors focus on financial habits and financial behaviour of university students and their skills in terms of financial literacy concept. This study is aimed at comparison of levels of financial literacy of chosen economic faculties in Slovakia, as well as comparison of levels of financial literacy between the first year undergraduates and those graduates who are in the final year of their studies. The authors statistically process primary data which were collected through a survey in 2015-2016. There participated 496 students from three selected universities in Slovakia: Faculty of Economics, Technical University of Košice (EKF TUKE) with overall frequency 228 respondents, Faculty of Management of University of Prešov in Prešov (FM PU) with 93 respondents and Faculty of National Economy of the University of Economics in Bratislava (NHF EUBA) with 195 respondents. These Slovak universities have been active for many years and they provide various economically oriented study programs. They also realize research activities besides those educational ones. The written form of survey by means of structured questionnaire that consisted of 54 questions was used in order to collect the necessary data. Questionnaire structure was divided into three types of questions so it also considered key categories of a given issue. The targets as well as character of a survey were determined by a form of questionnaire and questions' concept. The students' FL was evaluated by 7 specific and practical (mathematical) tasks with multiple choices and one correct answer on the basis of content point of view. In the research, there was applied a verified and internationally respected procedure, which has also been used by the Global Financial Literacy Excellence Center (GFLEC) at the Washington university in the U.S. (e.g. Lusardi and Tufano, 2009).

We analyze correlative data dependence of selected variables and their intensity is analysed using Probit model. The research line is defined by a few hypotheses, and the main goal is to explain the impact of respondents' financial literacy in terms of their sex, high school background and university study program on financial habits:

H1: Level of respondents' FL connected to respondents' sex. The primary source of this hypothesis was a research made by an international study, PISA (2012, in cooperation with GFLEC). This research made a conclusion that male respondents are more frequently ranked at higher, but also lower levels of FL evaluation (wide variance of achieved FL level). Female respondents reached average results in this research. Our research primarily focused on a possibility of such differentiation between sexes in terms of FL in students of specific economic faculties in Slovakia.

H2: Level of respondents' FL defined as an input of students, which is connected to high school type. Many high school study programs offer different knowledge of FL. On the other hand, FL is inevitable in daily life of each individual who becomes a client, customer, debtor, creditor, etc. In this context, each individual should have a certain level of FL. The differences presumed by this hypothesis are of main interest of this research, while accepting a fact that only a part of population continues in the university studies.

H3: Level of FL is increased by completing economic study programs at the university. The individuals achieve the highest level of education by completing the university study programs also in economic field. It is estimated that those individuals who did not complete any economic study programs, or are at the beginning of such studies have significantly lower level of FL than those respondents who are about to complete their economic studies.

H4: Level of FL is connected to respondent's financial habits. Individuals learn to manage their money from childhood and thus obtain financial habits in diverse ways that affect their wellbeing throughout whole lives. We assume that those who have the appropriate financial habits will be able to achieve higher level of FL.

3 Results and Discussion

In our empirical research we run Probit regression that is interpreted by marginal effects in contrary of the Logit model (binary logistic regression) measuring the odds ratio of studied problem. Practical tasks used in survey questionnaire which enabled to evaluate the level of students' FL in selected economical faculties were thematically-oriented to financial skills and abilities of respondents in simple and complex interest rate, inflation, influence of interest rates on particular types of investments. In our analysis, the dependent variable is financial literacy, or financial illiteracy of students. Our dataset consists of 496 observation, where 320 were females and 176 were males.

In Table 1 are presented results of Probit analysis. This Probit model as a whole is statistically significant and overall percentage of cases that are correctly predicted by the model is 57.15 %. Model indicates, that expect variable Gender, no other variable has a statistically significant impact on financial literacy of our sample. Results show that a one unit change in the Gender variable, decreases the probability of being financial literate by -0.066575470. In this sense of analyzed variable Gender we can point out that men are 6.7 % less likely to be financial literate than comparable female respondents, while controlling for other variables in the regression.

Table 1 Probit regression

Coefficients:	Estimate	Std. Error	z value	Pr(>|z|)		Marginal Effects
(Intercept)	5.47862	146.95417	0.037	0.9703		
Gender	-0.27503	0.12031	-2.286	0.0223	*	-0.066575470
Education						
Business Secondary School	0.24059	0.16764	1.435	0.1512		0.058238704
Hotel academy	0.18705	0.42730	0.438	0.6616		0.045280294

Secondary vocational school	-0.07195	0.34980	-0.206	0.8370	-0.017416282
Year of study	-5.09719	146.95412	-0.035	0.9723	-1.233879175
Financial habits	0.01140	0.12228	0.093	0.9257	0.002759785

Source: own processing

Studied model as a whole defined gender as a statistically significant variable. Concerning compound interest and risk diversification, men of all respondents in our survey are less likely to respond correctly to the question compared to women. Generally, fewer men at all three Slovak economic faculties can answer all questions correctly compared to women. But, for instance, if we look deeper on students at EKF TUKE, male students of this faculty achieve higher level of FL than female students. For instance, where only 10.13 % of male respondents are financially illiterate, while this number is in female respondents much higher, 30.87 %. Similar results are consistent with majority of studies (Lusardi and Mitchell 2011; Prast and Soest, 2016; Klapper et al. 2015) where show significantly higher male success concerning financial knowledge than female one. Interestingly, the analysis does not prove statistically significant dependence ($p > 0.05$) of year of study between the first year undergraduates and those graduates who are in the final year of their studies. Comparison of levels of financial literacy as a whole at both input and output achieved comparable worth. Although the results of Probit regression showed no significance of this variable throughout the study sample, among the faculties themselves included in the questionnaire we can find certain differences. A frequency rate of financially illiterate students from EKF TUKE was lower at the end of their studies (9.68 %) as at the beginning of their studies (33.33 %). Similar connection was found out at NHF EUBA, where a rate of financially literate students of the first year (53.13 %) was lower than in students of the last year at particular faculty (72.34 %). Logical connection was found in two universities, in Košice and Bratislava, while analyzing the relation between FL level of respondents and level of their studies at the university. In both cases, the statistically significant dependency was confirmed ($p < 0.05$), which means that financial knowledge depends on completed level of study at particular university. However, this validity was not confirmed at FM PU ($p > 0,05$), where the rate of financially literate first-year students at FM PU forms 31.58 %, while only 27.78 % of the last year students are financially literate. Business Secondary School in comparison to Grammar School, or other types of high schools teach many subjects of economy and they provide primary or broadened knowledge of finances and economy for their students. Therefore, it was supposed that respondents who attended Business Secondary School would reach a higher level of FL, but based on these results we reject this hypothesis where we do not recognize any statistically significant dependency. According to fourth hypothesis linked to students' financial habits, there surprisingly prevail findings leading to no significant interdependence ($p > 0.05$). The analysis does not show that better financial habits of students necessary cause higher level of FL our sample. It could be caused by insufficient amount of tasks related to financial habits oriented to retirement planning and management. If we take a deeper look on these results, up to 73.19 % of students reported that they have not think about the financing of their pensions yet and did not search any information on retirement planning. Only fewer than one third of the sample of students indicated that they actually attempted to do a retirement saving calculation. Since the saving of funds for retirement is a long process dependent on savings strategies, the pension savings themselves should be long-term and regular, because only in that case could be the saver progressive in investment strategies and only in that case could he achieve adequate recovery (Cenker, 2017; Zvaríková and Majerová, 2014). One of research limits was uneven representation of respondents at researched faculties and the second one lower number of respondents of our sample. Three selected faculties of economy were examined due to procedural and technical difficulties of a given survey. This focus limits the outputs' generalization of the whole Slovak population.

4 Conclusions

It can take many years of experience to develop good financial habits, but the benefits of being responsible with spending are well worth any effort it takes to develop good financial skills needed for at least adequate and sustainable wellbeing and household budgeting. Financial problems and debts result from bad decision making and lower financial knowledge. One of the way to protect better financial future of students is highlight and amplify financial education at school and help students with understanding the ways in which individuals can avoid making financial mistakes on a regular basis and it is necessary to make sense of the funding policies on education programs to increase of their efficiency and equity. This study deals with evaluating of FL among university students with economic field. The aim of the research line contained explanation of the impact of respondents' financial literacy in terms of their sex, high school background and university study program on financial habits. By using Probit model we can conclude a statistically significant dependency between variables FL and gender where female students achieved higher level of FL and are more likely to be financial skilled compared to male, no other variable has a similar impact on FL of our sample. Further, analyzed model does not prove statistically significant relation of year of study, it means that first year undergraduates and those graduates who are in the final year of their studies achieved comparable score point of FL and we do not see significant development of student's financial skills after graduation in the majority of study programs. University students of our sample showed lower skills related to acquired financial habits than we assumed. Declared findings showed that the majority of students of our sample actually did not attempt to do a retirement saving calculation and do not yet have a substantial idea of what the amount of their pensions will be. Seeing that FL of individuals is able to influence the future state of their environment, it is crucial to focus further research on problems of FL of young and elderly as a important indicator of the country's future development.

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Tobacco Tax and Tobacco Consumption in Slovakia

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Abstract: *Selective consumption taxes and particularly the excise tax on tobacco and tobacco products represent the important source of income for the state budget of the Slovak Republic. In 2016 the tobacco tax revenue amounted to EUR 673.2 million, which represents 6.12% share of the total tax revenues.As the argument for increasing the excise taxes on tobacco products the idea that selective excise taxes have a significant impact on reducing the consumption of the taxed commodities, and thus contribute to mitigating the negative effects associated with their consumption, is widely used. The price sensitivity of the tobacco consumers has been indicated by several scientific papers, mainly from various health organizations. The aim of this paper is to verify whether the development of the excise tax on tobacco and tobacco products in SR indicates the sensitivity of the Slovak tobacco consumers to increased tax rates and prices as well as to determine the factors which could influence their elasticity.*

Keywords: tobacco tax, economics of tobacco, tobacco policy, demand for cigarettes, elasticity

JEL codes: D11, H21, H23

1 Introduction

This paper is a part of the ongoing research focused on the impact of the tobacco taxation on the consumption of tobacco products in Slovakia. The aim of the research project is to determine the main factors forming the consumer's response to the increased tax rate as well as to assess the real price elasticity of the demand for tobacco products in the Slovak Republic. We aim to analyse whether the small regular increases of the tobacco tax rates (as done by the Slovakia and most of the states worldwide) is an effective measure to reduce the tobacco consumption and if so under what conditions. By analysing the ways how consumers react to the increased tax, assessing the influence of the price on the new consumers and analysing the development of the tax revenues reaction to the increased tax we would like to sketch a theoretical framework for the future tax policy measures to be taken in this field.

Selective tax on consumption, and particularly excise duty on tobacco products represent an important source of income for the state budget of the Slovak Republic. In 2016 the revenue from the tax amounted to EUR 673.2 million, which represents 6.12% share of the total tax revenues. In order to justify the existence of a higher excise duties on tobacco products the governments often claim that selective excise taxes have a significant impact on reducing the consumption of taxed commodities, and thereby contribute to mitigating the negative effects related to their consumption while achieving preventive function. This argument appears also in the official legislative documents related to this tax. For example, in the explanatory memorandum of the law concerning the introduction of a minimum price for cigarettes in packs from November 2009 (Slovak Parliament Press, 2009) we can read: *"...according to the World Bank price increases of tobacco products are the most effective single measure to prevent smoking. A price increase of 10% decreases consumption on average adults about 4% in Member States with high income. More importantly, the impact of higher prices is likely to be greatest on young people, who are responsive to price rises than older people."*

With the continuous increase of the tax rates and the prices of tobacco products (see for example Válek, 2008) various questions arise. We will focus on the factors determining

the elasticity of the tobacco demand. The question is: What is the pattern of the smoker's reaction to the increased price of cigarettes? After determining the framework of the elasticity factors we will focus on assessing the characteristics of the tobacco demand elasticity in Slovakia.

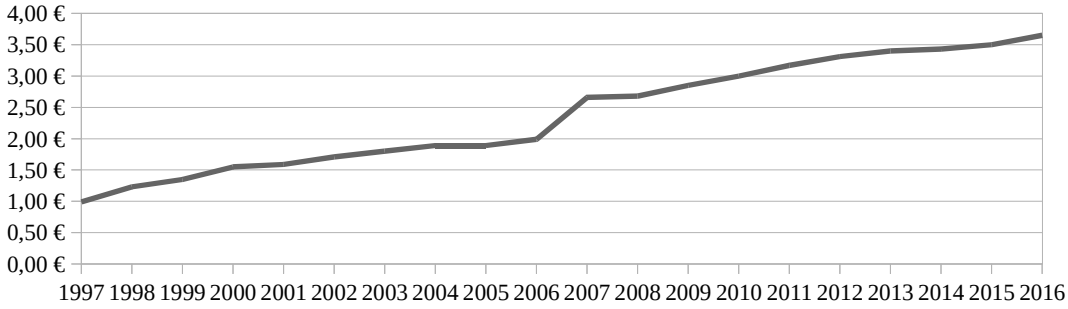
2 Analysis

Regarding the methodology of the research - we use the indirect indicators in order to assess the real cigarette consumption and thus to assess the impact of the increased tax. The reason is that we are not able to collect relevant data for all components of the tobacco consumption.

Results of many analyses of elasticity and the impact of the excise tax on tobacco products has confirmed relatively low elasticity of demand for tobacco products. According to the World Bank study 10% increase in tax has the effect of 4% reduction in consumption. Similar results can be found in work related to the impact of excise duty on tobacco products in developing countries. According Aloui (2003) an increase in excise duty on tobacco products in Morocco led to a decrease in consumption. Increase of the tax by 10% should reduce the demand for cigarettes among adults by 3.3%. The World Health Organization has several analyses which show similar results (e.g. Nassar, 2003). These analyses are based on estimates of elasticity and all recommended to increase the tobacco tax as one of the major tools to reduce the tobacco consumption. This reduction in consumption may occur as a result of reduced consumption of current smokers, and as a result of discouraging youth from start smoking (Rozada, 2002). At the same time the positive impact of the tax increase on the government revenue remained as well when the tax increase of 10% resulted in an increase in budget revenues of about 6%. Similarly in China, where the elasticity of demand is estimated between -0.65 and -1.0, analyses reveal mainly the fiscal importance of the tobacco tax. As reported by Hu (1997), if we assume a lower level of demand elasticity -0.65, then increased tax led to a price increase of 10%, a 6.5% decrease in sales volumes and simultaneously increase sales revenues by 2,9%. Given the effective tax rate 38% in 1992 these estimates imply the tax revenue growth by 18.2%. Conversely, if we assumed price elasticity of demand of -1.0 and assume that the tax is fully passed on to consumers, Hu stated that the doubling of the tax rate would reduce consumption by 40% while increasing tax revenues by about 20%.

The particular goal of our paper is to find the answer to the question: How tobacco consumers in Slovakia responds to increased price of tobacco products due to the increase in the tobacco tax rate? Is the current system of tobacco taxation in Slovakia forcing existing smokers to quit and deter the potential smokers to become permanent? As first we shall accept the fact that the increase of the tax is at least fully reflected in the price of the tobacco product. On the basis of empirical data, it can be confirmed that an increase in excise duty on tobacco leads to at least complete shift of burden on to consumers, which means an increase of the price of cigarettes by the amount of the tax increase.
Until 2010 the basis for the tax burden calculations was the price of the most sold cigarettes brand. Since 2010 all the brands on the market (cheaper brands as well as premium ones) are being considered. The WAP is calculated as the total value of all cigarettes released into tax free circulation, based on the retail selling price inclusive of all taxes, and the total number of cigarettes released into tax free circulation.
As we can see on Figure 1 the tax rate increase is reflected in prices. However, since the WAP is available for a limited time period only, we still use the most sold cigarettes price (Marlboro King Size), which is annually published by the Statistical Office of the SR.

Figure 1 Average Marlboro cigarettes price EUR/19 pcs. 1997 - 2016



Source: author, based on Slovak Statistical Office (SO) data

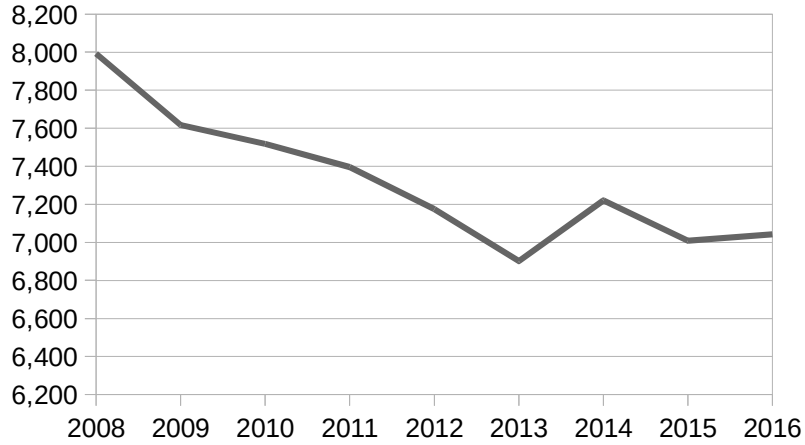
These values are not coherent to the Weighted Average Price of cigarettes. The WAP indicator would be more precise but it was introduced in European Union since 2010 only. However, the trend of the price development is comparable within the relevant time period. We can conclude that the tax increase is at least fully shifted on to existing consumers.

If we want to asses the impact of the increased price on consumption we would need the real data on the total tobacco consumption within the country. Total consumption of cigarettes (tobacco products) C*total* = consumption of the cigarettes sold (taxed) within the country (C*tax*) + consumption of the cigarettes purchased outside the country (C*out*) + consumption of the cigarettes smuggled into the country (C*smu*)

$$C_{total} = C_{tax} + C_{out} + C_{smu}$$

In order to asses the impact of the tax increase on consumption we shall eliminate the influence of the C*out* and C*smu* factors. Due to the nature if these factors it is not possible to rationally asses their volume[2]. In order to proceed in our analyse we shall assume that their volume is not increasing (given the tobacco prices in neighboring EU countries and Schengen area arrangements). However, regarding the size of the total consumption, estimations done by the biggest tobacco products distributor in Slovakia - Philip Morris International exist. We shall still keep in mind that these estimates do not cover the C*out* and C*smu* factors.

Figure 2 Total tobacco products consumption estimates of the Philip Morris International (billions of pieces)

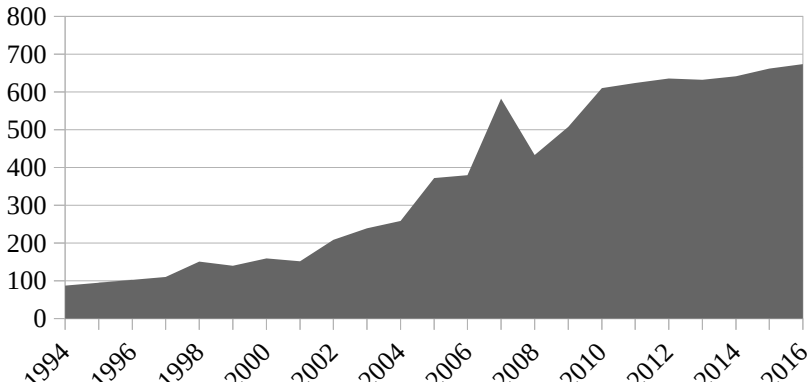


Source: Author, based on the Philip Morris International (PMI) data

[2] Yurekli and Sayginsoy estimated that in 1999, 3.4% of global cigarette consumption was illegal, whereas a study by Joossens et al. found that 11.6% of the global cigarette market is illicit.

However, if we take a look at the government revenue we will see a different picture.

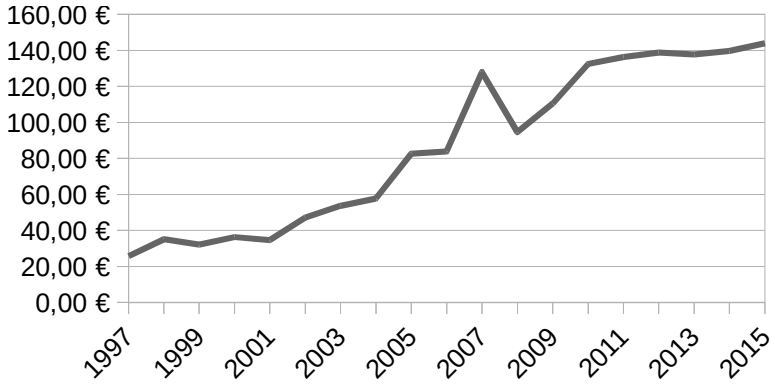
Figure 3 Total tobacco tax revenues in Slovakia 1994 - 2016



Source: author, based on Financial Directorate of the SR (FD) and SO data

Similarly, if we take the number of the people between 15 and 100 years of age (possible smokers) into consideration, we can observe the following development (Figure 6).

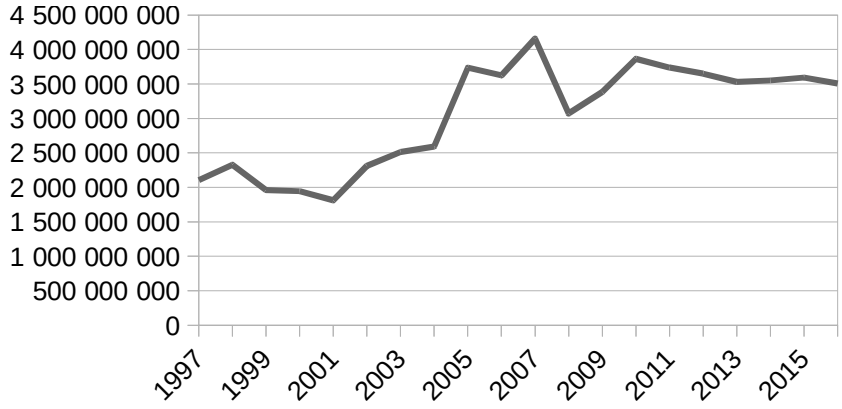
Figure 4 Total tobacco tax revenues per capita in Slovakia 1997 - 2015



Source: author, based on the FD and SO data

Other indirect indicator comprises of the total tobacco tax revenues divided by the average cigarette price (based on the statistical prices). This indicator, average tobacco unit, represents an indirect indicator of the consumed units of tobacco products (cigarettes).

Figure 7 Volume of the average tobacco units 1997 - 2016



Source: author, based on FD and SO data

Previously stated indicators provide an indirect insight into the tobacco products consumption. These shall be considered carefully in order to asses the real effects of the tax on consumption.

Despite the PMI estimates, given the indirect indicators, it is possible that the overall tobacco consumption in Slovakia is not declining in longer period.

It seems that smoking is not just a question of money. Smoking is an addictive consumption which means that smokers are "irrationally" unwilling to quit smoking. The impact of the increased tax on new smokers is unclear and shall be studied further.

If we want to proceed further in our analysis we shall understand how existing smokers react in case of the increased tax rate and price.

The demand for cigarettes is characterized by a low demand response to a moderate rise in the price of cigarettes. The demand for tobacco is specific and we can also call it "addictive" demand. A taxpayer who is forced to bear the selective consumption tax will have natural tendencies to avoid or at least mitigate it. His interest is to maintain the same level of utility / consumption as before introduction or increase of the tax.

Observed the smokers habits we formulated the following possibilities for the substitution (in hierarchical order):

1. to change 'expensive' cigarettes for cheaper cigarettes (cheaper brands);

2. to smoke relatively less taxed tobacco (hand-rolled cigarettes);

3. to search for smuggled (illegal) cigarettes;

4. to reduce the volume of consumed tobacco products

5. to quit smoking - the complete cessation of consumption – non-smoker.

Relevancy of such ways of substitution indicates the material Forecast of tax revenues and social contributions of government for the years 2013 - 2016 by the Institute of Financial Policy at the Ministry of Finance of the Slovak Republic (Hagara, Sporina, 2013):
"The performance of the tobacco tax remain slightly behind the expectations. Slovak Financial Authority and distributors of tobacco products suspect that since the end of last

year consumers of the cheaper brands of cigarettes substitute towards hand-rolled cigarettes and alternative tobacco products. In some regions of Slovakia the sale of the tobacco for own production of cigarettes continues at a price lower than the actual amount of excise duty, which indicates illegal (untaxed) production of tobacco. From these reasons the estimate of the tobacco tax revenue has been revised for about EUR 10 million in 2013."

So for the existing smokers to quit smoking is probably the least wanted reaction. Given the small price increases the consumers probably still have potential to absorb the higher price without significant change in the volume of consumption.

3 Results and Discussion

Observed development of the selected indicators show that the continuous tax increase is at least fully reflected by the price increase (full tax shift). The tax revenue measured by the absolute amount as well as per capita rises. This could mean either harder burden for the existing smokers or even more new smokers within the population. The indirect indicator, the average tobacco unit, shows stable development of the tobacco consumption. The real consumption is hard to observe directly. The estimates made by the biggest tobacco distributor might not reflect the C*out* and C*smu* factors. According to their estimates the real consumption decreases. Starting decline of the tobacco consumption and tax revenues in the last years could mean:

1. higher impact of the other factors (C*out* and C*smu*);
2. shift to the other tobacco products (less taxed) as hand rolled tobacco;
3. lower per capita volume of smoked cigarettes or decline in number of smokers;

Ad 1) This is very hard to asses. The out-of-country purchases are supposed to decline since the prices are getting comparable within Slovak neighbours. The real effectiveness of the border controls in case of Ukraine is complicated to asses.

Ad 2) This shift is very probable. It was indirectly confirmed for instance by the tobacco industry representatives, as well as the KPMG analysis. Richie Gretler – Regional Director Central Europe of the Imperial Tobacco in his investor day presentation on September 2010 stated as one of their business successes a growth of their „white stick" (hand-rolled cigarettes) share in four accession markets (Poland, Slovakia, Czech Republic and Hungary) from 22.3 per cent in 2004 to an estimated 25.7 per cent in 2010 (Gretler, 2010; similarly the KPMG, 2013).

All mentioned reactions of the consumers mean the higher propensity to substitution. This could mean that we have reached (at least temporarily) the breaking point on the Laffer curve in case of tobacco. However, it is not clear which way of substitution prevails. We assume that the cessation of smoking is hierarchically least reaction to a higher price. The deterrent effect of the price to the new smokers is also questionable since the motivations to start smoking are probably not sensitive to prices.

4 Conclusions

The total consumption of tobacco products in Slovakia is despite the data from tobacco distributors very difficult to asses. The level of tobacco products smuggled into the country or purchased abroad is impossible to determine. We were not able to acquire the official consumption data from the tobacco distributors. Based on the increase in tobacco tax rates, subsequent increase of tobacco products prices and tax revenues we could express a presumption that the demand for tobacco products in Slovakia is still relatively low elastic. The indirect indicator, the average tobacco unit, shows stable development of the tobacco consumption over observed period. This is contradictory to the estimates done by the biggest tobacco products distributor.

Given the current system of tobacco taxation (gradual small changes) the reaction pattern of the existing smokers suggests very low propensity to reduction or elimination of smoking. The potential smokers are probably not sensitive to current price changes of cigarettes as well. The other, non-financial, factors could play more important role in their case.

Reduction of the level of the tobacco products consumption by the tobacco tax could be seen more as the secondary effect and not as the main purpose of the existence of this tax. Therefore, we can assume that in the case of selective consumption taxes, it is rather a rigorous use of Ramsey's approach to taxation (i.e. fiscal function) than a real impact on the consumption of a harmful commodity in a short period of time. Research shows that with the gradually rising tobacco tax rates the absolute tax revenue rises as well. Thus, selective excise taxes are rather an effective source of public funds than a mean to smoking reduction.

Acknowledgments

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Multiple state models for critical illness policy

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Abstract: *The main goal of this paper is to apply multiple state models for an insurance policy combining disability income insurance benefits and critical illness benefits. We consider a policy with term 40 years to a life aged 25 which provides a death benefit, a disability benefit and a critical illness benefit. Using the data supplied by the Continuous Mortality Investigation (CMI) we calculate the premium payable continuously for this policy.*

Key words: multiple state model, stochastic process, Markov process, critical illness,

JEL Classifications: C51, C52, G22, J11

1 Introduction

The main goal of this paper is to apply multiple state models for an insurance policy combining disability income insurance benefits and critical illness benefits. The data we used in our contribution were supplied by the Continuous Mortality Investigation (CMI). The CMI is a research organisation established by UK actuarial profession.

Disability insurance, long-term care insurance and critical illness cover are becoming increasingly important in developed countries as the problems of demographic aging (Pacáková, V., Jindrová, P. (2014)) come to the fore. The private sector insurance industry is providing solutions to problems resulting from these pressures and other demands of better educated and more prosperous populations.

Critical illness insurance (CII) is a type of long term insurance that provides a lump sum on the diagnosis of one of a specified list of critical illnesses within the policy conditions. CII coverage includes (but is not limited) cancer, heart attack, stroke, coronary artery by-pass graft, kidney failure, major organ transplant, multiple sclerosis and other causes. CII has been very popular in the UK. UK sales peaked in 2002 when around 1 million new policies were issued by CMI Working paper 50 (2011). There is no restriction on how to spend the CII benefit. Most of the CII policies in the UK are linked to mortgages as this is a considerable financial commitment and diagnosis with a critical illness could affect the individual's ability to repay the mortgage. There are two types of critical illness policy: Full Accelerated, which covers both critical illness and death, and Stand Alone, which covers only critical illness. Most of the policies in UK are accelerated policies (88%) and they are attached to life insurance, term insurance or endowments. Typically, regular premiums are payable throughout the term while the policy is in force.

We describe the actuarial structure of disability insurance, long-term care insurance, and critical illness cover. Actuarial problems such as pricing and reserving are considered within the context of multiple state modelling, providing a strong and sound framework for analysing personal insurances.

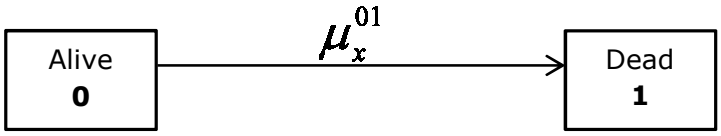
Our contribution is based on Markov process that can be used to develop a general, unified and rigorous approach for describing and analysing disability and related insurance benefits. The use of Markov process or Markov chain in life contingencies and their extensions has been proposed by several authors; for example Dickson, D. C., Hardy, M. R., & Waters, H. R. (2013), Haberman, S., & Pitacco, E. (1998).

2 Methodology and Data

Multiple state models are one of the most exciting developments in actuarial science nowadays. They are a natural tool for many important areas of practical interest to actuaries. They provide solid foundation for pricing and valuing complex insurance contracts.

We can represent life insurance survival model diagrammatically as shows Figure 1. An individual is, at any time, in one of two states, "Alive" or "Dead".

Figure 1 The alive-dead model



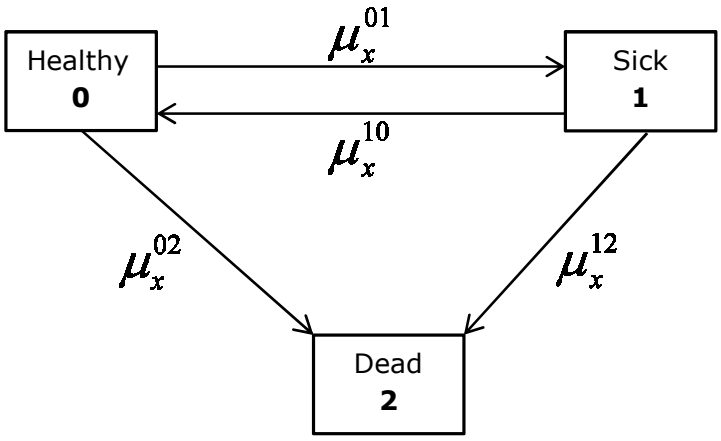
Source: Own processing

Transition from state '0' to '1' is allowed, as indicated by the direction of the arrow, but transition in the opposite direction is not possible.

We can use this simple two state model to reformulate the survival model such as we define a random variable $Y(t)$ which takes one of the two values '0' and '1'. Suppose we have an individual aged x years at time t=0. The event $Y(t)=0$ means that an individual is alive at age x+t, and $Y(t)=1$ means that an individual died before age x+t. The set of random variables $\{Y(t)\}_{t\geq 0}$ is an example of a continuous time stochastic process. We will assume that $\{Y(t)\}_{t\geq 0}$ is a Markov process. The alive-dead model represented by Figure 1 captures all the life contingent information that is necessary for calculating insurance premiums and policy values. The force of mortality μ_x^{01} fully describes the lifetime distribution.

But there are more complicated insurance policies which require more sophisticated models. These policies consist of a finite set of states with arrows indicating possible movements between them. Each model appropriate for a given insurance policy is constructed in a similar manner.

Figure 2 The disability income model



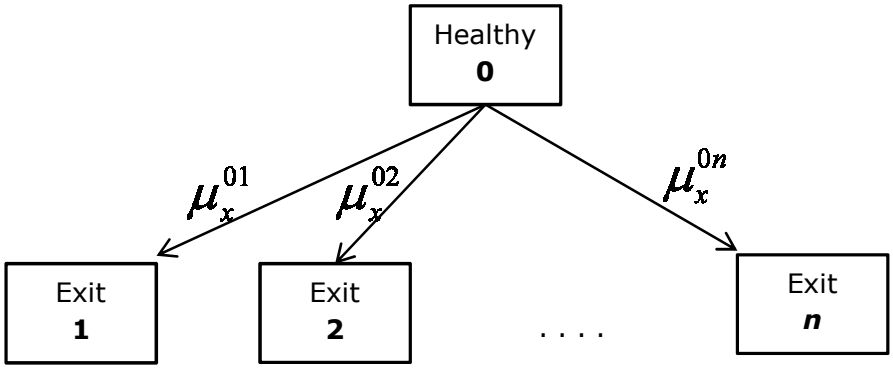
Source: Own processing

The condition for a payment relating to the policy, for example a premium, sum insured, is either that the individual is in a specified state at that time or that the individual makes an instantaneous transfer between a specified pair of states at that time.

The disability income insurance pays a benefit during periods of sickness, the benefit ceases on recovery. Figure 2 shows a model suitable for policy which provides an annuity while person is sick, with premiums payable while the person is healthy. The model represented by Figure 2 differs from that in Figure 1 in one important aspect: it is possible to transfer from state '1' to state '0', that is, to recover from an illness. This model illustrates an important general feature of multiple state models that is the possibility of entering one or more states many times. This means that several periods of sickness could occur before death, with healthy (premium paying) periods in between. This model has three states, and we can define a continuous time Markov process, $\{Y(t)\}_{t\geq 0}$, where random variable $Y(t)$ takes one of the value '0', '1' and '2'.

Other extension of the model illustrated in Figure 1 is a multiple decrement model. A multiple decrement model is characterized by having a single starting state and several exit states (absorbing states), but no further transitions. Figure 3 illustrates a multiple decrement model with n+1 states. A policyholder is supposed to be healthy at the time of the commencement of the policy and he/she stays in this state until at some time he/she transits to one of the n possible exit states that means a death or a critical illness occurred.

Figure 3 A multiple model with several exits



Source: Own processing

In general case, with states 0, 1, 2, …, n, we refer to μ_x^{ij} as the force of transition or transition intensity between states i and j at age x. The transition intensities are fundamental quantities which determine everything we need to know about a multiple state model.

Consider an insurance policy issued at age x and with term m years described by a multiple state model with n+1 states, labelled 0, 1, 2, …, n. Let

μ_y^{ij} denote the transition intensity between states i and j at age y,

δ_t denote the force of interest per year at time t,

$B_t^{(i)}$ denote the rate of payment of benefit at time t while the policyholder is in state i,

$S_t^{(ij)}$ denote the lump sum benefit payable instantaneously at time t on transition from state i to state j.

Then the policy value ${}_tV^{(i)}$ for a life in state i at time t is given by the **Thiele's differential equation**

$$\frac{\mathrm{d}}{\mathrm{d}t}\,{}_tV^{(i)} = \delta_t \cdot {}_tV^{(i)} - B_t^{(i)} - \sum_{j=0,\,j\neq i}^{n} \mu_{x+t}^{ij} \cdot \left(S_t^{(ij)} + {}_tV^{(j)} - {}_tV^{(i)}\right), \qquad (1)$$

for i = 0, 1, …, n and 0 < t < m.

We assume that δ_t, $B_t^{(i)}$ and $S_t^{(ij)}$ are continuous function of t. The premium is included within this model as negative benefit and expenses can be included as addition to the benefits.

We can use formula (1) to calculate policy values numerically. We choose a small step size h and replace the left-hand side of (1) by $\frac{{}_tV^{(i)} - {}_{t-h}V^{(i)}}{h}$.

We will then use Euler's method (starting with ${}_mV^{(i)} = 0$) to calculate the policy values at durations m-h, m-2h, …, h, 0.

3 Results

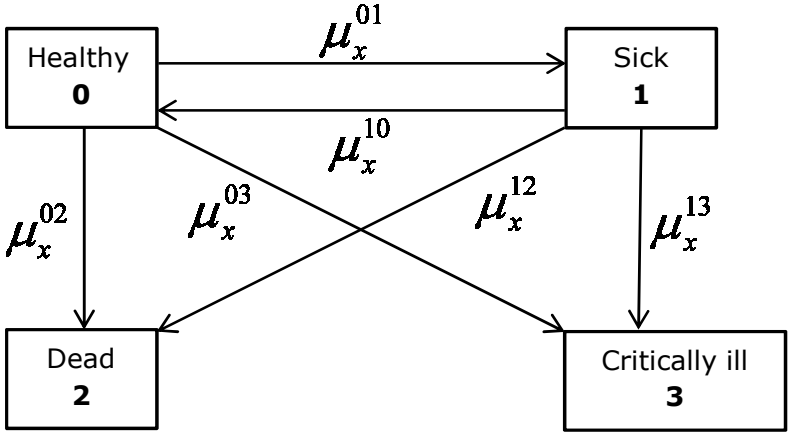
Consider the model (Figure 4) for an insurance policy combining disability income insurance benefits and critical illness benefits. An insurance company issues a policy with term 40 years to a life aged 25 which provides a death benefit, a disability benefit and a critical illness benefit as follows:

- a lump sum payment of 200 000 USD is payable immediately on the life becoming critically ill,
- a lump sum payment of 100 000 USD is payable immediately on death, provided that the life has not already been paid a critical illness benefit,
- a disability income annuity of 25 000 USD per year payable whilst the life is disabled payable continuously,

with no lapses and no expenses. (Expenses can be included in as additions to the benefits)

Premium is payable continuously provided that the policyholder is healthy. We assume an interest rate of 2 % p.a.

Figure 4 Schema of our model



Source: Own processing

For calculation we use transition intensities from the CMI Working paper 50. From these data we apply our model for particular critical illnesses: cancer and stroke for female population.

The transition intensities are as follows:

$$\mu_x^{01} = 4 \cdot 10^{-4} + 3{,}5 \cdot 10^{-6} \cdot \exp\{0{,}14 \cdot x\},$$

$\mu_x^{02} = 5 \cdot 10^{-4} + 7{,}6 \cdot 10^{-5} \cdot 1{,}094174^x$, (Gompertz-Makeham's law of mortality)

$\mu_x^{03} = \exp\{-13{,}425 + 0{,}09313 \cdot x\}$, for Stroke and

$\mu_x^{03} = \exp\{-10{,}135 + 0{,}08347 \cdot x\}$, for Cancer,

$$\mu_x^{10} = 0{,}1 \cdot \mu_x^{01},$$

$$\mu_x^{12} = \mu_x^{02},$$

$$\mu_x^{13} = \mu_x^{03}.$$

Thiele's differential equations for ${}_tV^{(0)}$ and ${}_tV^{(1)}$ are

$$\frac{\mathrm{d}}{\mathrm{d}t}\,{}_tV^{(0)} = \delta_t \cdot {}_tV^{(0)} + P - \mu_{25+t}^{01} \cdot \left({}_tV^{(1)} - {}_tV^{(0)}\right) - \mu_{25+t}^{02} \cdot \left(100\,000 - {}_tV^{(0)}\right) - \mu_{25+t}^{03} \cdot \left(200\,000 - {}_tV^{(0)}\right), \quad (2)$$

$$\frac{\mathrm{d}}{\mathrm{d}t}\,{}_tV^{(1)} = \delta_t \cdot {}_tV^{(1)} - 25\,000 - \mu_{25+t}^{10} \cdot \left({}_tV^{(0)} - {}_tV^{(1)}\right) - \mu_{25+t}^{12} \cdot \left(100\,000 - {}_tV^{(1)}\right) - \mu_{25+t}^{13} \cdot \left(200\,000 - {}_tV^{(1)}\right)$$

.(3)

Using Euler's method with a step size $h = \frac{1}{12}$ and with the boundary conditions ${}_{40}V^{(0)} = {}_{40}V^{(1)} = 0$ we calculate the policy values.

These equations we solve by using Excel build-in tool "Solver". Requiring ${}_0V^{(0)}$ to be equal to 0 (using equivalence principle) gives P_S = 1 435.59 USD for stroke and P_C = 1 773.26 USD for cancer.

4 Conclusions

We have presented an application of multiple state models to problems in actuarial science. There are various extensions of multiple state models. One way is to allow the transition intensities out of a state to depend not only on individual's current age but also on how long they have been in current state. This breaks the Markov property assumption and leads to the new process known as a semi-Markov process. This could be appropriate for the disability income insurance process where the intensities of recovery and death from the sick state could be assumed to depend on how long the individual had been sick, as well as on current age.

For the numerical solution of differential equations we used Euler's method. Its advantage is that it is relatively simple to implement. There are more sophisticated ways of solving such equations, for example the Runge-Kutta method.

The transition intensities are fundamental quantities which determine everything we need to know about a multiple state models. Therefore it would be useful to have data from domestic insurance industry. Our further research will focus on estimation of transition intensities for the Czech Republic (or other central European countries) in similar manner as in Pacáková, V., Jindrová, P., Seinerová, K. (2013).

There is a need for awareness of model risk when assessing an insurance policy combining disability income insurance benefits and critical illness benefits, especially with long term. The fact that transition intensities can be estimated does not imply that they can sensibly describe future medical development.

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Impact of R&D investments on earnings predictability

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Abstract: *The aim of this paper is to empirically investigate the impact of R&D investments on earnings predictability. R&D investments are considered to generate one of the most valuable companies' assets in the era of knowledge economy. This type of investment is however very different from more traditional forms of capital or financial investments. Firstly, R&D projects create more informational asymmetry between a reporting entity and investors. Information about firm's innovation activities is confidential and expected to be hidden from competitors and as a result disclosure level of R&D intensive firms is supposedly low. Secondly, technological and market outcomes of R&D are usually associated with uncertainty and it is very difficult to determine market success of invented products, innovative services and other research accomplishments. On the basis of these two assumptions, we hypothesize that earnings of R&D intensive firms are less predictable. On the sample of more than 900 firms listed on US stock exchange, we examine the relation between firm's R&D intensity and earnings predictability, controlling for firm's profitability, leverage ratio, size and industry affiliation. For measuring the predictability of earnings, we use accounting based metrics proposed by Francis et al. (2006) and Lipe (1990). Earnings predictability is very desirable property of company required by analysts and investors, our findings can have practical implications for estimating cost of capital and valuation of R&D intensive firms.*

Keywords: R&D, earnings predictability, intangible assets, R&D determinants, R&D disclosure

JEL codes: G30, G32, O32

1 Introduction

Intangible investment is a broad concept, which consists of several categories of expenditures like: employee training, brand enhancement, software development, building customer relationships and many more. Accounting rules put special emphasis on R&D investments requiring disclosing specific information in financial reports while other intangible investments are generally aggregated with other expense items and usually are not visible separately in financial statements (Guo et al., 2006). In consequence R&D outlays are supposedly one of a very few categories of intangibles reported directly in financial statements and can be easily investigated from researcher's point of view.

R&D investments are considered to generate one of the most precious assets in the economy. Companies put a lot of effort to invent not only new products and services, but also improvements in all aspects of company's activity like logistics, distribution, marketing, H&R, etc. (Fagerberg et al., 2009). Nowadays this type of investments involves a lot of resources and at the same time is very different from typical capital or financial investments like inputs in property, plant and equipment or governmental bonds. This distinction of intangible investments is especially important and troublesome for financial reporting.

The first and the most significant difference is uniqueness of R&D investment. As Aboody and Lev (2000) point out, radically new drugs under development or software programs are unique for the firm while other investments usually share common characteristics across companies within an industry. Similarly, the knowledge about R&D output and its profitability in one company is not very useful in estimating the output and profitability of R&D project in another firm, even in the same industry. As a result it is very difficult to estimate market success of invented products, services and other research accomplishments.

The second distinguishing feature and specificity of R&D investment, related to financial reporting, is informational asymmetry. As Zhao (2002) points out, information about research activity is confidential and is expected to be very hard to copy for competitors. Inventions are guarded internally by corporate procedures and outside the company by patents, trademarks, etc. Language used by scientists and inventors is very technical and hardly understandable for accountants. Therefore reporting R&D activity is a matter of disclosure requirements from one side and reluctance or even inability to report required information. This is the main reason of the underreporting of R&D expenditures.

The third problem in measuring the research output is that there is no organized market for R&D. Market prices serve an important role in the accounting process of asset recognition and measurement (marking-to-market). Physical and financial asset are usually standardized, homogenous products for which market prices are available to the public and this is not possible for R&D.

So far at least several studies have investigated the impact of R&D investment on the reported earnings, especially company's profitability and qualitative characteristics of earnings. One strand of research is focused on the relation between R&D expenditures and future profitability (Bublitz and Ettredge, 1989; Sougiannis, 1994, Ballester, Garcia-Ayuso, Livnat, 2003). The other group of studies is related to qualitative characteristics of earnings like value relevance and earnings management. Some of them documented a positive relation between R&D spending measures as current R&D intensity or growth and stock returns or market value (Hirschey and Weygandt, 1985; Shevlin, 1991; Lev and Sougiannis 1996; Chan et al. 2001; Chambers et al. 2002; Penman and Zhang 2002; Healy et al., 2002; Eberhart et al. 2004). Results of most studies suggest that information on R&D expenditures/assets is value relevant for investors. The others investigate the relation between R&D and earnings management (Perry and Grinaker, 1994; Mande et al. 2000; Seybert, 2010; Markarian et al. 2008). But there is still a paucity of research that explores other qualitative characteristics like earnings predictability. Our study aims to fill this gap and test what is the impact of R&D investments on earnings predictability.

Predictability is a very desirable property of earnings required both by analysts and investors. Lipe (1990) defines this as the ability of earnings to explain themselves. High predictability means that historical earnings are good estimates of current ones. Dichev and Tang (2009) point out that time-horizon of prediction is very limited, usually no more than one year. Conceptually there are two methodological approaches to predict future earnings. The first method is based on historical accounting data and time-series analysis (regression) and for this reason the measure of earnings predictability is called accounting-based. The second approach uses measures based on forecasts of market analysts. Das et al. (1998) note that this approach is superior because analysts' forecasts encompass much wider spectrum of publicly available information than reported in financial statements.

Hope et al. (2006) argue that low disclosure level negatively impacts earnings predictability what may translate into higher cost of capital and impairment of shareholder value. Furthermore they theorize that a low level of disclosure and unpredictable earnings are symptoms of informational asymmetry between management and shareholders. The level of earnings predictability is the function of earnings

surprises. The nature of R&D investments suggests that they may be a source of these surprises. Disclosure level of R&D intensive firms is supposedly lower and informational asymmetry is higher. Amir and Livne (2005) compare riskiness of investment in R&D to a football player contract. The output of research projects is in most cases very unpredictable and may result in a big success, but equally likely in failure. Investing in R&D resembles gambling what also should translate in less predictable earnings. The results of other studies provide more arguments supporting the above hypothesis. For example studies of Berk et. al (2002) and Ho et al. (2004) shows that investors require a higher rate of return from investments in R&D intensive firms. Another study of Kothari et al. (2002) documents that the future earnings stream generated by R&D investments is more uncertain than that generated by investments in tangible long-lived assets.

The luxury to invest in research projects is reserved only for companies with a stable cash position. R&D costs are usually one of the first to be cut in the time of financial stress. Hence companies with worse economic condition and less predictable earnings are less willing to invest in intangibles. Company's cash position and its profitability potentially may be important factors influencing relation between R&D spending and earnings predictability and that is necessary to control for them in our study.

Another important feature of R&D project is the time needed for a result to show off. It takes on average two years from the completion of the project to its commercial launch. There are few studies related to this issue, but most of them suggest that the result of a research project is determined after the period of two or three years (Lome et al., 2016; Leonard, 1971; Rapoport, 1971; Pakes and Shankerman, 1984). For the purpose of our research we assume that on average it will be a two-year period of time. For this reason we formulate the following hypothesis: R&D investments negatively impact earnings predictability after a two-year period.

Characteristics of the reporting entity have influence on the relation between R&D spending and the probability of its success. More than 70 years ago Schumpter (1942) noticed that large companies are better prepared to commercially exploit research inventions. Cifti and Cready (2011) provide empirical evidence that larger firms are able to generate more value per dollar invested in R&D and that they cause less earnings variability. They explain this phenomenon by a greater ability of larger firms to: (1) assure commercial success of newly invented products, (2) diversify R&D investments risks and (3) achieve spillover effect and (4) "cost spreading" advantages of R&D project. The latter one refers to the ability of larger companies to spread the R&D costs across larger sales bases and usually larger firms have more products, services and scale of operations, which can benefit from R&D inventions. Another phenomena – a "spillover effect" is defined as the ability of one discovery to stimulate breakthroughs in other related areas. The results of this study reveal a very important distinction. The size of the company may not be an important factor for inducing production of new inventions, however it is crucial to bring such innovations to the market and realize high profit margins. For this reason in our study we need to control for firm's size.

Another characteristic of high R&D companies is reluctance of bank sector to invest in R&D intensive companies. Barclay et al. (1995) document that companies in high R&D industries like biotechnology, pharmaceuticals, computers, software, etc. finance their operations mostly with equity. As a result we can expect lower R&D intensity in high leveraged firms.

In our study we assume that: firstly, investments in research projects create more informational asymmetry between reporting entity and investors and secondly, technological and market outcomes of such projects are in majority of cases difficult to predict. On the basis of these we theorize that earnings of R&D intensive firms are less predictable. In other words we hypothesize that level of R&D investments is a negative determinant of earnings predictability.

2 Methodology and Data

In order to test our hypothesis, firstly we need to measure predictability of earnings. We use accounting based metric of earnings predictability and follow in this regard model proposed by Francis et al. (2004) and Lipe (1990):

$$NI_{t+1} = \alpha + \beta\, NI_t + \varepsilon_t \quad (1)$$

where:

NI – net income

The measure of earnings predictability (EP) is estimated by regressing earnings in time t on historical data using the following formula (autoregressive model):

$$P = \sqrt{\sigma^2(\varepsilon_t)} \quad (2)$$

The lower the value of P the higher earnings predictability of earnings. We estimate P for each firm-year observation. In order to normalize and make earnings predictability measure more usable in the regression analysis, we use EP measure as a natural logarithm of P. We calculate earnings predictability using time-series regression on historical accounting earnings for ten-years period (2007–2016). We eliminate companies for which we have less than nine observations in time-series. For each company we obtain two measures of earnings predictability for the year 2016. One measure is calculated on the basis of the net income before tax (NI_BT) and the second measure on the basis of net income after tax (NI_AT). We also use two measures of R&D intensity we are commonly used in accounting research. The first (RD_INT1) is calculated as R&D expenses to sales and the second one (RD_INT2) as R&D expenses to total assets.

We test our hypothesis using the following model:

$$EP_{i,t} = RD\_INT_{i,t-2} + SIZE_{i,t} + LEV_{i,t} + ROA_{i,t} + IND_{i,t} \quad (3)$$

where :

$EP_{i,t}$ – measure of earnings predictability for *i*-firm in *t* time;

$RD\_INT_{i,t-2}$ – R&D intensity for *i*-firm in *t-2* time measured as R&D expenses to sales (RD_INT1) or R&D expenses to total assets (RD_INT2);

$SIZE_{i,t}$ – firm's size measured as natural logarithm of total assets;

$LEV_{i,t}$ – leverage of *i*-firm in *t* time measured as total debt to total assets;

$ROA_{i,t}$ – *i*-firm's profitability in *t*-time measured by return on assets (two measures, the first one ROA_BT is calculated on the basis of net income before tax and the ROA_AT – is calculated using net income after tax);

$IND_{i,t}$ – firm's sector affiliation.

In model we use values of all variables for the year 2016 except for R&D intensity, for which we use two-years lagged values - for the year 2014. We use OLS regression to test if R&D intensity is a significant determinant of earnings predictability.

Our sample consists of US stock listed companies. US GAAPs create a very unique regulatory setting with a conservative approach to R&D disclosure and require full expensing all R&D costs in income statement (with very few exceptions - e.g. software). In consequence it is possible to determine the level of R&D investment for each company-year observation.

Our initial sample consists of 10 003 US listed companies. We eliminate banks and financial institutions and observations with negative value of equity. Due to lack of available data required to calculate earnings predictability measure and R&D intensity ratio we end up with 943 firms for RD_INT1 and 909 firms for RD_INT2.

3 Results and Discussion

Correlation analysis presented in Table 1 and Table 2 shows that in most cases there is no strong correlation between variables used in the model. The only exception is correlation between firm's size and earnings predictability, what was previously expected given the Cifti and Cready (2011) theory. Additionally correlation analysis demonstrates that correlation between two R&D intensity measures (RD_INT1 and RD_INT2) is high (77%) but at the same time it demonstrates that they are not identical.

Table 1 Correlation matrix for variables EP and ROA before tax

Variables	EP_BT	RD_INT1_{t-2}	RD_INT1_{t-2}	SIZE	LEV	ROA_BT
EP_BT	1.000					
RD_INT1_{t-2}	-0.157	1.000				
RD_INT2_{t-2}	-0.208	0.770	1.000			
SIZE	0.889	-0.314	-0.362	1.000		
LEV	0.403	-0.176	-0.152	0.422	1.000	
ROA_BT	0.237	-0.578	-0.508	0.412	0.004	1.000

Source: authors' own elaboration

Table 2 Correlation matrix for variables EP and ROA after tax

Variables	EP	RD_INT1_{t-2}	RD_INT1_{t-2}	SIZE	LEV	ROA
EP	1.000					
RD_INT1_{t-2}	-0.132	1.000				
RD_INT2_{t-2}	-0.182	0.770	1.000			
SIZE	0.880	-0.314	-0.362	1.000		
LEV	0.400	-0.176	-0.152	0.422	1.000	
ROA	0.211	-0.576	0.505	0.410	0.012	1.000

Source: authors' own elaboration

In Table 3 descriptive statistics are presented. Some of variables were tailored and extreme values were cut off in order to eliminate outliers.

Table 3 Descriptive statistics of variables

Variables	Min.	Max.	Mean	Median	St. Dev.	Variance	Skewness	Kurtosis
EP_BT	0.759	16.928	10.181	10.185	2.065	4.265	-0.041	3.217
EP_AT	0.751	16.600	10.229	10.243	1.966	3.697	-0.073	3.457
RD_INT1_{t-2}	0.000	1.000	0.157	0.060	0.260	0.068	2.518	8.223
RD_INT2_{t-2}	0.000	1.000	0.108	0.045	0.176	0.031	3.093	13.465
SIZE	0.000	1.061	13.479	13.715	2.441	5.959	-0.250	3.129
LEV	0.000	0.992	0.522	0.539	0.262	0.069	-0.230	2.129
ROA_BT	-1.000	1.000	0.001	0.032	0.214	0.046	-2.089	13.080
ROA_AT	-1.000	1.000	-0.018	0.030	0.221	0.049	-2.080	12.284

Source: authors' own elaboration

In order to check robustness of our results we test our hypothesis using two measures of earnings predictability as dependent variables (EP_BT and EP_AT) and two measures of two-years lagged R&D intensity (RD_INT1 and RD_INT2). As a result we performed four regression analyzes reflecting all possible combinations (see Table 4).

Results of the regression analysis provide evidence that higher R&D investments lead to lower earnings predictability. In all combinations of EP and R&D intensity measures the latter one is a significant negative determinant of earnings predictability (the higher the value of EP the lower earnings predictability).

Table 4 Results of regression analysis for combinations of EP and RD_INT

		Results of regression analysis			
dependent vaiable	independent vaiable	Coeff	Std. error	t-statistic	p-value
RD_INT1_{t-2}	EP_BT	0,28852	0,14184	2,03 **	0,042
RD_INT2_{t-2}	EP_BT	0,79350	0,25482	3,11 ***	0,002
RD_INT1_{t-2}	EP_AT	0,34581	0,14852	2,33 **	0,020
RD_INT2_{t-2}	EP_AT	0,90944	0,26640	3,41 ***	0,001

		No. of obs.	Prob > F	R-squared	Adj. R-squared	Root MSE
RD_INT1_{t-2}	EP_BT	909	0,000	0,819	0,818	0,857
RD_INT2_{t-2}	EP_BT	943	0,000	0,818	0,817	0,861
RD_INT1_{t-2}	EP_AT	909	0,000	0,793	0,793	0,897
RD_INT2_{t-2}	EP_AT	943	0,000	0,794	0,793	0,897

Notes: *** Significance at 1% level; ** significance at 5% level; * significance at 10% level.

Source: authors' own elaboration

The results of the study for other – control variables reveals interesting and intriguing relations. Firstly, the theory formulated by Cifti and Cready (2011) postulates that larger firms are more able to control and exploit the benefits of R&D investments. We expected a positive relation between the size and earnings predictability. Unexpectedly regression analysis showed a negative relation, suggesting that the larger company the less predictable earnings are. Secondly, we noticed that leverage ratio is negatively correlated with R&D intensity (see Table 1 and Table 2), what is consistent with the observations that high-R&D companies finance their activity mostly with equity. However when we control for R&D intensity, regression analysis shows that the more indebted company the less predictable earnings are. The third control variable is consistent with our predictions and common sense. Regression analysis demonstrates that firm's profitability is a positive determinant of earnings predictability. Output of our empirical study also confirms that sector affiliation is an important control variable.

4 Conclusions

Our empirical findings provide evidence that the level of two-year lagged R&D investments is a negative determinant of current earnings predictability. We tested our hypothesis on the sample of more than 900 US listed companies using different measures of earnings predictability and R&D intensity. We learn from our study that profitability is a positive determinant and leverage ratio and firm's size are negative

determinants of earnings predictability. The latter one is difficult to explain and needs further investigation. Additionally the regression analysis shows that industry affiliation plays an important role in shaping earnings predictability.

Our study has several limitations. Firstly, we use only accounting-based measures of earnings predictability, which does not provide a complete picture of the problem. Further investigation is required to test the impact of R&D investments on earnings predictability using analysts' forecast measures. Secondly, we use small sample covering a short period of time. Extending time-horizon of the study would provide more convincing arguments. Thirdly, future research should extend the analytical framework of this study by including other variables, which potentially may influence quality of earnings, like for example audit quality (BIG-4 auditor) and influence of macroeconomic factors (i.e. financial crisis). Our study provides a new insight into the nature of R&D investments showing its negative impact on earnings predictability. Empirical results may be of use for company's valuation process and financial analysts.

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Financial resources of local government units in respect of the financial perspective of the European Union

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Abstract: Finance is the basis for the implementation of public tasks and determines the conditions of local economic development. One of the key issues relevant for local and regional development is the local government unit's capacity in investment activities. They are the most important category of beneficiaries of EU funds. Based on literature review, I have posed the following research hypothesis: there are four key indicators that determine the absorption capacity of the local government units as a beneficiary of EU funds. I have also analysed the relationship between total budget revenue, budget expenditure, results achieved and debt. I have found that: absorption capacity is closely correlated between the financial condition and the state of local finances, what means that changing in the financial system of local governments units does not affect the absorption capacity and can significantly reduce it. Data were obtained from the GUS Local Data Bank and studies by the Ministry of Finance, as well as data from the National Regional Councils of the Accounting Chamber, covering years 2007-2013.

Keywords: local government unit, absorption capacity of local government unit

JEL codes: H72, H77, F42

1 Introduction

Finance is the basis for the implementation of public tasks and determines the conditions of local economic development. One of the key issues relevant for local and regional development is the local government unit's capacity in investment activities. They are the most important category of beneficiaries of EU funds. Nowadays, one of the basic problems of functioning of local government units is the limited financial resources in relation to the scope of current tasks and reported investment needs. The rate of socio-economic development depends on the level and structure of income, which determines the investment activity of local government units [Poniatowicz, 2016]. In period 2007-2013, local government units received 17.3 bilion EUR, which constituted about 25% of all EU funds allocated to Poland [Raport…, 2013]. Approximately 80% of the funds raised by local governments are investment subsidies, which are an important source of financing local government investment [Kobiałka, 2013].

The aim of this paper is to identify the current key components that determine the absorption capacity of the local government units as a beneficiary of EU funds. The author is also trying to answer the question: how important it was to support EU funds in the implementation of the investment and how much caused the deterioration of the financial situation of local government units?

This problem is important not only from the point of view academic discussion, but also has many practical and political implementations. The unfavorable economic processes that have emerged in recent years in the polish local finance system have not affected the absorption capacities of local government units and can significantly reduce them. In this sense, the following determinants are important: limited stability and revenue efficiency, additional government performance without adequate financial compensation, and restrictive local debt monitoring system.

Absorption capacity is seen as the ability of the region to make efficient use of external financial resources and is essential to achieving economic and social cohesion [Brdulak,

2001]. Demand Absorption Capacity refers to the actual capacity of applicants for support to create good projects. Supply Absorption Capacity means financial capacity to co-finance programs and projects supported by the European Union.

Based on the research, it should be underlined, that local government units are a large group of beneficiaries of EU funds, [Kornberger-Sokołowska, 2010].

Assuming that, in the local finance system, there are four most important key components deciding on the capacity of absorbing local governments as beneficiaries of EU funds. These are: budget revenue, budget expenditure, results achieved and debt.

I have posted the following research hypothesis: (H1) absorption capacity depends on the level of budgetary income and expenditure (including current and capital), budgetary performance (general and operational), and local government debt.

Wojciechowski [2012] found, that the state of public finances allows to assess the functioning of the local government unit and its development possibilities. The level and structure of income that determines investment activity is decisive. Research showed, that total income is a strategic element in the local government finance system, not only from the point of view of the financial autonomy of local government units but also in the context of the possibility of applying for EU funds. The resources of own funds of local government units determine the possibility of using other, supplementary sources of financing [Sierak, 2015], what was confirmed also in other studies [Gonet 2013]. The limited stability of income of local government unit is due, inter alia, to frequent changes in the legal regulations related directly or indirectly to the local government unit. On the other hand, the yield of local government unit income sources is primarily influenced by macroeconomic factors, including economic fluctuations.

Another important factor negatively affecting local government finances is the commissioning by the state of additional tasks to local government units without guaranteed financial sources. The result of such actions is primarily the increase of local government current expenditures and, consequently, the need to reduce capital expenditures, including investment ones, also cofinanced from EU.

The next issue, significant from the point of view of absorption capacity, is the introduction of new debt limits, called as new debt limits, from January 2014 to the Polish local government system. Individual debt ratio (IWZ), as laid down in Art. 243 of the Public Finance Act of 2009 (Act, 2009). The new indicators are based on the operating surplus category and are much more restrictive than the existing regulations limiting the debt of local government.

Taking into account that repayable instruments (loans, municipal bonds) are treated by the local government units as an absorption tool, all mechanisms controlling the debt are at the same time mechanisms regulating absorption capacity. In the context of the tightening of the mechanisms for regulating local government debt, it is highly probable that some territorial government units may have a difficult access to financial resources from the European Union, primarily due to lack of capacity to supplement the own financial sources.

2 Methodology and Data

My hypothesis requires the analysis on national level. In order to measure the level of absorption of EU funds I have employed total income and total EU-CAPEX income, and for expenditure – total capex expenditure, debt level caused by the implementation of capex expenditure, due to the fact, that most studies confirmed, that these factors are most important determinant at EU funds absorption. Every variables are in bln PLN.

I have used a descriptive statistics method, using data from national accounts, covering the years 2007-2013. Data were obtained from the GUS Local Data Bank and studies by

the Ministry of Finance, as well as data from the National Regional Councils of the Accounting Chamber.

3 Results and Discussion

Important factors of effective absorption of EU funds are the factors resulting from the overall financial condition of local government units. Their measure is the financial capacity of local government units to guarantee adequate funds for the implementation of investment projects. Financial capacity is characterized by the level of income, the level of co-financing, the operating result, the deficit. My analyses has shown the following conclusions, table 1.

Table 1 Funds for financing and cofinancing of EU programs and projects in total income of local government units in the years 2007-2013

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Total INCOME, BLN PLN	131,38	142,57	154,84	162,80	171,31	177,41	183,46
EU-CAPEX INCOME, BLN PLN	6,62	5,45	14,51	13,79	16,35	17,08	16,01
CAPEX EXPENDITURE, BLN PLN	24,6	30,8	41,6	43,3	41,2	34,4	33,5
EU-CAPEX INCOME/TOTAL INCOME, %	5,03	3,82	9,37	8,47	9,54	9,63	8,73

Source: own study based on the Local Data Bank 2007-2013

Over the seven-year period, funds received annually by the local government units related to the implementation of EU programs and projects increased three times from the level of 6.6 billion PLN in 2007 to 16.01 billion in 2013. The share of EU subsidies in total incomes was different in different years (the lowest level was recorded in 2008 - 3.82%, the highest in 2011 - 9.54%). The share of investment expenditures makes it possible to draw conclusions about the freedom of local government administration. It can be considered that during the period 2007-2010 investment expenditures did not show any fluctuations in business conditions. From 2011 there is a decrease in investment expenditure, especially in 2012-2013. Limited investment scale was characteristic for the whole sector. It is also important to indicate how the debt of the local government unit was developed for programs and projects co-financed by EU funds, presenting table 2.

Table 2 Debt of local government units for programs and projects co-financed by EU funds in the years 2007-2013

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Total DEBT, BLN PLN	25,88	28,76	40,29	55,09	65,76	67,84	69,16
EU-CAPEX DEBT, BLN PLN	2,38	2,06	2,42	4,95	6,96	6,44	10,21
EU-CAPEX DEBT/TOTAL DEBT, %	9,20	7,16	6,00	8,99	10,58	9,49	14,76

Source: own study based on the Local Data Bank 2007-2013

At present, the share of total indebtedness does not exceed several percent, and in the analyzed period it was the highest in 2013 (14,76%), the lowest in 2009 (6%). The reason for the increase in the debt of local governments is also the new regulation

introduced in the Act on Public Finance. It mobilized local governments to intensify their indebtedness to old rules.

The remaining, important determinants of absorption capacity and investment capacity are general and operational budgetary outcomes. Table 3 presents changes in the general performance of local government unit (budget deficits / budget surpluses), collectively, in 2007-2013. The construction of an individual debt ratio depends on the operating margin, so the presented results are very relevant in terms of absorption capacity. On the basis of the data presented, one can postulate a thesis about systematically improving, roughly from 2011, aggregate operational results of local government in Poland. This is mainly the effect of the rule of at least balanced current balance of the current budget, effective since 2011. (Article 242 paragraph 1 of the Public Finance Act).

Table 3 Deficit and budget surpluses of local government units in period 2007-2013

	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Total DEFICIT, BLN PLN	2,27	-2,62	-12,99	-14,97	-10,29	-3,05	-0,38
BUDGET SURPLUSES, BLN PLN	17,72	17,74	11,96	9,28	10,99	11,63	14,34
EU-CAPEX DEBT/TOTAL DEBT, %	9,2	7,1	6,0	9,0	10,6	9,5	14,8

Source: own study based on the Local Data Bank 2007-2013

4 Conclusions

European Union funds are a significant source of funding undertakings in the area of local and regional development**.** Absorption capacity is perceived as the ability of the region to make effective use of external funds and depends on the conditions of making available these resources and on the level of socio-economic development and financial condition of local government units. In the financial economy in 2007-2013 there were disturbing phenomena that affected their financial standing. This can significantly reduce the possibility of raising funds from the EU in the future, because the capacity of the local government unit to apply for EU funding depends on the possibility of providing own. The most important threats include the reduction of financial autonomy of local governments and the reduction of their ability to finance investments. Consequently, the scale of local government investment has been reduced. Especially important is the increase in total indebtedness of local government units. However, the European Union does not fund projects, but it subsidizes, requires a specific contribution from the beneficiary. Growing budget deficit led to a significant increase in the level of debt. However, on the other hand, the limited total income of local governments units increases the demand for debt. Debt is also an indispensable instrument to increase the absorption capacity of local government units. Finally, my conclusions are following:

- absorption capacity of local government units is determined by the financial condition and state of local finance. This applies to budgetary revenue and expenditure (including current and capital / investment), budgetary performance (general and operational), and local government debt.
- the implemented investment activity, supported by the EU investment subsidies, did not significantly influence the increase in the debt of the local government sector,
- investment expenditures during the analysed period stay resistant for prosperity changes,

- in the period 2017-2013, the funds received annually by the local government unit related to the implementation of EU programs and projects increased three times (from the level of PLN 6.6 billion in 2007 to the level of PLN 16 billion in 2013).
- changing external conditions (prosperity, the law) may negatively affect the ability of local governments to secure their own funds necessary to absorb European funds in next years.

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Taxonomy of EU Member States from the View of VAT Imposed on Immovable Property (year 2017)

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Abstract: *The aim of the paper is to identify and systematize selected rules contained in the Council Directive 2006/112/ES on the common system of value added tax relating to taxation of immovable property and subsequently, while using cluster analysis, to divide EU Member States into groups according to VAT tax rates applicable. To identify the relevant legal norms contained in the Council Directive 2006/112/ES the legal regulation as valid and effective as to 01 January 2017 was taken into account. To carry out a classification of the EU Member States, the data published by the European Commission was utilized. For the reasons of cluster analysis, five possible VAT objects were taken into consideration (social housing, renovation and repairing, building land, supplies of new buildings and construction work on new buildings). On the basis of results reached one can observe that there is a relatively high variability in the rules established in legal regulations covering issues connected with immovable property. A presumption as to the utilization of exceptions and discretion given to the Member States can be considered as valid. At the same time the results reached prove that Member States can be divided into several groups that demonstrate high similarity in VAT taxation of immovable property.*

Key words: European Union, harmonization, immovable property, tax rate, VAT

JEL codes: H25, K34

1 Introduction

The Council Directive 2006/112/EC of 28 November 2006 on the common system of value added tax, as amended (hereinafter referred to as „Directive" only) represents a fundamental legal regulation of value added tax (hereinafter referred to as „VAT" only) in the area of the European tax law. As stated in the Directive, its aim is to contribute to the establishment of an internal market where conditions of competition are not distorted and the free movement of goods and services is not hindered (see item (4) of the Preamble of the Directive). The aim of the Directive is also to eliminate tax evasion or avoidance which occur in connection with the abolishment of internal frontiers (see e. g. items (27), (42), (55) and (59) of the Preamble of the Directive). Despite the existence of many (and in some aspects very strict) rules binding for the Member States there has been a certain level of discretion left. The Directive also lays a huge number of exceptions for many Member States. Above stated can be observed also in relation to the rules stated for the taxation of immovable property at which this paper is aimed. Its purpose is to identify and systematize some rules as rooted in the Directive just for the VAT object given and further more to divide the EU Member States into groups according to the VAT burden imposed on immovable property.

2 Methods and data

A part which deals with the identification and systematization of fundamental rules as stated in the Directive is based on a qualitative research – namely on a case study while using content analysis of legal documents to gain relevant information. The legal state as valid and effective as to 01 January 2017, if not stated otherwise, has been taken into consideration. Gathered information in connection with the data published by the European Commission (2017) creates the fundament for a cluster analysis. Its aim was to divide EU Member States on the basis of tax rates imposed on different types of transactions connected with immovable property. For the analysis carried out a tax burden for transactions as specified below was taken into consideration:

- Social housing;
- Renovation and repairing;
- Building land;
- Supplies of new buildings and
- Construction work on new buildings.

States which imply several tax regimes (*exemption with or without refund of tax paid at preceding stage* – zero rate) and/or different types of tax rates (*standard tax rate, reduced tax rate and/or super-reduced tax rate*) for the same transaction were excluded from the created data matrix. These States were included in one separate cluster for which above stated fact was the feature (see the chapter "Results and Discussion"). For the lack of data available also Luxembourg was excluded. To carry out the cluster analysis for the remaining EU Member States, the Ward method was used.

3 Results and Discussion

Fundamental terms connected with the VAT have been determined partly in the Directive itself and partly in its implementing legal regulation which is the Council Implementing Regulation (EU) No. 282/2011, as amended (hereinafter referred to as „Regulation"). The basic terms and criteria are shown in Table 1 below.

Table 1 Fundamental terms

Term	Definition	Specification
Building	Any structure fixed to or in the ground.	Article 12 of the Directive
Land on which a building stands	Detailed rules can be lay down by a Member States.	Article 12 of the Directive
Building land	Any unimproved or improved land defined as such by the Member States.	Article 12 of the Directive
Immovable Property	a) any specific part of the earth, on or below its surface, over which title and possession can be created; b) any building or construction fixed to or in the ground above or below sea level which cannot be easily dismantled or moved; c) any item that has been installed and makes up an integral part of a building or construction without which the building or construction is incomplete, such as doors, windows, roofs, staircases and lifts; d) any item, equipment or machine permanently installed in a building or construction which cannot be moved without destroying or altering the building or construction.	Article 13b of the Regulation

Term	Definition	Specification
Services connected with immovable property	Services with a sufficiently direct connection the immovable property, e. g.: a) the drawing up of plans for a building or parts of a building designated for a particular plot of land regardless of whether or not the building is erected; b) the provision of on site supervision or security services; c) the construction of a building on land, as well as construction and demolition work performed on a building or parts of a building.	Article 31a of the Regulation
	Where equipment is put at the disposal of a customer with a view to carrying out work on immovable property, that transaction shall only be a supply of services connected with immovable property if the supplier assumes responsibility for the execution of the work. A supplier who provides the customer with equipment together with sufficient staff for its operation with a view to carrying out work shall be presumed to have assumed responsibility for the execution of that work. The presumption that the supplier has the responsibility for the execution of the work may be rebutted by any relevant means in fact or law.	Article 31b of the Regulation

Source: own elaboration using Directive and Regulation.

As to the determination of the place of supply services connected with immovable property the Directive is very strict and logical – it is solely the place where the immovable property is located (see Article 47 of the Directive).

In relation to tax rates, the Directive is not so hard and fast. In fact there are set some rules (limitations), however, while respecting them the Member States can state their amount by themselves. Four types of tax rates are used: namely standard rate, reduced rates, zero rate and parking rate (see Article 96 – 122 of the Directive). The aim has been to reach the state where similar goods and services would bear the same tax burden in the territory of particular Member States. A Member State can use so called transition periods – they provide the Member State an extra time for the continuous adoption of domestic legal regulations to the rules stated by the Directive. During this transitional period, certain derogations concerning the number and the level of rates are possible (see item (31) of the Preamble of the Directive). The parking rate is a rate which is used on the basis of the transitional provisions of the Directive which aim is to moderate the impact of tax rate increase (Szarowska, 2009).

Until 31 December 2017 the standard rate shall be at least 15 % (Article 97 of the Directive). Reduced rates shall be two maximally (Article 98 of the Directive) not being lower than 5 % (Article 99 of the Directive). Some States apply so called super-reduced rate – that is a tax rate lower than 5 % (see Article 109 – 122 of the Directive).

Member States which, at 1 January 1991, were applying a reduced rate to housing may continue to apply such a rate. (Article 114 of the Directive) Member States can also exempt a supply of buildings or parts of a building before their first occupation including the lands on which the building stands and including the building lands. Member States can apply also criterion other than that of first occupation, e. g.:

- the period elapsing between the date of completion of the building and the date of first supply provided that this period does not exceed five years;
- the period elapsing between the date of first occupation and the date of subsequent supply provided that this period does not exceed two years.

In this respect it is worth mentioning that the European Union supports social housing as a service of general economic interest. Charter of Fundamental Rights of the European Union states, "*In order to combat social exclusion and poverty, the Union recognises and respects the right to social and housing assistance so as to ensure a decent existence for all those who lack sufficient resources, in accordance with the rules laid down by Union law and national laws and practices*.". (see Article 34 para. 3 of the Charter of Fundamental Rights of the European Union). Legal regulations contained in the Directive seem to be in perfect line with those contained in the Charter of Fundamental Rights of the European Union.

Member States may also allow taxable persons a right of option for taxation in respect of following transactions:

- the supply of a building or of parts thereof, and of the land on which the building stands, other than the supply referred to under Article 12 para. 1 letter a) of the Directive;
- the supply of land which has not been built on other than the supply of building land referred to in point (b) of Article 12(1) of the Directive;
- the leasing or letting of immovable property. (Article 137 of the Directive)

Totally 11 of all the EU Member States introduced the exemption – it means that supply of the goods and services are exempted from taxation. However, prevailing number of countries does not make refund of tax paid at preceding stage possible (hereinafter referred to as "ex") in such cases. United Kingdom represents the only state which makes refund of tax paid at preceding stage possible (hereinafter referred to as "0") with the exception of the sale of building lands. (European Commission, 2017) For more details see Table 2 below.

Table 2 Exempted transactions with and without refund of tax paid at preceding stage

	BE	DE	CY	LU	MT	AT	PT	SK	FI	SE	UK
Social housing					ex		ex			ex	0
Building land	ex	ex	ex	ex	ex	ex	ex	ex	ex	ex	
Supplies of new buildings		ex		ex	ex	ex	ex		ex	ex	0
Construction work on new buildings											0

Source: own elaboration using (European Commission, 2017).

Used abbreviations: BE – Belgium, BG – Bulgaria, CZ – Czech Republic, DK – Denmark, DE – Germany, EE – Estonia, IE – Ireland, EL – Greece, ES – Spain, FR – France, HR – Croatia, IT – Italy, CY – Cyprus, LV – Latvia, LT – Lithuania, LU – Luxembourg, HU – Hungary, MT – Malta, NL – Netherlands, AT – Austria, PL – Poland, PT – Portugal, RO – Romania, SI – Slovenia, SK – Slovakia, FI – Finland, SE – Sweden, UK – United Kingdom.

The list of supplies of goods and services to which the reduced rates may be applied is determined in the Annex III of the Directive as follows: "*provision, construction, renovation and alteration of housing, as part of a social policy*". (item (10) of the Annex III of the Directive); (European Commission, 2016b) VAT reduced tax rate can be applied not only for the construction but also for a renovation of social housing. Tax rates lower than 5 % (super-reduced tax rate) are applied by Estonia, Italy and Luxembourg. (European Commission, 2017) This rate can be used by the Member States which, on 01 January 1993, were obliged to increase their standard rate in force at 01 January 1991

by more than 2 %. Member States applying super reduced tax rate are shown in Table 3 below. (Article 114 of the Directive)

Table 3 Super-reduced tax rate in %

	ES	IT	LU
Social housing	4	4	
Supply of new buildings		4	3
Construction works on new buildings	4	4	3

Source: own elaboration using (European Commission, 2017).

A task of the European Union is to create a VAT system providing a possibility to apply a reduced rate for the construction and reconstruction of social housing by state, social and private providers as a fundamental living need of local nature which does not influence business activities among Member States, neither correct working of internal market. (European Commission, 2012)

Reduced tax rate in connection with the support of housing is applied by a half of EU Member States. The lowest one (5 %) is applied in Cyprus, Hungary and United Kingdom. The highest level of the reduced tax rate is applied in the Czech Republic – the tax rate is 15 % (European Commission, 2017). Reduced tax rates used in the EU Member States are show in Table 4 below.

Table 4 Reduced tax rate in %

	BE	CZ	IE	ES	FR	IT	CY	HU	NL	PL	PT	RO	SI	UK
Social housing	6 12	15	13.5	10	5.5 10	10	5	5		8	6	5	9.5	5
Renovation and repairing of the building for housing	6	15	13.5	10	5.5 10	10	5		6	8	6		9.5	5
Building land			13.5											
Supply of new buildings			13.5	10		10		5		8			9.5	
Construction work on new buildings	6 12		13.5	10		10				8	6		9.5	

Source: own elaboration using (European Commission, 2017).

Standard tax rate is used for the supplies for which no preferential regime is applied. The lowest standard rate in the amount of 17 % is used by Luxembourg. The highest one is in Hungary (27 %). Median of the standard tax rates amounts to 21 %. The summary of the standard tax rates is shown in Table 5 and Figure 1 below.

Table 5 Standard tax rates in %

	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV
Social housing		20		25	19	20		24		20	25			21
Renovation and repairing of the building for housing	21	20		25	19	20		24		20	25			21
Building land		20	21	25		20		24	21	20	25	22		21
Supply of new buildings	21	20	21	25		20		24	21	20	25	22	19	21
Construction work on new buildings	21	20	21	25	19	20		24		20	25		19	21

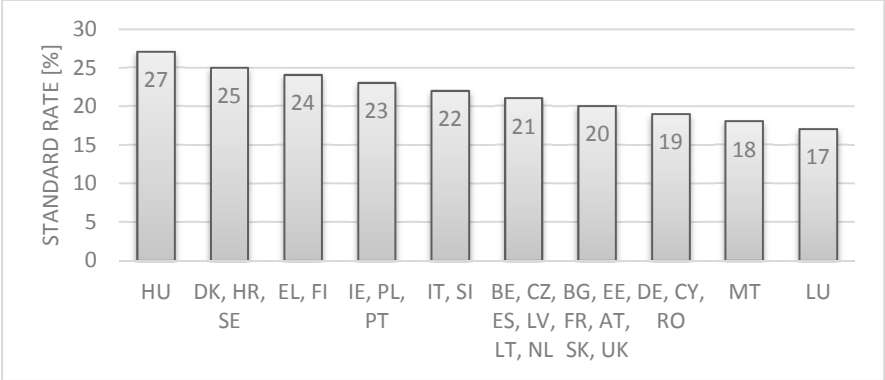
	LT	LU	HU	MT	NL	AT	PL	PT	RO	SI	SK	FI	SE	UK
Social housing	21	N/A	27		21	20					20	24	25	20
Renovation and repairing of the building for housing	21	N/A	27	18	21	20	23	23	19		20	24	25	20
Building land	21		27		21		23		19	22				20
Supply of new buildings	21		27		21	20	23		19	22	20			20
Construction work on new buildings	21	17	27	18	21	20	23	23	19	22	20	24	25	20

Source: own elaboration using (European Commission, 2017).

Used abbreviations: N/A = not applicable.

Ireland is the only EU Member State which does not apply standard rate for any assessed categories of transactions. Most of goods and services in this area are the subject to reduced tax rate in the amount of 13.5 %.

Figure 1 Standard VAT rates in 2017



Source: Own elaboration using (European Commission, 2017).

Above stated similarity disappears when taking account of tax burden of other types of transactions in connection with immovable property. Based on the results from the cluster analysis, one can observe that EU Member States can be divided into three basic clusters (see Table 6 below).

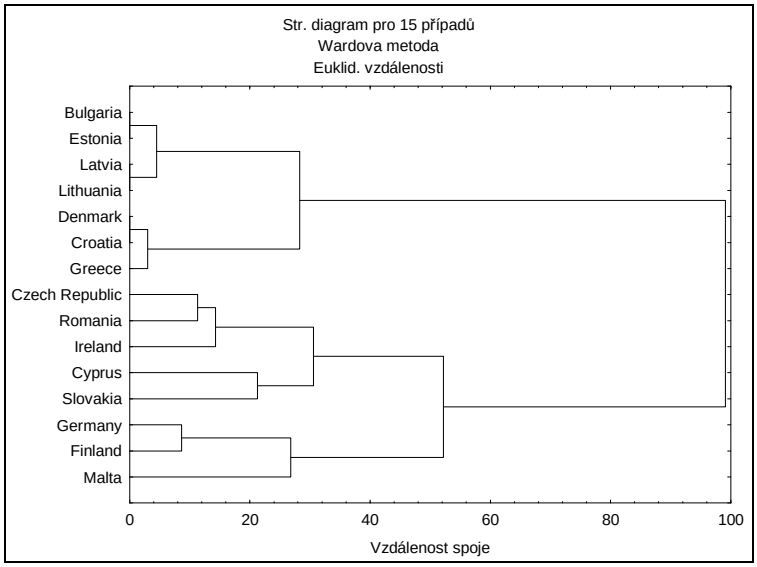
Table 6 Results of cluster analysis

	States included in the cluster
Cluster I	AT, BE, ES, FR, IT, HU, NL, PL, PT, SE, SP, UK
Cluster II	BG, DK, EE, EL, HR, LV, LT
Cluster III	CZ, CY, FI, GE, MA, SK, RO, IR

Source: own elaboration using results of cluster analysis.

The first cluster includes the Member States which apply different regimes, eventually different types of rates, for the same transaction (depending on specific conditions of the transaction). Cluster II and cluster III (see also Table 6 above and Figure 2 below) represent Member States which apply one regime/tax rate on particular transactions in question.

Figure 2 Results of cluster analysis



Source: Own elaboration.

Member States included in Cluster II are those which apply only one standard tax rate for all types of transactions in question. In this respect, Chalupka (2017) gives that the existence of a single VAT rate is in harmony with the theory of optimal taxation; it leads to the reductions in administrative costs and in tax evasions. EU Member States included in cluster III represent those which apply different regimes/tax rates for particular transactions, however, with no variability as to the regimes/tax rates for a particular transaction.

4 Conclusions

As stated by Široký (2008), the essence of the VAT is taxation of added value which is a value that a payer add to the value of purchased goods and services. Thus, taking account of the value of immovable property and connected services, the rules for VAT and tax rates are of great importance. That is to say, the VAT can influence significantly the final price of the immovable property and/or services connected with immovable property. Then, it is a very sensitive political issue, especially in respect of new construction and social housing.

From the results reached one can observe that there are significant differences in the rules stated by the Member States for imposing the VAT on immovable property and connected services. It seems that the discretion given by the Directive is widely used. Only several Member States use one tax rate for all the transactions in question. Member States evidently prefer other aspects than those of administrative costs. Some of them even find themselves in breach of the rules in relation to tax rates (European Commission, 2016a). The results reached also suggest that it is possible to distinguish three basic groups according to the VAT rules for the immovable property and connected services.

The rules for VAT rates are currently considered as inconvenient for several reasons (for more details see e. g. (European Commission, 2016a)). There are some proposals how to solve it. A relatively progressive proposal stated by the European Commission (2016a) is that "… *all currently existing reduced rates, including derogations, legally applied in Member Stated would be maintained, the possibility to apply them could be made available to all Member States*". This solution would be, according to the opinion of the authors of the paper, in line with the principle of prohibition of discrimination. The fact that some Member States met certain conditions in the past has not been a sufficient

reason for taking the same advantage from other Member States. However, such a solution could create other serious problems (including those for public budgets).

Acknowledgement

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The Impact of E-sales on Birth and Death Rate of Businesses in the Czech Republic

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Abstract: *Since 2016 the Czech Republic has gradually been implementing the system of electronic records of sales of goods and services in cash – ´E-sales´ (Czech abbreviation: EET). It is a modern communication means between entrepreneurs and the Financial Administration of the Czech Republic. The objective of this article is to evaluate, with the support of the latest data by the Czech Statistical Office, the influence of the electronic register on the birth and death rate of businesses in the Czech Republic in 2016. The contribution compares the differences between the number of newly-established and closed business units according to their size, the declared legal form of enterprise, and the basic level of nomenclature of economic activities (CZ-NACE) in the years 2010 – 2016. Methods of comparative analysis and analysis of trends are used. At the end of the paper, thanks to the net balance analysis and the average annual growth rate of new businesses analysis, we disprove the hypotheses about the significant impact of the new system introduction on the number of small and medium-sized businesses in the Czech Republic (mainly natural persons and legal entities – limited liability companies), as well as on the number of active business units according to selected economic activities in which the system was started in the first phase.*

Keywords: business, business environment, E-sales, national economy

JEL codes: L25, L26, O10

1 Introduction

On 1st December 2016, a new sales reporting system has been launched in the Czech Republic. The main purpose of the electronic records of sales is for businesses to report their cash sales directly to the tax authority via an online system. Technically, the tax payers' cash registers have been connected to a server of Ministry of Finance ("MF"), and have to exchange information about sales in real time. The MF server provides a unique transaction code, which has to be printed at each receipt from the cash register. (TPA, 2016)

This obligation applies to all business entities taxable by income tax in the Czech Republic, if they receive payments for their goods or services in a different way other than a wire transfer (e.g. cash, a credit/debit card, a check, etc.). The Tab. 1 shows the starting dates for different industrial sectors.

Table 1 – Phases of Electronic Records

Phase	Starting as of	Applicable to
1st Phase	1st December 2016	Accommodation and catering services
2nd Phase	1st March 2017	Retail and wholesale
3rd Phase	1st March 2018	Other activities except those included in the 4th phase, for example freelancers, transport, agriculture
4th Phase	1st June 2018	Selected crafts and production activities

Source: collection of Laws (2016), Records of Sales Act

The biggest group of opponents of this Act are self-employed persons (according to Matzner, 2015), where this author also explains the main difference between the cash register and the E-sales. The cash register saves the data about sales into the internal memory, while system E-sales saves data online into the system of Financial Administration. This solution looks more effective in written form, because it uses the modern technology. However, exactly this moment could be the biggest problem of this method, because it requires not only constant access to these technologies, but also the ability to use them, for both sides – state, as well as the obligated entities. The constant access to the internet enabling the connection with the server of Financial Administration is more or less achievable. However, both large retail chain and small self-employed persons need to get all necessary technical equipment and all required software, and both of them have to learn to use these technologies. This could be the most critical point for small self-employed persons, because this request could have fatal consequences for many of them. The concerns of self-employed persons are understandable, because especially small self-employed people will be under the greatest administrative and financial pressure, where huge companies will still continue doing tax evasions. Moreover, considering turnover of these companies, these evasions will be probably significantly higher than can be done by any self-employed person.

The business entities are one of the most important aspects in modern history. They are a source of basic economic values, they determine the pace of economic and technological development, and they are the object of this development too. Due to employing a large part of the population they play a significant role in social systems of society, affect the character of the regions, the development of society, politics, culture, and many other branches. (Geršlová, 2012) The institutions have the impact on the quality of entrepreneurial activity and they affect the process of economic development. (Acs, Desai, Hessels, 2008)

The survey about the number of newly established and closed down business units is one of the most important indicator of the condition and of the level of entrepreneurial environment in macroeconomic context. The annual increase in number of business units can be considered as a signal of climate favourable for entrepreneurship, which consequently helps to develop the business sector, increases the employment, and increases the economy growth as well. (Hamplová, Kovárník, 2016), (Hamplová, Kovárník, Jedlička, 2016)

2 Methodology and Data

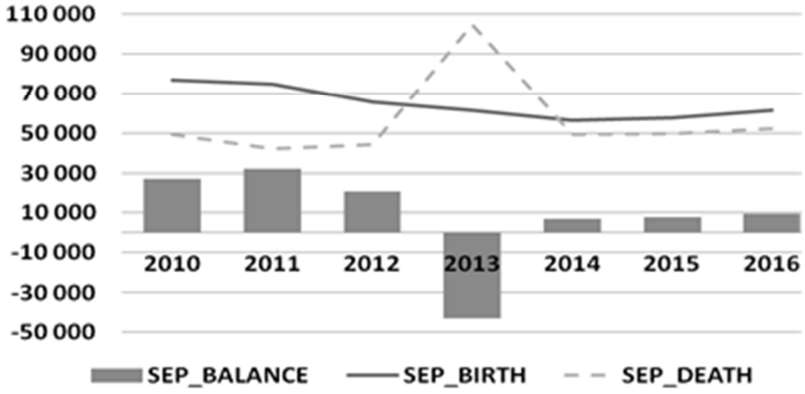
The internal database of Czech Statistical Office obtained from the Register of economic subjects has been used during the analysis in this article. The information about newly established and closed down business units between 2010 – 2016 has been obtained on the Department of Information Services of Czech Statistical Office. The data are analysed according to the legal form of business units, according to their size (number of employees), and according to the nomenclature of economic activities "CZ-NACE". Authors analyse only data for the whole Czech Republic, they do not analyse any regional disparities in this article. As far as methodology is concerned, the method of trend

analysis has been used for evaluation of number of newly established and closed down business units. This trend analysis means mostly year-on-year growth rate, which measures relative change of analysed variable with respect to previous period. Based on the aim of this article, the value in the year 2016 is crucial. For complex evaluation of the tendency in the number of newly established and closed down business entities between 2010 – 2016 has been used the value of average growth rate as a geometric mean of each growth coefficients.

3 Results and Discussion

The first part of analysis is about the development of number of business entities according to the legal form between 2010 – 2016. It means analysis of tendency among self-employed persons in total, and among the biggest group of them – private entrepreneurs in business under the Trade Act. As self-employed persons are considered also agricultural entrepreneurs – natural persons, and others (e.g. physicians, veterinarians, auditors, etc.). It is obvious that the number of newly established self-employed persons (SEP) is for 7% higher in 2016 than in 2015, where the number of closed down units in 2016 is higher for 5% than in 2015 (Figure 1).

Figure 1 Number of newly established and closed down units between 2010 – 2016 in the legal form Self-Employed Person (SEP); Year-on-Year Growth Rate of SEP

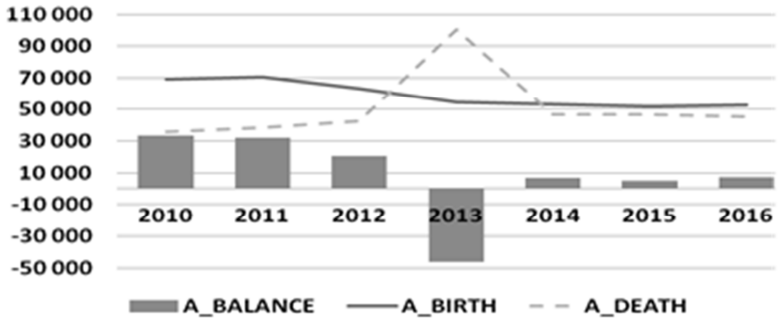


	2010	2011	2012	2013	2014	2015	2016	Ø10-16
SEP_BIRTH	1,12	0,97	0,88	0,94	0,92	1,02	1,07	0,9841
SEP_DEATH	0,54	0,85	1,05	2,35	0,47	1,01	1,05	0,9217
SEP_BALANCE	-1,16	1,19	0,65	-2,04	-0,16	1,11	1,21	

Source: own research based on data from the Czech Statistical Office (2016)

The analysis shows (Figure 2) that in the A group (private entrepreneurs in business under the Trade Act) is the number of newly established in 2016 only for 2% higher than in 2015. The number of closed down units is even for 3% lower in 2016 than in 2015. Significant decrease in this category has not been shown.

Figure 2 Number of newly established and closed down units between 2010 – 2016 in Private entrepreneurs in business under the Trade Act (A); Year-on-Year Growth Rate

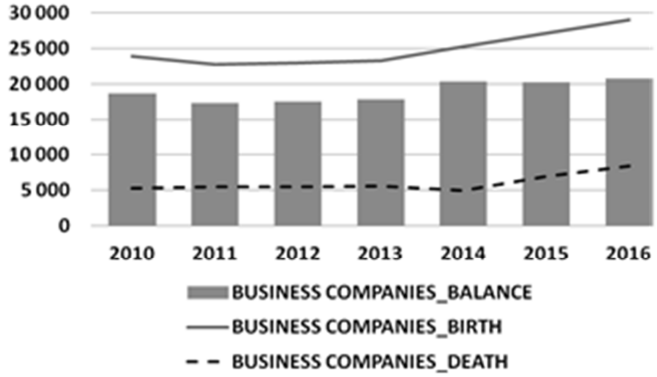


	2010	2011	2012	2013	2014	2015	2016	Ø10 -16
A_BIRTH	1,07	1,02	0,89	0,86	0,98	0,97	1,02	0,9719
A_DEATH	0,94	1,08	1,10	2,36	0,46	1,00	0,97	1,0251
A_BALANCE	1,27	0,96	0,64	-2,24	-0,15	0,74	1,46	

Source: own research based on data from the Czech Statistical Office (2016)

Next analysis focuses on the tendency among entrepreneurs – legal persons, where these legal persons are in the Czech Republic limited liability companies (LLC), joint-stock companies, limited partnerships, general commercial partnerships, and cooperatives. The most frequently used type is Limited Liability Company. It is obvious that the number of newly established business units in total (see Figure 3) is for 7% higher in 2016 than in 2015, as well as in 2015 and in 2014. Consequently, the number of closed down business units in 2016 is for 21% higher than in 2015, however, this value is even higher in 2015 compared with 2014 (39%). Same results can be seen in the analysis of LLC only (see Figure 4). It is possible to see increased business units loss, however, this loss is not any extreme happening only in the year 2016.

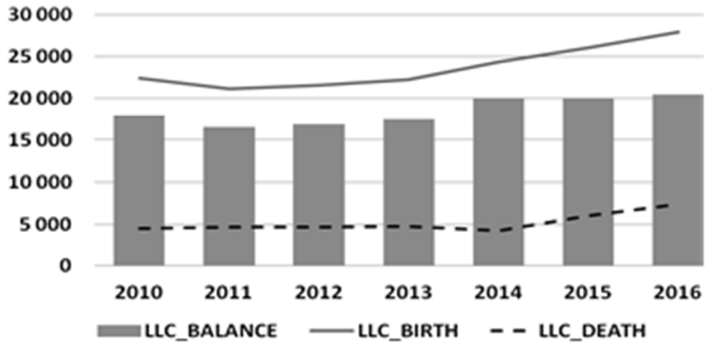
Figure 3 Number of newly established and closed down units between 2010 – 2016 among the legal persons (Business Companies); Year-on-Year Growth Rate of Business Companies



	2010	2011	2012	2013	2014	2015	2016	Ø10 -16
BUSINESS COMPANIES_BIRTH	1,04	0,95	1,01	1,01	1,08	1,07	1,07	1,0340
BUSINESS COMPANIES_DEATH	1,01	1,03	1,01	1,01	0,89	1,39	1,21	1,0688
BUSINESS COMPANIES_BALANCE	1,05	0,93	1,01	1,02	1,14	1,00	1,02	1,0224

Source: own research based on Czech Statistical Office (2016)

Figure 4 Number of newly established and closed down units between 2010 – 2016 among the legal persons Limited Liability Companies (LLC); Year-on-Year Growth Rate of LLC



	2010	2011	2012	2013	2014	2015	2016	Ø10 -16
LLC_BIRTH	1,03	0,94	1,02	1,03	1,10	1,07	1,07	1,0363
LLC_DEATH	1,02	1,04	1,01	1,01	0,91	1,39	1,23	1,0763
LLC_BALANCE	1,04	0,92	1,02	1,04	1,15	1,00	1,02	1,0244

Source: own research based on Czech Statistical Office (2016)

Next analysis focuses on the development in the number of business units according to the size of these units (number of employees, see Table 2) between 2010 – 2016. The authors are using 11 different groups, where the analysis of year-on-year growth rate has been done. The analysis shows that the highest number of newly established compared with 2015 is in the group with 50 – 99 employees (56%), but relatively high numbers of newly established units in 2016 compared with 2015 are in the group with 250 – 499 employees (25%) and in the group with 6 – 9 employees (15%). The analysis of closed down units is the highest number in 2016 compared with 2015 in the group with 250 – 499 employees (40%), next in the group with 100 – 199 employees (8%), and after that in the group without any employees (5%). With respect to the other groups, there can be seen even decrease in the number of closed down units in 2016 compared with 2015. The significant decrease in the number of micro-, small-, and medium-sized companies has not been proven.

Table 2 Year-on-Year Growth Rate of newly established and closed down units between 2010 – 2016 in different groups according to the size

Size of business (number of employees)	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Ø2010 - 2016**
not reported_BIRTH	1,04	0,79	0,92	1,69	0,64	1,01	1,01	0,9759
not reported_DEATH	0,55	0,83	1,09	3,04	0,35	1,04	0,99	0,9165
0*_BIRTH	0,97	1,26	0,85	0,16	4,15	1,12	1,01	0,9625
0*_DEATH	0,78	1,17	1,16	1,39	0,75	1,00	1,05	1,0203
1 - 5_BIRTH	1,36	1,00	1,01	0,96	1,01	0,99	1,04	1,0479
1 - 5_DEATH	1,05	0,99	1,11	1,09	0,86	1,06	0,83	0,9928
6 - 9 _BIRTH	1,14	1,01	1,09	0,88	0,88	1,06	1,15	1,0227
6 - 9 _DEATH	0,92	0,75	0,80	1,22	0,66	1,13	0,89	0,8936
10 - 19 _BIRTH	1,27	0,92	1,05	0,89	0,92	0,94	1,09	1,0052
10 - 19 _DEATH	0,70	0,76	0,74	0,80	0,70	1,14	0,98	0,8193
20 - 24_BIRTH	1,62	0,48	1,74	0,79	0,77	1,24	0,85	0,9798
20 - 24_DEATH	0,74	0,81	0,86	0,53	0,70	1,21	0,71	0,7726
25 - 49 _BIRTH	1,32	1,01	1,04	0,81	0,86	0,84	1,05	0,9785
25 - 49 _DEATH	0,61	0,94	0,71	0,62	0,79	0,91	0,94	0,7774

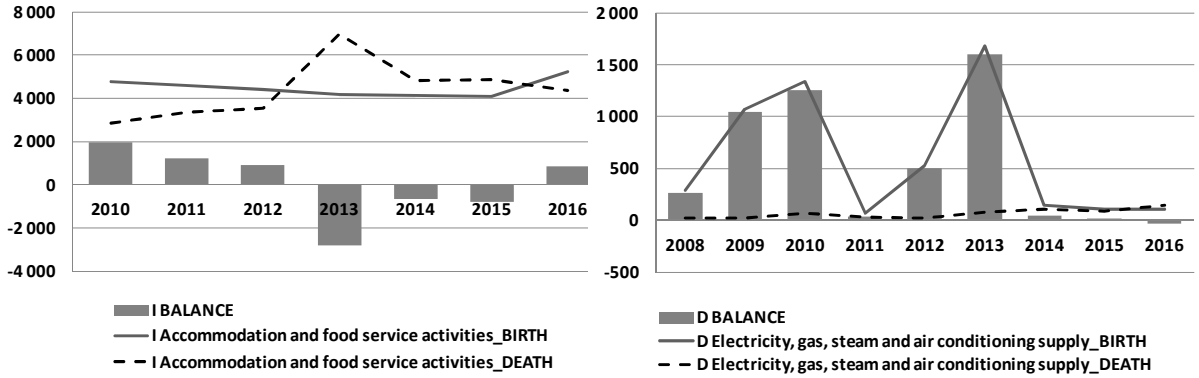
50 - 99 _BIRTH	1,82	0,61	1,03	0,84	0,78	0,86	1,56	1,0000
50 - 99 _DEATH	0,73	1,72	0,42	0,65	0,65	0,85	0,76	0,7561
100 - 199 _BIRTH	0,81	1,54	0,95	0,58	0,82	1,89	0,53	0,9211
100 - 199 _DEATH	1,05	2,13	0,34	0,34	1,20	1,08	1,08	0,8671
200 - 249 _BIRTH		0,33	4,00	0,75	1,00	1,00	0,33	0,8327
200 - 249 _DEATH	0,42	1,80	0,44	1,00	1,00	1,25	0,40	0,7742
250 - 499 _BIRTH	3,00	0,33	1,00	1,00	0,25	4,00	1,25	1,0324
250 - 499 _DEATH	0,80	1,38	0,45	1,00	0,50	1,00	1,40	0,8607
* without employees								

Source: own research based on Czech Statistical Office (2016)

The last part of trend analysis focuses on last important factor, which can reveal the fact that the introducing of E-sales in 2016 affected in a way the establishment and the termination of business units in the Czech Republic. Based on the analysis of newly established and closed down business units according to the economic activity is possible to see following results. 21 different nomenclatures of economic activities have been analysed. It is possible to identify (see Figure 5) high relative increase of newly established units in nomenclature I – Accommodation and food service activities, where this increase was for 27%. The second highest increase (16%) has nomenclature H – Transportation and storage, and the third highest has S – Other service activities (13%). With respect to the relative decrease in the number of business units, the biggest change has nomenclature D – Electricity, gas, steam and air conditioning supply (increase for 56%), the second highest (34%) has nomenclature R – Arts, entertainment and recreation, and the third highest (31%) has B – Mining and quarrying.

The most surprising is non-standard increase of business units in nomenclature O – Public administration and defence, compulsory social security (for 276% in 2016), and even higher decrease of business units in this nomenclature, where this decrease for 21times higher in 2016 than in 2015. However, this extraordinary situation cannot have influence on the verification of hypothesis about the influence of E-sales on the number of newly established and closed down business units. It can be assumed that in NACE No. 84 will be non-standard business units, where these units will be probably freed from registration. Based on the Act No. 112/2016, §12 (according to Collection of Laws, 2016), about the registration of sales, the contributory organizations are freed from the electronic registration of sales, where this legal form is assumed in this business sector. It was assumed that this part of analysis will bring the answer, whether the introduction of E-sales has had the impact on the number of business units in the NACE nomenclature No. 55 – 56 (I – Accommodation and food service activities), where above mentioned Act was implemented since 1st December 2016. The significant decrease in the number of business units has not be proven.

Figure 5 Number of newly established and closed down units between 2010 – 2016 in different business sectors and Year-on-Year Growth Rate of newly established and closed down units between 2010 – 2016



CZ-NACE	2010	2011	2012	2013	2014	2015	2016	Ø2010 - 2016
B_BIRTH	1,05	0,87	0,91	1,23	0,66	1,72	0,74	0,98
B_DEATH	0,48	1,50	0,72	5,15	0,21	0,93	1,31	0,95
B_BALANCE	2,25	0,59	1,13	-1,61	-0,38	2,73	0,50	
D_BIRTH	1,25	0,05	7,72	3,19	0,09	0,74	0,98	0,72
D_DEATH	3,32	0,38	0,89	3,12	1,33	0,88	1,56	1,31
D_BALANCE	1,20	0,03	12,50	3,20	0,03	0,42	-1,79	
H_BIRTH	0,85	0,97	0,83	1,06	0,92	1,29	1,16	1,00
H_DEATH	0,83	1,08	1,14	2,87	0,32	1,02	0,99	0,99
H_BALANCE	2,33	-2,47	5,10	6,63	0,12	0,35	-0,57	
I_BIRTH	0,98	0,96	0,96	0,94	1,00	0,99	1,27	1,01
I_DEATH	0,98	1,18	1,05	1,98	0,69	1,01	0,90	1,06
I_BALANCE	0,98	0,63	0,73	-3,12	0,24	1,16	-1,12	
R_BIRTH	1,18	1,01	0,94	0,86	0,91	1,23	1,12	1,03
R_DEATH	1,00	1,12	0,88	3,03	0,28	1,11	1,34	1,04
R_BALANCE	1,26	0,97	0,97	0,08	8,89	1,28	1,04	
S_BIRTH	1,03	0,99	0,90	0,98	0,75	1,14	1,13	0,98
S_DEATH	1,18	0,78	1,13	2,48	0,40	1,03	1,07	1,02
S_BALANCE	0,97	1,09	0,83	0,35	1,81	1,22	1,16	
O_BIRTH	0,76	0,50	1,28	0,84	0,35	6,09	2,76	1,14
O_DEATH	0,69	4,91	0,22	1,79	0,70	0,67	20,90	1,44
O_BALANCE	0,82	-2,19	-0,16	-0,92	1,58	-2,47	-4,96	

B - Mining and quarrying, D - Electricity, gas, steam and air conditioning supply, H - Transportation and storage, I - Accommodation and food service activities, R - Arts, entertainment and recreation, S - Other service activities, O - Public administration and defence; compulsory social security

Source: own research based on Czech Statistical Office (2016)

4 Conclusions

The aim of this article was to create an overview of the number of newly established and closed down business units in the Czech Republic based on the date from the Czech Statistical Office between 2010 – 2016. The trend analysis of this period and especially the analysis of the year 2016 can reveal the fact, whether the introducing of the 1st phase of E-sales has had the influence on the number of newly established or closed down business units. The trend analysis has been made according to the legal form of

business units, according to their size (number of employees), and according to their economic activity.

Based on the results is possible to make a conclusion that the significant loss of business units in different groups has not been proven. The 1st phase of introducing of E-sales has had no impact on either significant number of closed down or newly established business units of natural persons, legal persons, micro-sized, small-sized, or medium-sized companies. Moreover, there is no significant impact even in the business sector which has been affected by the E-sales at the end of previous year mostly. The authors of this article are aware that the year 2017 will be more important for the evaluation of the influence of E-sales, of course. The number of affected business units will be higher, where only 5% of business units were affected in the year 2016, and already 20% of them will be affected in the year 2017. Therefore, the evaluation of the influence of E-sales on the number of newly established and closed down unit in the year 2016 is limited; however, it gives us the opportunity for the next analysis in the following year.

Acknowledgments

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Loan-To-Deposit Ratio and Financial Stability: macroprudential policy perspective

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Abstract: *This paper evaluates the relation between the loan-to-deposit ratio (LTD) and financial stability and hence the usefulness of the LTD as a macroprudential policy indicator or instrument. In general, an increase of the LTD should indicate a financial stability decrease. Subsequently we adopt a macroprudential policy perspective and test financial sector stability with respect to the currency (domestic/foreign) in which loans and deposits are denominated. This is done in a linear empirical framework by using large factor-augmented VAR model (FAVAR) which is not limited to number of variables used. For such analysis, it is appropriate to choose an open economy with a bank-based financial system and potential substitutability between domestic and foreign currency loans and deposits. Therefore, we analyze the Czech Republic and Hungary as these countries meet the above listed characteristics. Our results suggest that the structure of financial transactions in terms of domestic/foreign currency denomination cannot be ignored or disregarded in relation to financial stability objective.*

Keywords: FAVAR, financial stability, LTD, domestic/foreign currency loans and deposits

JEL codes: C32, E32, E44, G18

1 Introduction

Sources of investments as well as the role of savings and their origins attract the attention of economists for quite some time. J. M. Keynes has even made the balance of savings and investments a key condition for the balance of the entire economy. The macroeconomic nature of his analysis directly encouraged an empirical analysis, which is very common to the present day. In financial systems in which banks play a significant role, deposits are undoubtedly a principal factor influencing credit activity. On the other hand, the openness of the economy, the free movement of capital, and mergers and acquisitions in the financial sector has weakened the domestic nature of savings and investments, as well as the importance of domestic deposits as a source of credit provided by banks. However, recent financial crisis has shown that domestic deposits could be one of the stabilizing factors that may mitigate the negative spillover effects of increasing financial risks coming from the international markets into the domestic economy.

Most studies argue that Central European countries have relied on foreign funding to fuel their credit growth (Impavido et al., 2013). They underline the high foreign ownership of banks and the parent bank policy and strategy towards the foreign subsidiaries. Several papers recorded the fact that especially foreign exchange mismatches were the reason of the build-up phase of the financial cycle in some emerging markets (Brockmeijer et al., 2011, page 22). Nevertheless all these studies omit a very important factor (besides the fact that subsidiaries have their own capital and that they are under legislation and supervision of the country where they are located): how much are credits financed by

domestic deposits in each country and how important are foreign sources for domestic credits.

Recently, the loan-to-deposit (LTD) ratio and its structure is more and more often discussed as a representative indicator of banking sector stability and hence the financial stability. According to some studies, if macroprudential policy should be able to encompass all important providers of credit, liquidity, and maturity transformation, then the LTD ratio could be one of representative indicators of macroprudential policymaking (see Brockmeijer et al., 2011 and Park et al., 2012, among others). ESRB (2016) states that simpler structural liquidity ratios such as the LTD ratio are promising both in their role as indicators and as regulatory instruments addressing maturity mismatches and market illiquidity. In Europe, LTD ratio is currently used as a supplementary indicator of individual bank stability by some central banks without any official numerical target or limitation. Basel III accords consider the net stable funding ratio (NSFR) which provides a sustainable maturity structure of assets and liabilities (BCBS, 2013, page 1). Explaining virtually the same relations as LTD ratio, NSFR seems unnecessarily complicated and hard to operate.

In this paper, we aim to evaluate the usefulness of LTD ratio as a potential standalone macroprudential policy tool and to see if we can find a rationale for setting some mandatory numerical target. Since the objective of a macroprudential policy is to curb systemic risk and reduce procyclicality of a financial sector, we aim to verify: (i) the relationship between the LTD ratio stability and the stability of the financial sector and (ii) the pro-cyclicality of the LTD ratio and its two components (loans and deposits). We also consider the currency structure of loans and deposits in the analysis and argue that while exploring LTD ratio in some countries, the currency structure of loans and deposits needs to be considered as well. For such analysis, it is appropriate to choose an economy with a bank-based financial system and potential substitutability between domestic and foreign currency loans and deposits. Therefore, we choose the Czech Republic and Hungary as our training sample as these countries meet the above listed characteristics.

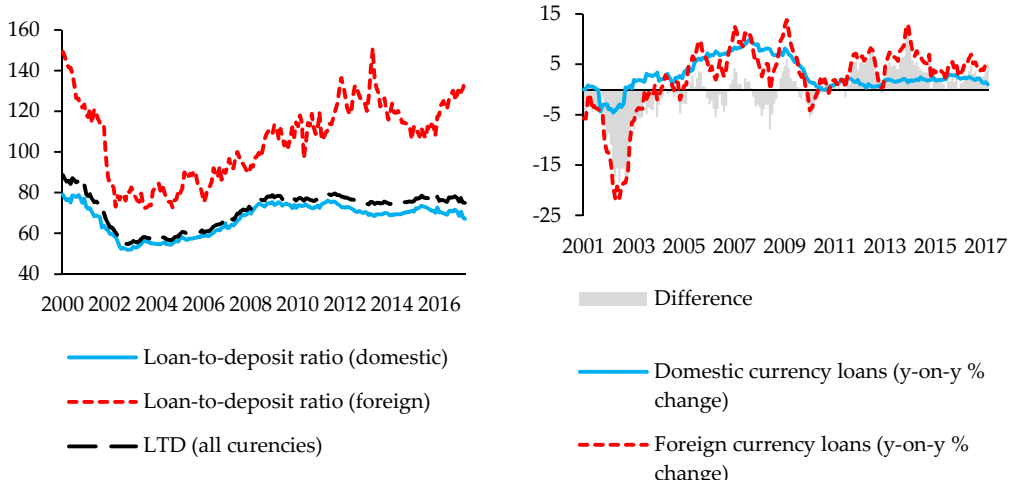
The rest of the paper is organized as follows: Section 2 lays down some stylized facts on the matter; Section 3 explains our used methodology and data; Section 4 discusses empirical results and Section 5 concludes.

2 Stylized Facts

Most studies find that in general, higher LTD ratios are associated with greater risk of bank distress (IMF, 2013) and therefore with more unstable financial environment and lower stability of financial system. Another conclusion is that a huge increase of loan-to-deposit levels brings the likelihood of a bank failure; Bologna (2013) claims such failures occur two to three years later. If such chronological succession exists the LTD ratio can be used as a predictive policy tool. The idea behind the LTD ratio regulation is that the amount of bank loans could depend on the amount of its deposits.

In the Czech Republic banks supervised by the Czech National Bank maintain relatively low LTD ratio. However, if we separate the LTD ratio according to the currency in which considered transactions take place, we may identify potential risks. First, as evident from Figure 1, there is a huge gap between domestic (in CZK) and foreign (other currencies) LTD ratios ranging from around 50 percent to more than 150 percent in 2000-2016 period. And even though foreign currency loans form only a minor part off total lending in the Czech Republic, they exhibit much steeper growth compared to domestic currency loans (5.1 percent to 1.7 percent on average, 2011-2017 data). In total, this may be seen as a potential future threat to financial sector stability and needs to be monitored closely.

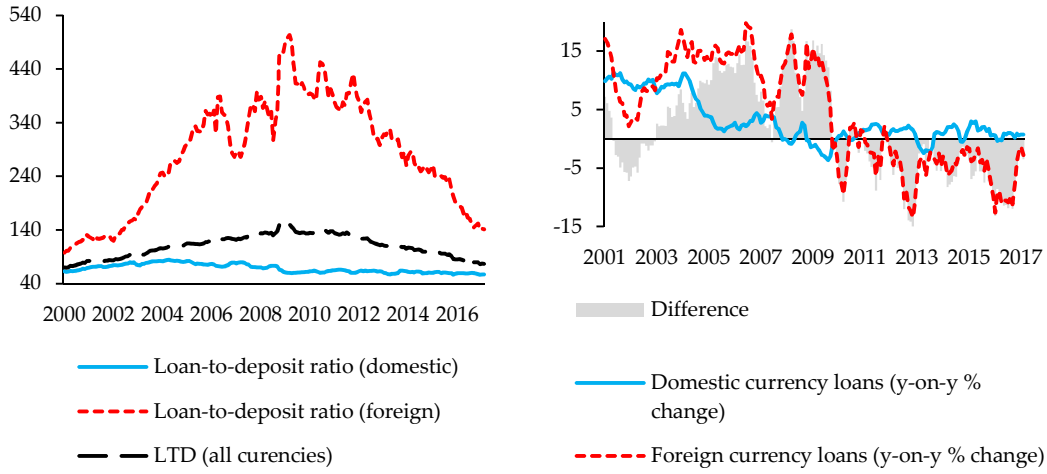
Figure 1 Loan-To-Deposit Ratio – Czech Republic



Source: Czech National Bank data, own processing

Hungarian domestic banks experienced different development compared to the Czech banking sector (Figure 2). In the great moderation period (2002-2006) their LTD ratio was increasing steadily, and peaked at 148 percent in January 2009. Again, it is useful to separate the LTD ratio per currencies to uncover potential risks. As expected, the domestic/foreign LTD ratios in Hungary exhibit huge differences in levels and in growth rates. Prior to the financial crisis, foreign currency loans grew much faster than domestic currency loans (about ten percentage point faster on average, 2002-2008 data) but the dynamics changed after the crisis and foreign currency loans growth rate has been falling steadily while the domestic currency loans exhibit positive growth rate. However, this does not change the fact that the foreign LTD ratio is still relatively high in Hungary (141 percent at end-2016) and pose a significant threat to financial sector stability.

Figure 2 Loan-To-Deposit Ratio – Hungary



Source: Hungarian National Bank data, own processing

3 Methodology

The major interest of this study is to verify: (i) the relationship between the LTD indicator and the stability of the financial sector and (ii) the pro-cyclicality of the LTD indicator and its two components (loans and deposits). Performing such analysis requires a great number of variables (including both macroeconomic and financial data) to be

incorporated into the model and analyzed in detail. However, most of the widely used and accepted macroeconomic models, such as the vector autoregression (VAR) models, suffer from major limitations. The information sets utilized by VAR models or single equation models are rather small to retain the degrees of freedom. To get around this fact, we use a factor-augmented VAR (FAVAR) model introduced in Bernanke et al. (2005). The basic idea of the FAVAR model rests on incorporating a large amount of data series into a small number of factors which are then used for the estimation of a VAR model. We specify an $M \times 1$ vector of macroeconomic time series Y_t and a $K \times 1$ vector of unobserved factors F_t. We assume that the joint dynamics of F_t', Y_t' is given by the following equation:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \Phi(L) \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \varepsilon_t \ , \tag{1}$$

where $\Phi(L)$ is a lag polynomial and ε_t is an error term with a zero mean and a covariance matrix Q. Equation (1) describes a standard VAR model which represents a reduced form of a linear rational-expectations model including both observed and unobserved variables. However, due to the unobserved variables, the model is impossible to estimate. To deal with this issue we assume that additional informational time series X_t are linked to the unobservable factors F_t and the observable factors Y_t by:

$$X_t' = \Lambda^f F_t' + \Lambda^y Y_t' + e_t' \ , \tag{2}$$

where Λ^f and Λ^y are matrices of factor loadings and e_t' is a serially uncorrelated error term with a zero mean (innovation shock). Equation (2) captures the idea that both vectors Y_t and F_t are pervasive forces that might drive the common dynamics of X_t. We use a two-step principal components approach, which is a nonparametric way of estimating the space spanned by the common components $C_t' = (F_t', Y_t')$ in (2).

Data and Identification Scheme

Our vector X_t incorporates 100 monthly time series representing the Czech and Hungarian economy and the rest of the world. The national data are drawn mainly from Czech National Bank and Central Bank of Hungary databases and the international data are drawn from European Central Bank database. Our sample period covers data from January 2000 to February 2017. The choice of sample period is driven by data availability. The set of variables can be divided into five blocks: (i) real economy variables (industrial production index, retail sales, labour market indicators), (ii) prices (consumer price index, industrial producer price index, house prices, real wages), (iii) credit and interest rates, (iv) financial sector variables (regulatory variables, exchange rates, market indexes, financial cycle indicator, asset prices), and (v) open economy variables (real economy and financial sector development in Eurozone).

To identify the policy innovations, we apply recursive Cholesky decomposition to the covariance matrix. For this purpose, we divide our panel of variables into two groups: slow and fast-moving variables (Stock and Watson, 2002). We assume that slow-moving variables display a lagged response to a shock, whereas fast-moving variables react contemporaneously. In our setting, blocks describing the real economy, prices and the external environment are classed as slow-moving (in the given order). The remaining variables are classed as fast-moving.

4 Results and Discussion

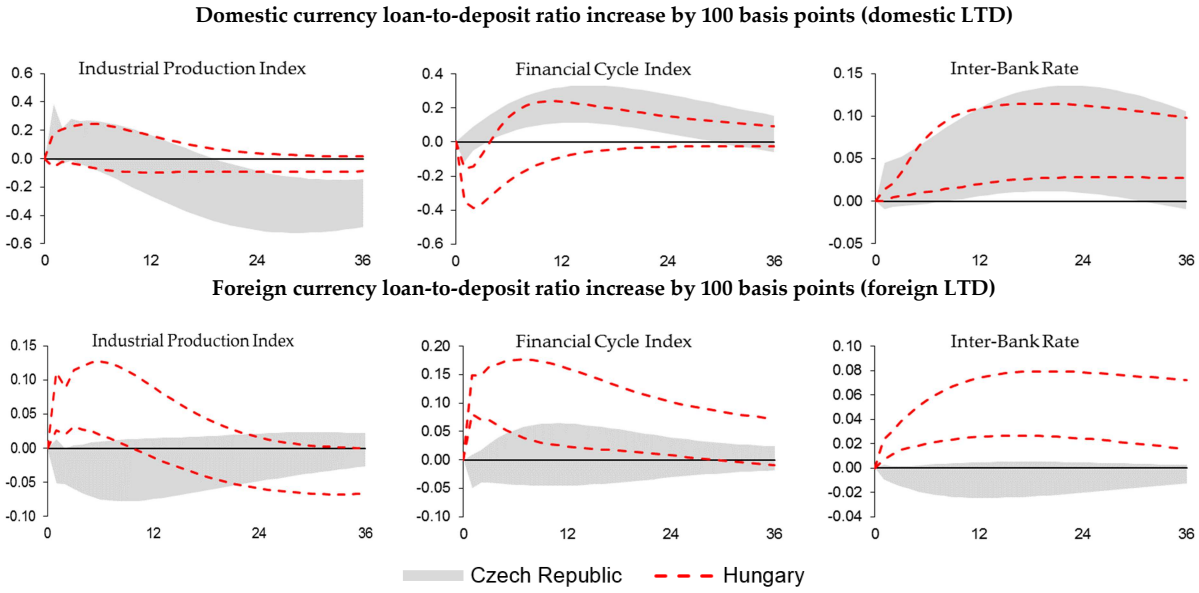
The main objective of a macroprudential policy is to curb systemic risk and procyclical behavior of banks. Hence, to verify the usefulness of LTD as a macroprudential policy instrument, we first evaluate the impact of an increase in loan-to-deposit ratio on real economy and financial sector (*LTD shock*) and second, we consider how the LTD components respond to an increase in real economic activity (*economic cycle shock*). The increase in LTD shock is normalized so that the increase itself is assigned by 50 % to the loans increase and by 50 % to the deposits decrease. Evidently in real economy the proportion could be different and a change in LTD ratio has been usually triggered by loans increase or decrease. That is one of reasons why the LTD ratio is a suitable indicator from the point of view of banking (financial) sector stability.

We present the effects of identified shocks in Figures 3 to 4 using impulse response functions (IRFs). To account for any uncertainty in the factor estimation, we also calculate accurate confidence intervals as in Kilian (1998). The IRF can be constructed for any variable in our information set. However, due to space constrains, we only report here those relevant for our analysis. The baseline model specification, including optimal lag-length and number of factors, is based on Schwarz information criteria and employs 3 lags of explanatory variables and 3 factors. Since there is always a considerable time lag between for instance, a decision to apply for a loan and the moment of granting the loan, we decided that all the variables would enter the estimated equations with the lag of 3 months (one quarter). To check for robustness of our results, we also try to estimate the FAVAR model with different number of lags and 5 and 7 factors which yield comparatively identical results.

Relationship between LTD Ratio and Financial Sector Stability

The logic behind the LTD ratio indicator suggests that the higher is the banks' participation in wholesale funding, the bigger is its contribution to the systemic risk of the financial sector. In this regard, associating higher LTD ratios with higher risk (higher instability) of financial sector, we may consider to set some LTD limits. We simulate two shocks associated with LTD ratio increase – one for transactions in domestic currency and the other for transactions in foreign currency. Doing this we want to emphasize that in some countries it is important to take into account the currency structure of loans and deposits.

Figure 3 Impulse Responses to LTD Shock



Source: CNB data, own computations
Note: Responses were normalized to account for a 100 basis point positive innovation; 10th and 90th percentiles of the distribution reported. Except for the inter-bank rates, the variables are in year-on-year changes, annualized.

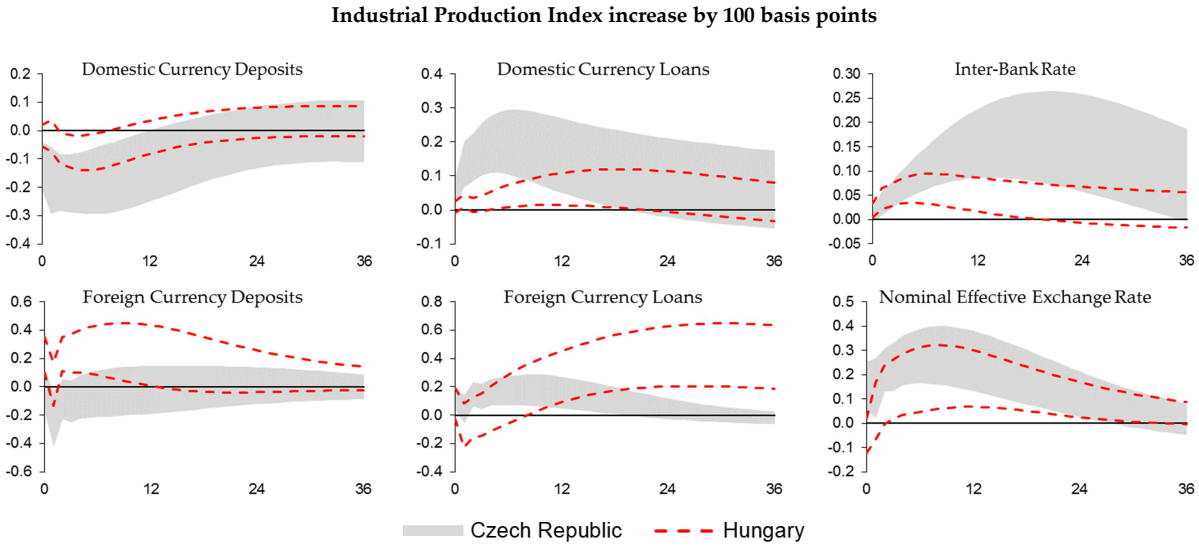
First, increasing domestic/foreign currency LTD ratios gives quite different outcomes in the Czech Republic and Hungary (Figure 3). The results are heavily influenced by the relative importance of foreign currency loans and deposits in both countries. In the Czech Republic, foreign currency loans and deposits play much less important role than in Hungary (Brzoza-Brzezina et al., 2010). This is one of very important reasons why an increase in banks' share in wholesale funding (domestic LTD shock) increases the risk of financial instability in the Czech Republic and forces hands of the CNB to become more restrictive (we use the inter-bank rate to proxy for the main central bank policy tool) whereas responses to foreign LTD shocks are statistically insignificant.

In Hungary, the situation is quite different. Increasing domestic LTD ratio has no significant effect on real economic activity on average and it temporarily improves the financial sector stability. However, increasing foreign LTD ratio gives completely different results. It boosts real economic activity but hugely destabilizes the financial sector. And since these transactions are in foreign currency, there is little the national bank can actually do to strengthen financial stability and mitigate increasing credit and exchange rate risks. This country-specific example shows that the currency of financial transaction matters and this fact should be taken into account when considering the use of the LTD ratio as a macroprudential policy instrument.

Pro-cyclicality Aspect of Banks Lending

In a similar logic we try to find evidence of banks pro-cyclical behavior. This would point to LTD ratio usefulness as macroprudential policy tool. We use countries industrial production index to proxy for real economic activity and simulate a positive economic cycle shock. In general, especially bank loans show pro-cyclicality in terms of the amounts of their supply and demand. But even deposits may become pro-cyclical, as the economic subjects do not behave rationally and do not necessarily modify their typical saving behavior in good times. As apparent from Figure 4, results of our estimation are again heavily dependent on the relative importance of foreign currency loans and deposits in the Czech Republic and Hungary.

Figure 4 Impulse Responses to Economic Cycle Shock



Source: CNB data, own computations
Note: Figure 3 note applies.

In general, positive economic cycle shock causes domestic currency loans to grow as economic subjects are becoming less risk-adverted. However, domestic currency deposits are decreasing. This means that during economic boom, economic subjects are more likely to increase spending and borrow more, but they do not increase their savings. In total, domestic LTD ratio indicator would grow more than proportionally because of the combination of nominator and denominator effects. These results confirm that banks tend to increase their wholesale funding during times of economic expansion, in active response to rising demand for loans. And the wholesale funding is considered to be a factor that expands the pro-cyclicality of lending. This alone suggest the potential usefulness of the LTD ratio indicator.

We may observe different responses in case of foreign LTD ratio components. While the responses in the Czech Republic are insignificant or very little in size, in Hungary both deposits and loans increased following a positive economic cycle shock. This may be viewed as a suitable development but one must not forget the risk stemming from exchange rate movements. The issues related to the substitution of domestic currency loans for foreign in Hungary are well covered in the literature (Endresz and Harasztosi, 2014; Beckmann and Stix, 2015 among others).

5 Conclusions

The LTD ratio regulation is a strong policy instrument that directly limits the ratio of deposits to loans and thus puts a restriction on banks assets management. In this paper, we take a closer look at the usefulness of LTD ratio as a standalone macroprudential policy tool. While keeping in mind the macroprudential policy goals, we analyze whether the LTD ratio has the potential to curb the systemic risks and reduce banks procyclical behavior. We choose the Czech and Hungarian banking systems as a training sample. Our results can be summarized as follows: (i) the currency structure of LTD ratio components cannot be neglected while performing a close-up analysis of an individual bank or the entire banking sector; (ii) the higher the banks' shares in wholesale funding, the bigger their contribution in increasing systemic risk and (iii) during economic booms, economic subjects are more likely to increase their demand for credits while their saving behavior remains unchanged, thus further increasing the LTD ratio on aggregate.

Overall, the empirical evidence suggest that the LTD ratio is a useful macroprudential policy tool as it reduces lending procyclicality and limits systemic risk build-up. Considering the criticism of NSFR operationalization (see ECB, 2014, page 127), we may advocate the promotion of a LTD ratio to a standalone macroprudential policy tool with a numerical target and possibly time-variant nature. However, the exact upper value of the LTD ratio remains an open question and should be the subject of further research in this area. Moreover, we highlight the need to consider the currency structure of loans and deposits in particular countries.

Acknowledgments

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The usual disclaimer applies.

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Macroeconomic Determinants of Shadow Banking: evidence from Spain

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Abstract: *Shadow banking is a term that corresponds to credit intermediation outside the regulated banking system. Shadow banking system constitutes over one-quarter of total financial assets in the euro Area. Traditional banks now rely more on short-term funding from other financial intermediaries, which also cover shadow banking entities. Due to this fact they may become more susceptible to runs and liquidity shortages and endanger overall financial stability. Macroprudential authorities should therefore carefully monitor and supervise the growing share of shadow banking activities in the financial system. This paper presents a novel evidence on the shadow banking system dynamics in Spain. We chose Spain as a training sample because of its highly dynamic housing markets and related high securitization of loans. We use different methods to estimate the shadow banking size. We estimate a Bayesian ARDL model to uncover possible determinants of shadow banking system dynamics. Based on preliminary results, we conclude that macroeconomic environment may significantly influence the evolution of shadow banking system.*

Keywords: shadow banking, credit intermediation, Bayesian ARDL

JEL codes: E44, G21, G28

1 Introduction

Shadow banking is a term that refers to credit intermediation, liquidity and maturity transformation activities outside the conventional banking system and gained substantial attention worldwide after the global financial crisis events. The Financial Stability Board was engaged since 2011 in a global project to closely monitor and evaluate risks stemming from shadow banking system development. Early estimates show that the United States, the euro area and the United Kingdom have the largest shadow banking systems (IMF, 2014 a). However, literature coverage of the topic varies among these groups tremendously. While in the United States, the shadow banking estimation and associated micro- and macroeconomic analysis is a growing field (Adrian and Shin, 2009; Pozsar et al., 2013; etc.), it has been paid very little attention in the UK or in the euro area. This is caused mainly by the fact that there are no official data sets available for European countries.

Recent ECB and IMF studies have provided methods to estimate shadow banking system size in Europe but either they do not engage in any deeper data analysis (Bakk-Simon et al., 2012) or it is not the main point of interest (IMF, 2014 a). In this paper, we use newly available data from ECB/Eurosystem and propose an empirical framework to uncover the effects of selected determinants on shadow banking system development. Due to space constrains, we perform a country-specific analysis as an illustrative example. We chose Spain as a training sample for several reasons.

First, Spain was one of the European countries most heavily affected by the Great Recession, which hit the country in 2008. Second, the Spanish banking system has been financing a frantic real estate boom of the 2000s by securitization and almost collapsed after the housing bubble burst, only to be rescued by a massive public bail-out representing 5.8% of the country´s GDP (the second largest GDP share after Ireland). Despite a subsequent bank restructuring process started in 2012, four years later the

main 6 banks´ real estate exposure was still about 15% of their balance sheet, being five times higher than the equivalent exposure in France and more than seven times higher than this exposure in the Nordic countries (Stúcklin, 2017). Third, the banking crisis in Spain mainly originated in and affected domestic savings banks (cajas de ahorros) which represented an alternative credit source for regional economic development and held 45% of total assets in 2008. Albeit these institutions were subject to similar banking supervision as the commercial banks, they were managed and controlled by local and regional governments, thus effectively being under the influence of political parties and trade unions (see Martin-Aceňa, 2014 or Ruiz et al., 2016). Undoubtedly, this system of "capitalismo de amiguetes" (crony capitalism) and related misconduct finally led to the destabilization of the whole financial system. However, in a rather loose sense the pre-recession "cajas" can be considered shadow banks which makes the Spanish story even more interesting, no matter that we measure the size of shadow banking system here in a more traditional way.

The paper is organized as follows: Section 2 provides working definitions and some stylized facts on shadow banking system size and dynamics in Spain; Section 3 describes model details and data sources; Section 4 discusses our results and Section 5 concludes.

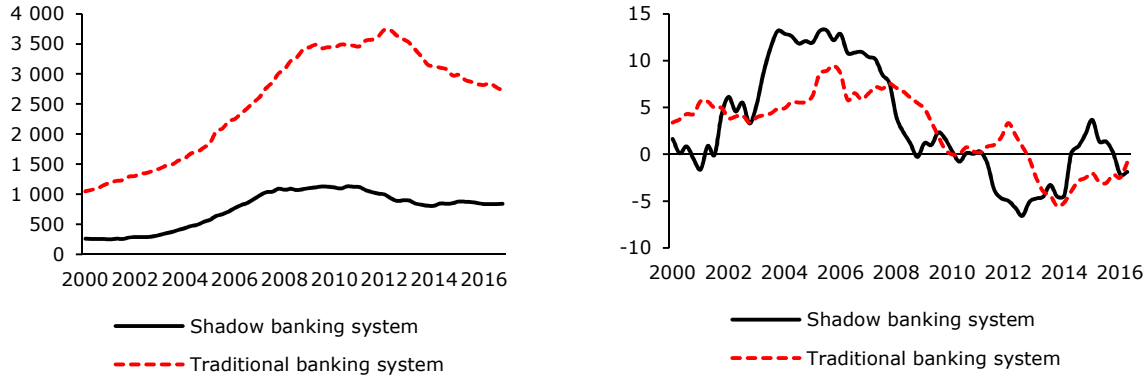
2 Shadow Banking Development in Spain

A definition of shadow banking is not straightforward and it deserves very close attention. Most of the existing studies build shadow banking definition on the grounds of the entity that carries it out. By this definition, a shadow bank is an entity that conduct maturity, credit, and liquidity transformations without government guarantees or access to central bank liquidity (Pozsar et al., 2013 among others). Other definition focus instead on instruments, which the entities use. Claessens and Ratnovski (2014) states that all financial activities, except traditional banking, requiring private or public backstop to operate are classed as shadow. An ideal definition is impossible to obtain due to the complexity of financial system and the large differences in shadow banking activities across countries. However, we believe that the second-best definition should incorporate both, an entity-based and instrument-based definition (such as ones from FSB, 2013 or IMF, 2014a). For the purpose of this paper, we define shadow banking on the base of its main components. Shadow banks are than described as credit intermediation entities outside the regular banking system that are involved in securitization activities and are active in money market mutual funds, repo markets and hedge funds.

Spanish banks are mostly concentrated on credit intermediation but are highly active in securitization, promoted and initiated by banks, and carried by financial vehicle corporations. In short, the original lender can sell his claims to another unregulated entity or she/he can issue securities backed by the underlying assets. This process can be described as liquidity transformation. Depending on the underlying assets, a maturity transformation might also take place. Other institutions such as specialized credit institutions and money market funds, which may be of relative importance in other countries, exhibits relatively low volumes in Spain.

Panel A at Figure 1 shows our original estimate of shadow banking system size in Spain. Compared to the size of traditional banking, we can see that it roughly takes around 30% of total financial sector. In total, credit intermediation grew rapidly prior to the financial crisis. After the Lehman's in 2008, both traditional and shadow banking sector growth experienced significant slowdown (Figure 1, panel B) and the size of banking sector in Spain even started to decrease since 2010. Since 2014 the shadow banking sector growth started to outperform the traditional banking sector which may pose a future threat to financial stability.

Figure 1 Shadow vs. Traditional Banking System Size and Growth

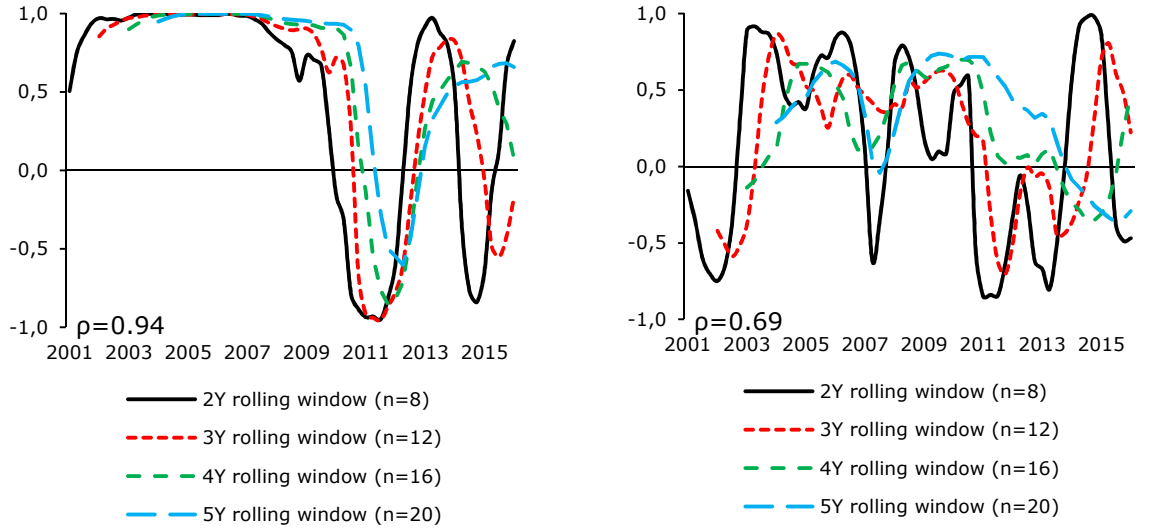


a) total assets in levels (billions of Euros) b) total assets annual growth rate (percentages)

Source: authors' calculations based on ECB/Eurosystem data

To see the mutual development of a relation between traditional and shadow banking sector, we compute dynamic correlations with different rolling window size for both, the data in levels (Figure, panel A) and in annualized growth rates (Figure 2, panel B). Overall, data in levels exhibits strong correlation prior the crisis but the correlation become weaker and unstable ever since starting with year 2009-2010. This finding suggests that the relationship between traditional and shadow banking changed significantly after the crisis. This claim is also supported by the rolling window correlation of data in growth rates, even though these are much more time-variant and evolve with severe dynamics.

Figure 2 Estimated Rolling Window Correlations for *n* Observations



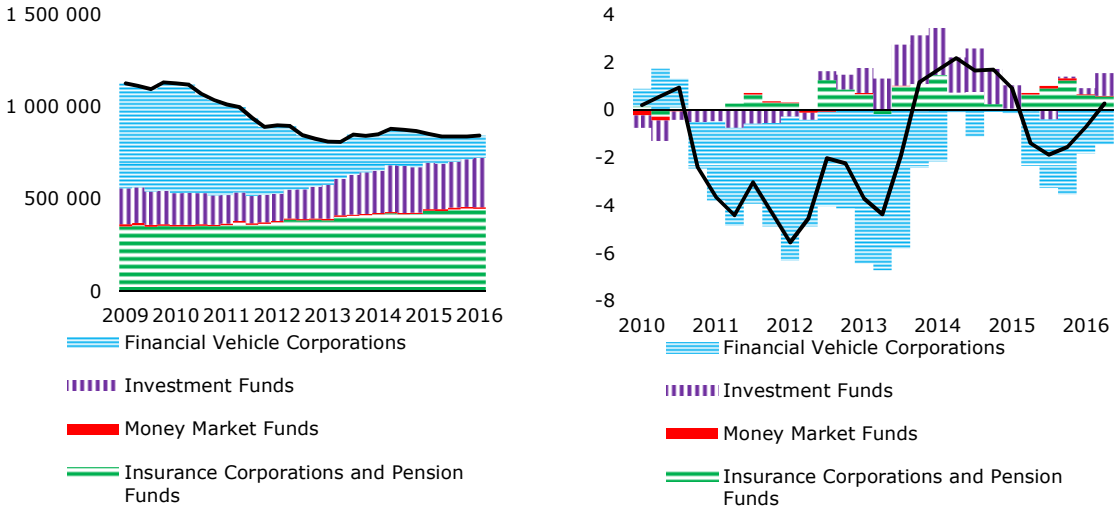
a) rolling window correlations (levels) b) rolling window correlations (growth rates)

Source: authors' calculations based on ECB/Eurosystem data

Figure 3 shows the breakdown of shadow banking sector in Spain by single components. Nowadays, the shadow banking system is concentrated around pension funds and insurance corporations (52%), investment funds (31%) and financial vehicle corporations (15%). The development of shadow banking sector from 2009 to 2016 documents that after the crisis, various types of funds have been stepping in (often as intermediaries for insurance companies and pension funds) to provide long-term credit to the private sector while banks have been repairing their balance sheets and retrenching from certain

activities (see IMF, 2014b). This also explains the continuous decrease of financial vehicle corporations.

Figure 3 Spanish Shadow Banking Sector – Component Breakdown



a) total assets in levels (billions of Euros) b) annual growth rate decomposition

Source: authors' calculations based on ECB/Eurosystem data

3 Data and Methodology

To estimate shadow banking dynamics, we use quarterly time series obtained from ECB/Eurosystem database. The data span ranges from the first quarter of 1999 to the fourth quarter of 2016. The shadow banking system size is estimated in line with our proposed definition as the sum of total assets of financial vehicle corporations, investment funds, insurance corporations, pension funds and money market fund shares (see Table 1 for description). Further, we consider traditional banking system size, short-term nominal interest rates, term spread and real GDP as potential drivers of shadow banking system dynamics. It should be noted that all data are publicly available and come from a single source so that our results can be replicated or extended on other counties.

Table 1 Data Description

Variables	Mnemonics	Description
Shadow banking assets (broad measure)	sb_broad	comprises of financial corporations other than MFIs: financial vehicle corporations, investment funds, insurance corporations, pension funds and money market fund shares (total assets, mil. EUR)
Traditional banking assets	banks	regulated banks size (total assets, mil. EUR)
Short-term interest rates	euribor_r	3-months inter-bank rate (EURIBOR), average of observations through period
Term spread	spread	calculated as a difference between 10Y government bond yields and 3M EURIBOR rate
Real GDP	gdp_r	real gross domestic product (mil. EUR, seasonally adjusted data)

Source: ECB/Eurosystem data

Model Selection

To verify the potential determinants of shadow banking system development, we use Bayesian estimation method with instrumental variables. This method allows us to combine the a priori knowledge gained from relevant international studies or other believes along with information from specific economy. This method is particularly useful for economies with short time series, which is our case. We argue that the dynamics of shadow banking development can be described by the following equation:

$$SB\_broad_t = \alpha SB\_broad_{t-1} + \beta X_t + \varepsilon_t \ , \quad (1)$$

where $X_t = [gdp\_r, banks, euribor\_r, spread]$. The expected directions of action of the individual variables are captured in the equation (2). In line with IMF (2014a), we assume the estimated coefficients to be positive for real GDP and traditional banking system size but negative for EURIBOR and term spread. The expected direction of the effect of individual variables is in line with the empirical results presented in the literature.

$$SB\_broad_t = \alpha SB\_broad_{t-1} + \beta_1 gdp\_r_t + \beta_2 banks_t - \beta_3 euribor_t - \beta_4 spread_t + \varepsilon_t \ , \quad (2)$$

For econometric estimation purposes, the component ε_t is considered a residual with the process described as follows:

$$\varepsilon_t = \mu \varepsilon_{t-1} + e_t \ , \quad (3)$$

where μ is an autoregressive coefficient and ε_t is i.i.d. shock with normal distribution $N(0, \sigma_\varepsilon)$. For model estimation using the instrumental variables method, we further assume that:

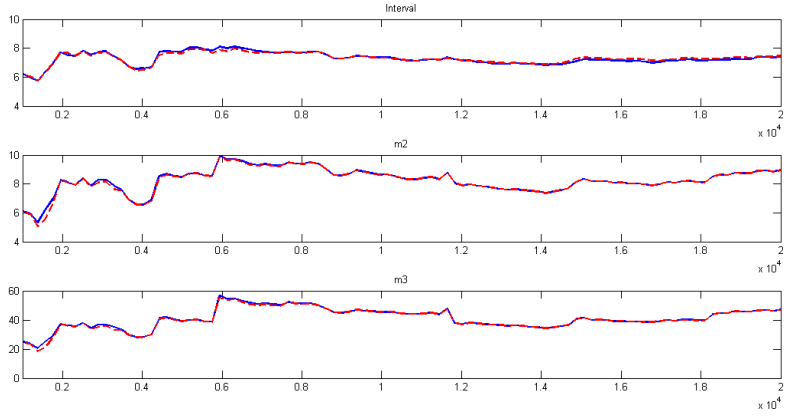
$$X_t = \rho X_{t-1} + \vartheta_t \ , \quad (4)$$

where ρ is an autoregressive coefficient linked to the vector of instrumental variables and $\vartheta_t \sim N(0, \sigma_\vartheta)$.

4 Results and Discussion

Figure 4 illustrates a satisfactory diagnosis of Bayesian estimation. Specifically, it illustrates the convergence statistics of two generated Markov chains, which gradually converge. The horizontal axis shows the chain length (number of iterations) and individual statistics are captured on the vertical axis. The chains statistics converge fast to each other. Afterwards, the values are gradually stabilized. The values are becoming stable prior 10,000 iterations in all three cases - interval, m2 and m3. The use of generated parameters to calculate the distribution of parameters and their main statistics in the range of 10,000-20,000 is therefore credible.

Figure 4 Convergence Statistics



Source: authors' calculations

In case of the effect of a previous values of shadow banking system size (coefficient a_sb_broad), the posterior modus and posterior mean are higher than the presumed a priori mean value that lies beyond the posterior confidence interval and confirms the high persistence of this indicator. Regarding the magnitude of the impact of real GDP on the size of the shadow banking system (a_gdp_r), the posterior modus and posterior mean are higher than the presumed a priori mean value which however lies inside the posterior confidence interval. This result is statistically significant at the chosen significance level and confirms the hypothesis that the shadow banking sector, in most of the cases, reacts pro-cyclically to the development of real GDP in Spain. In a similar logic, we identify a positive influence of the size of the traditional banking sector on the size of shadow banking (a_banks). A priory mean value is close to posterior mean and mode, lies inside the 90% confidence interval and is statistically significant. This finding shows that banks tend to use shadow banking activities often as complementarities and therefore move in the same direction. In Spain, more than 99% of securitized assets are originated by banks and carried on by financial vehicle corporations. Mandel et al. (2012) already confirmed that banks often sponsor shadow banking activities. It should be noted however, that these findings may vary among particular countries. For instance, other shadow banking components, such as the investment funds, insurance corporations and pension funds may act as rather subsidiaries to traditional banking. However, this was not the case of Spain in most of our sample period as these subjects started to gain on importance only in the last couple of years. The impact of the EURIBOR interest rate on the size of the shadow banking system (a_euribor_r) is identified as negative, which is in line with the theoretical assumptions. Decreasing nominal interest rate boosts the search for a yield motive of traditional banks who are searching for more profitable sources of income and often engage in securitization activities. In line with IMF study (2014) we identified this effect as statistically less significant, which might be also due to rather flat prior. The impact of the term spread on the size of the shadow banking sector (a_spread) is identified as statistically insignificant albeit positive. This finding is also in line with the impact identified in the IMF study (2014a), if we consider the entire observed period in their paper. Again, this is logical and it confirms the fact that traditional banks often use shadow banking activities for liquidity and maturity transformations (search for liquidity motive).

Table 2 Estimated Parameter Results

Parameters	Prior distribution	Posterior mode	Posterior mean	90% Bayesian posterior interval
a_sb_broad	B(0.5; 0.1)	0.6763	0.6487	[0.5272; 0.7633]
a_gdp_r	N(0.41; 0.24)	0.6653	0.6347	[0.3425; 0.9838]
a_banks	N(0.36; 0.1)	0.3127	0.3262	[0.1911; 0.4519]
a_euribor_r	N(0; 1.00)	-0.2266	-0.2422	[-0.6775; 0.1293]
a_spread	N(0; 1.00)	0.2652	0.2315	[-0.2513; 0.7370]
p_sb_broad	B(0,2; 0,10)	0.3857	0.4226	[0.2435; 0.6088]
r_gdp_r	B(0,2; 0,10)	0.8768	0.8642	[0.8349 ; 0.8974]
r_banks	B(0,2; 0,10)	0.8927	0.874	[0.8489; 0.8975]
r_euribor_r	B(0,2; 0,10)	0.6539	0.648	[0.5449; 0.7538]
r_spread	B(0,2; 0,10)	0.8107	0.8073	[0.7453; 0.8777]
Standard errors of shocks				
u_sb_broad	IG(0.4; 0.2)	1.3864	1.4491	[1.2361; 1.6666]
u_gdp_r	IG(0.4; 0.2)	0.3983	0.4136	[0.3512; 0.4736]
u_banks	IG(0.4; 0.2)	0.9363	0.9823	[0.8293; 1.1050]
u_eurobor_r	IG(0.4; 0.2)	0.7290	0.744	[0.6399; 0.8666]
u_spread	IG(0.4; 0.2)	0.5563	0.5736	[0.4916; 0.6597]

Source: authors' calculations

All autoregressive components are statistically significant at 10% level and confirm that lag values are relevant instruments for individual macroeconomic variables. According to the results presented in the table, the most rigid variables are real GDP and the size of banking sector (coefficients r_gdp_r and r_banks). Finally, we interpret the standard deviation of shocks based on the a priori assumed inverse gamma distribution. In this case, the posterior mode and mean value are significantly higher than a priori mean values in the case of the four shocks with the highest posterior values estimated. Table 1 presents also the results on standard errors of shocks affecting the size of the shadow banking sector (u_sb_broad), the size of the banking sector (u_banks), the interest rate (u_euribor_r) and the term premium (u_spread). Prior and posterior distributions are available in Figure 1A the Appendix.

5 Conclusions

Shadow banking activities in Spain constitutes of over one third of total banking sector and pose a notable threat to financial sector stability. Nowadays, the main components of Spanish shadow banking system are pension funds and insurance corporations, investments funds and financial vehicle corporations. In this paper, we aim to uncover the driving macroeconomic forces behind the shadow banking system development. Our findings can be summarized as follows: (i) the shadow banking system is highly pro-cyclical; (ii) its components may act as both, complementarities (financial vehicle corporations) or substitutes (investment funds, insurance corporations and pension funds) to traditional banking, however in Spain the role of financial vehicle corporations is dominant; (iii) low interest rates and an increase of term spreads tend to be associated with more rapid growth of shadow banks in most of the cases and (iv) country-specific factors and the relative importance of individual shadow banking components play a role in the analysis and should not be disregarded.

Overall, we may expect the shadow banking system to continue to growth, especially in the current environment of tighter bank regulations and low interest rates. Migration of lending intermediation from banks to nonbanks may be associated with increased market and liquidity risk but this is difficult to assess yet. In the end, there are some important

challenges ahead. First, data gaps remain challenging and need to be addressed. The ECB/Eurosystem data is definitely a step forward but is still far from perfect as it does not offer sufficiently long information on a sectoral level. Second, incorporating the shadow banking development into regulatory policy remains an open question. Third, cross-border effects of shadow banking needs to be considered as well.

In future research, we plan to address some of these issues. We will broaden the sample and consider a cross-sectional dimension and measure the effect of a regulatory framework. We will also aim to analyze the individual components of shadow banking system.

Acknowledgments

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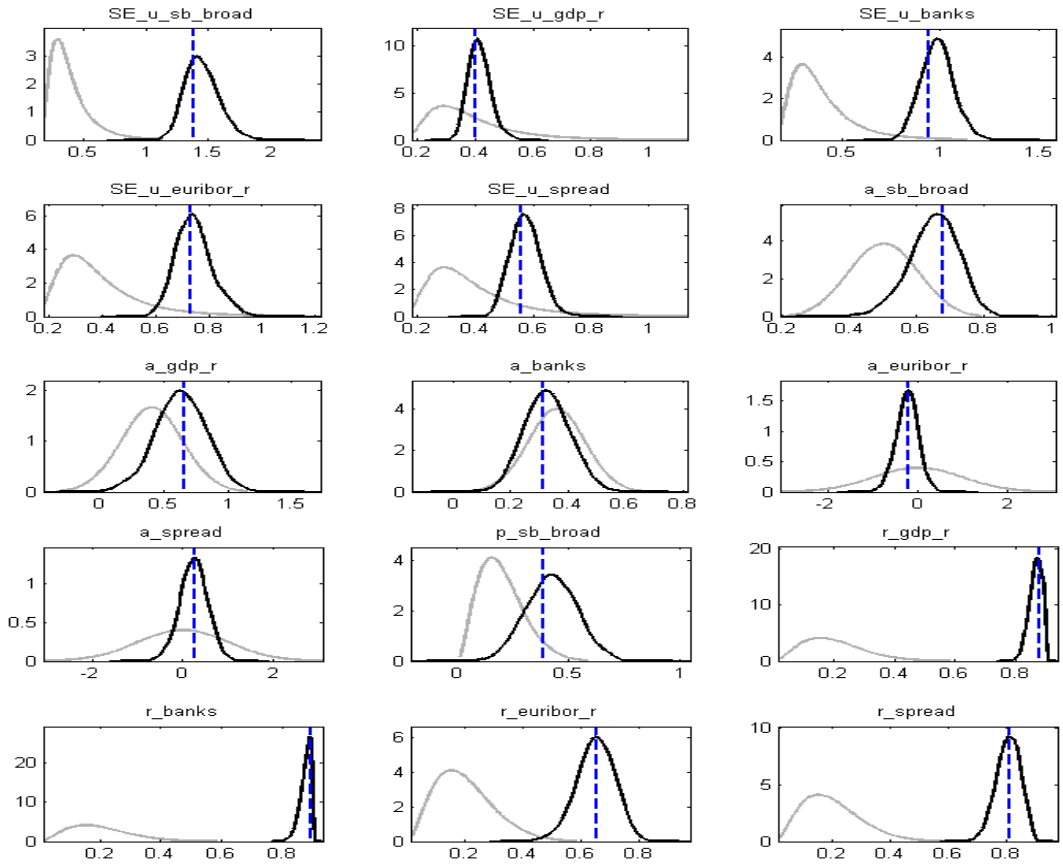
Appendix

Figure 1A Prior and Posterior Distributions



Source: authors' calculations

A Comparative Analysis of Shadow Economy in Croatia and Slovakia

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Abstract: *Shadow economy includes all unrecorded economic activities, employment and income. All shadow economy activities are unregulated, untaxed, unregistered and unmeasured by official statistics. Since Croatia and Slovakia are countries in transition, numerous elements exist that support shadow economy in international exchange. Shadow economies in Croatia and Slovakia influence all kinds of economic activities with allocative, stabilizing, welfare and redistributive effects. The objective of this paper is a comparative analysis of shadow economy in Croatia and Slovakia in the period 2005 – 2014. The labour approach is used because it relies on the difference between real and registered use of labour. Results show that, in this period, the level of Croatian shadow economy under the labour approach was highest in 2008 (3.65 percent), while in Slovakia it was highest in 2006 (27.47 percent). In order to improve the quality of the fight against corruption and to reduce the level of shadow economy, it is necessary to continue the development of the judiciary, take actions to improve the independence of the judiciary, review the principles of financial support for law enforcement and provide measures to improve their wages.*

Keywords: fiscal policy, shadow economy, labour approach, Croatia, Slovakia

JEL codes: H20, H26, O17

1 Introduction

Since Croatia and Slovakia are countries in transition, numerous elements exists that support shadow economy in international exchange. Some of these elements include inefficiency in privatisation, non-existent industrial policy, frequent changes of legislation, lenient criminal measures for combating illegal activities, etc. It is characteristic of countries in transition to achieve a faster and more successful transition due to higher rates of economic growth, lower unemployment rates and faster development of the private sector. There are numerous factors that affect the growth of shadow economy in countries in transition. Vehovec (2002), North (1997) and Kaufmann and Kaliberda (1996) claim these are political repression, an inadequate legal system, high tax burdens, macroeconomic instability and the culture of non-payment. Vehovec (2002) and North (1997) list the following factors: non-functioning of property rights, high entrepreneurial risk and high transaction costs. The World Bank (2001) claims these are large-scale legislative and regulatory changes, massive redistribution of national wealth, lack or inefficiency of institutions of public control. Bejakovic (2002) lists the following factors: lack of democratic, economic and regulatory institutions, lack of tax-paying experience, discretionary rights of public servants and state prodigality.

In 2004, the Croatian Government adopted a plan of short-term and long-term measures for combating shadow economy. Therefore, the Ministry of Finance of the Republic of Croatia continued with consistent supervisory activities in its scope, particularly in cooperation with the Tax Administration and the Customs Administration. These activities

mainly refer to increased supervision of fiscalization and value added taxes as well as supervision and detection of illegal activities in the field of transport of excise goods, performance of unregistered activities, residence tax and vessel control. Taxpayers whose goods and services are paid in cash are under supervision. Special attention is given to supervision on the Adriatic coast and in the City of Zagreb. The main initiative of the Slovak Government is focused on tax evasion and tax avoidance. The Action Plan to improve the fight against tax evasion was introduced in 2012. The unification of the collection of taxes, duties and levies, and the suppression of tax evasion indicate clearly that its aim is ensuring sufficient budgetary resources. The government considers its key role to be the uncompromising, conceptual and systematic fight against tax evasion. The effectiveness of existing legislation and the Code of Criminal Procedure should be assessed and the possibility of introducing new tax offenses should be analysed. The strategy of the Slovak Government and Ministry of Finance in the area of tax administration puts emphasis on strengthening tax collection and the fight against tax evasion and fraud. Achieving this goal should help introduce new and stricter rules to tax legislation, increase the frequency and quality of tax audits through organizational changes and, overall, increase the number of staff in audit departments. It will also extend the territorial scope of the Tax Office for selected taxpayers to the entire territory of the Slovak Republic. The aim of this paper is to estimate under the labour approach the size of shadow economy in Croatia and Slovakia in the 2005-2014 period. The empirical approach is based on methodology used by Svec (2009) and Crnkovic-Pozaic (1997). For the purposes of this paper, shadow economy is defined as paid work which is legal in all respects other than it is not declared to authorities for tax, social security or labour law purposes (Williams and Franic 2015; Aliyev 2015; Boels 2014; Williams, Franic and Dzhekova 2014; OECD 2012; Polese and Rodgers 2011; European Commission 2007).

2 Methodology and Data

Shadow economy can be difficult to quantify because of the complexity of the phenomenon itself. Depending on the analysed period and theoretical assumptions, different assessment methods have been used. The methods can be divided into those with a direct and those with an indirect approach. The direct approach encompasses the use of micro approaches, or well-designed surveys and samples based on voluntary responses or tax inspection and other effects of determining compliance with the law. The indirect approach focuses on developing a psychological contact between the state and its citizens to encourage commitment to compliance among citizens and thus greater self-regulation.

The indirect approach, also known as "indicating", offers 4 indicators. These are:

- The currency demand method (Tanzi 1983, 1980; Gutmann 1977; Cagan 1958);
- The electricity consumption method–two indicators: Kaufmann-Kaliberda method (1996) and Lackó method (Lackó 1998, 1996) and
- The Multiple Indicators Multiple Causes (MIMIC) method (Giles, Linsey and Werkneh, 1999; Schneider 1997, 1994; Thomas 1992; Frey and Weck-Hannemann 1984)

According to Nastav and Bojnec (2007), the three main groups of methods to quantify the size of the shadow economy can be identified as direct methods, indirect methods and modelling. In this paper, the labour approach is used because it belongs to indirect methods and relies on the difference between real and registered use of labour.

Davidescu (2014) considers that "the labour approach method is one of the indirect methods and is meaningful only if the changes in official population activity rates are caused by factors related to the shadow economy. The advantages of this method are data availability and simplicity. The disadvantage is the fact that the initial value of

unofficial employment is always zero" (p. 26). The assumption is not realistic, but the method algorithm itself gives this value. The obstacles of this method are:

- The assumption of the full-time participation of the unemployed in the shadow economy (and that no one with an official job participates (part-time) in the shadow economy) is not properly grounded due to sampling errors, underreporting and the fact that not all of those registered as unemployed according to the Labour Force Survey work full-time in the shadow economy.
- The problem of underreporting of data to the Labour Force Survey.
- Different data sources on the labour force in the economy are very limited in their consistency: the Labour Force Survey measures employment, whereas the administrative sources usually report the jobs.
- The method doesn't include and measure people with a second job.

According to Svec (2009) and Crnkovic-Pozaic (1997), the activity rate can be defined as a ratio of persons who either are or wish to be economically active in relation to all persons of working age:

Activity rate = (the employed + the unemployed) / persons of working age (1)

The employed + the unemployed=labour force (total labour supply, total working population,de facto economically active population) (2)

Alternative definition:

Activity rate = (the employed + the unemployed) / total population (3)

Share of the employed in the unofficial economy = (hypothetically active – de facto active) / de facto active (4)

The main source of data is the Croatian Bureau of Statistics-Statistical Yearbook 2005-2014 and Statistical Office of the Slovak Republic-Statistical Yearbook 2005-2014.

3 Results and Discussion

The aim of this paper is to use the labour approach to calculate and compare the value of shadow economy in Croatia and Slovakia: the method based on historical activity rates (administrative data) using annual data covering the 2005-2014 period. Moreover, the paper also presents a correlation coefficient under the assumption of regression analysis.

For the calculation of unofficial employment, the following data are needed: population, number of employed and unemployed people. Based on that, an algorithm is used to calculate the activity rate, hypothetically active population and unofficial economy for a certain time series. The results of Croatian data are shown in Table 1.

Table 1 Administrative data from 2005-2014 (in thousands)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total population	4442.0	4440.0	4436.0	4434.0	4429.0	4418.0	4280.0	4268.0	4256.0	4239.0
Total employed	1420.5	1467.9	1516.9	1554.8	1498.7	1432.4	1411.2	1395.1	1364.0	1342.0
Total unemployed	308.7	291.6	264.4	236.7	263.2	302.4	305.3	324.3	345.1	328.2
De facto active population	1729.2	1759.5	1781.3	1791.5	1761.9	1734.8	1716.5	1719.4	1709.1	1670.2
Activity rate (%)	38.9	39.6	40.1	40.4	39.7	39.2	40.1	40.2	40.1	39.4
Hypothetically active	1729.2	1728.4	1726.8	1726.0	1724.1	1719.8	1666.1	1661.4	1656.7	1650.1
Unofficial employed (%)	0.00	1.77	3.06	3.65	2.14	0.86	2.93	3.37	3.06	1.20

Source: authors' research based on data from the Statistical Yearbook 2005-2014, Croatian Bureau of Statistics.

Table 1 leads to the conclusion that, in the observed period, there is a significant decrease in the activity rate until 2006, followed by a growth and then again by a decrease until 2009. In the 2005-2014 period, the de facto active population declined much faster than the total population grew. After 2010, the de facto active population grew and, thus, so did the rate, especially after 2011. After 2013, the de facto active population recorded a high decline despite the accession to the European Union (after 1 July 2013). The results of Slovakian data are presented in Table 2.

Table 2 Administrative data from 2005-2014 (in thousands)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Total population	5393.6	5400.9	5400.9	5412.2	5424.9	5435.2	5404.3	5410.8	5415.9	5421.3
Total employed	2216.0	2301.0	2357.0	2434.0	2366.0	2318.0	2315.0	2329.0	2329.0	2363.0
Total unemployed	427.50	353.40	291.90	257.50	324.2	389.0	367.90	377.50	386.0	358.70
De facto active population	2643.5	2654.4	2648.9	2691.5	2690.2	2707.0	2682.9	2706.5	2367.6	2721.7
Activity rate (%)	49.0	49.1	49.0	49.7	49.5	49.8	49.6	50.0	43.7	50.2
Hypothetically active	2643.5	2647.1	2647.1	2652.6	2658.8	2663.9	2648.7	2651.9	2654.4	2657.1
Unofficial employed (%)	0.00	27.47	0.07	1.44	1.17	1.59	1.27	2.02	12.12	2.37

Source: authors' research based on data from the Statistical Yearbook 2005-2014, Slovakian Bureau of Statistics.

During the observed period, Slovakia recorded a constant activity rate, except for 2014 when it reached its highest level (50.2). When compared to the Croatian activity rate, the situation is completely different because the activity rate was (39.4). Slovakia found itself in an interesting environment in 2006 when its activity rate was 49.1 per cent and the rate of unofficial employment was very high (27.47). The activity rate is inversely proportional to the estimate of people employed in unofficial economy. As the activity rate falls, the unofficial employment grows. The obtained result is meaningful as the Croatian population switches from official to unofficial economy. Therefore, the assumption that everybody who leaves the labour force enters unofficial economy is not entirely correct. There is always a share of active population that becomes inactive, but

this method cannot be used to calculate its percentage. By analysing possible correlations between employment in the official economy, unemployment in official economy and employment in unofficial economy during the observed 2006-2014 period (the initial year has been ignored, in which the labour approach supposes that the unofficial employment is zero, because the difference between the hypothetically active and de facto active population is zero), a negative significant relationship between official employment and official registered unemployment was noticed. The results are presented in Table 3.

Table 3 Pearson's correlation coefficients for the 2006-2014 period (administrative data) in Croatia and Slovakia

VARIABLE	CROATIA	SLOVAKIA
Official employment and official unemployment	-0.97	-0.18
Unofficial employment and official employment	0.31	-0.12
Unofficial employment and official unemployment	-0.24	-0.87

Source: authors' research.

In Croatian economy, it is realistic to assume that the increase in the number of employed persons in official economy at the same time decreases the number of registered unemployed persons. The positive relationship between unofficial employment and official employment (0.31) can be explained as follows: persons employed in official employment are satisfied with their jobs and income and do not think about moving to the shadow economy. In Slovakia, the situation is totally different because the relationship between unofficial employment and official employment is negative (-0.12). This can be explained by the fact that persons employed in official employment are unsatisfied with their jobs and income and are thinking of moving to the shadow economy. An interesting situation can also be observed in the relationship between unofficial employment and official unemployment – it is negative in both countries, although Slovakia recorded a higher negative correlation coefficient (-0.87) compared to Croatia (-0.24). This can be explained by the fact that the decrease in the number of unemployed persons leads to an increase in unofficial employment because the unemployed become part of the unofficial sector. A comparison of these data with the data presented by Svec (2009), in which the author also analyzed the correlation coefficient between official unemployment, official employment and unofficial employment for the 2002-2007 period in Croatia, shows that the results are very similar. The author also found a negative correlation between official unemployment and official employment (-0.92). What is interesting is the fact that there is a huge difference between unofficial employment and official employment (-0.74) which is negative compared to these results, while the difference between unofficial employment and official unemployment (0.41) was positive as opposed to results which gave a negative correlation coefficient (-0.24). For Slovakia, this correlation is even more negative (-0.87). By analyzing empirical results from this paper, it has been estimated that there are two negative correlations in the observed 2006-2014 period (official employment and official unemployment and unofficial employment and official unemployment) and one positive correlation between unofficial employment and official employment in Croatia. In Slovakia, negative correlations are recorded for all three relationships.

4 Conclusions

The main reasons that have affected the rise of the shadow economy in the past decades in Croatia and Slovakia are the following: tax policy characterised by substantial tax rate increases; increasing burden of labour costs; obtaining different social supports; dissatisfaction with actions and goals of the government; and changes in work ethics. The Croatian and Slovak governments have to carry out an economic policy that will ensure economic growth and increase the living standard of their citizens. If real income

increases and economic growth is achieved, it can be expected that the size of shadow economy will decrease.

The size of shadow economy in Croatia and Slovakia was estimated using the labour approach that relies on the difference between actual (real) and official (registered) use of labour for the 2005-2014 period. In Croatian economy, it is realistic to assume that the increase in the number of employed persons in official economy at the same time decreases the number of the registered unemployed persons. The positive relationship between unofficial employment and official employment (0.31) can be explained by the fact that persons employed in official employment are satisfied with their jobs and income and do not think about moving to shadow economy. On the other side, the situation is different in Slovakia because a negative relationship is recorded (-0.12) for the same variables. This can be explained by the fact that persons employed in official employment are unsatisfied with their jobs and income and are thinking of moving to the shadow economy. By analysing empirical results, it has been estimated that there are two negative correlations in the observed 2005-2014 period (official employment and official unemployment, -0.97, and unofficial employment and official unemployment, -0.24) and one positive correlation between unofficial employment and official employment (0.31) in Croatia. In Slovakia, negative correlations are recorded in all three relationships (official employment and official unemployment -0.18, unofficial employment and official employment – 0.12 and official unemployment and unofficial employment – 0.87). Due to a lack of accurate evidence, the use of labour approach (only administrative data) is limited for concrete policy measures. Even so, in order to reduce the shadow economy, the Croatian and Slovakian governments need to implement serious sets of measures, especially structural reforms. Croatia and Slovakia cannot fight against shadow economy in an organized and efficient way until authorities are not ready to eliminate corruption. In order to improve the quality of the fight against corruption, it is necessary to continue the development of the judiciary, take actions to improve the independence of the judiciary, review the principles of financial support for law enforcement and provide measures to improve their wages. Thus, further research and detailed in-depth studies are needed in both countries. A recommendation would be to design a special country-based survey for every economic activity, which would result in an in-depth insight into the true state of the Croatian and Slovakian shadow economy.

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The changes in capital structure of selected banking markets as a result of new regulations

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Abstract: *Among many different factors that has influenced banking market for the last few decades the regulations are thought to be the crucial ones. The new prudential standards implemented by the Basel Committee treat banks' capital as a foundation for safety. The appropriate level of bank's capital helps to manage all kinds of risks. European directives that have had to be implemented to national regulations have remarkably changed the market environment and influenced banks and credit institutions' market policy. Fulfilling capital requirements has become one of their most important objectives. On the other hand, capital safety may favour maintaining the stability of banks.The paper presents the review of European regulation in this field and their impact on selected banking market. The author has chosen Germany and Poland as an representation of European largest economies. The purpose of the paper is to present the similarities and differences between the regulation impact on the west and east Europe.*

Keywords: Basel III, capital regulations, banking market, credit institutions' liabilities, bank capital, structure of bank capital

JEL codes: G21, G28

1 Introduction

Events that took place in the twentieth century fostered alternately different doctrines relating to the scope and scale of regulations of a banking sector. Supporters of the 'free banking' called for more loosening in regulatory discipline, believing in the ability of banking sector self-regulation and market supervision. In turn, their opponents pointed to the advantages of banks' strictly regulations, by creating more and more restrictions and requirements for capital adequacy.

Since the 30s of the twentieth century, so since the Great Depression, prudential standards were gradually implemented, aimed at countering the threat of banking institutions' bankruptcy. At the beginning, there were set the guidelines, regulating the scope of activity carried out by banks and prudential standards depending on the scale of this activity as well as risk exposure. A particular role was attributed to the banks' own funds - as a non-repayable source of financing, enabling the absorption of losses and guaranteeing the fulfilment of claims for creditors in case of potential bank's insolvency. So that equity became a main axis of banks' prudential regulations (Marcinkowska, 2005).

The paper presents the evolution of prudential regulation, the contemporary capital requirements and their impact on Polish and German banking market.

2 Basel I and Basel II: History of the regulations' evolution

In the late 80s of the twentieth century with the growing importance of risk management and the need to regulate banking supervision, the Basel Committee on Banking Supervision developed innovative rules relating to the security of the banking system. The reason was to create a level playing field for 'internationally active banks'. Basel Committee is not a supervision authority, and its recommendations are not applicable legal standards. These are only recommendations for good practice that national authorities may implement to their legislation in the form of relevant law acts, adapting to financial system specificities. At the same time, due to the high authority of the Committee, they are recognised in many countries around the world as a basis of created legal acts.

In 1988 the Basel Committee has introduced a capital measurement system, presented in the document known as *Basel Capital Accord* (Basel I). The most important element of Basel I became a synthetic measure of the *Capital Adequacy Ratio* (CAR). This indicator, also known as Cooke ratio (*Total Capital Ratio* – TCR, *Capital to Risk Weighted Assets Ratio* - CRAR), presents how much capital a bank must hold to its activity to be safe (Nocoń, 2015). Initially, Capital Adequacy Ratio was referred only to credit risk. Therefore, it was defined as a relation between bank's capital base (own funds, consisting of Tier I capital, as a basis to cover losses, and Tier II capital as supplementary capital for a bank) to risk-weighted assets (Iwanicz-Drozdowska, 2012):

$$CAR_I = \frac{c_{tier\ I} + c_{tier\ II} - c_{deduction}}{r_{cred}} \geq 8\%$$

wherein:

$$r_{cred} = r_{bs} + r_{obs}$$

where:

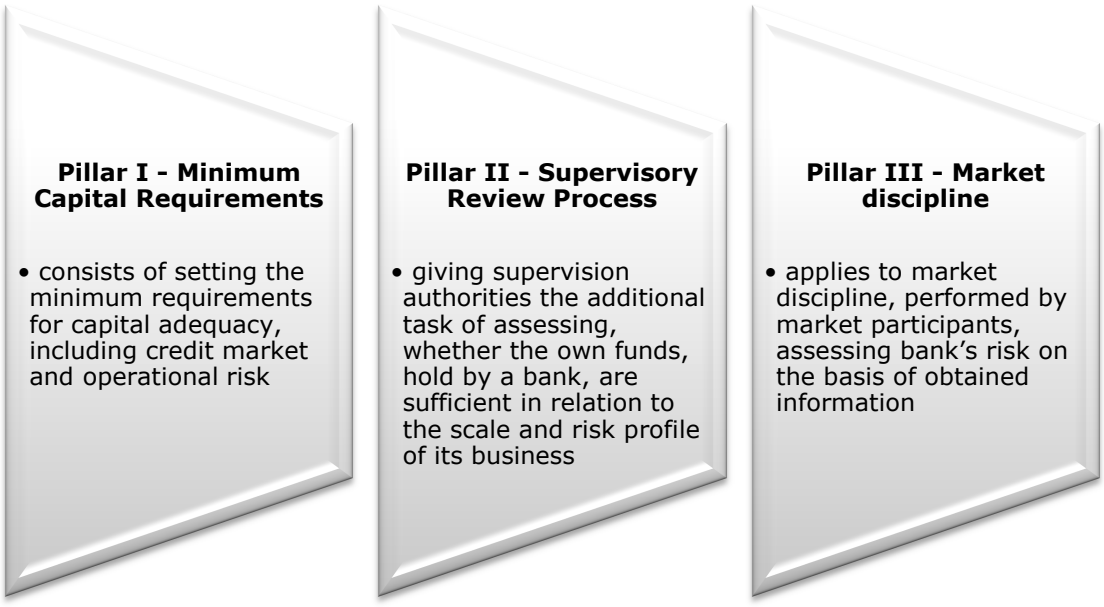
CAR_1	– Capital Adequacy Ratio
$c_{tier\ I}$	– basic funds (core capital, basic equity) - tier I capital
$c_{tier\ II}$	– supplementary funds – tier II capital
$c_{deduction}$	– positions which reduce the total amount of funds
r_{cred}	– exposure to credit risk (risk-weighted assets)
r_{bs}	– exposure to credit risk on balance sheet items
r_{obs}	– exposure to credit risk on off-balance sheet items.

Basel I required that the capital adequacy ratio can not be lower than 8%(Iwanicz-Drozdowska, 2012). It also defined four asset classes and four non-balance sheet liabilities classes, by assigning them risk weights (0%, 20%, 50% and 100%). A significant advantage of this approach was simplicity, which on the other hand - was also a main basis of criticism, because the assets were equally treated in the same group, without the possibility of varying the level of risk (Marcinkowska, 2010).

However, changing environment of the banking sector, dynamic development of financial markets, high volatility of prices on the financial markets, orientation only on credit risk, and in particular the criticism of the oversimplified measurement in Basel I, led to the need to include in the measurement of capital adequacy, in addition to credit risk, also other kinds of risk, like: price (market) risk and operational risk. The work on the improvement of the Basel Agreement was revealed in 2004, presenting its new framework known as Basel II - *The New Basel Capital Accord* (Basel Committee on Banking Supervision, 2004). In June 2006 revised and improved version of the concept of Basel II was published (Basel Committee on Banking Supervision, 2006). Its main foundation became the idea of economic capital, defined as the minimum value of own funds, which secures all unexpected losses, taking into account the bank's preferences regarding the accepted level of risk (Adamowicz, 2005). Additionally, a third category of

capital was introduced - *Tier III capital* (available to cover market risk). Basel II took into consideration a proposal of measuring capital adequacy, which was based on three complementary pillars (Iwanicz-Drozdowska, 2012) - see figure 1.

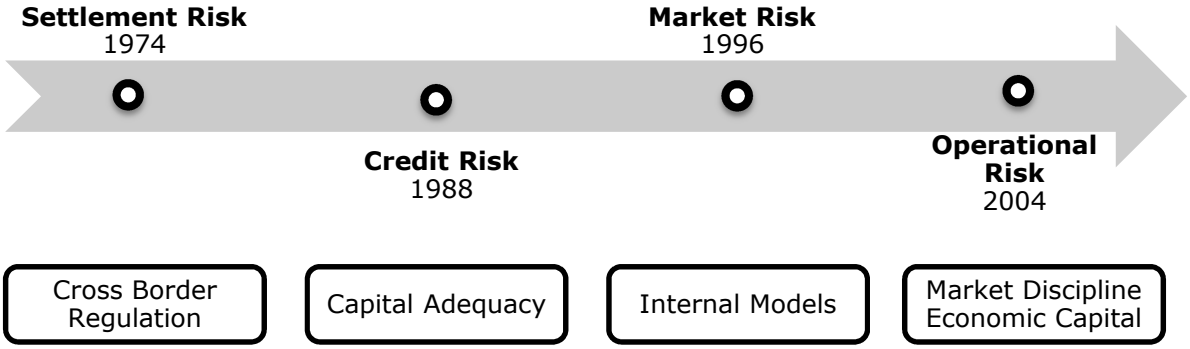
Figure 1 The basic concept of Basel II



Source: Own work.

The New Basel Capital Accord maintained previously used definition of own funds and the minimum 8% level of Capital Adequacy Ratio. However, it implemented in its estimation - apart from credit risk – also market and operational risk (see figure 2). In place of previously used approach – equally for all banks - was recommended the system, which consisted of three methods, allowing banking institutions to choose the most appropriate for them: a simple approach (assigning weights depending on the assets credit quality), as well as intermediate and advanced approaches. Therefore, capital requirements according to Basel II are much more dependent on the risks incurred by a bank (Marcinkowska, 2010). Furthermore, the New Basel Capital Accord allowed banks to use their own risk models (based on the VaR methodology) in estimation of market risk exposure.

Figure 2 Evaluation of Basel Committee Initiatives.



Source: Own work.

The capital adequacy ratio according to Basel II is defined as follows (Iwanicz-Drozdowska, 2012, Marcinkowska, 2009, Kopiński 2008):

$$CAR_{II} = \frac{c_{tier\ I} + c_{tier\ II} - c_{deduction} + c_{tier\ III}}{r_{cred} + 12{,}5\ (r_{mark} + r_{oper})} \geq 8\%$$

where:

$c_{tier\ III}$ – *third category* of *own funds - tier III capital*
r_{mark} – exposure to market risk
r_{oper} – exposure to operational risk

However, during implementation of the new recommendations of Basel II in early 2007 (also underwent severe criticism), the first symptoms of the global financial crisis occurred. It revealed many imperfections in risk management and existing supervisory regulations. Therefore, the international bodies, including the Basel Committee on Banking Supervision, were forced to revise the mandatory amount of banks' equity capital. As a result, in the years of 2010-2011, the Basel III framework was presented, which will come into force successively until 2019.

3 Post-crisis capital requirements - Basel III

As a reaction of low level of capital security of banks during the global financial crisis, in December 2010 the Basel Committee has published two documents (Iwanicz-Drozdowska, 2012):

- Basel III: A global regulatory framework for more resilient banks and banking systems,
- Basel III: International framework for liquidity risk measurement, standards and monitoring.

These documents constitute a set of regulations known as Basel III, which strengthens previous equity requirements. It distinguishes two categories of capital in banks (Iwanicz-Drozdowska, 2012a, Nocoń, 2016):

- tier I capital described as going concern capital,
- tier II capital described as gone concern capital.

Thereby, Tier III capital - introduced in The New Basel Capital Accord, disappeared (Iwanicz-Drozdowska, 2012a). The Basel Committee has also proposed tightening the rules for qualifying specific positions as core capital, to fully meet the requirements associated with the ability to cover losses. The amount of the capital adequacy ratio was left at the previous level of 8%.

According to Basel III (Basel Committee on Banking Supervision, 2011), Tier I capital consists of common equity tier I (CET1) and additional tier I capital. However, the main emphasis is on common equity Tier I, which includes:

- ordinary shares issued by a bank,
- the issue premium arising from the issuance of instruments classified as *common equity Tier I*,
- retained profits and other accumulated profits and disclosed reserves.

Basel III has tightened existing recommendations, assigning a greater role of Tier I capital. Banks should, therefore, maintain capital adequacy ratios at the following levels (Basel Committee on Banking Supervision, 2011):

- Common Equity Tier I ratio (CET1) ≥ 4,5%
- Tier I Capital ratio ≥ 6%
- Capital Adequacy Ratio (Tier I + Tier II) ≥ 8%

Despite the fact that the Basel Committee maintained the current level of capital adequacy ratio at a level of 8%, it also introduced two capital buffers:

- *capital conservation buffer* – which has protective character,
- *countercyclical buffer* – which has countercyclical character.

Their aim is to increase the security of banks and banking sector, increasing requirements for the level of capital adequacy ratio, taking into account common equity tier I. Capital conservation buffer has appeared in 2016 at a level of 0.625%, in 2017 it will increase to 1.25%, after that to 1.875%, and from the beginning of 2019 it will amount to 2.5% (Basel Committee on Banking Supervision, 2011).

Recommendations proposed in Basel III seem to be the a result of a concern for an adequate level of capital security for banks. Basically, Basel III is intended to strengthen banks' stability and increase funds security. Nevertheless, Basel III identifies the same capital adequacy ratios for all banking institutions, as a guarantor of safe global banking. However, it is highly disputable to adapt Basel regulations to national banking systems. Each country is governed by its own law referring to banks and attempts of transnational regulations common for all, which often turn out to be difficult to implement.

4 The changes in capital structure on Polish and German banking market

As a result of the last financial crisis and the implementation of new regulations, the European banking market has changed remarkably. Different economies adapt to all this changes in a different way. Germany and Poland has been chosen to present the results of new regulation implementation as they are the representation of European largest economies.

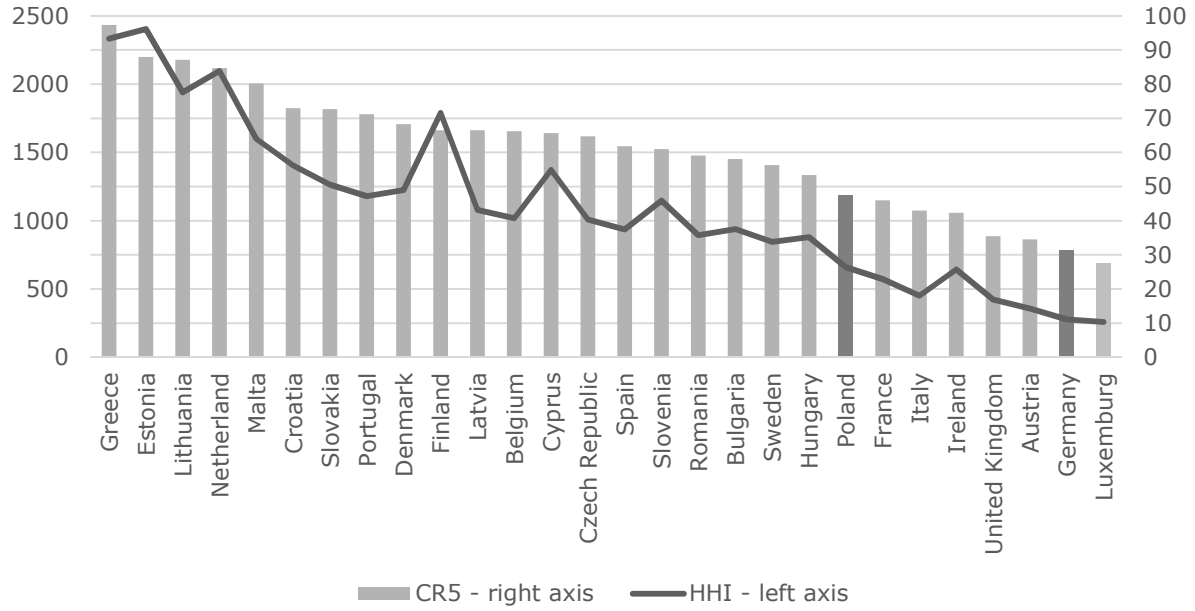
The primary result of the crisis was banking market consolidation. It has led to increasing market concentration. The commonly used indexes for measuring the market concentration are Herfindhal-Hirshman index for credit institutions' total assets and concentration ratio. Both, Polish and German banking market become slightly more concentrated today, and the position of the five largest credit institution on the market has increased (see Table 1). Comparing with other European countries, both countries remain quite competitive ones. In 2016 the average level of HHI index was 1107. The level of this index in both countries is definitely below the mean. Similarly, the concentration ratio of both banking market is lower than the average for Europe that was 61.1 in 2016. Germany is still one of the less concentrated market in Europe. (see Figure 3).

Table 1 The concentration of Polish and German banking market

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Poland										
HHI	640	562	574	559	563	568	586	656	670	659
CR^5	46.6	44.2	43.9	43.4	43.7	44.4	45.2	48.3	48.6	47.7
Germany										
HHI	183	191	206	301	317	307	266	300	273	277
CR^5	22.0	22.7	25.0	32.6	33.6	33.0	30.6	32.1	30.6	31.4

Source: own work based on ECB Banking Structural Statistical Indicators

Figure 3 The concentration of European countries' banking markets in 2016



Source: Own work based on ECB Banking Structural Statistical Indicators

Such a market structure means that there are many credit institutions conducting their activity on the market. All of them must fulfill the regulatory requirements concerning the capital as a guarantee of safety. Since the beginning of the financial crisis, the capital base has increased in both countries. In Poland, the total assets has almost doubled, from the level of 526 757 to the level of 778 298 million Polish zloty. In Germany, since 2007 it has tripled from the level of 302 891 to the level of 921 785 million euro (see Table 2).

Table 2 The CI's assets conducting activity on Polish and German banking market

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Poland (in million Polish zloty)										
the assets of branches	34590	56927	56477	57426	30198	29475	33739	33926	34088	35194
the assets of subsidiaries	492167	636851	606633	674432	774585	800689	860450	904654	894712	743104
Germany (in million euro)										
the assets of branches	137576	156185	151784	164883	189429	257255	185858	196033	252254	309763
the assets of subsidiaries	165315	172391	513322	631519	674870	630983	550653	595308	575902	612022

Source: own work based on ECB Banking Structural Statistical Indicators

The capital increase enabled creating the stable banking system in both economies. The overall solvency ratio exceeds the minimum requirements of 8% in both countries. During the period considered it has been at the comfortable level. Today it has reached the level of 15.81% in Poland and 17.91% in Germany. Tier 1 ratio has also been above the expected requirements. According to Articles 83 and 96 of the Act of 5 August 2015 on Macroprudential Supervision over the Financial System and Crisis Management, since 1 January 2016, a countercyclical buffer rate has been set at 0% for credit exposures on

the territory of the Republic of Poland. This rate shall apply until it is changed by a regulation of the Minister of Finance. According to German Banking Act, the domestic countercyclical buffer rate shall be between 0% and 2.5% of the total risk exposure amount (German Banking Act, Article 10c). Since the 1st January 2016, the recommended level is the same like in Poland (ESRB, 2016). Both countries are prepared for Basel III standards in this case (see Table III)

Table 3 The Basel indicators for Polish and German banking market

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Poland									
Overall solvency ratio	12.44	11.34	13.46	14.01	13.29	14.87	15.57	14.90	15.81
Tier 1 ratio	11.86	10.17	12.10	12.59	11.88	13.14	13.96	13.73	14.51
Capital buffer (%)	n/a	3.34	5.46	6.01	5.29	6.87	7.57	6.90	7.81
Germany									
Overall solvency ratio	11.43	12.99	14.27	15.28	15.78	17.39	18.67	17.25	17.91
Tier 1 ratio	7.9	9.26	10.63	11.43	11.72	13.80	15.19	14.75	15.44
Capital buffer (%)	n/a	4.99	6.27	7.28	7.78	9.39	10.67	9.25	9.91

Source: own work based on ECB Banking Structural Statistical Indicators

Both, the Polish and German banking market are characterised by strong capital base that enables banks to remain stable during periods of stress when losses materialise. It will help to create resilience on those markets and banks' sustainable development.

5 Conclusions

The banking systems are the most significant sectors of today's' economy that enable the development of other areas. Since the last few decades, the role and importance of financial institutions have been systematically increasing. Their resilience is one of the conditions necessary for other enterprises development and the stability of the whole country's economy. The experience of the last financial crisis show that the free market is not able to create self-regulation that will be able to assure long-term stability. As a result, many regulatory initiatives has occurred. The crucial for banking market are Basel regulations. They focus on banks' capital as a guarantee for banking systems' safety. The necessity of fulfilling Basel equity regulations and measures has caused some changes in banking sectors' capital level. Presented data shows that, during the last ten years, the capital base of Polish and German banking markets has increased remarkably. The changes in the capital level enable not only fulfill but even exceed all the Basel I, II and III requirements. Therefore, both market might be assessed as stable and prepared to absorb any unexpected losses that might occur in the future.

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Two Variables Affecting the Economic Value Added (EVA)

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Abstract: *Economic value added EVA is one of the most important indicators of financial analysis, however, it has not been being used widely in practice yet. A possible reason is its calculation that is more complicated than for conventional one, e.g. ratios. This complexity primarily involves calculating the average weighted cost of capital (WACC) and unequal approach to the calculation of net operating profit after tax (NOPAT), the WACC and NOPAT are initial variables for the calculation of EVA. The aim of this paper is to summarize the basic approaches to calculating WACC, particularly the cost of equity and to calculate NOPAT and finally to simplify the calculation of EVA with mathematical analogy modifications. Mathematical adjustment has proved that economic value added is essentially a net profit weighted by the debt proportion in the overall capital structure. This post is to submit a simplification of the indicator of economic value added in an effort to extend its application in practice.*

Keywords: Economic value added, EVA, Average weighted cost of capital, WACC, Net operating profit after tax, NOPAT.

JEL codes: M21

1 Introduction

Economic value added EVA is one of the most important indicators of financial analysis, however, it has not been being used widely in practice yet. A possible reason is its calculation that is more complicated than for conventional ones, e.g. ratios. This complexity primarily involves calculating the weighted average cost of capital (WACC) and unequal approach to the calculation of net operating profit after tax (NOPAT), the WACC and NOPAT are initial variables for the calculation of EVA. The aim of this paper is to summarize the basic approaches to calculating WACC, particularly the cost of equity and to calculate NOPAT and finally to simplify the calculation of EVA with mathematical analogy modifications.

The goal of business should not be only profit maximisation.

Profit is to be regarded as an accounting entry, which should be viewed in the context of other indicators (Businessvize, 2017).

In recent decades, the pressure put on shareholder value has been strengthened, i.e. the pressure to increase shareholder value, the result of which was the creation of EVA that better affects the interests of shareholders and other stakeholders (Synek, 2002).

The goal of business should therefore be to maximise market value (Accenture, 2011).

In response to this request, economic value added EVA occurred at the beginning of 1990s. It was first published in 1991 by the American consulting firm Stern Stewart & Co. Its informative value became one of the most important indicators of financial analysis.

According to Synek (2002), the creation of economic value added and its maximisation is the goal of business. This governs everything - evaluation of investment, new products, and internal departments. EVA is the basis of material involvement, on which the reward system is based. It forms a complex management system, of which main task is to analyse the factors that contribute to the value creation and ensures the decisions that will bring increasing value for shareholders (shareholder value) and increasing benefits

for everybody who is closely connected with the existence of the company (stakeholder value).

Despite the undoubted importance of this indicator, it is not used by many small companies, because its calculation is complicated, to some extent.

Only 35.6% percent of companies monitor EVA, while 88.9% profit after tax (Horová and Hrdý, 2007).

Unlike common ratios indicators of financial analysis, the variables entering EVA calculation cannot easily be found in the financial statements.

The aim of this article is to show that EVA is basically affected only by two variables. This will result not only in more frequent use in practice, but a financial manager also gets the information on how to particularly act to improve this indicator using a very simple pyramidal decomposition.

2 Methodology and Data

Economic value added EVA (Eng. conomic value added) is a part of the so-called value performance criteria (Hrdý and Krechovská, 2013).

This indicator is based on economic profit, which counts with all the costs of invested capital (equity and debt), which distinguishes it from the financial profits on which common financial analysis is based.

EVA is given by the relation (Stewart, 1999):

$$EVA = NOPAT - WACC\ x\ C \quad (1)$$

Where:

- NOPAT is net operating profit after tax (Eng. net operating profit after tax)
- WACC is the weighted average cost of capital (Eng. weighted average cost of capital)
- C is invested capital.

Thus, economic profit is defined as earnings that exceed the cost of capital, i.e. EVA should be greater than zero so that the enterprise creates a new, the so-called added value, and thereby increases the original value of the company.

NOPAT

NOPAT, or net operating profit after tax, which is a rather complicated indicator, even in the Anglophone literature, enters the calculation of EVA.

The English version of Wikipedia (2010) states two different calculations. The first works with strictly terminological approach, where it only deducts the operating profit from the amount paid in taxes – i.e. it multiplies it by a tax shield (1-t).

Investopedia (2010) says that NOPAT does not include the tax savings resulting from the deduction of interest expense.

Therefore, NOPAT is already defined differently in its domestic environment and the harder it is to transfer it into the Czech environment.

NOPAT can be expresses in two ways (2), (3).

$$NOPAT = EBIT\ x\ (1-t) \quad (2)$$

Where:

- EBIT is earning before interest and tax (Eng. Earnings before interest and tax),
- t is income tax rate

Or

$$NOPAT = EAT + I\ (1-t) \quad (3)$$

Where:

- EAT is net profit after tax,
- I are cost interests,
- t is income tax rate.

WACC

The second indicator entering the EVA calculation is the weighted average cost of capital WACC (Eng. weighted average cost of capital).

WACC can be calculated as the sum of the unit costs of equity and debt, where the capital structure acts as a weight (Hrdý and Krechovská, 2013):

$$WACC = n_{vk} * \frac{K_{vk}}{K} + n_{ck} * (1-t) * \frac{K_{ck}}{K} \quad (4)$$

Where:

- n_{vk} are costs of equity (required profitability),
- n_{ck} are costs of debt,
- t is income tax rate,
- K_{vk} is equity,
- K_{ck} is debt,
- K is total capital.

While the capital structure can be found in the balance sheet and the costs can of debt be easily calculated, mostly as the average interest rate, the costs of equity are difficult to be determined.

Generally, the costs of equity can be determined either on the basis of market-based approaches, or methods and models based on accounting data.

According to Dluhošová, the basic methods, used to estimate the costs of equity (Dluhošová, 2006), are:

- Capital Asset Pricing Model CAPM (Capital Asset Pricing Model),
- Arbitrage Pricing Model – APM (Arbitrage Pricing Model),
- Modular models,
- Dividend growth model.

The economist William Sharpe's Capital Asset Pricing Model CAPM was created in the 1960s. This market-based approach to determine the cost of equity indicates that the expected risk changes in direct proportion to the beta coefficient. Beta coefficient expresses the rate of a specific market risk through the weighing the shares sensitivity to changes in market portfolio (Kislingerová, 2010).

APM model also belongs to a market valuation of assets, but unlike the CAPM, it is a multi-factor model. This model takes into account both macroeconomic factors (GDP, inflation) and microeconomic factors (profitability, indebtedness, liquidity, size).

The modular method of determining the WACC is used in an economy with imperfect capital market and short-term functioning market economy.

Alternative cost of equity is defined as the sum of the risk-free asset profitability and risk premiums. In this case, the risk premiums are not derived from the capital market, but from the business accounting data as (Dluhošová, 2006):

$$WACC = R_F + R_P + R_{FS} + R_{LA} \quad (5)$$

Where:

- WACC is the total capital cost of a debt-free company,
- R_F is a risk-free interest rate,

- R_P is a risk surcharge for the commercial business risk,
- R_{FS} is a risk surcharge for the risk resulting from the financial stability,
- R_{LA} is a risk surcharge characterising the company size.

In the modular method, the starting point is the current profitability of risk-free securities, to which, on the basis of an expert estimate, surcharges are added for different types of risks, resulting e.g. from indebtedness or a reduced level of company liquidity.

Determining costs with the use of the modular method is possible even without expert estimates. There is a method, which describes a specific method of calculation, see Kislingerová (2010).

The dividend model is used for shares valuation, when the market price of the shares is determined by the present value of future dividends from the shares in individual years.

Assuming an infinite period of holding shares and a constant value of dividends, the shares market price can be determined as perpetuity (Nývltová and Marinič, 2010).

The disadvantage of market models CAPM and APM is their limited applicability only for joint stock companies with public shares. CAPM and APM models and the modular method do not assume expert estimates.

Neither the dividend model can be generally recommended because few companies (if any) can be found in current conditions in the Czech Republic, which regularly pay dividends and the amount of dividends paid fully reflects the requirements of shareholders for increased value of invested capital, and they no longer expect, in addition to the payment of dividends, increase in the market share rate (Nývltová and Marinič, 2010).

Given that the aim of this paper is to simplify, or rather allow, the calculation of EVA, and the calculation of WACC and the components of costs of equity for all businesses, it is necessary to offer businesses a different method of calculation.

3 Results and Discussion

Similarly to the dividend model of costs of equity calculation, it can be stated that the dividends are essentially the cost of equity, as well as the interests are the cost of debt.

Given that equity is a potential liability to the owners, the entire profit after tax can also be understood a potential pay-out to the owners. Dividends may be substantially equal to the profit after tax and the profit after tax is thus the cost of equity.

The cost of equity is thus calculated as capital profitability, which is essentially the value of ROA:

$$n_{VK} = \frac{EAT}{K} \tag{6}$$

Where:

- EAT is profit after tax,
- K is the capital.

Now, we can proceed to the simplification of EVA, which is demonstrated mathematically and through the exercise experiment in this paper.

As we stated, EVA is calculated:

$$EVA = NOPAT - WACC\ x\ C, \tag{7}$$

NOPAT can be calculated:

$$NOPAT = EAT + I * (1 - t) \tag{8}$$

And WACC as in (4) can be by a modification of (6) calculated:

$$WACC = \frac{EAT}{K} * \frac{VK}{K} + \frac{I}{CK} * (1 - t) * \frac{CK}{K}. \quad (9)$$

If NOPAT and WACC are put into the calculation of EVA, we get:

$$EVA = EAT + I * (1 - t) - (\frac{EAT * VK * K}{K^2} + \frac{\mathrm{CK} * \mathrm{I} * (1-\mathrm{t}) * \mathrm{K}}{\mathrm{CK} * \mathrm{K}}) \quad (10)$$

If we cancel out the variable of total capital K and the variable of debt CK, we get this equation:

$$EVA = EAT + I * (1 - t) - EAT * \frac{VK}{K} - I * (1- t) \quad (11)$$

If we adjust it mathematically, we get:

$$EVA = EAT - EAT * \frac{VK}{K}, \quad (12)$$

After factoring out we get:

$$EVA = EAT * \left(1 - \frac{VK}{K}\right), \quad (13)$$

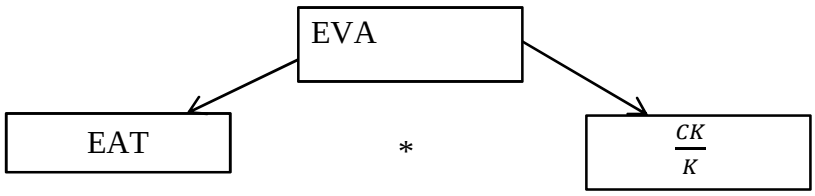
This can be finally written as:

$$EVA = EAT * \frac{\mathrm{CK}}{\mathrm{K}}. \quad (14)$$

From the derivation above, we gained an equation, when EVA is only affected by the net profit after tax and debt structure.

From a simple multiplier pyramidal decomposition, Fig. 1, it is clear that it is not necessary to calculate cost of equity and debt for the positive influence on EVA. EVA will grow with increasing net profit and debt.

Figure 1 Multiplier Decomposition of EVA



Source: own

The following example will practically prove the new equation for the calculation of EVA.

It is therefore necessary to calculate the value of EVA in the traditional way and the new suggested way to verify that the results are the same.

Exercise: Equity is 500 000 CZK, debt is 400 000 CZK, the profit after tax is 200 000 CZK, the effective tax rate of 18%, the cost of debt is 0.0721% per annum, interests are 28 500 CZK.

The exercise is first solved by the original equation of (1), (3) and (4):

$$EVA = 200\,000 + 28\,500 * (1 - 0{,}18) - (\frac{200\,000 * 500000x900000}{900000^2} + \frac{400000 * 28500 * (1-0{,}18) * 900000}{400000 * 900\,000}). \quad (15)$$

$$EVA = 88\,889. \quad (16)$$

When calculating using a new equation (1) (3) and (7), EVA is calculated very easily:

$$EVA = 200\,000 * \frac{400000}{900\,000} \quad (17)$$

$$EVA = 88\,889. \quad (18)$$

The results (16) and (18) prove that the significant simplification of equation led to the same result as in the use of a more complex equation.

4 Conclusions

The aforementioned indicates that the economic value added is essentially a net profit weighted by the debt proportion in the overall capital structure. Besides the net profit indicator, which is an absolute indicator itself, there is also a noticeable tendency of the inclusion of debt. Since there is a rule that debt is a generally cheaper type of financing in comparison with equity, cost of capital is basically integrated here as well, albeit it does not appear in a simplified concept of EVA.

This post is to submit a simplification of the indicator of economic value added in an effort to extend its application in practice.

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The Structure of Banks' Assets in Terms of Portfolio Theory and Bank Capital Regulation

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Abstract: *In the period of the financial crisis, the current question is how banks should invest, as interest rates and market yields are low, and capital growth is required as a result of bank regulation requirements. Balancing between risk and return in the banking sector is still sustaining and contributing to the pro-cyclical behavior of banks. This article addresses the question whether it is appropriate to undertake a high risk in the banking sector and whether the risk is adequately compensated by adequate returns. It compares the portfolio risk of traditional loans and portfolio of securities eligible for inclusion into the HTM (Held to Maturity) portfolio.*

Keywords: bank assets portfolio, portfolio risk

JEL codes: G11, G18

1 Introduction

- Markowitz (1952) or (Markowitz, 1952)
- Black and Scholes (1973) or (Black and Scholes, 1973)
- Phillips et al. (2009) or (Phillips et al., 2009)

This issue of balancing between risk and returns in the banking sector and pro-cyclical behavior of banks confirm several authors such as Gordon, Alexandre, Shu (2014) that if regulation allows a hidden increase in risk in banks' trading books without penalty in the form of a capital increase, then the pro-cyclical nature.

This problem is not new; it represents the relationship between regulation and market behavior of banks.

This question is visible to other authors, such as Koehn a Santomero (1980), who argue that banks with low risk aversion had higher capital requirements but also a higher probability of bankruptcy.

Van Hoose (2007) looked at banks as portfolios managers. The primary effect of any system of capital requirements is, according to the leverage effect of the portfolio, to change the ratio between capital and assets. It is probable that the result will be a change in the assets portfolio of the financial institution.

Koehn and Santomero (1980) have generalized that the capital requirements and the reliability of the banking system as a whole depend on the distribution of risk aversion across banking systems. Kahane (1977) argued that it is not possible to effectively reduce the risk by regulating if the subject of regulation is not the composition of assets.

In addition, we have been inspired by research of the author Tanda (2015) on the relationship between capital and risk-taking, the behavior of banks, as a key link in the regulation of capital.

The author points out the differences in the behavior of banks under of selected characters. Its benefits are mainly in comparison to several studies and the methods used. For example, bank size may have a negative impact on capital growth (Berger et al., 2008), because larger banks have easier access to capital markets (Ahmad et al., 2009), which is associated with greater flexibility in the use of hybrid instruments or subordinated debt, they can rely on public pressure in case of emergency.

The paper of Beltratti, A. and Stulz, R. (2009) deals with the question of why banks behave better during the financial crisis. They say the hypothesis that the release of regulation leads to problematic behavior of banks, and vice versa, the regulation is tightening during the crisis and this leads to better bank behavior. They also point out that during the crisis; large banks have a lower performance than small ones.

The bank's assets can be viewed as a portfolio in the sense of Markowitz's modern theory of the portfolio. The question of the optimal composition of the portfolio looks at the yield of each component and its correlation. Conversely, it does not take into account the liquidity risk or the credit risk, which gives some limitations to the results and recommendations of Markowitz's modern portfolio theory for the bank portfolios.

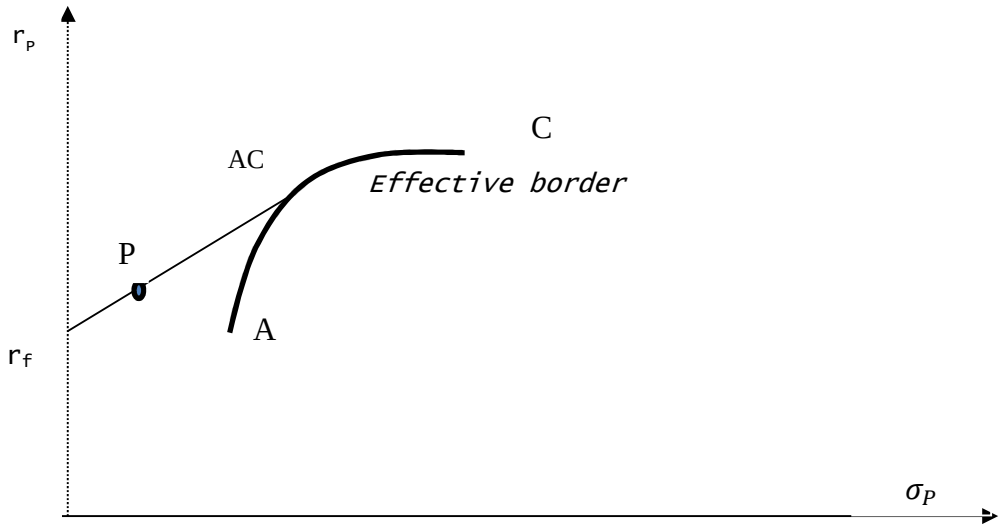
2 Methodology and Data

We have created a portfolio of loans as a market portfolio on the basis of Markowitz's portfolio theory. We compared the portfolio theory recommendations with gap analysis recommendations. Gap analysis took into account the maturity of loans and the expected rate of interest, Markowitz's portfolio theory takes into account volatility and covariance between portfolio components.

In addition, it must be included in mind that in the real world, investors can achieve better results by combining the market portfolio with risk-free investments. In this respect, we use the capital market line theory.

Inspiration to combine a market portfolio with a risk-free investment was mainly bank practice during the financial crisis.

Figure 1 Capital Market Line



Source: own processing

All portfolios constructed on the basis of a combination of market (in our case credit portfolio) and risk-free investment will lie on the rf-AC line. The higher the portion of the market portfolio, the more profitable the yield will be. The higher the share of risk-free investment, the yield will be closer to rf.

For portfolio creation we used data on loans in the euro area, namely their volumes and interest rates. Loans were broken down by maturity and by type. These data are from the ECB (Statistical Data Warehouse) for the period 2015.

Data on the German and Greek bond prices are from the Bloomberg site.

Model Specification

The Capital Market Line (CML) is an effective combination of the risk-adjusted market risk portfolio with the risk-free asset. Markowitz extended his theory to risk-free assets, which are mainly government bonds.

The mathematical expression of the capital market line is as follows:

$$E_{(r_p)} = r_f + \frac{E_{(r_m)} - r_f}{\sigma_m}.\sigma_p \qquad (1)$$

where:

E_{rp} = *expected market yield of the market portfolio*

r_f = *risk-free yield*

E_{rm} = *expected market yield of the market portfolio*

σ_m = *market portfolio risk*

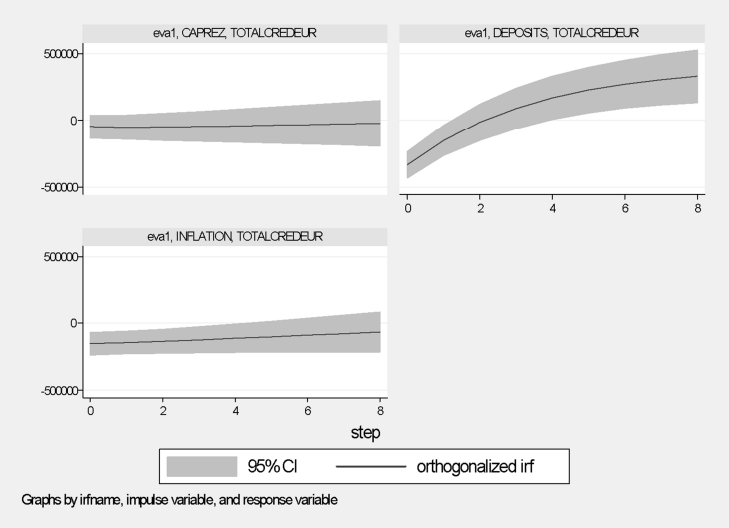
σ_p = *portfolio risk with risk-free asset*

On the capital market line CML are portfolios that combine market portfolio and the risk-free assets (Sharpe, Alexander, 1999).

3 Results and Discussion

At the beginning, we wanted to point out the sensitivity of loan development to selected factors, namely inflation, deposits and capital in the euro area. It appears that the most significant impact on the development of loans has had deposits, and that inflation and capital have had no significant impact on the credits development.

Figure 1 Impulse- Response Function between Credits and Inflation, Credits and Deposits, Credits and Capital



Source: www.ecb.int. Statistical Data Warehouse.

We have prepared a portfolio of loans as a market portfolio based on Markowitz's portfolio theory.

Table 1 Impact of Predicted Interest Rates, Credit Volumes and Portfolio Theory on the Recommended Loan Portfolio

Type of credit	Weight in portfolio design	Weight in the portfolio - real	Recommended weight in %	What is recommended to do	Expected Interest Rate Movement	Short-term/ Long-term Credit	Profit / loss (on the basis of gap analysis)	What to do? Recommended movement of credits (as result of gap analysis and portfolio theory)
TO_3M NONFINCORP	-0,4475	27,958	0	↓	↓	ST	↓	↓
TO1Y NONFINCORP	2,8747	12,68	2,87	↓	↓	ST	↓	↓
OVER5NONFINCORP	-1,7725	1,731	0	↓	↓	LT	↑	Discrepancy
TO1YHOSING	**4,130**	**4,212**	**4,133**	↑	↑	**ST**	↑	↑
1_5HOUSING	**21,12**	**1,378**	**21,12**	↑	↓	**LT**	↑	↑
OVER5HOUSING	**6,871**	**1,645**	**6,87**	↑	↓	**LT**	↑	↑
TO1YCONS	11,266	0,007	11,26	↑	↓	ST	↓	Discrepancy
1_5CONS	21,938	2,446	21,93	↑	↓	ST	↓	Discrepancy
OVER5CONS	28,803	2,482	28,80	↑	↑	LT	↓	Discrepancy
TO1Y TO1MIL NONFINCORP	0,1054	3,846	0,105	↓	↓	ST	↓	↓
HOUSE PURCHASE	5,1004	8,729	5,100	↓	↓	LT	↑	Discrep

OVER 10Y								ancy
TO1Y OVER1MIL NONFINCORP	-0,0250	32,17	0	↓	↓	ST	↓	↓

Source: own processing

On the basis of the analysis, we have come to the conclusion that in the euro area, the housing credits groups have profitable potential and this is shown in the Table 1 in highlighted rows. The risk is related to a possible change in the interest rate, so caution is required over 5 years.

The portfolio of loans (it means the market portfolio) has a yield of 5,733,728 and a risk of 0.000092968.

When investing in a market portfolio and a risk-free asset, new options will be added to the eligible set. In our case, we will combine the loan portfolio as a market-efficient portfolio and risk-free assets in the form of government bonds of Greece and Germany.

In the case of Greece's government bonds, we will see the paradox that the asset is considered risk-free on the basis of membership of sovereign bonds. In fact, the market risk is high and the site is able to capture Markowitz modern portfolio theory.

On the basis of the theoretical backgrounds, we will combine the market portfolio of loans with the government bond component.

Government bonds are referred to in the theoretical literature as a risk-free component because they are the state's issuer and the credit risk is 0.

On the other hand, these bonds, especially at the time of the financial crisis, have market risk. In order to express their market risk, we can build a portfolio of Greek and German government securities.

Table 2 Optimal Portfolio of Securities, Yield and Risk

Securities type	**Recommended share in the portfolio**
GTGR6M*	0,25922923
GTDEM6M**	0,008287163
GTGR25Y***	0,483489
GTDEM25Y******	0,24899929

Risk	0,003895
Yield	6,893793

GTGR6M* = Government bonds, Greece, maturity 6 Month
GTDEM6M** = Government bonds, Germany, maturity 6 Month
GTGR25Y*** = Government bonds, Greece, maturity 25 Years
GTDEM25Y**** = Government bonds, Greece, maturity 25 Years

Source: own processing

Given the risk of the securities portfolio, it is not possible to talk about a risk-free investment. It may be considered risk-free in view of the fact that the OECD government securities have zero credit risk.

Table 3 Optimal Portfolio of Securities, Market Portfolio, Yield and Risk

	Yield	Risk	Risk to Yield Rate
Portfolio of Securities	6,8937	0,0038953	0,000565051
Portfolio of Credits (Market Portfolio)	5,7337	0,0000929	1,62142E-05
Combined Portfolio 50:50	6,3137	0,001994	0,000315843
An increase of how much (Combined – Market)	0,5800	0,001901	0,003277736
An increase how many times (Combined/ Market)	1,1011	21,449961	19,47939795

Source: own processing

The increase in risk is disproportionately high in relation to the increase in the combined portfolio yield. As the table shows, the yield of the combined portfolio growth is a 1,101 fold; increase of the risk was 21.4499 fold. If we assume that the optimal yield growth is such an increase, which is accompanied by the least increase in risk, the porphyria does not meet the assumptions of optimal yield growth. Banks thus have an inadequate low yield increase exposed to an unreasonable high risk.

4 Conclusions

As we can see, the market risk of government securities in this case is even higher than the market risk of the loan portfolio. This means that, in fact, banks face a higher risk of purchasing government securities than is assumed by their risk-free assets. Market risk is often not taken into account. The increased risk is offset by a higher return, and it is questionable whether this increase in risk is adequate to the growth of the mixed portfolio yield.

In order to reduce risk, the banks will need to consider alternative solutions that would identify the onset of new risks, crises and the solutions offered in the regulation so as to reduce the rate cyclical nature of regulation. Several steps in this direction have already been made.

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Analysis of the impact of capital structure on business performance

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Abstract: *The aim of the paper was to analyse the impact of company's capital structure on its performance. To achieve goal, the data of Slovak businesses were used. An input analysis of the capital structure of selected sector was carried out in order to generalize and elaborate conclusions aimed at the capital structure of analysed businesses. Selected indicators of capital structure were calculated to analyse the relationships between these indicators and business performance. The results of the correlation analysis were complemented by examining the impact of selected independent variables on business performance applying regression analysis and principal component analysis. On the basis of the findings, capital structure model was formulated to quantify the impact of changes in capital structure on business performance. The contribution of the paper is the identification of capital structure indicators that affect business performance as well as the construction of capital structure model. The article as well as the research, which is the basis for paper elaboration, is the result of professional public interest focused on the finding whether the capital structure is the determinant of business performance.*

Keywords: business performance, capital structure, indicators, model

JEL codes: C10, G32, G17, M21, C53

1 Introduction

One of the fundamental problems of business financial management is to determine the correct composition of the funds needed to finance business activity, characterized by the term financial structure (Růčková, 2008). Capital structure is less comprehensive term and expresses only the structure of long-term capital. According to another definition, capital structure informs users about the type of capital, the period during which funds are fixed and business stability as well. It provides information on whether an enterprise makes optimal use of this capital in terms of indebtedness and capital commitment (Sedláček, 2003). According to Jánošová (2008), the company's capital structure is quantified using a wide range of indicators. The most common used indicators are: Total debt to total assets, Equity ratio, Debt to equity ratio, Equity to debt ratio, Interest coverage (key performance indicator, driver of the risk of capital structure), Interest burden, Equity to fixed assets ratio, Financial leverage, Stability and other indicators. Debt ratios create a network with strong relations between them (Štefko, Gallo, 2015), which results in synergic effect of indicators` impact on business performance. Development of debt ratios of performance evaluation should be focused on the processing and design of indicators which are most closely connected to the performance evaluation (Suhányiová, Suhányi, 2011).

The idea of proper capital structure was dealt with many financial management experts. Several theories (static and dynamic theories on capital structure) have been processed and many views on the issue of sources of financing of business activities (Závarská, 2012) have been published. An intensive discussion on this issue has started since the

original work of Modigliani and Miller (1958) was published. Frequently discussed was the issue of capital structure in terms of ownership that would maximize the economic profit and business performance. In general, these capital theories can be divided into two basic groups. The first group consists of static theories and second group consists of dynamic theories of capital structure. Static theories deal with the issue of optimal indebtedness and look for answers to the question of whether there is optimal indebtedness, how to define it, on the basis of which criteria and in terms of who (the owners, managers or creditors). This group involves classic theory, traditional approach (U curve theory), theory of Miller and Modigliani (MM model) and trade off model. On the contrary representatives of dynamic theories argue that there is no uniform methodology for determining optimal capital structure due to the specific conditions of each enterprise. Dynamic theories include theory of hierarchical order and signalling model.

Financial theory definitely confirms a certain link between capital structure and performance. In general debt is cheaper than equity. Business owner accepts higher risk than the creditors, since the return on an investment for the creditors takes priority over the return on capital invested by business owners. Therefore business owners require higher appreciation of capital invested in the enterprise. Increasing the share of debt in the financial structure of an enterprise can therefore positively affect the amount of economic profit. On the other hand with the rise in indebtedness the risk of bankruptcy is growing (Kiseľákova, Šofranková, 2015). This risk is gradually projected into the expectation of creditors who start to demand an increase in return on their investment to offset the risk they incur. The aim of the business owner is therefore to optimize the capital structure, with the intention of reducing the Weighted average cost of capital (WACC).

Research problem:

Does the company's capital structure affect business performance? What is business performance at different equity to debt ratio? What is the impact of capital structure on Cost of equity and business performance? How does the capital structure affect Cost of equity evaluation calculated by CAPM (Capital Assets Pricing Model) and Build-up model?

2 Methodology and Data

Analysed company is an electrical engineering stock company, which produces terminal telecommunication equipment such as standard, over-standard and special phones, residential equipment, electrical installation material and others. The company's range of products is mainly oriented to the electrical engineering industry, but a large part of the production is focused on the automotive and construction industries. The company's data for the years 2010-2016 were used as part of the analysis. From the capital structure point of view, company is financed by equity, while the average value of the indicator Equity ratio is 78%.

The aim of the paper *was to find out the impact of capital structure on business performance.*

Methods: EVA Equity and EVA Entity models were used to calculate performance. The formula (1) indicates that the Economic Value Added is expressed in two ways.

$$EVA_{Equity} = (ROE - r_e) \times E \quad (1)$$

where EVA stands for Economic Value Added, ROE is Return on Equity, E is Equity and r_e represents Rate of Alternative Cost of Equity.

One formula shows what is known as the spread $(ROE - r_e)$, which expresses the relative EVA/E (Neumaierová, Neumaier, 2016). The relative EVA is needed as input to the correlation matrix.

Formula for the calculation of EVA Entity is as follows:

$$EVA_{Entity} = NOPAT - WACC \times C \quad (2)$$

where $NOPAT$ stands for Net Operating Profit after Tax, $WACC$ is Weighted Average Cost of Capital and C represents Paid Capital.

For the calculation of Cost of equity we used CAPM with the acceptance of market, external and systematic risks. In order to compare performance results and the influence of risks on performance, we applied Build-up model for Cost of equity evaluation. This model accepts internal - financial risks and internal and external business risks. Cost of equity, which enters into the calculation of EVA indicator, was quantified applying CAPM - we used formula:

$$r_{eCAPM} = r_{fUSA} + \beta \times ERP_{USA} + CRP \quad (3)$$

where r_f stands for Risk-free rate of return of US T-bonds, ERP is Equity Risk Premium of US market, β represents coefficient of systematic risk and CRP is Country Risk Premium (Damodaran, 2001) and Build-up model - we applied formula:

$$r_{eBU} = r_f + r_b + r_{fin} \quad (4)$$

where r_b stands for Risk premium for business risk and r_{fin} is Risk premium for financial risk (Mařík et al., 2011).

To analyse relationships between capital structure indicators (Total debt to total assets, Equity to debt ratio, Current liabilities to total assets, Equity to fixed assets ratio, Interest coverage, Financial leverage) and performance indicator (EVA/E) we used correlation matrix (Table 1) and Principal Component Analysis (Figure 1). To confirm the impact of capital structure and cost of capital on performance, we used multiple linear regression model.

Table 1 Correlation matrix

	Total debt to total assets	**Equity to debt ratio**	**Financial leverage**	**Interest coverage**	**Equity to fixed assets ratio**	**Current liabilities to total assets**	**EVA/E**
Total debt to total assets	1.0000	-.9971	.9998	-.0150	-.4541	.9607	.2332
	p= ---	p=.000	p=.000	p=.975	p=.306	p=.001	p=.615
Equity to debt ratio	-.9971	1.0000	-.9954	-.0122	.4564	-.9638	-.2651
	p=.000	p= ---	p=.000	p=.979	p=.303	p=.000	p=.566
Financial leverage	.9998	-.9954	1.0000	-.0230	-.4535	.9589	.2225
	p=.000	p=.000	p= ---	p=.961	p=.307	p=.001	p=.632
Interest coverage	-.0150	-.0122	-.0230	1.0000	.5659	.1688	.1551
	p=.975	p=.979	p=.961	p= ---	p=.185	p=.717	p=.740
Equity to fixed assets ratio	-.4541	.4564	-.4535	.5659	1.0000	-.2105	-.1179
	p=.306	p=.303	p=.307	p=.185	p= ---	p=.650	p=.801
Current liabilities to total assets	.9607	-.9638	.9589	.1688	-.2105	1.0000	.2128
	p=.001	p=.000	p=.001	p=.717	p=.650	p= ---	p=.647
EVA/E	.2332	-.2651	.2225	.1551	-.1179	.2128	1.0000
	p=.615	p=.566	p=.632	p=.740	p=.801	p=.647	p= ---

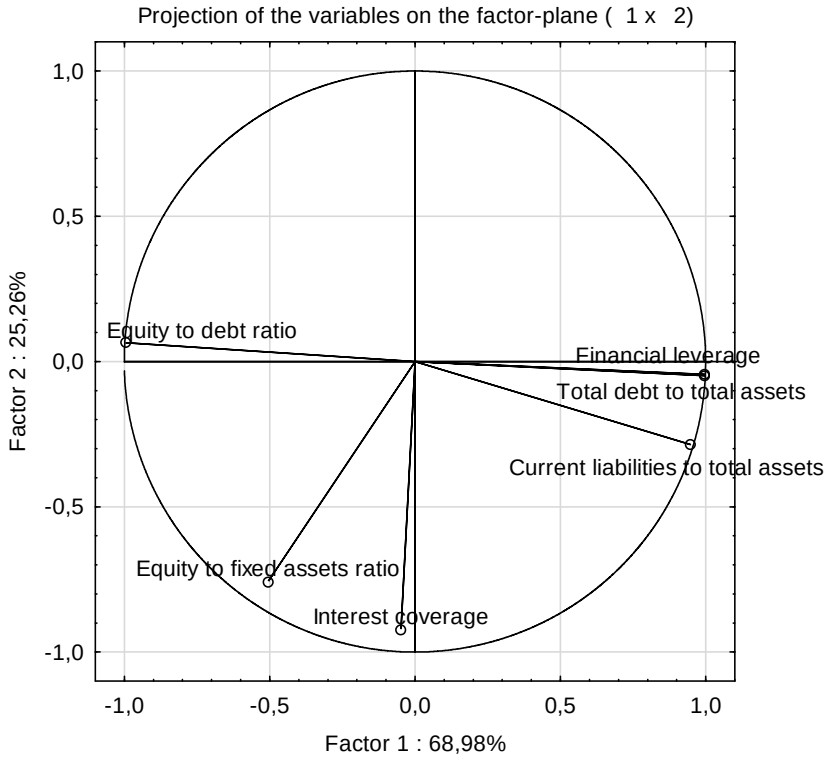
Source: processed by authors in STATISTICA

From the matrix (Table 1) is evident, that there is a strong, indirectly proportional relationship between Equity to debt ratio and Total debt to total assets, and there is a strong, directly proportional relationship between Total debt to total assets and Financial

leverage. Similarly there is a strong directly proportional linear relationship between Current liabilities to total assets and Total debt to total assets. In the case of Interest coverage, we did not notice a significant relationship with the analysed indicators. Interest coverage does not create a pair with any indicator because the way of its calculation is considerably different from other analysed indicators. Interest coverage can be considered as a key performance indicator that does not correlate with any indicator within a given group. None of capital structure indicators correlate with the indicator EVA/E. Based on above mentioned, it can be stated that there is no significant relationship between the selected debt ratios and performance.

Applying Principal component analysis for the analysis of indicators of indebtedness we obtained two main components which involve 94% of the data variability. The first principal component evaluates Total debt to total assets, Equity to debt ratio, Financial leverage, and Current liabilities to total assets. The second principal component gives information about Interest coverage and Equity to fixed assets ratio (Figure 1).

Figure 1 Projection of the variables on the factor - plane



Source: processed by authors in STATISTICA

Since the correlation matrix did not confirm significant relationships between capital structure indicators and indicator EVA/E, we did not create a regression model with these independent variables. Nevertheless, we tried to reveal the impact of the capital structure on performance. Therefore we used equity, debt, Cost of equity, Cost of debt and Cost of capital as independent variables.

Two regression models were statistically significant - EVA Equity model applying Build-up model for Cost of equity calculation. This model demonstrated significant impact of Cost of equity and equity on EVA Equity. In the case of these indicators P – Value was less than 0.05. Estimated multiple regression model for $EVA_{EquityBU}$:

$$EVA_{EquityBU} = \alpha + \beta_1 ROE_i + \beta_2 r_{eSMi} + \beta_3 E_i \quad (5)$$

$$EVA_{EquityBU} = 2.941E + 06 + (-389.218)ROE_i - 1.557E + 07 r_{eSMi} - 0.124E_i \quad (6)$$

In the second model all indicators show statistically significant impact on EVA_{Entity}, P - Value < 0.05. Estimated multiple regression model for $EVA_{EntityBU}$:

$$EVA_{EntityBU} = \alpha + \beta_1 D_i + \beta_2 r_{di} + \beta_3 r_{eSMi} + \beta_4 WACC_i \quad (7)$$

$$EVA_{EntityBU} = 291{,}581 + 0.028 D_i + 7.575E + 06 r_{di} - 3{,}868E + 06 r_{eSMi} - 48{,}289.6 WACC_i \quad (8)$$

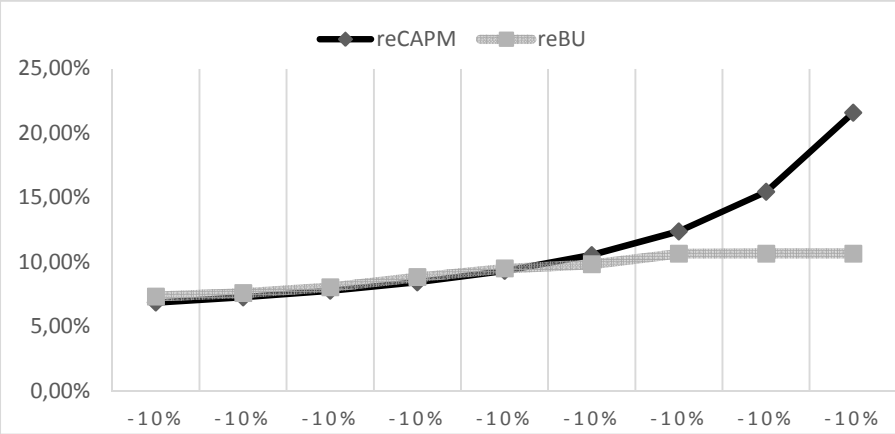
3 Results and Discussion

When constructing different regression models, we found out that the impact of capital structure on performance is determined by the way how performance is calculated. In the case of EVA Equity application, the impact of equity on business performance was confirmed only when we calculated the Cost of equity applying Build-up model. This can be explained by the fact that individual inputs of Build-up model are influenced by business capital structure. When calculating EVA Equity indicator applying CAPM, the impact of the change in capital structure on performance was not confirmed. In the case of EVA Entity, the impact of the change in debt and therefore in equity on the performance was confirmed when we calculated the Cost of equity applying Build-up model. Based on the above mentioned, we can suppose that in the case of calculating Cost of equity applying CAPM, the statistically significant impact of business capital structure on business performance was not confirmed.

In the next part of the paper, we presented the results of simulation and research of the impact of change in the capital structure on cost of capital and performance. In this analysis of capital structure and its impact on performance, we gradually reduced equity by 10% and increased debt by the same percentage.

We recorded the comparison of Cost of equity calculated by CAPM and Build-up model. Comparison of Cost of equity is shown in Figure 2.

Figure 2 Cost of equity for different capital structure

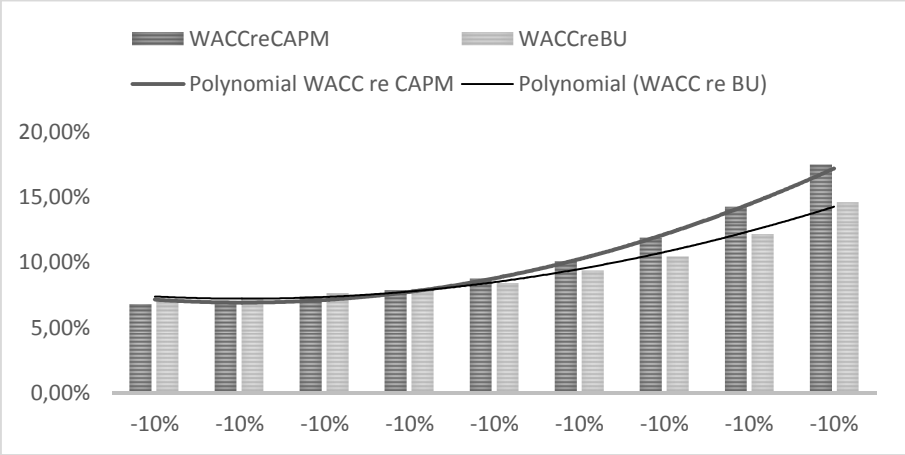


Source: Authors

Figure 2 shows the change in Cost of equity calculated by CAPM and Build-up model. This change occurred as a result of a change in the capital structure (we changed the capital structure by gradual replacement of equity by debt) in favour of debt. For the capital structure of 50% equity and 50% debt, we can see that Cost of equity calculated by both models is the same. The difference arises in the capital structure of 60% debt and 40% equity, at which Cost of equity calculated by CAPM begins to grow. From this capital structure, the impact of increased indebtedness begins to appear in calculating systematic risk. We also noticed an increase in Cost of equity calculated by Build-up model, but this growth was more moderate. Based on above mentioned calculation it can

be stated, that on a certain debt line, Cost of equity increases because the risks which the owners of capital have to bear, increases too.

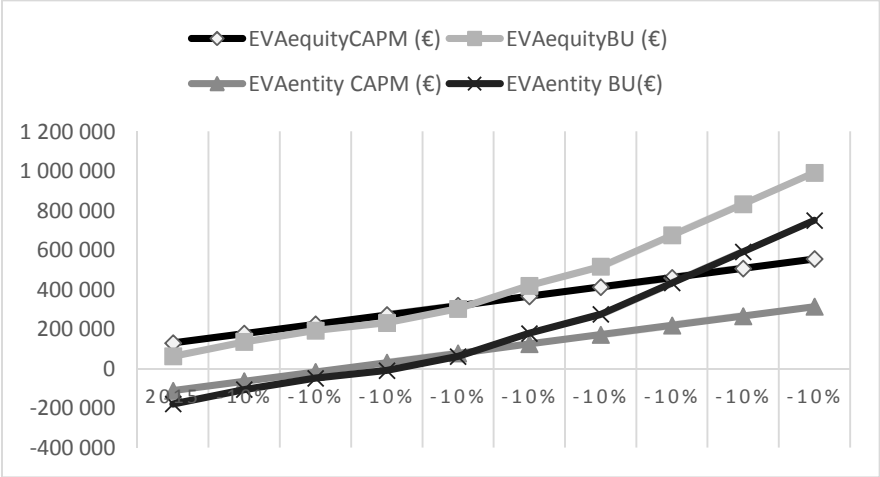
Figure 3 Cost of capital for different capital structure



Source: Authors

In Figure 3 we can see the development of Weighted average cost of capital. These costs increase approximately from the capital structure of 60% equity and 40% debt. This increase is associated with rising risks for both owners and creditors as a result of growth of debt. Similarly to Figure 2, we can see that Cost of equity is higher in the case of CAPM application.

Figure 4 Development of economic profit for different capital structure



Source: Authors

In Figure 4 we can see that by increasing the share of debt in capital, the economic profit increases and therefore the value of the performance rises too. In the figure, it is possible to identify deviations in the case of application of the relevant model for quantification of EVA economic profit and for quantification of the Cost of equity. If the economic profit is calculated by EVA Entity model, the value of economic profit for the capital structure of 60% equity and 40% debt is negative. Subsequently, the economic profit reached positive values due to the impact of debt, which positively reflected in the NOPAT through interests. Despite the increasing risk of both owners and creditors, the impact of interests on NOPAT is higher. Based on the above mentioned it can be stated that the influence of the change in the capital structure in favour of debt is positive for the development of economic profit. In the case of EVA Equity the value of the economic profit is increasing by a gradual increase in debt, despite increasing risks. In this case,

Financial leverage, Return on equity and Cost of equity increase as a result of growth of systematic risk. However, the increase in profitability is faster than the increase in the Cost of equity.

4 Conclusions

From the calculations of the selected indicators, we found out that the indicator Interest coverage does not correlate with any capital structure indicator. This indicator can be considered as a key performance indicator. We can describe the capital structure indicators using two main components. The calculations of the indicators that enter into the quantification of the EVA indicator and the calculation of the EVA indicator itself showed that the change in the capital structure changes the values of the EVA indicator. Based on the regression analysis, we were able to confirm the impact of the capital structure on performance only in the case of Build-up model application, while in the case of CAPM application the impact was not confirmed. It is given by the method of calculating the Cost of equity. In the case of Build-up model, we quantified financial risk, which was partly based on the capital structure indicators. Therefore their impact reflected in the value of Cost of equity. For the CAPM, we applied only market risks, without the impact of internal risks. This analysis will be subject to future research, we will focus on more extensive data collection and more detailed analyses.

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Technical Efficiency of Banks Selected countries of Eastern Europe

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Abstract: *Increased capital requirements are associated with the need to create additional income, with the expansion of banks' performance. The growth of the banking margin can generate downward pressure on prices of resources and the rise in interest rates on loans. Expected growth in the interest margin can be linked to the growth of capital by a certain unit. It should be monitored as to meet the expectations of regulators and how they manifest themselves in countries with different levels of development of the banking sector. In this article we will focus on the efficiency of banks selected countries of Eastern Europe. We will analyze how the technical efficiency of banks is if we consider for their output the net interest margin as presupposes to achieving expectations connected with increasing capital. For these purposes will be used the method of DEA – Data Envelope Analysis.*

Key words: technical efficiency of selected banks of Eastern Europe, DEA analysis

JEL Classification: G21, C58

1 Introduction

The financial crisis has shown the fact that the regulation could not prevent bank failures, that excessive risk has not been adequately covered by capital requirements.

Often discussed problem is high level of pro-cyclicality of the bank regulation. Pro-cyclicality is defined as common designation of mutually reinforcing ("positive correlation") mechanisms by which the financial system can amplify economic fluctuations and eventually induce or worsen financial instability.

Appendix 1 of the document of the Bank for International Settlement (2008) "Addressing pro-cyclicality financial system: a possible framework" sets out possible approaches and solutions in the field of prudential and financial reporting, which can be used to dampen pro-cyclicality of the financial system.

Increased capital requirements are associated with the need to create additional income and with the expansion of banks' net interest margins. The growth of the banking margin can generate pressure on prices of resources and the rise in interest rates on loans. Expecting these trends we analysed whether banks are now enough efficiently in the use its resources with regard to their net interest margins.

Newly discussed is a problem of the duty of the banks to create additional reserves to cover losses. The measures proposed EBA about the creation of so-called "Eligible Liabilities" referred to as system MREL (Minimum Required Eligible Liabilities) that the bank must have. The new proposal foresees that banks will have to increasing the amount of eligible liabilities in the form of additional long-term debt.

The problem may be in them that the banks of Central and Eastern Europe will create the additional resources in a greater extent than banks in Western Europe, as do not have the types of liabilities that may be recognized as eligible liabilities, but they have another

Despite a high degree of globalization and integration of banking markets and services, there are arguments for maintaining the national character of the banking system. Therefore, we see meaningful analysis of the conditions of technical efficiency in these selected markets.

2 Methodology and Data

For evaluation of banks efficiency we chose the technical efficiency based on DEA analysis.

Technical efficiency refers to the ability of decision making units (banks, insurance companies, firms, universities, faculties, hospitals and others types of production units) to obtain the maximum amount of output by a given volume of inputs, or indicates the minimum necessary input to produce a given volume of the output.

It means the DEA Models are input oriented or output oriented. Input oriented models give recommendation about what should be done with inputs (the amount of decreasing inputs) and output oriented models give recommendations, what should be done with the output (the amount of increasing output by given inputs).

The DEA Models not only recognize efficient and no efficient production units, but DEA gives recommendations, what should do production units to achieve efficiency frontier.

In contrast to technical efficiency, the allocative efficiency takes into account the size of the bank as a production unit.

This contribution is focused on technical efficiency.

DEA analysis belongs to the non-parametric methods of efficiency measuring. The disadvantage of DEA Models is that there is not possible to separate the effect of random errors and errors in the measurement of inefficiency.

DEA measures the relative efficiency of production units in the examined group of units. Changing the group involving the unit, we can expect changing of efficiency of evaluated units.

Among the first scientists who have developed a DEA Model is M. J. Farrell. Best known is his work "The Measurement of Productive Efficiency" published in the Journal of the Royal Statistics Society in 1957.

Model Specification

In this contribution will be used an input-oriented CCR model and BCC model.

Input-oriented CCR-I (Charnes-Cooper-Rhodes-Input) model can be written in the form of linear programming problems (Jablonský, Dlouhý, 2004):

$$\max z = \sum_{i=1}^{m} u_i * y_{iq} \qquad (1)$$

Under the conditions:

$$\sum_{i=1}^{m} u_i * y_{iq} \leq \sum_{j=1}^{r} v_j * x_{jk\,;} \quad k = 1,2,\ldots..n$$

$$\sum_{i=1}^{m} u_i * y_{iq} - \sum_{j=1}^{r} v_j * x_{jk} \leq 0 \quad k = 1,2,\ldots..n$$

$$\sum_{j=1}^{m} v_j * x_{jk} = 1$$

$$u_i \geq 0, i = 1,2, \ldots . . m$$

$$v_j \geq 0, i = 1,2, \ldots . . r$$

Input-oriented BCC-I (Banker-Charnes-Cooper-Input) model can be written in the form (Jablonský, Dlouhý, 2004.

$$\max z = \sum_{i=1}^{m} u_i * y_{iq} + \mu \qquad (2)$$

Under the conditions:

$$\sum_{i=1}^{m} u_i * y_{iq} + \mu \leq \sum_{j=1}^{r} v_j * x_{jk\,;} \quad k = 1,2, \ldots . . n$$

$$\sum_{j=1}^{m} v_j * x_{jk} = 1$$

$$u_i \geq 0, i = 1,2, \ldots . . m$$

$$v_j \geq 0, i = 1,2, \ldots . . r$$

Parameter μ reflects the conditions of convexity of the BCC-I model.

The output oriented CCR Model can be written in this form:

$$min = \sum_{i=1}^{m} v_i * x_{io} \qquad (3)$$

Under the conditions:

$$\sum_{r=1}^{s} u_r * y_{rj} - \sum_{i=1}^{m} v_i * x_{ij} \leq 0 \quad j = 1,2, \ldots . . n$$

$$\sum_{j=1}^{n} u_r * y_{ro} = 1$$

$$u_r \geq 0, \qquad r = 1,2, \ldots . . s$$

$$v_i \geq 0, \qquad i = 1,2, \ldots . . m$$

3 Results and Discussion

This article analyzes the efficiency of banks in selected countries of Europe on the basis of data published by the Bank Scope, National Bank of Slovakia and the ECB. The analysis uses the standard tools of descriptive and analytical statistics and statistical program MaxDEA is used for the DEA (Data Envelopment Analysis) applied to the example of the selected banks. Our aim was to examine whether the banks in selected counties of Eastern Europe have different results in terms of overcoming the financial crisis.

The theoretical nature of the DEA requires that subjects observed in the group (DMU = Decision Making Unit) have to be banks with similar focus. Therefore, we omitted specialized banks, housing savings banks and state guarantee bank. The number of production unit has an impact on the number of analyzed factors in efficiency measurement. By rule the number of analyzed inputs and outputs should not be greater than one third of analyzed production units.

To the development of the theory and practice of using DEA models in the Czech Republic contributed works of authors such as Jablonský, Dlouhý, Novosádová (2006).

The application of DEA Analysis deals for example Palečková (Řepková) (2012).

In Slovakia, we can mention the works of Luptáčik (2010), Zimková (2014) and Vincová (2006).

This contribution aims to analyze the technical efficiency of banks in the banking sectors of some of the countries of Eastern and Central Europe in terms of overcoming the financial crisis.

Since we wanted to get a picture of how the financial crisis influenced the efficiency of banks. This analyzes has been done for 2013, because this period is considered to be a shift in the post-crisis development. The output is net interest margin and inputs are total equity and personnel expenses.

On this basis, we obtained results of CCR and BCC-I models.

Table 1 The results of efficiency of banks in Croatia in terms of CCR and BCC-I Model

Coutry	DMU Name	CCR	CRS Proportionate Movement (Total_Equity)	CRS Proportionate Movement (Personnel_Expenses)	BCC-I	VRS Proportionate Movement (Total_Equity)	VRS Proportionate Movement (Personnel_Expenses)
CROATIA	Hrvatska Postanska Bank DD	0,1201	-167091	-20245,5	0,121564	-166832	-20214
CROATIA	Hypo Alpe-Adria-Bank dd	0,0536	-608203	-34997,6	0,072438	-596106	-34301,5
CROATIA	Partner Banka dd	1	0	0	1	0	0
CROATIA	Podravska Banka	0,4760	-26995,9	-3423,27	1	0	0
CROATIA	Societe Generale - Splitska Banka dd	0,0561	-417615	-40207,4	0,062883	-414633	-39920,4
CROATIA	Veneto Banka d.d.	1	0	0	1	0	0
CROATIA	Zagrebacka Banka dd	0,0217	-2003639	-103282	0,025371	-1996319	-102904

Table 2 The results of efficiency of banks in Slovenia in terms of CCR and BCC-I Model

Coutry	DMU Name	CCR	CRS Proportionate Movement (Total_Equity)	CRS Proportionate Movement (Personnel_Expenses)	BCC-I	VRS Proportionate Movement (Total_Equity)	VRS Proportionate Movement (Personnel_Expenses)
SLOVENIA	Gorenjska Banka d.d. Kranj	0,8919	-17899,2	-1587,92	1	0	0
SLOVENIA	Nova Kreditna Banka Maribor d.d.	0,2490	-388784	-29138,2	0,270619	-377601	-28300
SLOVENIA	Raiffeisen Banka dd	1	0	0	1	0	0
SLOVENIA	SKB Banka DD	0,4827	-138465	-15672,3	1	0	0
SLOVENIA	UniCredit Banka Slovenija d.d.	0,4872	-116762	-11589,1	0,500953	-113633	-11278,5

Table 3 The results of efficiency of banks in Lithuania in terms of CCR and BCC-I Model

Coutry	DMU Name	CCR	CRS Proportionate Movement (Total_Equity)	CRS Proportionate Movement (Personnel_Expenses)	BCC-I	VRS Proportionate Movement (Total_Equity)	VRS Proportionate Movement (Personnel_Expenses)
LITHUANIA	AB DNB Bankas	0,0926	-382091	-29489,3	0,166233	-351099	-27097,4
LITHUANIA	AB SEB Bankas	0,0599	-707968	-34500,6	0,147209	-642237	-31297,4
LITHUANIA	Citadele Bankas AB	0,6500	-16156,7	-1890,68	1	0	0
LITHUANIA	Danske Bank A/S	0,3582	-17372,2	-6730,11	0,820077	-4870,63	-1886,91
LITHUANIA	Siauliu Bankas	0,3426	-61130,8	-7164,8	0,498433	-46645,7	-5467,08
LITHUANIA	Swedbank AB	0,0684	-881838	-39158,7	0,128522	-824971	-36633,5
LITHUANIA	UAB Medicinos Bankas	1	0	0	1	0	0

Table 4 The results of efficiency of banks in Latvia in terms of CCR and BCC-I Model

Coutry	DMU Name	CCR	CRS Proportionate Movement (Total_Equity)	CRS Proportionate Movement (Personnel_Expenses)	BCC-I	VRS Proportionate Movement (Total_Equity)	VRS Proportionate Movement (Personnel_Expenses)
LATVIA	ABLV Bank AS	0,1131	-165836	-25274,4	0,119643	-164627	-25090,2
LATVIA	AS DNB Banka	0,2085	-188440	-14720,6	0,21063	-187949	-14682,3
LATVIA	Baltic International Bank-Baltijas Starptautiska Banka	1	0	0	1	0	0
LATVIA	Jsc Latvian Development Financial Institution Altum	0,7263	-21263,8	-1559,89	0,730928	-20906,9	-1533,71
LATVIA	Meridian Trade Bank	0,9667	-684,799	-93,0794	1	0	0
LATVIA	Norvik Banka	0,3317	-32343,9	-7952,33	0,42562	-27800	-6835,12
LATVIA	Rietumu Banka	0,2590	-201694	-15041,9	1	0	0
LATVIA	SEB banka AS	0,1569	-362239	-19642	0,159085	-361341	-19593,3

Table 5 The results of efficiency of banks in Slovakia in terms of CCR and BCC-I Model

Coutry	DMU Name	CCR	CRS Proportionate Movement (Total_Equity)	CRS Proportionate Movement (Deposits)	BCC-I	VRS Proportionate Movement (Deposits)	VRS Proportionate Movement (Personnel_Expenses)
SLOVAKIA	Vseobecna Uverova Banka	0,8901	-861263	-10682,1	0,89406	-830467	-10300,1
SLOVAKIA	Slovenska sporitelna	1	0	0	1	0	0
SLOVAKIA	OTP Banka Slovensko	0,8057	-218467	-2323,76	1	0	00
SLOVAKIA	CSOB SK	0,7537	-1007998	-14159,3	0,787183	-871012	-12235,1
SLOVAKIA	UniCredit Bank Slovakia	0,6426	-3641023	-30617,7	0,656858	-3495977	-29398
SLOVAKIA	Postova banka	1	0	0	1	0	0
SLOVAKIA	Prima banka Slovensko	0,4565	-823976	-20782,1	0,741586	-391814	-9882,25
SLOVAKIA	Sberbank Slovensko	0,5542	-704241	-8862,46	0,738484	-413146	-5199,2
SLOVAKIA	Tatra Banka	0,6982	-2121431	-32149,3	0,701367	-2099301	-31813,9

The column "Proportionate movement" shows what the bank should do with their inputs in order to achieve efficiency frontier. And so, as problematic we can see the need to increase capital required by regulation, although banks do not have conditions to create sufficient outputs.

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4 Conclusions

The analysis of technical efficiency banks refer to the risk that the banks' interest margins are not sufficient to create additional capital. Personnel cost are too high in banks of Central and Eastern Europe. The results show differences in efficiency according to the BCC and CCR models. This means that it is necessary to take into account the size of the bank.

Results indicate that the slowdown in credit activities in the sphere of the real economy has a significant impact on the banking sector. Actions to support of the development and lending are needed. This trend is observed in all surveyed countries of Central and Eastern Europe. Individual measures in the regulation should be aligned so as to fulfill the defined objectives and are not in conflict with each other with other measures, and to act counter-cyclically.

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Assessing the Impact of the Financial Crisis on Global Insurance Regulation

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Abstract: *The aim of this paper is to analyze the impact of the financial crisis on insurance markets in different regions of the global insurance market and to evaluate changes in global approaches to insurance regulation depending on the effects of the financial crisis. The financial crisis has triggered an identified banking crisis and has shifted through the contagion channels from the US mortgage market to other financial sectors and regions of the world. With regard to the integration of financial institutions and the globalization of financial markets, a number of regulatory proposals has emerged in recent years to address the impact of the crisis, to eliminate the trigger of the crisis and to prevent recurrence of the causes of the crisis. This paper builds on the contribution of the authors (Vávrová, Nečas, 2016) published at the international scientific conference European Financial System 2016, whose main objective was to assess the development of financial health of insurers within the global insurance market in the period of lingering financial crisis and to draw conclusions based on the analysis of the insurance sector.*

Key words: financial crisis, globalization, insurance market, regulation, authority, contagion channel, trigger

JEL codes: G01, G15, G22, G28

1 Introduction

The financial crisis hit the economies of states in a significant way. In 2009, real GDP fell by 4.4% in the EU Member States and by 4.5% in Euro area countries (Eurostat, 2015). In this sense, one can even speak about one of the worst crises since the Great Economic Crisis in the 1920s and 1930s. The cause of the financial crisis and the subsequent economic downturn was not one particular fact, but it was the effect of multiple factors, shocks and imbalances. Thus, short-term and long-term factors can be found that resulted in the outbreak of the financial crisis, which dates back to 2008-2009. Problems can be found in economic policy, over-expected earnings expectations, poor coordination of crisis management by international institutions, and underestimation of the risk of the outbreak of the crisis. Governments and regulators have begun to pursue a set of measures to address the financial crisis that can be summarized into specific areas (for more see Baldwin, Wyplosz, 2013). Central banks have had to provide liquidity to the financial system and to start substantial expansionary policies. Large financial institutions, called systemically important institutions, had to be rescued. Governments subsequently had to use fiscal policy to prevent a recession. Also, the response to the financial crisis was the introduction of more prudent, higher regulation of financial markets and the establishment of regulatory institutions and mechanisms to prevent financial instability and the recurrence of the financial crisis (Baldwin, Wyplosz, 2013).

The aim of this paper is to analyze the impact of the financial crisis on insurance markets in different regions of the global insurance market and to evaluate changes in global

approaches to insurance regulation depending on the effects of the financial crisis. The financial crisis has triggered an identified banking crisis and has shifted through the contagion channels from the US mortgage market to other financial sectors and regions of the world. With regard to the integration of financial institutions and the globalization of financial markets, a number of regulatory proposals has emerged in recent years to address the impact of the crisis, to eliminate the trigger of the crisis and to prevent recurrence of the causes of the crisis.

This paper builds on the contribution of the authors (Vávrová, Nečas, 2016) published at the international scientific conference European Financial System 2016, whose main objective was to assess the development of financial health of insurers within the global insurance market in the period of lingering financial crisis and to draw conclusions based on the analysis of the insurance sector.

2 Methodology and Data

The methodological approach used for the processing of this paper was as follows: used methodical procedures focused mainly on descriptive method, causal analysis, synthesis and comparative analysis. Data sources mainly served as secondary sources, both published studies on the topic of the impact of the financial crisis on global insurance regulation, studies of both foreign and Czech origin as well as publicly accessible sources characterizing the most important regulatory and supervisory institutions operating on global insurance markets. Other methods used were induction and deduction, where induction helped to draw general conclusions based on the analysis of underlying data and deduction led to the assessment of the impact of financial crisis on global insurance regulation.

3 Results and Discussion

In the context of the global view of the insurance markets, it should be noted that the regulatory issues vary considerably and were addressed individually for the insurance markets in individual countries (Burling, Lazarus, 2011). The reactions of regulatory and supervisory institutions and the approach to modification of regulatory procedures differed globally at the time of the outbreak of the crisis and its scale, as well as the experience and ability of regulators to develop effective measures. It was important to respond individually to the country's insurance market, but at the same time, to coordinate measures internationally (Kriele, Wolf, 2014). Regulatory institutions discussed and prepared scenarios of longer-term changes; to provide the immediate interventions the following measures were used: provision of repayable financial assistance, order to sell certain parts of financial institutions, ban on the transfer of dividends and profits abroad, limitation of managers' payouts and transactions of speculative character (see Pavlát, Kubíček, 2010).

As for questions regarding global regulatory issues, there is a need to mention international organizations representing the global insurance markets. An important role in the insurance industry is played by the International Association of Insurance Supervisors (IAIS). This association deals with regulatory issues and supervisory issues in the insurance industry. In order to achieve the goal of maintaining stable insurance markets and globally supporting financial stability on a global scale, it provides its members a forum to share information and experience from the development of insurance markets, as well as share experience from supervision. One of the results of this association's activity is the issue of the Insurance Core Principles (ICPs). These are globally recognized insurance supervision requirements that are structured to suit diverse insurance markets.

Table 1 Insurance Core Principles

ICP 1 Objectives, Powers and Responsibilities of the Supervisor
ICP 2 Supervisor
ICP 3 Information Exchange and Confidentiality Requirements
ICP 4 Licensing
ICP 5 Suitability of Persons
ICP 6 Changes in Control and Portfolio Transfers
ICP 7 Corporate Governance
ICP 8 Risk Management and Internal Controls
ICP 9 Supervisory Review and Reporting
ICP 10 Preventive and Corrective Measures
ICP 11 Enforcement
ICP 12 Winding-up and Exit from the Market
ICP 13 Reinsurance and Other Forms of Risk Transfer
ICP 14 Valuation
ICP 15 Investment
ICP 16 Enterprise Risk Management for Solvency Purposes
ICP 17 Capital Adequancy
ICP 18 Intermediaries
ICP 19 Conduct of Business
ICP 20 Public Disclosure
ICP 21 Countering Fraud in Insurance
ICP 22 Anti-Money Laundering and Combating the Financing of Terrorism
ICP 23 Group-wide Supervision
ICP 24 Macroprudential Surveillance and Insurance Supervision
ICP 25 Supervisory Cooperation and Coordination
ICP 26 Cross-border Cooperation and Coordination on Crisis Management

Source: International Association of Insurance Supervisors

Tab. 1 represents an overview of Insurance Core Principles that were issued to support global supervision of insurance industry. ICPs provide a framework for global supervision of all insurers and insurance groups. This framework does not affect reinsurance companies in any significant way, only in predefined situations, this also applies to insurance intermediaries, where this framework is very rarely applied. Based on Insurance Core Principles, the International Monetary Fund (IMF) assesses systems and levels of insurance supervision (Mesršmíd, 2015). IAIS is a non-profit organization based on in the form of voluntary membership. This association belongs to global reach organizations whose task is to seek efficient and consistent supervision in order to achieve stable insurance markets. It is also a member of the Financial Stability Board.

To meet its objectives the IAIS focuses on creating support materials for supervisory work and developing methodology for global systemically important insurers and internationally active insurance groups. Institution continued with the ICPs and issued the Basic capital requirements for global systemically important insurers and the Principles of higher absorption of loss. These requirements belong to the important points of global regulation, as their application will lead to the Global insurance capital standards. The scheduled date of receipt after the calibrations in 2017 and 2018 is October 2018. "After completed, Global capital requirements will replace the Basic capital requirements as the basis for higher absorption of losses" (see IAIS, 2015).

Global capital requirements will measure the capital adequacy of internationally active insurance groups (IAIGs) and for global systemically important insurers (G-SIIs). Global systemically important insurers are financial institutions that are defined by the FSB as: "institutions of such magnitude, market importance and such global interconnectedness that their difficulties or bankruptcy could cause substantial disruption of the global financial system and have adverse economic consequences for a number of countries". According to IAIS, the internationally active insurance group is defined as: "an insurance group that has total assets of at least USD 50 billion or gross written premiums of at least USD 10 billion (on a rolling three year average basis). In addition, its premiums are written in three or more jurisdictions and at least 10% of the group's total gross written premium is written outside the home jurisdiction". By the end of 2016, the FSB together with IAIS published an updated list of global systemically important insurers for 2017:

- Aegon N. V.,
- Allianz SE,
- American International Group, Inc.,
- Aviva plc,
- Axa S.A.,
- MetLife, Inc.,
- Ping An Insurance (Group) Company of China, Ltd.,
- Prudential Financial, Inc.,
- Prudential plc.

The G-SIIs represent the role of global players and a considerable attention must be given to them because their decline would endanger the financial stability of global insurance markets. They would have to meet the requirements of higher absorption of losses, the principle of intensified and coordinated supervision and the resolution of possible crisis of insurers and plan of recovery procedures.

The International Monetary Fund is an organization that often acts as a commentator and evaluator of the level of supervision in the insurance sector, when its control, monitoring and oversight activities help to ensure the stability of the global financial system. The International Monetary Fund focuses on stress tests in the field of insurance but it also provides reports on overall observation and publishes a detailed assessment of compliance with the core principles, especially with regarding to regulation of insurance. A detailed assessment of compliance with core principles and reports about the results of organizations' activities, such as IAIS, are published in the Global Financial Stability Report, in particular to make the information available and inspiring for other institutions (Mesršmíd, 2015).

Another institution that cannot be omitted is the Financial Stability Board (FSB), which was mentioned above in connection with global regulation linked to the new requirements for G-SIIs and IAIGs. In the context of the effort to resolve and overcome the global financial crisis, the G-20 Summit was convened in London in November 2008, where it was agreed to adopt the Action plan to implement the principles of financial sector reform. This plan addressed short-term, medium and long-term measures, focusing on transparency, strengthening of regulation and coordination at international level, as well as strengthening of supervision, especially in the case of rating agencies (Pavlát, Kubíček, 2010). In connection with the financial crisis and the adoption of the Action plan to realize the principles of financial sector reform, the Financial Stability Board was established. The FSB was formed in 2009 as the successor of the Financial

Stability Forum (FSF). The next G-20 meeting was held in Pittsburgh, also in 2009, where the FSB Charter was approved, which included the organizational structure and objectives of the organization. The aim of this organization is to strengthen global financial stability by coordinating the agreed policies in order to facilitate coordination of the international exchange of information between the institutions responsible for financial stability and other international organizations and institutions (FSB, 2016).

The Financial Stability Board often cooperates with the G-20, which acts as the forum for international economic cooperation. The G-20 is often presented as a group of the world's richest economies. The aim of the G-20 is to promote global economic growth, investment and also to increase employment (Mesršmíd, 2015). The effort to meet these goals is also evident from current activities when the Berlin government (Germany is a current G-20 chairman) intends to target at the G20 summer summit in 2017 to support private investment that should lead to job creation globally and to improve infrastructure.

Other global institutions addressing insurance issues include the Global Federation of Insurance Associations (GFIA), which was established in 2012. This organization is based in Washington where the establishing meeting was held. The GFIA has 41 member associations of insurers, which create 87% of the world's total premiums written. The Federation sets up working groups considering current global insurance markets priority axes. There are currently 12 working groups in the federation (GFIA, 2016). The federation's task is to solve problematic points in insurance, such as collective supervision and regulation on a global scale, systemic risks, but also the fight against money laundering. The organization should take into account individual views from all area, to unify them and submit them to other organizations, such as IAIS. The GFIA acts in the form of a non-profit association that aims to increase efficiency in the insurance industry by exchanging information to each other between member associations, addressing issues of mutual interest to associations, and collaborating with other international organizations to further coordinate the sector's regulation on a global scale (Mesršmíd, 2015). The federation is represented by Europe, Australia, North and South America, Africa and Asia. Europe is represented through 13 insurance associations in this organization, but mainly through Insurance Europe, which is also a member of the Czech Association of insurance companies.

The regulation of the insurance markets of certain countries of the group G8 is specific. E.g., the financial system of Canada belongs to stable financial systems that were only very slightly affected by the financial crisis (Pánek, Valová, 2008). In Canada, the Ministry of Finance and four other independent agencies are subjects that supervise banks, insurance companies, and other financial institutions. The most important independent agency is Office of the Superintendent of Financial Institutions (OSFI) for the insurance market. This institution provides supervision not only of insurance companies but also of banks and federally managed pension plans. It has the task of gathering information from the financial markets, evaluating them and setting requirements for capital adequacy - usually at a higher level than international requirements. Also, its duty is to prepare a report about the operation of the sector for the Canadian Ministry of Finance and to present it every year (Pánek, 2012). The issue of regulation and supervision of the Canadian insurance market is addressed by a system of shared responsibility among federal and territorial authorities. As such, insurance companies have to be licensed at federal level, but at the same time they have to apply for a license in each territory where they intend to operate. The mentioned supervisory institution OSFI regulates the largest insurers under the Insurance Companies Act, while the regulation of smaller insurers is in charge in particular of territorial regulators.

In the USA, under the IAIS, three institutions are represented - Federal Insurance Office, Fed and National Association of Insurance Commissioners. These institutions will be characterized in the following part of the paper. The events of the financial crisis have opened a discussion about changes and possible implementations of new elements into

the regulatory system in the United States. A major reform of the financial sector supervision was signed by the president in 2010, a law called the Dodd-Frank Act, which led to the creation of special institutions (Koba, 2012). This law presents the framework under which the entire financial sector is regulated. It was designed to address unfavorable events related to the financial crisis, as the purpose of this law is to prevent the collapse of other financial institutions. Under this law, the Federal Insurance Office (FIO) was established to collect information on insurance companies to determine which commercial insurers pose a major risk to the entire financial system. According to Koba (2012) the aim of the Dodd-Frank Act is to strengthen the stability of the financial system, in particular by improving transparency and accountability in the financial system. With regard to regulation of insurance industry this area falls under the Head of the Dodd-Frank Act which addresses the issue of the Federal Insurance Office.

The regulation of financial market in the United States is governed by Federal Reserve System supervision and by other institutions (FED, 2010). National Association of Insurance Commissioners is an important institution for the insurance market (Pánek, 2012). In the insurance sector each individual state of the USA is dealing with its own legislation, but for a possible co-operation there is a non-governmental National Association of Insurance Commissioners (NAIC) which unifies national regulators of individual states. The mission of this association is to determine the minimum standards of international accounting, valuation, collateral, financial analysis and solvency in relation to the effects and consequences of the financial crisis. Concerning the structure and calibration of solvency requirements, NAIC has introduced a modernization initiative in this area in 2008, inspired by the European Union's solvency conditions (Mesršmíd, 2015). As regards insurance licensing activities, commercial insurance companies in the US have to apply for authorization in all countries where they want to operate their insurance businesses, the principle of a single license to conduct insurance business does not exist for insurance companies in the USA. While US insurance companies have to apply for a license in each country to obtain a national license, the advantage for policyholders is that they are protected in every US state by a guarantee fund in the event of the insolvency of the insurance company (Zweifel, Eisen, 2012). Therefore, if we compare the ways in which insurance market is regulated in Europe and the USA, we will find that they are somewhat different. Insurance companies of the USA are regulated at the state level, NAIC is the regulator. In the European Union, the regulatory framework applies to all member states. Since the end of 2013, efforts have been made in the United States to move towards a federally-regulated system. These efforts began on the basis of the FIO report that was presented in response to the Dodd-Frank Act call for studies and suggestions on how to modernize and improve the insurance regulation (Hull, 2015).

The financial system in Japan was initially characterized by the business and investment banking department, separately, but the convergence of these two areas began in the late 1990s. The regulation of the financial market in Japan falls under the Ministry of Finance and under supervision (Pánek, Valová, 2008). Japan's Financial Services Agency (FSA) is the regulator and supervisor of the insurance industry. This agency has also adjusted the regulatory framework for insurance, in particular in the area of solvency requirements, risk assessment, stricter documentation requirements and control of large insurance companies in shorter time intervals in the context of the financial crisis (Mesršmíd, 2015). The insurance market of Japan should be in line with ICPs. According to the International Monetary Fund, the Japanese FSA has taken the necessary steps to improve the oversight of holding companies in Japan and to conduct market analysis, but it should continue to focus on improving macro-prudential analysis. It should be active in cooperation with international supervisors, strengthen supervisory independence, prepare Early Warning System plans and improve regulation of collateral, especially in case of natural disasters.

4 Conclusions

Ideas expressed in this paper seek ways how to restore the growth and global competitiveness on the global insurance markets. The financial crisis was triggered by insufficient regulation of insurance markets, which could have been caused by excessive lending, new risky financial products and poor risk assessment. This crisis has revealed serious financial regulation shortcomings, the removal of which requires stronger and longer-term interventions than just focus on immediate action. According to Brokešová, Pastoráková, Ondruška (2014), it is important to pay attention to the insurance industry as it fulfills the function of stabilizing the economy. Regulators' interest in regulating and supervising insurance is increasing as the sector contributes to the economic development and stabilization of economies as a whole over the long-term. The resilience of the insurance industry proved particularly during the financial crisis, when the effects of the financial crisis were overcome in a short time due to the shock resistance of the insurance industry.

A number of authors tend to think of the benefits of more prudent regulation, stronger regulation of the insurance industry, but there are also opposing views that not consider a large amount of regulation as optimal. A number of regulatory initiatives could greatly flood the regulatory sector with high costs. Regulation forces high costs with respect to and compliance with solvency capital requirements. As a result, profits and overall growth in insurance may be reduced as well as less interest in the benefits of innovation. According to Ducháčková, Daňhel (2015), today's world is very complicated and in the current development of the new environment it is impossible to apply the principles that applied in the past. Inappropriate emphasis is placed on the over-formalized economy and the implementation of mathematical approaches and market regulation models, which do not include unexpected events, whereby the results of institutions do not take sufficient account of the volatility of economic events and then they are sharply in contrast to the current reality.

On the other hand, the Solvency II regulatory concept applied to the European Union's commercial insurers was supposed to contribute to better risk management and consequently lead to better strategic decisions. As part of EU regulation, the European Commission (see Mesršmíd, 2015) introduced a smart regulation concept that would reduce regulatory burdens and simplify existing legislation, while maintaining a high level of market protection. For the time being, however, it is only a goal of regulation in the outlook, not a current reality in regulating of insurance markets.

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Impact of high frequency trading on volatility in short run and long run

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Abstract: *Computers have overtaken the most of tasks in intraday trading on modern exchanges. From stock picking to deal timing, optimized algorithms are crucial in trading process. This phenomenon is apparent on the spot as well as on derivative markets. In this paper, we consider the effects of high frequency trading on the short term volatility. The aim of the paper is to investigate the links between high frequency trading (HFT) and spot volatility. High frequency with presence of market microstructure noise and also low frequency data from German stock market are considered. We employ Markov switching models to estimate the relationship of dynamics in stock returns and changes in the activities of high frequency traders. Activity of algorithmic traders is estimated by proxy variables based on the average size of trades. The problem of optimal sampling biases is avoided by incorporating Bundi-Russell (2008) test and test of Lagrangian multipliers. Market microstructure noise can cause biasness in the estimates of the empirical volatility measures and models based on such variables. It is mostly caused by bid ask bounce and technical realization of trading on certain exchanges. Most actively traded stocks listed on the German stock exchange (Deutsche Borse) are selected for the empirical analysis. Analyses of optimal sampling suggest that highest frequency without market microstructure noise should be approximately hourly. Results from models confirm the hypotheses of positive impact of high-frequency trading on market volatility. Interesting are conclusions that aggressive trading using market orders have smaller impact on realized volatility than market making using limit orders.*

Keywords: volatility, high frequency trading, Markov switching model

JEL codes: C24, C55, C58, G12

1 Introduction

Since the 1980s computer algorithms have helped traders to prepare and execute their investment decisions. Nowadays trading on world exchanges is dominated by computers who are capable to create and execute trades on their own. Securities exchanges are fully electronic and floor trading is not able to keep up with the challenge of automated trading. High frequency algorithmic trading without any doubt changed the basic features of stock and derivative markets. Financial scientists and traders are not able to justify whether this development improves or deteriorates market. Market efficiency and liquidity are increased at a cost of increased volatility and biased prices in turbulent situations (Kendall 2007). Both academics and practitioners cannot agree on the role of high-frequency trading in this new development. On one hand, high frequency traders (HFT) proclaim that their activities as market makers are increasing market liquidity for all traders, narrowing spreads and hence lowering overall transaction costs. On the other hand, there are long term institutional investors and traders used to floor trading who are criticizing HFT traders for scalping their orders (shifting the price of their orders before the orders of institutional investors reaches the market), manipulating the market (using forbidden techniques such as front running, quote stuffing, layering, spoofing, pinging and ignition) and boosting volatility. Academics have provided numerous studies that mostly take the side of HFT advocates, but there are also some studies confirming the HFT fault in volatility outbreaks. Since we are discussing timeframes of several dozen of minutes it is really difficult to analyze behavior of every HFT trader on every asset on

every market. That is why several manipulative schemes were overlooked in the past. Few minor financial market crashes, such as the 2010 Flash Clash or the case of Knight Capital, are believed to be at least partially caused by algorithmic trading. After such events regulators are searching for ways and methods to control the HFT market and strictly punishing those guilty of market manipulation. For example, circuit breaks are now implemented on the markets to shut down trading in case of increased volatility to prevent flash crashes. Also risk prevention measures have to be implemented in HFT companies, whose aim is to check the trading algorithms. Several companies were charged fines in millions of dollars for their manipulative practices on market.

In this paper, we focus on the impacts of computer driven trading on the volatility of stocks' prices. These are usually considered to be growing with increasing activity of High frequency traders. Our study is dealing with the analyses of the relationship between the high-frequency trading and price volatility both in high frequency (one minute frequency) and low frequency data (one hour frequency). In previous papers we have managed to address the best way to test optimal sampling frequency. Those test were also applied for the date from Deutsche Borse. Hence, one hour frequency was identified. Market microstructure noise (order book information that reflects variability of prices caused by the technical side of trading and existence of spreads between the bid and ask prices of the analyzed security) bias the estimations of realized volatility and make standardly used estimators unreliable. The effect of the market microstructure noise is negligible in the long run, where small discrepancies in price movements are overshadowed by much larger fluctuations caused by the variation of supply and demand. However market microstructure noise should be always dealt with in the high frequency data.

Relationship between the trading activity and volatility was known since the beginning of modern trading. Karpoff (1987) has proven direct positive link between volume of trading and volatility. 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) showed that after the introduction of HFT trading average size of the trade had started to play role in the stock volatility. Before that volatility was more dependent on the number of trades, and their size did not matter. Impact of average trade size on market volatility become more and more evident as shown by Chlistalla et al. (2011). 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. Chan et al. (2000) showed that only a number of trades matters, not volume of trading and trade size, when realized volatility is used as a proxy of market instability instead of volatility measured by absolute returns. Leal et al.(2016) provide evidences that HFT are positively active on volatility generation and are cause of flash crashes on the stock markets. On the other hand some studies suggest that high-frequency traders in general and especially market makers have tendency to decrease market volatility (Kirilenko et al., 2015).

This research differs from other existing papers in several aspects. First, we focus on of the European stock market (particularly the German stock market) as oppose majority of studies on the relationship between HFT trading and price volatility which were conducted on the US data. Second, we propose partially new methodology to measure the high-frequency trading based on the volume of trading, trading activity and average trade size and their changes in time. Third, we focus on the problem of appropriate sampling to detect market microstructure noise to analyze its role in this topic.

2 Methodology and Data

Methodology

Volatility of market prices (or returns) as a most common measure of investment risk can be calculated in several ways. For the matter of simplicity the standard deviation of market returns is often proposed. However it is largely dependent on returns of previous observations in the given sampled data. The most frequent data available for our analysis is minute data. Hence, the best choice for estimating the current market volatility is even simpler method. We have used the logarithm of the ratio of the highest and lowest prices during the observed time interval (minute) (Aldridge 2013).

$$\sigma_{i,t} = \log\left(\frac{high_{i,t}}{low_{i,t}}\right) \tag{1}$$

The most accurate measure of high-frequency trading activity is by capturing the number of orders send by HFT traders (both valid and canceled) and compare them to overall message traffic from all traders. But such data are not available mostly. If some exchanges keep such records, they only seldom distinguish between various types of order submission. Hence, it is necessary to create proxy variable to estimate HFT activity based on market and stock specific characteristics, such as number of orders with relatively small size 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.

$$hft_{i,t} = ln\left(\frac{\left(vol_{i,t-1} + \overline{\left(\frac{vol}{n}\right)}_{i,t,h}\right)\left(n_{i,t}+1\right)}{\left(vol_{i,t} + \overline{\left(\frac{vol}{n}\right)}_{i,t,h}\right)\left(n_{i,t-1}+1\right)} \frac{\left(n_{i,t} + \bar{n}_{i,t,h}\right)}{\left(n_{i,t-1} + \bar{n}_{i,t,h}\right)}\right) \tag{2}$$

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 dealing with the problem with market microstructure noise we move to formulate the model and choose the most appropriate method to analyze the impact of high-frequency trading on stock price volatility. We compare this relationship two data sets wit different frequencies based on the results of optimal sampling tests. The first data set (with presence of noise) with one minute frequency and the second where we run the same models on the data with one hour sampling frequency (chosen by the results of the Bandi-Russel test (2008) and test of Lagrangian multipliers for MMN by Shin, D. W., & Hwang, E. (2015)).

The initial model we have chosen to test the relationship of dynamics in HFT activity and market volatility has the following form:

$$\sigma_{\{i,t\}} = \alpha_i + \beta_{\{i,1\}} HFT_{i,t} + \beta_{\{i,2\}} RV_{i,t} + \beta_{\{i,3\}} AF_{i,t} + \beta_{\{i,4\}} V_{i,t} + \nu_{i,t} \quad (3)$$

where $RV_{m,t}$ is estimation of realized market volatility calculated from 30 one-minute returns previous to time t of German stock index DAX 30. $AF_{i,t}$ is a dummy variable indicating observations where without any trades matched during interval *<t,t-1>* 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 $\nu_{i,t} = u_{i,t} + \epsilon_{i,t}$, 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 not present.

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. This method show no feasible results or did not converge to any results. The second estimation procedure we used was GARCH(1,1) model with intraday adjustments for seasonality. If none of the external regressors were non-significant, we had switched to the exponential GARCH(1,1) model. In this case we use the same model as in the first case. The coefficients for seasonality in the model were not significant in any of cases. Hence, we switched to GARCH(1,1) model, but these model also did not bring any satisfactory outcomes.

As last method we have chosen Markov switching model techniques with three levels. More regimes brought any improvement to our results. This method helped us to obtain better explanatory power of the model (even though this is not necessary, as we are more concern by the coefficients for HFT variable) by estimating coefficients for three different levels of explained and explanatory variables. Switching to these levels is random process. Hence, if the coefficients in models will not be consistent, it would be difficult to explain the nature of tested relationship. Reduced-form of model is used in these estimations, because other control variables tended to be insignificant:

$$\sigma_{\{i,t\}} = \alpha_i + \beta_{\{i,1\}} HFT_{i,t} + \beta_{\{i,2\}} RV_{i,t} + \nu_{i,t} \quad (4)$$

Data

As was described before two different sampling of data were used for testing. The same models were applied on both samples in order to better comparison between of effects in particular samples. Different effects of algorithmic trading on spot volatility can be analyzed under the influence of market microstructure noise and without its presence. For the version with influence of MMN we have chosen one minute data and one hour date for the other one.

Most traded stocks on the Deutsche Borse were picked based on the following criteria: minimal volume of trading (at least 10 million shares a month), minimal market capitalization (at least 2 million EURO), and minimal number of active observations (at least 10 000 minute observation where at least one trade occurred). Only primary issues are selected. After excluding stocks with too many missing observations during selected period, 26 stocks fitted the imposed criteria. This might not be the optimal 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 give biased results (many other stocks are less frequently traded). The period selected for our analyses starts at April 15, 2015 and ends at October 19, 2015. Daily observations start at 9:06 a.m. and end at 5:24 p.m. to exclude opening and closing auctions because these periods usually contain negative spreads and increased volatility. Thus, the first and the last daily intraday returns are omitted, which grants that estimates of realized volatility are not biased by intraday jumps. All days with shortened trading time (due to holidays or system breakdowns) were excluded. The average summary statistics for all stocks is provided in Table 1. All data were gathered from Bloomberg.

For the analyzed period is typical rather stable slow decline of nearly all larger stocks traded on European markets, which also holds for German market. Standard deviation of returns was close to mean volatility given by the ratio of highest and lowest prices (Formula 1), which confirms that these two estimations of market volatility gives very close values. The average number of trades in observed one-minute is approximately 8. Approximately 155 limit orders were on both side of limit order book, which indicates sufficient activity of HFT traders and market makers for our analysis.

Table 1 Average summary statistics for all chosen shares from French market with one minute frequency on the period from April 15, 2015 to October 19, 2015

Variable	Mean	Maximum	Minimum	Stand. Dev
Price (P)	46.67	54.17	37.4	4.09
Profit (r) (in 0.001)	-0.3	22.21	-39.55	0.57
Number of trades (nm)	7.48	156	0	5.95
Number of sell orders (na)	158.02	852.15	14.38	65.41
Number of buy orders (nb)	155.07	794.38	13.19	63.14
Volume of trades (vm) (in ths)	3.37	810.87	0	5.53
Volume of sell orders (va) (in ths)	6.83	816.18	0	6.63
Volume of buy orders (vb) (in ths)	8.84	2718.17	0	19.16
Spread (s)	0.04	0.47	0.01	0.01
Order imbalance (oi)	0.19	0.42	0.06	0.05
Volatility (σ) (in 0.001)	0.47	16.47	0.03	0.36
HFT activity change (hft)	0	1.21	-0.77	0.15

Source: author

3 Results and Discussion

Both linear GMM estimation and GARCH(1,1) brought no satisfactory results for enough equities. Intraday seasonality played no role in any case either. With such a limited outcome we were not able to generate any general conclusion. There were full set of results for low-frequency data, but without high-frequency results we were not able to compare them.

Most accurate results were for the Markov model with 3 levels of switching. First we provide results for models applied on high-frequency 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 (Table 2). J-tests confirm validity of the results in all cases, and HFT activity coefficients are significant for every stock.

Aggressive trading that is restricted only to submission of market orders has smaller effect on market returns volatility, but is also positive. This is against our initial hypothesis. We have assumed that aggressive traders, who are willing to pay market price would cause more disturbance then total or just defensive trading. Only in one regime was the impact smaller.

Defensive market making after all seems to produce the most variability of prices from the chosen measures. As the regimes are not fixed it is difficult to compare them among shares. But in average limit orders tend to produce more volatility then market orders in HFT data. This might be explained by various factors such as the fact that the activity of market orders is smaller, that market makers submit limit orders further from the market price or just by bias caused by using proxy variable instead of direct measurement of HFT activity.

Coefficients of determination are quite small in comparison to standard econometrical practice. But while using high frequency data it is difficult to capture all variability hidden in MMN and other distortions.

Next we applied the same methodology on data with one hour frequency. This frequency of sampling was chosen after the analysis of tests for presence of MMN. With these data frequency without the presence of MMN all forms of HFT trading seems to have in average stronger influence on variability of prices.

Table 2 Markov switching model estimations of the model (4) for HFT and LFT activity (All statistics for coefficients of HFT are scaled to represent impact to one hour volatility)

	Mean coefficient	Standard deviation	Max	Min	Average R^2
High-frequency data - total					
Regime 1	5.60	4.39	10.49	0.83	0.30
Regime 2	3.05	3.24	7.76	0.44	0.22
Regime 3	2.46	1.70	4.08	0.90	0.23
High-frequency data - aggresive					
Regime 1	3.96	5.79	10.64	0.35	0.23
Regime 2	3.25	1.38	4.24	1.67	0.25
Regime 3	1.80	2.18	4.31	0.44	0.23
High-frequency data - defensive					
Regime 1	4.12	2.26	7.73	1.60	0.29
Regime 2	6.44	4.39	10.85	1.59	0.25
Regime 3	3.76	4.38	11.21	0.83	0.23
Low-frequency data - total					
Regime 1	5.75	4.99	16.25	0.21	0.64
Regime 2	4.84	7.35	27.29	0.35	0.64
Regime 3	6.50	7.51	22.93	-0.19	0.62
Low-frequency data - aggresive					
Regime 1	1.63	2.64	8.70	-0.30	0.64
Regime 2	3.38	5.94	21.54	-0.21	0.62
Regime 3	5.24	8.90	41.72	-0.09	0.54
Low-frequency data - defensive					
Regime 1	5.02	5.86	20.01	0.29	0.67
Regime 2	4.02	6.97	27.82	-0.20	0.62
Regime 3	6.35	5.91	22.20	0.19	0.61

Source: author

This might be due to aggregation and alternation of market orders in time. These results confirms hypothesis that HFT increases volatility in long run as well as short run. However in long run there seem to be few cases where also negative coefficients occurred, which suggest that HFT may also decrease volatility in certain occasions. Or it might be caused by external factors that we have not taken into account.

Significant influence of aggressive algorithmic trading has been also confirmed in low frequency data. But as in previous case the impact of defensive market making is higher after all. The coefficients of determination values confirm that this relationship is valid in all cases also for low-frequency data. The results for overall and defensive HFT activity

were very similar which is caused by much lower number of market orders compared to limit orders.

4 Conclusions

Lots of popular as well as academic papers have dealt with the pros and cons of algorithmic trading. Many criticized it for its adopting manipulative techniques and aggressive trading strategies used by some high-frequency traders. In this paper, we analyzed the link between HFT trading activities and volatility of stock market prices on the German stock market. We have concluded that the high frequency trading had a positive correlation with the variability of prices in all cases. These effects have also been proven for low frequency data without the presence of market microstructure noise. Effect on volatility is stronger in long run. This suggest that HFT is not part of the market microstructure noise. In our specifications of high frequency trading, the aggressive trading had weaker impact on volatility than the defensive trading, which is in contradiction with preliminary hypothesis. Our study supports some of our previous findings conducted on different European stock markets and contradict others. Anyway the relationship is the same in every market. HFT increases volatility of market prices.

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The Application of Sovereign Bond Spreads and the Development of the Stock Market on GDP Prediction: The Case of Visegrad Group

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Abstract: *The yield curve – specifically the spread between the long term and the short term interest rates is a valuable forecasting tool. It is simple to use and significantly outperforms other financial and macroeconomic indicators in predicting recessions one to six quarters ahead. 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. For better predictions it is good to use other overtaking indicators of economic activity as the development of the stock market. This paper aims to analyze the dependence between the slope of the yield curve, development of the stock market and an economic activity of selected countries between the years 2000 and 2016. The selected countries are the Czech Republic, Hungary, Poland and Slovakia. The natural and probably the most popular measure of economic growth is GDP growth, taken quarterly. We have found out that the bond spreads and stock market development might be used for predicting of the future economic activity, the best lags of bond spreads are 2, 4 or 5 quarters. 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

Many market observes 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 (or 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).

The aim of this paper is to show if the yield curve and development of the stock market possess the predictive power of the future economic activity in countries of Visegrad group (Czech Republic, Hungary, Poland and Slovakia) and to examine which time lag of the yield spread is the best for prediction of the future GDP. We are going to examine if this relationship has changed after the financial crisis.

Based on the literature review we are going to use the yield spread between 10-year and 3-month bonds. This spread has been proved as the best one for predictions.

Despite various researches, there is not any comprehensive theory that would prove the correlation between the yield spread and the economic development of the country yet. We often come across the statements that have only theoretical basis without generally valid empirical evidence. Economic models are largely based on the argument that the yield curve tends to be flatter in the situation of the tight monetary policy and the economic slowdown typically occurs with a slight time lag (Szarowska, 2015).

Almost perfect tool containing the relevant future data provides the yield spread of the government bonds. The simplest interpretation of the yield spread is through monetary policy of the country. Based on this criterion – relatively low spread reflects the restrictive and tight monetary policy and vice versa – high spread reflects loose monetary policy. We can find the theoretical justification for using of the spread in expectations hypothesis it assumes that a long term rate of return is the average of the current and expected future short term yields. The investor's decision to invest in short term or long term asset is completely irrelevant (Mishkin, 1990). Dependence of the yield spread and future economic activity can be derived from their connection to the monetary policy of the state. As bond yields react to monetary policy as well as monetary policy is able to respond to the output of the economy, the yield curve assumes overlapping of the policy measures and responses. The yield curve has the ability to reflect future production either directly or indirectly. Indirectly it comes to predicting of the future interest rate and the future monetary policy. It may also reflect the future production directly because the 10-year yields may depend on estimates of the output of the economy in 10 years.

The dependence of the development of stock market and the future economic activity has been proved already many times before (Duca, 2007; Levine and Zevros, 1993).

A question arises – how many months, quarters, years of future economic activity can be predicted by the yield spread? Based on the study of Bonser-Neal and Morley (1997) as well as Chinn and Kucko (2010) spread has the greatest ability in predicting one-year horizon (four quarters ahead). As it was mentioned above, to prove if the spread has the best predictive power in one-year horizon is one of the aims of this paper.

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. 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. Data relating to the stock market development, which is represented by the year-to-year evolution of the country's chosen index of shares in individual quarters of the specified period was obtained through the Bloomberg terminal. For the Czech Republic we chose index PX, for the Hungary index BUX, for Poland index WIG 20, for Slovakia index SAX.

The selected countries are the Czech Republic, Hungary, Poland and Slovakia.

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 4Q2016. 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 from one to six quarters (e.g. if the spread was lagged 4 quarters, then the interest rate spread used for 3Q2001 is actually from 3Q2000).

The last step is to find out which bond spread lag is the best for which country and to prove the hypothesis that the lag of four quarters is the best one.

To generate the GDP predictions with the different lags and stock market development the regression using the whole sample was run, and later on two divided samples of real GDP and stock market developments 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, β_1 and β_2 were estimated for each country:

$$GDP_{t+n} = \propto + \beta_1 * Spread_t + \beta_2 * Stock\ Market\ Development + \varepsilon_t \quad (1)$$

Where:

$GDPt + n$ is a prediction of the future real GDP in time $\mathrm{t} + \mathrm{n}$ quarters

n is the lag of spread, value of the lag can be 1, 2, 3, 4, 5, 6

$Spread_t$ is a spread between 10-year and 3-month government bonds in time t

$Stock\ Market\ Development$ is a year-on-year quarterly growth of the country's selected stock index

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 4Q2016. A regression of the whole sample was run and we got the results as seen in Table 1.

It is necessary to say that we can contribute this model statistically significant for all the countries because of p-value under 1% (***) respectively under 5% (**) or 10% (*). We got the best results of the models for lag 2 (Czech Republic and Slovakia) and for lag 6 (Hungary and Poland). All the models may be used as predictive models.

Table 1 Results of All Countries and Whole Sample from OLS Regression

1Q00 – 4Q16	Constant	Spread	P-value	StockM	P - value	R^2
Czech Rep. (n=2)	0,0398	−0,9382	0,0284**	0,01587	0,0371**	0,58133
Hungary (n=6)	0,01998	−0,4435	0,042**	0,0745	0,0052***	0,464120
Poland (n=6)	0,01647	0,27317	0,0015***	0,0015	0,0011***	0,562569
Slovakia (n=2)	0,050536	−0,5991	0,0915*	-0,0875	0,0276**	0,750617

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. In this case we got quite high values of R^2 which means that the variables were chosen well.

For example we can say that future real GDP of the Czech Republic will be:

$$\text{Real GDP}_{\text{Czech Republic t+2}} = 0{,}0398 - 0{,}9382 * \text{spread}_{\text{Czech Republic t}} + 0{,}01587 * \text{stock market}_{\text{Czech Republic t}}$$

By this model we can predict future real gross domestic product for the Czech Republic two quarters ahead.

We can test the hypothesis that the behavior of the spread, development of the stock market 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 4Q2016 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 – 4Q2016 (second sample) are in Table 3.

In the first period we got the best results of the models for lag 5 (Czech Republic and Hungary) and for lag 2 (Poland) and lag 3 (Slovakia). All the models may be used as predictive models.

R^2 are lower than in the time period of whole sample – 1Q2000 – 4Q2016, it means that the predictive power of these models in the first period (1Q2000 – 4Q2007) was lowered.

Table 2 Results of All Countries and Sample from 1Q2000 to 4Q2007

1Q00 – 4Q07	Constant	Spread	P-value	StockM	P - value	R^2
Czech Rep. (n=5)	0,016579	−0,6382	0,0425**	0,02764	0,0871*	0,35734
Hungary (n=5)	0,018279	−0,6471	0,061*	0,0463	0,0312**	0,39759
Poland (n=2)	0,011872	−0,4891	0,0051***	0,0015	0,0011***	0,56256
Slovakia (n=3)	0,030714	−0,4894	0,0845*	-0,00577	0,0476**	0,46052

Source: author's own calculations

In the second period (1Q2008 – 4Q2016) the best results were gained for lags mentioned in the Table 3 – lag 4 (Czech Republic, Poland and Slovakia) and lag 5 (Hungary).

All models are statistically significant. R^2 are higher than in the previous time spans, 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 – 4Q16	Constant	Spread	P-value	StockM	P - value	R^2
Czech Rep. (n=4)	0,040256	−0,4685	0,0084***	0,02767	0,00795**	0,73824
Hungary (n=5)	0,02597	−0,6435	0,0027***	0,01579	0,043**	0,59387
Poland (n=4)	0,03856	−0,0015	0,045**	0,067	0,0001***	0,71259
Slovakia (n=4)	0,04067	−0,876	0,0015***	-0,0967	0,0027**	0,85726

Source: author's own calculations

At the end we can summarize the new theoretical findings according to which lag is the best for predicting of the future GDP growth. We proved that in these selected countries the best lag is a lag of 2, 4 or 5 (we have added all results together and these lags showed up three times in total each). 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 lag is lag 2 or 5 is in contradiction with the theoretical background when almost everybody who predicts the future GDP growth by bond spread uses a lag of 4 quarters. However the lag of 4 quarters was mentioned above as well and we can say that this result contributes the theoretical background. We have shown that the stock market development has a predictive power on the future GDP activity as well as the bond spread and it makes the R^2 of the models higher.

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 already before). We showed that after the year 2000 the best predictive lags in the Czech Republic, Hungary, Poland and Slovakia are the lags 2, 4 and 5 quarters. 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 lag. We have shown that the development of the stock market has a predictive power as well and it helps the models to increase the R^2.

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 and other overtaking indicators 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 lag of 4 quarters is the best for predicting future GDP growth in the countries of the European Union.

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Empirical Analysis of Farmers' Winterkill Risk Perception

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Abstract: *Some studies have shown that personal risk perception influences risk attitudes of farmers as well as the type of risk management strategy undertaken. For this reason, identification of the structure of perceived risk and the formation of farmers' risk perceptions is crucial both for designing a government risk management policy applicable in the agriculture sector and for suppliers of risk management tools as it affects demand for insurance. The aim of this research is to investigate the perception of winterkill risk among Polish farmers, the factors which have an impact on this perception and the impact of acceptable (normal) and catastrophic event on risk perception. Statistical analysis, logit models were applied for analysing the representative poll taken in March 2012 in Poland (750 respondents) with the use of the CATI methodology. Preliminary results show that farmers' winterkill risk perception is affected mostly by farmer's loss experience. The structure of answers on risk perception depends also on the non-acceptable loss level.*

Keywords: winterkill, risk perception, risk management, agriculture risk, natural hazard

JEL codes: Q54, Q12, Q120, G220, D81

1 Introduction

Winterkill is one of the most important risk for Polish farmers. Unpredictable weather during winter may cause substantial losses even if the condition of winter grains and rape is sufficient or good. The most dramatic years in the last decade were 2010-2012, when up to 30% of autumn sown cereal and rape had to be ploughed-up (Central Statistic Office, 2012) and 2016.

Winterkill is an insurable peril and it is understood as "losses caused by frost killing, soaking, smothering, cold wind burning or planting of the crop in the period from the 1th of December to the 30th of April, that result in partial or total destroying of plants or partial or total yield reduction" (ACAIA). On a farm level, it causes a drop in crop production and, in the case of extreme losses, the necessity of removing the crop by ploughing up, reduce crop quality, and increase production costs by additional agricultural practices. Since it is a systemic risk, winterkill affects the whole sector resulting in wide economic losses on the macro level. According to the data provided by insurance companies the compensation for winterkill losses in 2006-2015 on average account for 38% of all compensation paid from compulsory crop insurance, with the remarkable share of 82% in 2012 (Prime Minister, 2016). One has to mention that the system has covered up to 25% of total arable land so far, so the real losses must have been much higher.

Risk management of natural hazard undertaken by a farmer depends, at least partly, on his risk perception (Ullah et al., 2016; Tucker et al., 2010; Birkholz et al., 2014; Li et al., 2017; Arbuckle et al., 2015). For this reason, identification of the structure of perceived risk and the formation of farmers' risk perceptions is crucial both for designing a government risk management policy applicable in the agriculture sector as well as for suppliers of risk management tools as it affects demand for insurance.

The aim of this research is to investigate the perception of winterkill risk among Polish farmers, the factors which have an impact on this perception and the impact of acceptable (normal) and catastrophic event on risk perception.

In order to discover how people perceive risk the following approaches have been developed. A classical approach assumes that the risk may be described by two dimensions: probability and potential damages (severity). The theory of expected utility assumes that agents have perfect information on the probabilities and potential damages related to risky events and for this reason their assessment of risk is identical to the objective risk. Hence factors which influence risk perception are objective. They could be divided into two groups: the factors determining farmers' risk exposure and the determinants of farmers' risk sensitivity (van Duinen et al., 2015).

The observed discrepancy between individual risk assesment and expert risk estimates based on classical approach caused the theory of risk perception to shift towards a psychological approach. It started with the heuristic paradigm (Tversky and Kahneman, 1973, 1979; Tversky et al., 1982). Reasearches based on this paradigm are concentrated on heuristics used by people to evaluate information that could become cognitive biases, e.g. representativeness, availability heuristic or anchoring and adjustment heuristic.

Within the psychological approach "the psychometric paradigm" was created as well (Fischhoff et.al., 1978; Slovic et. al, 1984, 1985). The judgement of riskiness for diverse hazards reflecting risk characteristics such as: voluntariness, controllability, newness etc. Factor analysis has revealed that these diverse characteristics are reducible to three factors: the first called 'unknown risk' (it has been composed of scales such as: unknown to those exposed, unknown to science, unfamiliar, and involuntary) the second,called 'dread risk' (has included the characteristics: severity of consequences, dread, and catastrophic potential) and finally the number of people exposed to the risk.

Research in psychology, sociology and cultural were combined in the Social Amplification of Risk Framework (SARF). It asserts that individual risk perceptions are susceptible to social norms through interactions within social networks. Communications of risk events pass from the sender through intermediate stations to a receiver and in the process serve to amplify or attenuate perceptions of risk (Kasperson et al., 1988).

2 Methodology and Data

Primary data was gathered on the basis of a survey conducted in March 2012 by means of the CATI method, with the use of a structured questionnaire, on a focus group of 750 farmers across Poland who grow crops. A representative sample was selected on the basis of the farm location and size. Answer variants and respondents' profiles were expressed by means of different qualitative variables: binary variables, polynomial variables – both nominal and ordinal ones. The data about the farmers and the characteristics of their farms was collected. Farm managers assessed 13 perils in the scale from 1 to 7, where 1 denoted a negligible peril, whilst 7 represented a definitely dangerous phenomenon. The list included hail, flood, winterkill, spring frost, drought, hurricane, plant pests and diseases, the farmer's health problems, increase in agricultural input prices, price volatility on the crop markets, political changes, property damage and sudden changes in agricultural technology. The data on acceptable losses in crops and losses in crops leading to a farm's bankruptcy were obtained according to declarations made by farmers, as well as data about loss experience and insured perils.

A non-parametric Kruskal-Wallis test and a Spearman's rank correlation analysis was conducted in order to determine the correlation between the perception of winterkill risk and the evaluation of other risks. In order to verify the hypothesis concerning the correlation between the spring frost risk perception and various qualitative features, a number of contingency tables (cross-tabulation) was produced and the Pearson's test of independence was conducted. As some of the features considered had quite a few variants, a problem appeared with regard to the appropriate sample size in each cell of the contingency table. Therefore, winterkill risk perception was categorised into three classes:

- Low level of risk, if it was evaluated 1 or 2,
- Medium level of risk, if evaluated 3 to 5,
- High level of risk, if evaluated 6 to 7.

Cramer's coefficient, based on chi-squared statistics was used as a measure of strength of this correlation or the non-parametric Kruskal-Wallis test was applied.

The potential determinants of risk perception researched were put into two groups. The first one based on the classical, the second on the psychological approach. Within the first gropup the following objective features influencing risk exposure or risk sensivity are included into the analysis: types of crops, province where the farm is located, farm size, dominant soil quality class, dominant production, production purpose, the use and character of additional, non-farming sources of income. The other group consists of the following determinants: sex, age, educational background, the degree of crop loss which does not jeopardise the farm operation, the degree of crop loss leading to bankruptcy, experience related to different perils: the frequency of various adverse occurrences in the previous 10 years and the scope of adverse occurrence affliction, i.e. the evaluation of the influence the adverse phenomenon had on the farm's income from crops (in the scale of 1 to 4, where 1 denotes lack of influence on the income, and 4 denotes a very big influence).

In the last stage of the research three ordered categories logit models were constructed in order to produce a tool to permit the respondents' classification into one of the three determined risk classes. In the first model the objective variables, in the second model the subjective variables and in the third model all statistically significant variables from the previous two models were assumed. It was assumed that the variables which remained in the model would be significant at the confidence level of 95 percent.

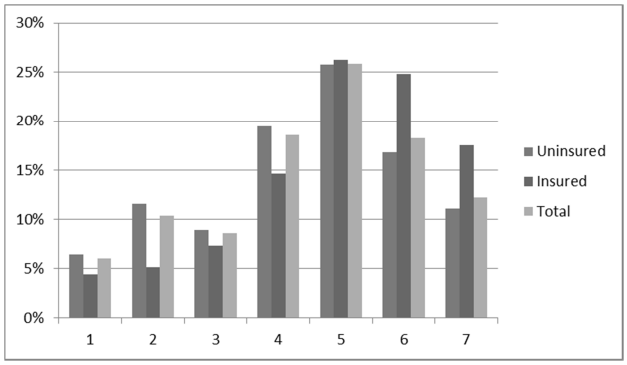
GRETL and Statistica10PL software was used for all the calculations.

3 Results and Discussion

The structure of winterkill risk assessment

The assessment of winterkill risk was on average 5.52. The analysis of figure 1 shows clearly that respondents most often gave medium or high grades to winterkill. The highest grades were given by the people who had insured their crops (6 and 7) and the lowest grades (1, 2, 3 and 4) were given by those who had not insured their crops. In order to confirm the statistical significance of the response distribution an independence test for qualitative features was conducted assuming three classes of risk assessment. The findings confirm a correlation between the risk assessment and a decision to buy a crop insurance policy (Chi sq. = 13.28) at a confidence level of 99.9 percent. This correlation is not very strong (Cramer coeff.= 0.13).

Figure 1 Distribution of winterkill risk rating in the whole focus group and in sub-groups of those who had insured their crops and those who had not



Source: author's own calculation

It is interesting, that the perception of winterkill is correlated to the assessment of other risks. The results of Spearman's rank correlation coefficients indicate that the strongest positive correlation is observed to other weather phenomena, i.e. spring frost (0.5608), hurricane (0.2841), hail (0.2768), to plant diseases and pest (0.2648) and also to exogenous risk like political changes relating to agriculture (0.3241) and dramatic changes in cultivation technology (0.2858). The weakness and the only one negative correlation could be observed in the case of flood (0.1590).

Factors affecting perception of winterkill

Objective features

The result of the chi-square independence test clearly points to the fact that winterkill risk perception is not affected by farm size. The correlation between the location of the farm and assessment of the winterkill risk placed on the verge of significance (Chi sq. = 33.66, p-value = 0.053; Cramer coeff.= 0.15). According to the historic statistical data, one could suppose that the sensitivity to winterkill is correlated to the types of crop and soil quality class. Both factors determine the plant condition and therefore its resistance to weather damages. It turns out that according to the results of U-Mann Whitney test the above assumption is valid for some sort of plants, i.e. winter barley, winter triticale and rye. Table 1 shows that this influence is not strong. Similarly the correlation between winterkill risk perception and soil quality class is not strong, despite being statistically significant (Table 2).

Table 1 Comparison of plants whose cultivation has the largest influence on winterkill risk perception, in the light of the Chi-square test of independence

Type of plant	Chi-sq. stat. (p-value)	Relationship
Winter barley	10.834 (0.004)	40.88 percent of farmers cultivating winter barley gave the highest rating to winterkill risk while 11.95 percent of these farmers gave it the lowest rating. In the cases of farmers who do not cultivate this crop the percentages are 27.75 percent and 17.6 percent respectively.
Rye	9.866 (0.007)	32.37 percent of farmers cultivating rye gave the highest rating to winterkill risk while 12.95 percent of these farmers gave it the lowest rating. In the cases of farmers who do not cultivate this crop the percentages are 27.81 percent and 21.52 percent respectively.
Winter triticale	11.37 (0.0033)	32.31 percent of farmers cultivating winter triticale gave the highest rating to winterkill risk while 12.75 percent of these farmers gave it the lowest rating. In the cases of farmers who do not cultivate this crop the percentages are 27.8 percent and 22.03 percent respectively.

Source: author's own calculations

Table 2 Winterkill rating distribution according to the soil quality class

Risk evaluation	Response distribution for all observations				Independence test findings	
	Soil quality class I and II	Soil quality class III and IV	Soil quality class V and VI	Not classified		
High	45.83%	26.60%	31.56%	55.88%	Chi sq.	18.83
Medium	41.67%	57.03%	18.27%	41.18%	p-value	0.00445

Low	12.50%	16.37%	9.36%	2.94%	C. coeff.	0.1120533

Source: author's own calculations

The factor which significantly affects winterkill perception is the dominant production. As Table 3 indicates, the highest ratings were given relatively more often if the dominant production involved pigs (more than 35 percent of these respondents gave it the highest rating) and crops (35.8 percent respectively). However the correlations are not strong. The production purpose (for their own use or to the market) does not affect the winterkill perception.

Table 3 Winterkill rating distribution according to the dominant production

Risk evaluation	Crops	Milk	No dominant production	Porkers	Independence test findings	
High	35.83%	17.50%	23.08%	35.11%	Chi sq.	20.236
Medium	50.80%	65.00%	55.49%	52.13%	p-value	0.0025
Low	13.37%	17.50%	21.43%	12.77%	C. coeff.	0.1177

Source: author's own calculations

The share of agricultural income in total farm's income influences significantly, however weakly, the winterkill rating distribution (Table 4). The risk perception is the highest if agricultural activity is the only source of income. The bigger the share of non-farming income, especially if it is available throughout the year and not only seasonally, the more often winterkill risk is assessed as medium or low.

Table 4 Winterkill rating distribution according to the source of income

	Response distribution for all observations				
Risk evaluation	**Only farming sources of income**	**Non-farming sources of income - seasonally**	**Non-farming sources of income – all year**	**Independence test findings**	
High	34.63%	32.73%	26.94%	Chi sq.	10.15
Medium	47.57%	45.45%	58.55%	p-value	p=0.0379
Low	17.80%	21.82%	14.51%	C. coeff.	0.0822

Source: author's own calculations

Subjective features

According to the results of the chi-square independence test personal features of a farmer like sex, age and educational background do not affect the winterkill risk perception. However, the subjective assessment of the degree of acceptable and non-acceptable crop loss influences winterkill rating distribution. The degree of crop loss that is perceived as normal, i.e. loss which does not jeopardise the farm operations, affects the distribution on the verge of significance and is very weak (Chi sq. = 12.20, p-value = 0.05762; Cramer coeff.= 0.09). Nonetheless, the degree of crop loss that according to the opinion of a farmer may lead to bankruptcy of his/her farm, has a significant effect on the winterkill perception, although not a strong one (Table 5). One has to notice that the degree of crop loss leading to bankruptcy increases the likelihood of giving this risk medium or low rating, and not very high.

Table 5 Winterkill rating distribution according to the degree of crop loss leading to bankruptcy

Response distribution for all observations						
Risk evaluation	**Crop loss from 10% to 30% yield**	**Crop loss from 31% to 50% yield**	**Crop loss from more than 50% yield**	**Hard to say**	**Independence test findings**	
High	31.90%	31.67%	33.14%	21.74%	Chi sq.	17.21
Medium	51.72%	55.56%	42.86%	61.96%	p-value	p=0.00853
Low	16.38%	12.78%	24.00%	16.30%	C. coeff.	0.1076

Source: own calculations

A strong correlation was noticed between various risk assessments and different variables denoting the farmer's experience with them. As the respondents were divided into three groups depending on their risk perception, whilst the occurrence frequency was indicated on a ratio scale, a classical analysis of variance and non-parametric Kruskal-Wallis test was conducted in order to identify the significant differences in the frequency of occurrence of particular risk connected with natural phenomena which the three groups had experienced. Table 6 presents the results which indicate that: the higher the given phenomenon's frequency of occurrence in the last 10 years, the larger the propensity to rate winterkill risk as highly dangerous. The exception to this rule is fire, flood, animal and plant diseases where the correlation is not observed. The differences between average ratings of winterkill risk made by people struck by a given phenomenon and those who had not been struck are especially high in case of spring frost and winterkill.

Table 6 Frequency of the phenomena vs. winterkill risk perception – results of the classical analysis of variance and non-parametric Kruskal-Wallis test

Phenomenon	**Statistics F and H**	**p-values**	**Type of relationship/ Average rating of phenomenon-struck farmers/ Average rating of phenomenon -unaffected farmers**
Drought	8.91	0.000	The more frequently drought occurred, the higher the risk was rated/3.36/ 2.36
	12.89	0.002	
Hail	6.83	0.000	The more frequently hail occurred, the higher the risk was rated/ 1.08/ 0.74
	11.58	0.003	
Spring frost	28.45	0.000	The more frequently spring frost occurred, the higher the risk was rated/ 4.04/ 2.15
	53.32	0.000	
Winterkill	54.13	0.000	The more frequently winterkill occurred, the higher the risk was rated/ 3.8/ 1.4
	65.2	0.000	
Hurricane	4.09	0.017	The more frequently hurricane occurred, the higher the risk was rated/ 0.51/ 0.36
	6.26	0.04	
Flood, fire, plant and pest diseases			Lack of significant relationship

Source: author's own calculations

The logit model in respondent classification according to their winterkill risk perception class

The fact that it was possible to identify several features of the respondents which affect their winterkill risk perception justifies a decision to evaluate their diagnostic power by means of constructing a logit model for ordered categories. First an objective model

(Model 1) was estimated. Subsequently, the model including the subjective features (Model 2) and then the model including objective and subjective factors (Model 3) were estimated. Table 7 presents the significant variables for the models along with their assessment of the parameters.

Table 7 Regression results for risk perception models – significant variables and logit model parameter assessments (N=750)

Variables of the model	Model 1 – objective features		Model 2 – subjective features		Model 3 –objective and subjective features	
	Coefficients	Standard deviation	Coefficients	Standard deviation	Coefficients	Standard deviation
Rape cultivated	0.53**	0.24			-0.01	0.30
Winter barley cultivated	0.51***	0.18			0.50**	0.23
Winter triticale cultivated	0.41***	0.15			-0.19	0.19
Rye cultivated	0.48***	0.15			0.15	0.19
Plant production dominant	0.59***	0.16			0.24	0.20
Pork production dominant	0.55**	0.24			-0.09	0.30
Production for market and own purposes	-0.36**	0.15			-0.11	0.19
Age 50-60			-0.43**	0.19	-0.41**	0.19
The number of winterkill problems			0.12***	0.04	0.12***	0.04
Influence of winterkill on income			2.16***	0.13	2.16***	0.14
Influence of hurricanes on income			0.24***	0.08	0.23***	0.08
Confidence ratio test	Chi-sq.(7) = 160.45 [0.0000]		Chi-sq.(4) = 774.21 [0.0000]		Chi-sq.(11) = 782.97 [0.0000]	

**Significant at the 5%level, ***Significant at the 1% level

Source: own calculations

The set of the significant variables and the parameter signs in model 1 are not surprising, except for the variable describing dedication of the production. The fact that a farmer produces not only for the market but also for his/her own purpose, further decreases the likehood of higher ratings of winterkill risk. In the group of subjective features (Model 2) the experiences with the weather phenomena, especially winterkill, are crucial for risk assessment. In the Model3 only one objective feature i.e. winter barley cultivation and all subjective factors are significant. The hit ratio obtained from both of the models is presented in Table 8. Due to the fact that experiences relating to various adverse occurrences affected winterkill perception to a much larger extent than the objective features, the obtained hit ratio in Model 2 and Model3 were much more accurate. One has to notice that the introduction of subjective factors make it possible to increase the hit ratio for farmers with low and high levels of risk perception to the satisfactory level and slightly decrease the hit ratio for medium rating.

Table 8 Classification matrix and hit ratios for Model 1, Model 2 and Model 3

Actual assessment	Model 1				Model 2				Model 3			
	Classification			Hit ratio	Classification			Hit ratio	Classification			Hit ratio
	Low	Medium	High		Low	Medium	High		Low	Medium	High	
Low	0	119	4	0%	122	1	0	99%	122	1	0	99%
Medium	0	380	18	95%	1	343	54	86%	1	346	51	87%
High	0	209	20	9%	0	101	128	56%	0	104	125	55%
Hit ratio (total)				53%	Hit ratio (total)			79.1 %	Hit ratio (total)			78.9 %

Source: own calculations

4 Conclusions

By comparing the hit ratios in models 1 and 2 one can state that subjective features are crucial for identifying people with low and high assessment of winterkill. Introducing subjective factors increases the hit ratio from 0%(!) to 99% by low ratings and from 9% to 56% by high ratings. The objective features as such enable only to recognize people with average winterkill risk assessment. It is similar to another risk of cold weather – spring frost (Kaczała and Wiśniewska, 2015).

The analyses carried out indicate that within the subjective features, farmer's experiences in terms of most natural perils are of primary importance. The essential ones are especially the experiences caused by winterkill.

It is worth noticing that the subjective assessment of the level of crop loss that leads to bankruptcy influences the winterkill risk assessment. The level of acceptable loss that does not jeopardize the functioning of a farm is less significant.

Model 2 and Model 3 very well identifies the people who rate winterkill risk perception as low or medium but it undervalues these ratings for people in the "high" group. This means that in order to identify the people who rate winterkill as dangerous additional information would have to be introduced into the model.

The way of measuring the risk perception used in this research is the simplest one. Additionally one have to be conscious, that the year of the survey followed three years hardly affected by winterkill. It could strengthen the importance of experiences as winterkill risk perception determinant.

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Negative interest rates – consequence staying in error? (empirical evidence)

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Abstract: *The paper is focused to further description and analysis the selected aspects of behavior of Czech banking as a cybernetic system. The objective of the paper is to clarify the implications of central bank regulatory interventions in relations of the managing system (regulator – central bank) to managed system (controlled system – commercial banks) as relationships between operational indicator (discount rate) and regulated indicator (commercial rates).The paper draws on data published by the Czech National Bank (CNB) at http://www.cnb.cz. Methodology of the paper is principally based on the economic cybernetics with special focus to the time series methods and trends analysis. The usual description, literary research, comparison and analytic-synthetic methods are used here as well. The main expected results of the paper relate to the linkages between discount rate and the commercial rate (still not explored), which leads to a discussion of negative commercial rates. Conclusions of the paper partly redefine the position of the central bank in the banking system of the Czech Republic.*

Keywords: banking system, cybernetics, discount rate, negative commercial rate

JEL codes: C67, E58, G21, G38

1 Introduction

The aim of the paper is to clarify the implications of central bank regulatory interventions in relations of the managing system (regulator – central bank) to managed system (controlled system – commercial banks) as relationships between operational indicator (discount rate) and regulated indicator (commercial rates).

It should be noted that this paper is focused exclusively on the conditions in the banking system of the Czech Republic. This applies both to the theory and practice of managing this sphere of the financial system of the Czech Republic, as well as to the analyses and conclusions of the author of the paper. And above all - as conclusions and evidence of empirical character are formulated in the paper - the analyses and all the conclusions and evidence formulated herein are based on data relevant to the environment of the Czech Republic. Any generalizations of the results of the paper to other banking systems (or other territories) are subject to subsequent stages of research in the field.

Within the system of operational management of the monetary policy by the central bank (CNB), confidence remains in the possibility of managing capital cost in the commercial sphere (hereinafter referred to as the commercial rate) using three types of interest rates with a special focus on the regulatory potential of the discount rate (Revenda, 1999). The focus of theory on this rate is based on the assumption that this rate is usually considered to be the most important rate in capital cost management processes (Dvořák, 1999). Therefore, this paper focuses mainly on the discussion of this rate in the given context.

After all, the virtually invincible confidence of the theory of banking system management in the regulatory potential of the discount rate is not the exclusive domain of domestic theoretical authorities. Very similar or even identical positions can be found, for example, even in the context of the US banking system management theory (Mankiw, 2000).

Significant doubts concerning the legitimacy of this confidence in the ability of the CNB to manage the capital cost at the commercial rate level through the discount rate have been previously published by Kalouda (2014a), Kalouda (2014b) and Kalouda (2014c). The above publications show that the commercial rate cannot be perfectly managed using the discount rate and thus the assumption is wrong.

However, the aforementioned existing results of research did not follow the wider context of the analyzed issue, they did not show what can result from dwelling in this error. Therefore, this paper focuses on presenting empirical evidence of the fact that the persistent efforts of the CNB to manage commercial rates through the discount rate necessarily lead to a discussion of the need for, or even the necessity of, the introduction of negative interest rates.

2 Methodology and Data

The maximum allowable length of the paper makes it virtually impossible to provide a detailed presentation of all methodological procedures that led to the results presented below.

Similarly, the thematic focus of the paper, its obvious interdisciplinarity lead to the risk of an increase in the length of the paper beyond an acceptable limit.

Therefore, we will limit ourselves to the briefest overview possible of the most important topics discussed, in connection with the relevant sources.

Methodology

The methodological input is of key importance for this paper. This fact is defined both by the nature of the issues studied and by the researches previously carried out in the relevant field, or by the publications of the results achieved respectively, to which this paper is very closely tied.

The methodical basis of the paper is naturally formed by the usual steps

- description,
- analysis,
- comparison, and
- synthesis.

In addition, however, the specific topic and the target focus of the paper virtually forced the application of methodological tools which have been less frequently used in the given context. These include, in particular:

- economics, applied mainly in capital cost management (discount rate), represented by Mankiw (2000), Revenda (1999), Soto (2009) and hysteresis in the economic environment (unemployment) (Němec, 2010),
- mathematical economics, here used to answer the question to what extent cybernetic models are usable for solving economic problems, represented by Allen (1971) and Bíza (2014),
- technical cybernetics, explaining the principles of automatic control in the form of feedback systems with a special focus on the existence of hysteresis-type nonlinearities represented by Balátě (2004), Fikar and Mikleš (1999), Houpis and Sheldon (2014), Kubík et al. (1982), Švarc (2003), Švarc et al. (2011) respectively,
- economic cybernetics, transforming the methodology of technical cybernetics into the environment of economic systems, as discussed by Allen (1971), Šerý (2010), Kalouda and Svítil (2009), and Kisačanin and Agarval (2001),

- financial business management in the form of applications of its access to economic cybernetics, as illustrated by Kalouda (2015) and Kalouda (2016), including elements of strategic management, with the primary use of Johnson and Scholes (1989),
- applied statistics, represented by Arlt and Arltová (2009), Arlt and Radkovský (2001), Blatná (2009), Cipra (2008), Hindls et al. (2007), Řezanková and Löster (2013), Swoboda (1977) and Šerý (2010),
- financial markets, primarily using information from Rejnuš (2014) as well as
- behavioral economics, or perhaps more precisely behavioral finance, in the form of Pompian (2006) and Shefrin (2007).

Data

The paper is primarily based on freely available input data published by the CNB, see http://www.cnb.cz/cs/financni_trhy/penezni_trh/pribor/rok_form.jsp, and http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS, to which (in order to save space) we hereby refer. These data include the time period from 31 January 2004 to 30 September 2013. The values of the discount rate and commercial rate are monitored.

The above data are essentially unusable for the given purpose in their original form. The necessary modifications are described and justified in Chapter 3. Results and Discussion.

Model Specification

In this case, the modelled object is the banking system of the Czech Republic. We model the processes of managing capital cost at the level of businesses rate (commercial rate) by the CNB using the discount rate. The model of this system is the graphical representation of the dependence of the commercial rate on the discount rate.

This relatively simple model is, in principle, based on the assumption that the requirement for the linearity of the modelled system is met (Švarc et al., 2011). However, it is able to describe the expected nonlinearities that are typical for the banking system with sufficient accuracy. The relative simplicity of the model used is thus not an obstacle to its use for describing the situation and identifying the problem in order to obtain the reference characteristics of the examined system (Fikar and Mikleš, 1999).

3 Results and Discussion

The dependence of the variables monitored is described primarily by the static characteristic, see Švarc (2002), Kubík et al. (1982), Balátě (2004) respectively.

In order to identify the desired dependence, it is necessary to approximate the data with a suitable approximation function. The nature of the problem suggests that it should be a linear function. The result obtained using the standard SW support (MS EXCEL) is shown in Figure 1.

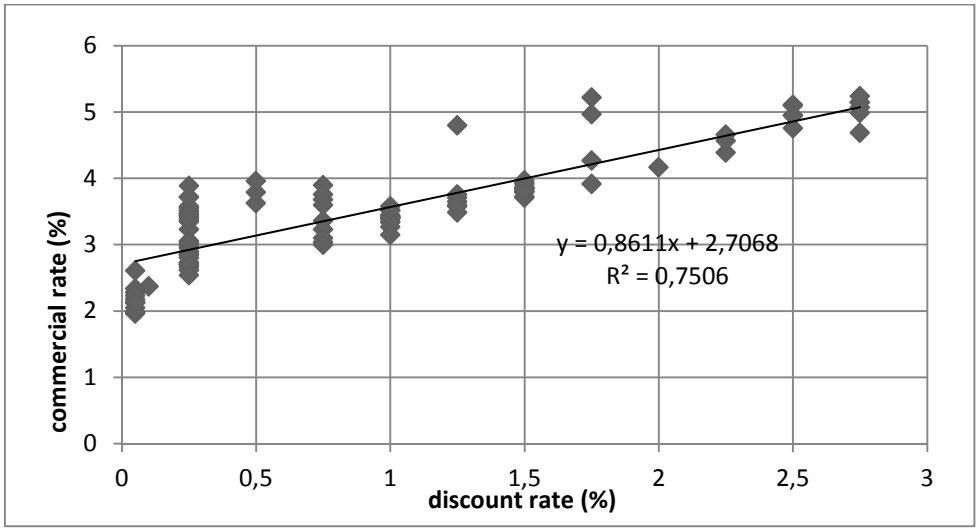
Data in Figure 1 suggest that, in terms of this concept, the banking system of the Czech Republic could be considered as a linear system only with obvious reservations.

It is a positive finding, however, that the core data set tend to cluster, which will be used immediately. Previous results (Kalouda, 2014a, Kalouda 2014b, Kalouda, 2014c) lead more or less to the clear conclusion that the behavior of the banking system of the Czech Republic is different in the case of an increasing discount rate and it is different when the discount rate is decreasing.

In addition, it will be necessary to also respect the second condition for the specific construction of the static characteristics, which is the requirement for the use of stabilized data, see, for example, Švarc (2002).

Both of these lead to the requirement to filter the data of the core data set so that they meet both conditions. The result will be two isolated approximate static characteristics, one for the increasing of the discount rate and the other for the decrease in the discount rate.

Figure 1 Static characteristics of the core data set



Source: Prepared by the author using data from ARAD - Time series system - CNB. [on-line] Retrieved from: <http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS>[Accessed on 26/11/2013].

Consequently, the complex static characteristics will be constructed from the approximated data. These will be static characteristics depicting the dependence of the commercial rate on the discount rate for both increase as well as decrease in the discount rate.

In the last step, we will proceed to the approximation of the dependencies identified by straight-line sections in the stylized form of the resulting static characteristics. They will be further used for a model experiment with multiple cycles of increase and decrease of discount rates. The aim is to prove the influence of hysteresis of the banking system of the Czech Republic on the concept of negative interest rates.

Primary data filtering

The purpose of filtering the input core data set is primarily to

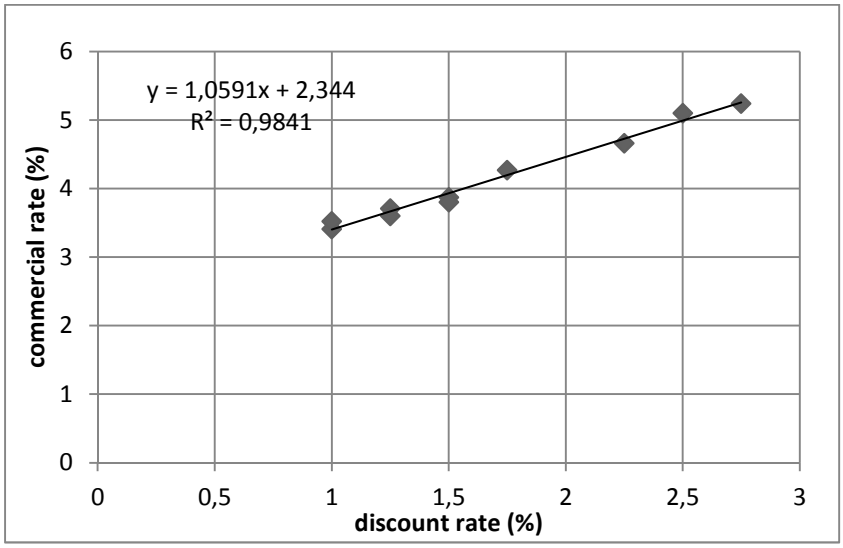
- split the data into two subsets (for the increase and decrease of the discount rate), as well as to
- stabilize data by considering only steady-state data.

Dividing data by discount rate growth or decrease is a smooth and unambiguous step. The acquisition of stabilized data is less clear, however, using the preliminary results (Šerý (2010), Kalouda (2014a), Kalouda (2014b), Kalouda (2014c) and mainly Kalouda (2016) together with Artl and Radkovský (2001)) we are concluding that two months are sufficient for the stabilization of the commercial rate.

The results of these modifications are captured in Figure 2 and Figure 3.

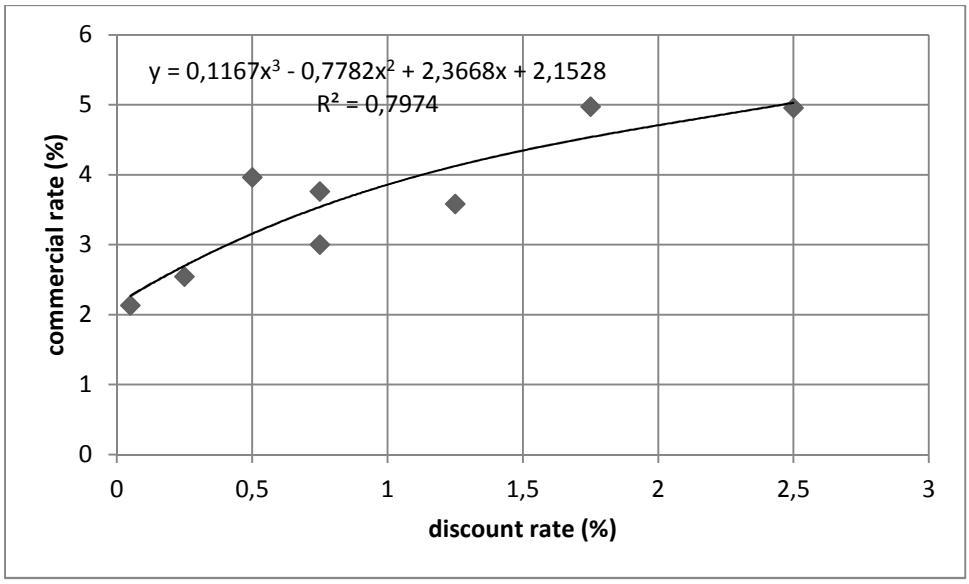
It is apparent from Figure 3 that it is impossible to obtain the perfect linearization of the static characteristic for the discount rate decrease. This leads to the previously deduced hysteresis-type non-linearity which is characteristic for the banking system of the Czech Republic.

Figure 2 Static characteristics – increase in the discount rate (stabilized data)



Source: Prepared by the author using data from ARAD-Time series system-CNB. [on-line] Retrieved from: <http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS> [Accessed on 26/11/2013]

Figure 3 Static characteristics – decrease in the discount rate (stabilized data)

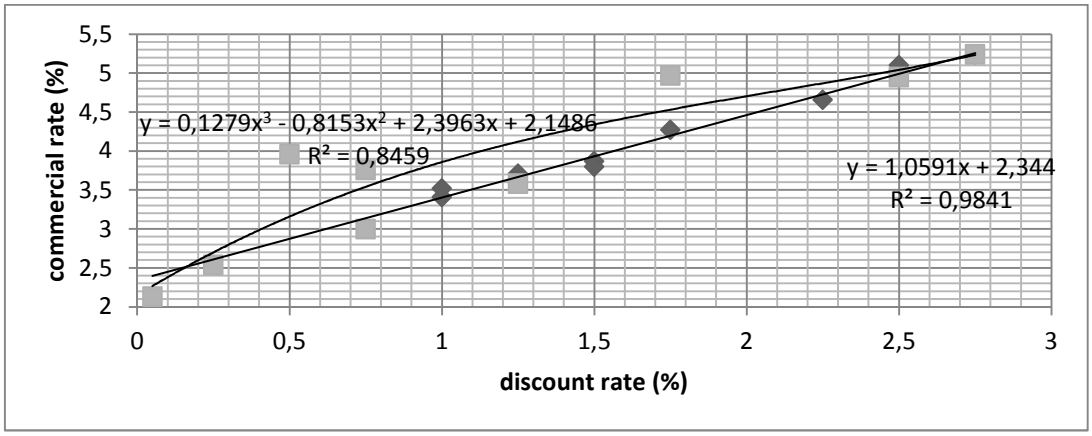


Source: Prepared by the author using data from ARAD-Time series system-CNB. [on-line] Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS [Accessed on 26/11/2013].

Complex static characteristic

In this case, we also chose a graph to present the results obtained. The reason is simple – an attempt not to overburden the paper with an excess of numerical data (all data can be naturally provided for review by the author of the paper). The result is captured in Figure 4.

Figure 4 Complex static characteristic



Source: Prepared by the author using data from ARAD-Time series system-CNB. [on-line] Retrieved from: <http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS> [Accessed on 26/11/2013].

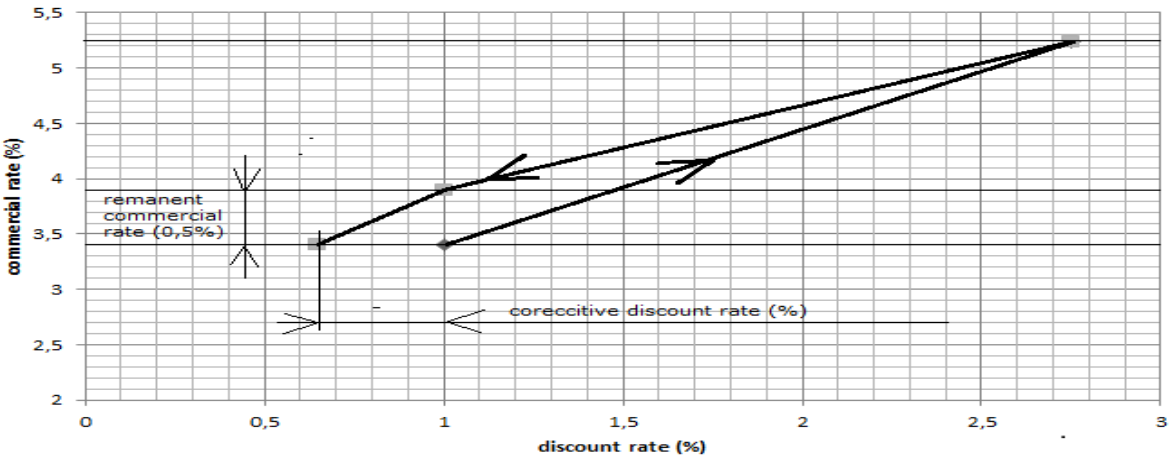
Approximated static characteristic

The approximated static characteristic (see Figure 5) represents the idealized shape of the Figure 4. The decisive (accurate) data are:

- "start" values of the discount rate and the commercial rate [1,00%; 3,40%]
- maximum values of the discount rate and the commercial rate [2,75%; 5,24%]
- coordinates of the remanent commercial rate [1,00%; 3,90%]
- coordinates of the coreccitive discount rate [0,65%; 3,40%]

The approximated static characteristic is created from the input data according to Figure 4, i.e. for the basic (first) cycle increase and the subsequent decrease in the discount rate.

Figure 5 Approximated static characteristic (basic increase-decrease cycle)



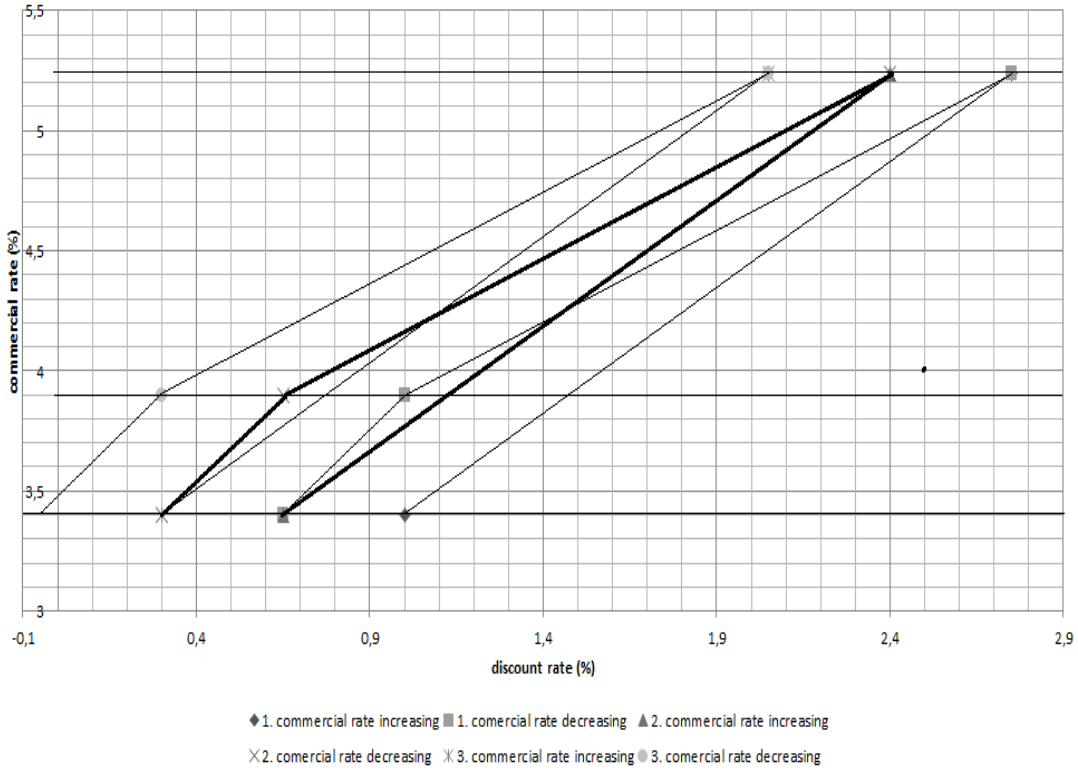
Source: Prepared by the author using data from ARAD - Time series system - CNB. [on-line] Available at: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS [Accessed on 26/11/2013].

Model experiment (repeated discount rate increase-decrease cycles)
The repeated cycles immediately follow each other, i.e. they always start where the previous cycle ended.

The first cycle ended with a decrease in the discount rate to its original value of 1,00%. The corresponding value of the commercial rate, however, was not the original 3,40% - it reached a value higher by the remanent commercial rate (0,50%), i.e. 3,90%. The commercial rate will reach the original value of 3,40% only if the commercial rate drops from 1,00% to 0,65%. This represents a decrease in the discount rate by the value of a coreccitive discount rate of 0.35% (see Figure 5).

These data are deduced from the complex static characteristic (see Figure 4).

Figure 6 Resulting static characteristic



Source: Prepared by the author using data from ARAD - Time series system - CNB. [on-line] Retrieved from: http://www.cnb.cz/cnb/STAT.ARADY_PKG.STROM_DRILL?p_strid=0&p_lang=CS [Accessed on 26/11/2013].

The resulting conclusion from the model experiment is, according to the data from Figure 6, obvious: In the long run, the regulatory potential of the discount rate in the definition range of positive numbers is exhausted in the given case after three discount rate growth-decrease cycles. The only option how to apply the discount rate as a rate that controls the commercial rate is to take into account the negative values of the discount rate.

This conclusion is in remarkable consistency with the current situation - the discount rate is virtually zero. The same applies to the REPO rate, sometimes considered as an alternative tool for controlling commercial rates.

4 Conclusions

The conclusions we have reached in this paper are undoubtedly alarming.

They quite clearly exceed the horizon of the famous "storms in a glass of water" that may have applied to a small group of banking system management theorists, or a small group of highly privileged "banking sector captains".

The introduction of negative interest rates may be, to a certain extent, acceptable to the world of high finance, especially to its sub-group that can financially positively balance even with real economic drops, even at the level of drops of the national economy as a whole. Which in itself is a crazy possibility, completely beyond any morality. Except for business morality, of course.

Under no circumstances, however, would negative interest rates be acceptable to the population. Here, on the contrary, with a probability bordering on certainty, citizens would perceive negative interest rates as a punishment. As an absurd punishment, since it would be a punishment for depositing (through savings deposited in commercial banks) their temporarily available funds into the national economy. Which would quite certainly (in this case, all illusions must be put aside) shake up the trust of the citizens in the system. Actually, with easily predicted impacts - even a "man in the street" is financially literate enough to find a satisfactory investment alternative (Greenspan, 2008). It is difficult to precisely determine the impacts of these activities on the stability of the domestic financial system. However, they appear to be scary to the author of this paper.

They can be compared with a one-off loss of approximately CZK 600-800 billion associated with the transformation of the Czech economy into a market economy or about CZK 600 billion "leaving" the Czech economy every year due to excessively unilaterally effective considerations which led to the apparent sell-out of the domestic industrial base.

This is the moment when the game is over. The moment when "financial alchemy" (King, 2017), however seductive it appears to be, must end. And that is why this paper seeks to be a modest contribution to the effort to bring both the theoretical discussion and practical action back to the level of common sense.

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Financial Capital Inflows, Current Account Deficit and Economic Growth in Turkey

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Abstract: *The presence and direction of the relationship between economic growth and current account balance is one of the most fundamental economic matters especially in developing countries. Some economists show that current account deficit arising from increasing import of capital good spurs faster economic growth. Contrarily, some group of researches detect that an increase in the rate of economic growth promotes imports of goods and services, which lead to a deterioration in the current account balance. Some economists also argue that there is a mutual relationship between economic growth and current account balance. This study aims to shed new lights on this controversial issue by examining the Turkish case. Accordingly, using data between 2003 and 2006, we analyse the relationship between economic growth and current account balance financed by capital flows. Empirical findings indicate that there is a bidirectional relationship between economic growth and current account deficit financed by capital inflows. Thus, stability of growth rates in Turkey depend on financing of current account deficit permanently.*

Keywords: Current Account Deficit, Capital Inflows, Growth

JEL Codes: F32, F43

1 Introduction

The sources of economic growth and its interactions with other macroeconomic variables have been the most important subject in the literature for a long time. In this framework, the link between current account balance and economic growth draw special attention. Traditionally, based on Keynesian import function, some economists argue that a rise in national income result in current account deficit by stimulating import, which can be called as "growth-led current account deficit" hypothesis. Contrarily, some group of researchers put forward that current account deficit may play a promoting role in the economic growth process of developing countries which supports "current account deficit-led growth". According to this view, increasing the volume of imported intermediate and capital goods causing current account deficit promotes economic growth.

Looking at the literature, most of the previous studies have focused on the effect of national income on import or current account deficit. However, along with the improvements in international capital movements, accelerating financial capital inflows to developing countries and its relation with the economic growth in these economies have induced economists to think the macro economic effects of current account deficit. Accordingly, researchers start to concern with current account deficit financed by capital inflows as a significant dynamic of economic growth for developing countries. Consequently, international capital movements make "current account deficit-led growth" hypothesis much more popular against to "growth-led current account deficit" hypothesis.

Today, the direction of relationship between current account deficit and national income has been a quite controversial issue in the literature. Some economists argue that a rise

in national income results in current account deficit by stimulating import, while other group of economists imply a causal relationship from current account deficit to economic growth. Some economists also indicate a mutual relationship between them. In order to shed new lights on this controversial issue, our study examines the causal relationship between current account deficit and economic growth in Turkey. The paper is organized as follows. Section 2 provides a review of the related literature. Section 3 set out the data, methodology and results. Final section concludes with the key findings and makes policy implications.

2 Literature Review

There exist a vast literature aiming to indicate the direction of relationship between current account balance and economic growth. Causal relationship from economic growth to current account deficit called as "growth-led current account deficit" hypothesis while unidirectional causal link from current account deficit to economic growth named as "current account deficit-led growth" hypothesis. Several studies in the literature also find bidirectional causality between economic growth and current account deficit.

Supporters of "growth-led current account deficit" hypothesis argue that an increase in national income deteriorates the current account balance by stimulating import of consumption goods. Keynesian import function asserts that national income positively affect the import. It is clear from this point of view that current account balance is negatively affected by the level of national income since economic growth enhance the imports based on well-known Keynesian multiplier model. In line with the above thinking, mainstream studies have tended to rely on econometric analysis focusing particularly on the causal relationship from economic growth to current account deficit.

Pacheco-Lopez and Thirlwall (2007) analyze the causality relationship between economic growth and current account balance for the period 1977-2002 in 17 Latin American countries. Panel data analysis concludes that economic growth caused to increase in current account deficit. Lebe et. al. (2009) employ Granger causality and Vector Autoregressive Model on data covering the term of 1991-2005 in Turkey and Romania. Results of analysis show that increasing economic growth rate deteriorates current account balance in both countries. Yalçınkaya and Temelli (2014) investigate the relationship between economic growth and current account deficit in the nine emerging market economies for the period 1992-2013. It is concluded that economic growth has a positive effect on current account balance. Concerning with the studies specially focusing on Turkey, Yılmaz and Akıncı (2011) attempt to investigate the link between current account balance and growth. They use Granger Causality Test and Johansen Cointegration Analysis for the period of 1980-2010. Their findings suggest that direction of relationship operates from economic growth to current account deficit. Finally, Yurdakul and Ucar (2015) examine the relationship between current account deficit and economic growth in Turkey for the period of 1999– 2014. The results of Granger causality and VAR analyses indicate that there is a unidirectional relationship from economic growth rate to current account deficit.

Contrary to "growth-led current account deficit" hypothesis, some groups of economists have argued that economic growth can be driven by imported production input in developing countries. It is clear that imported production input like capital and intermediate goods have a significant role in production process in developing countries. Therefore, increased imports play a complementary role in promoting economic growth by enlarging the amount of input in production process. In other words, increasing volume of imports has the potential to play a significant role in promoting economic growth in developing countries that suffer from scarcity of intermediate and capital goods to use in production process. In summary, current account deficit arising from imports has a potential to enhance economic growth for developing countries.

Malik et. al. (2010) investigate the relationship between economic growth and current account deficits in Pakistan over the period of 1969-2007. The results of Johansen cointegration test and Error Correction Model show that decreasing in the current account deficit enhance economic growth. Kogid et. al. (2011) examines the causality relationship between imports and economic growth from 1970 to 2004 in Malaysia by using Engle-Granger two steps, Johansen and Toda-Yomamoto procedures. They detect that import has a paramount important role in spurring the growth of the economy. Rahman and Shahbaz (2013) analyse the impacts of economic growth on current account balance in Pakistan over the period 1990 to 2010. They apply the structural break autoregressive distributed lag bounds testing approach in order to examine the relationship between the growth and current account deficit. Empirical results confirm that there is a strong causality running from imports to economic growth. Looking at the studies examining the Turkish case, Ugur (2008) examines the causal relationship between import and economic growth by using the Granger causality test and Impulse Response and Variance Decompositions Models for the monthly data set between 1994 and 2005. Findings show that economic growth is significantly influenced by imports which caused to current account deficit. Çiftçi (2014) also investigates the relationship among economic growth and current account deficit between 2001 and 2012 in Turkey. The results of Johansen Cointegration and Granger Causality suggest that current account deficit has positive impact on national income for Turkish economy.

It seems that there are numerous studies indicating the validity of "growth-led current account deficit" hypothesis and "current account deficit-led growth" hypothesis. Some studies in the literature also find bidirectional relationship between economic growth and current account deficit. Calderon et. al. (1999) examine the interaction among the economic growth and basic macroeconomic variables in 44 developing countries between 1966 and 1994 by using generalized moment methods. Results of panel data analysis shows that economic growth and current account deficit effect each other. Songur and Yaman (2013) analyse the interaction among the economic growth and current account balance for ten countries between 1981 and 2010. Findings of panel data analysis indicate a bidirectional causality between economic growth and current account deficit. Erdoğan and Acet (2016) investigate the relationship between economic growth and current account deficit by using quarter data between 2003 and 2015 in Turkey. Empirical results of VAR analysis show that there is a mutual interaction between economic growth and current account balance for Turkey. Thus, they indicated that developments in economic growth and current account deficit are dependent each other.

In this analytical framework, there has been much attention recently devoted to the role of capital inflows in financing current account deficit. Researchers show that capital inflows also play a significant role in stimulating economic growth by financing current account deficit in developing countries. Accordingly, capital inflows to developing countries finance current account deficit arising from imported capital and intermediate goods. To this respect, capital inflows play crucial role in the production process and thus economic growth. In connection with emerging economies, Akbaş et. al (2014) analyse the relationship between capital flows, current account deficit and economic growth in 20 emerging markets by employing Panel Causality Test over the period of 1990-2011. Unidirectional causality from capital flows to current account deficit and economic growth were strongly determined. Shahbaz and Rahman (2010) explore the role of capital inflows on economic growth in the case of Pakistan by employing ARDL bounds testing approach and Error Correction Model over the period of 1971-2008. Empirical evidence reveals that capital inflows have positive effect on economic growth by financing current account deficit. With regard to the case of emerging Asian economies, Xuan-Vinh Vo (2010) investigates the relationship between capital inflows and economic growth over the period 1980-2001 in South Korea, Indonesia, Malaysia, Thailand and the Philippines. In the framework of Generalized Method of Moments estimation technique, estimation results support the view that increasing capital flows to emerging countries are an

important stimulating factor in accelerating economic growth by enhancing import capacity.

3 Data, Methodology and Empirical Results

In this section we analyze the relationship between current account deficits (CAD), financial capital inflows (FCI) and Gross Domestic Product (GDP) in Turkish economy. Data set converted into logarithmic form consist of quarterly time series between 2003 and 2016. Data for current account deficits and financial capital flows are sourced from the Electronic Data Distribution System (EVDS) of the Central Bank of Republic of Turkey. Current account deficits cover the imbalances in the trade of goods and services while financial capital flows include movement of portfolio investments and other investments.

Empirical examination proceeds in the context of time series analysis. Firstly, we investigate the presence of unit root in the series by performing Zivot-Andrews (1992) unit root test which allows for examining the presence of unit root under structural break. Secondly, since Zivot-Andrews (1992) type unit root test allows for one break in the series, in order to reveal the cointegration relationship among the series we perform Gregory-Hansen (1996) cointegration test. Finally, long-run and short-run relationship among the variables would be investigated by the realm of fully modified ordinary least squares (FMOLS) method proposed by Phillips and Hansen (1990).

Unit Root Test

Our analysis commences by scrutinizing the stationarity check of the series by performing Zivot-Andrews (1992) unit root test that considers the structural break in the series. Results are displayed in Table 1. Apart from GDP, all variables are stationary at level by rejecting the null hypothesis of unit root with structural break. For GDP series the null hypothesis is not rejected since minimum t-statistics is lower than critical values for each model that allows for structural break in intercept, in slope and in both. However, by first differentiation all series become stationary since the calculated minimum t-statistics exceed the critical values proposed by Zivot and Andrews (1992) for each model hence, series are integrated at I (1).

Table 1 Zivot-Andrews Unit Root Test

Variables	Model	Break Date	Minimum t-statistics
LGDP	Model A	2007:2	-2.921 (2)
DLGDP	Model A	2008:4	-8.293* (2)
LGDP	Model B	2008:1	-3.063 (2)
DLGDP	Model B	2009:2	-7.731* (2)
LGDP	Model C	2008:4	-3.322 (2)
DLGDP	Model C	2009:4	-8.418* (2)
LCAD	Model A	2005:1	-6.379* (0)
DLCAD	Model A	2009:4	-9.392* (2)
LCAD	Model B	2012:2	-6.342* (0)
DLCAD	Model B	2005:4	-8.721* (2)
LCAD	Model C	2010:4	-6.488* (0)
DLCAD	Model C	2009:4	-9.308* (2)
LFCI	Model A	2010:2	-5.646* (0)
DLFCI	Model A	2010:1	-10.670* (0)
LFCI	Model B	2013:2	-5.612* (0)
DLFCI	Model B	2005:2	-10.058* (0)
LFCI	Model C	2010:2	-5.692* (0)
DLFCI	Model C	2009:4	-10.633* (0)

Notes: * indicates the significance level at 1 %. Lag length is selected by Akaike Information Criteria. Corresponding lag lengths are displayed in parenthesis. Model A considers the structural

break in intercept, Model B in slope and Model C both in intercept and slope. For critical values for each model see Zivot and Andrews, 1992: 257.

Gregory-Hansen Cointegration Test

Since Zivot-Andrews type unit root test allows for one break in the series, in order to reveal the cointegration relationship among the series we perform Gregory-Hansen (1996) cointegration test. Gregory and Hansen develop a cointegration test that accommodates single structural endogenous break in underlying cointegration relationship since the coefficients of cointegrated vectors might vary in time.

The findings of Gregory-Hansen cointegration analysis are reported in Table 2. The results indicate that Z_t and ADF test statistics reject the null hypothesis of no cointegration in Model 2 and Model 4 that underline the structural break in level shift with trend and regime and trend shift at 1 % significance levels. Furthermore, Z_t rejects the null of no cointegration in Model 1 and Model 3 at 5% significance levels. However, Z_a fails to reject the null hypothesis of no cointegration for all models. According to ADF tests statistics breaks are observed in 2006:2 and 2008:4 while it is 2006:4, 2007:3 and 2007:2 for Z_a statistics. All of these findings indicated that there is cointegration relationship among the national income, current account deficit and financial capital inflows in Turkey.

Table 2 Gregory-Hansen Cointegration Test

Model	ADF	Break Date 1	Z_t	Z_a	Break Date 2	Lag
Model 1	-3.05	2008:4	-5.19**	-34.63	2006:4	2
Model 2	-6.84*	2006:2	-6.20*	-43.72	2006:4	1
Model 3	-4.94	2006:2	-5.65**	-40.80	2007:3	0
Model 4	-7.83*	2008:4	-6.75*	-50.23	2007:2	1

Note: *,** indicates the rejection of null hypothesis at 1% and 5% significance levels respectively.

Lag length is selected by Akaike Information Criterion for long-run covariance estimation. Model 1:

Level Shift, Model 2: Level Shift with Trend, Model 3: Regime Shift where Intercept and Slope

Coefficients Change, Model 4: Regime Shift where Intercept, Slope Coefficients and Trend Change.

For critical values see (Gregory and Hansen, 1996: 109).

FMOLS Estimation

Existence of cointegration among the series provided by Gregory-Hansen cointegration test leads us to scrutinize the long-run and short-run mutual relationship between economic growth and current account deficit. In this context, we perform fully modified ordinary least squares (FMOLS) estimation method proposed by Phillips and Hansen (1990). The results are exhibited in Table 3 and Table 4 where upper part shows the long-run coefficients and lower part shows the short-run coefficients based on error correction form.

Table 3 FMOLS Estimation Results for Gross Domestic Product (GDP)

A- Long-Run Coefficients	
Dependent Variable: $LGDP_t$	Coefficient (Prob.)
$LCAD_t$	0.1328 (0.0000)*
$LFCI_t$	0.0826 (0.0883)**
D1	0.3490 (0.0000)*
B- Short-Run Coefficients (Error Correction Form)	
Dependent Variable: $DLGDP_t$	Coefficient (Prob.)
EC_{t-1}	-0.6910 (0.0000)*
$DLCAD_t$	0.0189 (0.0572)**
$DLFCI_t$	0.0438 (0.0009)*

Note: *, ** indicate the significance level at 1 % and 10% respectively.

Section A of Table 3 shows the impact of current account deficit and financial capital inflows on economic growth in the long run. According to the results both current account deficits and financial capital flows positively affect the GDP. Accordingly, current account deficits in Turkey enhance economic growth by promoting imported intermediate and investment goods which in turn leads to increase in production. Financial capital flows also positively affect GDP in the long-run since current account deficits are financed by the capital inflows. In other words, capital flows finance current account deficit which in turn triggers the economic growth. Finally, dummy variable which is represented by D1 in Section A of Table 3 is generated by assigning the value 0 and 1 up to structural break date and afterwards of the structural break date respectively through Gregory-Hansen cointegration test. Here the structural break date is decided to be the last quarter of 2008 according to the results of Gregory-Hansen cointegration test that considers the regime shift where intercept, slope and trend changes. The value of dummy variable is positive and statistically significant which in turn indicate the severity of structural break among the series on affecting GDP.

Section B of Table 3 is devoted to estimation results regarding the short-run relationship among the variables, which is based on error correction form. Error correction term is obtained by the residuals of long-run cointegration regression and enters to the regression with a one period lag. All the variables enter into the regression with a first differentiated form. Current account deficits and financial capital flows are positive and statistically significant in the short-run. These findings are in accordance with the long-run estimation results although the magnitudes of the coefficients are less than the coefficients in the long-run. The sign of error correction term is negative and statistically significant as expected.

Table 4 FMOLS Estimation Results for Current Account Deficits (CAD)

A- Long-Run Coefficients	
Dependent Variable: $LCAD_t$	Coefficient (Prob.)
$LGDP_t$	0.7101 (0.0000)*
$LFCI_t$	0.3291 (0.1287)
D1	0.3847 (0.0987)***
B- Short-Run Coefficients (Error Correction Form)	
Dependent Variable: $DLCAD_t$	Coefficient (Prob.)
EC_{t-1}	-0.4494 (0.0623)***
$DLGDP_t$	0.5443 (0.0326)**
$DLFCI_t$	0.2411 (0.1623)

Note: *, ** and *** indicates the significance levels at 1%, 5% and 10% respectively.

By using the same methodology, we also investigate the impact of economic growth and financial capital inflows on current account deficit in Table 4. Findings in Section A of Table 4 show that GDP has a positive effect on current account deficit while financial capital inflows does not have any significant impact current account balance in the long run. Dummy variable (D1) in Table 4 is obtained by the same way in Section A of Table 3. The coefficient of dummy variable is positive and statistically significant which points out that structural break among the series arising from the global financial turmoil in 2008 do have crucial impact on the long-run relationships among variables.

These findings are also corroborated by the short-run estimation based on error correction form, which is presented in Section B of Table 4. In the short-run GDP has positive impact on current account deficits in a lesser extent while short-run capital inflows don't have any significant impact on current account balance. Hence, either in the long-run or in the short-run increases in GDP exacerbates the current account deficits via stimulating imports in terms of demand for consumption goods. Finally, the sign of error correction term is negative and statistically significant through the expectations.

In summary, empirical findings indicate that there is a mutual relationship among the current account deficit and economic growth. Therefore, imports can be treats as a main source of economic growth although it deteriorates current account balance in Turkey. Thus, increased imports caused to current account deficit plays a significant role in promoting economic growth via transfer of production input from abroad. Results also indicate that capital inflows are essential in order to determine dynamics of interactions between current account deficit and economic growth in Turkey.

4 Conclusions

The direction of relationship between current account deficit and economic growth has been a quite controversial issue in the literature. In order to shed new lights on this controversial issue by examining the Turkish case, we examine the direction of relationship between economic growth and current account deficit financed by capital inflows in Turkish Economy. We employ Gregory-Hansen cointegration test and fully modified ordinary least squares (FMOLS) method on quarterly data set between 2003 and 2016.

Empirical findings show that there is a bidirectional relationship between the current account deficit financed by capital inflows and economic growth. This means that developments in economic growth and current account deficit are dependent each other. Thus, accelerating capital inflows to Turkey creates sources for financing imported capital and intermediate goods that will be utilized as inputs for production process, which enhances much more economic growth. In other words, the expansion of current account deficit financed by capital inflows is an integral part of economic growth in Turkey.

From the policy perspective, it can be concluded that sustainable growth rates in Turkey need policy framework covering the measures supporting steadily financing of current account deficit. Therefore, outward-looking economic growth policy should advocate the measures supporting permanent finance of current account deficit in Turkey. Thus, we also interpret the result of study as strongly supportive of the role of financial capital inflows in explaining continuous growth in Turkey. Consequently, policy makers should pay intensive attention to attracting capital flows permanently as a significant source for sustainability of current account deficit and economic growth in Turkey.

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The Causal Relationship between Inflation and Interest Rate in Turkey

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Abstract: *The causal nexus of inflation and interest rate has a significant role in the application of monetary policy. Indeed, interest rate-inflation nexus is important for policy makers to be effective in selection of the monetary policy aims and tools. However, there is no consensus among the economists about the direction of the causality relationship between inflation and interest rate. Some economists, in the framework of Fisher Hypothesis, argue that there is a positive causal relationship from inflation rate to nominal interest rate. Contrarily, other economists assert that any increase in interest rate accelerates inflation rate by raising the cost-push inflation. This paper aims to examine the relationship between inflation and interest rate in the case of Turkey in order to make a new contribution to the discussions about the direction of causality among the interest rate and inflation. We examine the interest rate-inflation nexus for the term 2002-2016 in Turkey by employing the cointegration and causality tests. The empirical results confirm that there exists a unidirectional causality from inflation to interest rate. From the policy perspective, it can be concluded that to provide price stability is essential for managing interest rate efficiently for Turkish economy.*

Keywords: Inflation, Interest Rate

JEL Codes: E31, E43

1 Introduction

Inflation and interest rate are two significant macroeconomic variables which are closely related each other. The inflation-interest rate nexus has been the subject of much empirical research in the literature. However, there exist a strong debate in the literature concerning with the causal direction of the relationship between interest rate and inflation. Most of the studies in the literature indicate the causality from inflation to interest rate, which advocate Fisher Hypothesis. Some researchers argue that any change in the interest rate caused to change in the inflation. Thus, how inflation and interest rate are related is one of the significant controversial issues in the literature.

Understanding the relation between inflation and interest rate is basic for policy maker in order to perform monetary policy effectively. Existing of causal relationship from interest rate to inflation let policy makers to control inflation rate by using policy interest rate. For example, when the price level increase, policy makers can reduce inflation rate by tighter monetary policies, so they will increase the level of interest rate. Accordingly, higher interest rate encourages people to save more and thus led lower level of consumption in the economy. As a result, prices come down since demand is less than the supply. Thus, it may be the best way to increase interest rate to stabilise the general price level if causal relationship runs from interest rate to inflation. That means directional relationship between interest rate and inflation affect the efficiency of monetary policy in achieving stable price.

Given the potency of the monetary policy in achieving stable price indicated above, greater attention has been paid to the nexus between interest rate and prices in recent decades. However, the causal direction of the relationship between inflation and economic growth still remains as one of the most debatable issue in the literature. In order to shed new lights on this controversial issue, this study examines the causal relationship between interest rate and inflation in Turkey. The organisation of the paper is as follows. Second Section briefly reviews the related literature. Third Section describes data and methodology and presents empirical results. Final section offers concluding remarks and makes some policy implications.

2 Literature Review

The direction of relationship between inflation and interest rate is closely related to effectiveness of stabilization programs. However, the causality between inflation and interest rate is a quite debatable matter in the literature. It is mostly, in the framework of Fisher Hypothesis, argued that increasing inflation rate results in increasing interest rate. Contrarily, some researchers assert that any change in the interest rate caused to change in the inflation which can be called as "interest rate-led inflation" hypothesis.

Supporters of Fisher hypothesis argue that increasing price level raises the level of interest rate by decreasing real money balance. Originally, Fisher (1930) hypothesized that the nominal interest rate is made up of two components: the expected rate of inflation and the real interest rate. Under the assumption of rational expectations, expected inflation rate equals to inflation rate in the end of the term. Consequently, Fisher hypothesis argue one-to-one relationship between the inflation and the nominal interest rate, assuming the real rate of interest rate unaffected. Thus, Fisher hypothesis provides theoretical basis for econometric analysis focusing particularly on the causal relationship from inflation to interest rate. Accordingly, the Fisher effect has been extensively examined and investigated in the literature.

Booth and Ciner (2001) analyze the bivariate relationship between Eurocurrency interest rate and inflation for nine European countries and US from 1978 to 1997. Empirical results reveal that there is a one-to-one relationship between Eurocurrency rates and inflation. Thus, findings supports the Fisher Hypothesis that markets participants incorporate a predictable portion of the inflation rate into the nominal interest rate. Saymeh and Orabi (2013) investigate the interactions among interest rate, inflation and economic growth in Jordan over the period 2000-2010. Employing Johansen Cointegration and Granger Causality Test, it is concluded that inflation causes interest rate, which confirms Fisher Hypothesis. Büberkökü (2014) examines the relationship between nominal interest rates and inflation within the framework of Fisher's hypothesis for seven emerging markets between 2003 and 2013. The cointegrating coefficients estimated according to panel group mean FMOLS and DOLS show that an increase in inflation rate raises nominal interest rate, which advocates Fisher hypothesis.

Concerning with the Turkish case, Şimşek and Kadılar (2006) investigates the relationship between nominal interest rate and inflation by using quarterly data from 1987 to 2004. Results of Autoregressive Distributed Lag model show that interest rate is determined by the inflation. Köksel and Destek (2015) analysis the relationship between inflation and interest rate for the period of 2002-2014. The results of Granger causality test show that nominal interest rate is increased by one-for-one in response to an increase in inflation rate. Thus, findings indicate that there is unidirectional causal relationship from inflation to nominal interest rate. İncekara et. al. (2015) test validity of Fisher Hypothesis by employing Johansen Cointegration and Granger Causality Test between 1989 and 2011. It is concluded that in the long run there is causal relationship from inflation to interest rate in Turkey, which advocates Fisher Hypothesis. Finally, Doğan et. al. (2016) examine the causality relation between the interest rates and inflation by using the data series between the 2003 and 2015 period. The results of

Johansen cointegration and Granger causality tests reveal that there is a causality relation from inflation to interest rates.

Contrary to Fisher hypothesis, some groups of economists have argued that rates of interest play a significant role in determining of inflation level. Concerning with the causal relationship from interest rate to inflation rate, it can be argued that there are two channels through which a variety in interest rate can affect the level of prices. Accordingly, the influence mechanism of interest rate on inflation can be operated in supply and demand channels indicated below (Bhunia, 2016: 20-21).

In the demand channel, a change in interest rate affects the individual's preference to consume out of their income. For example, an increase in the interest rate probably leads to decline in consumption by spurring savings since a rise in the interest rate increases the opportunity cost of consumption today. Thus, individuals save much more part of their income in order to have interest bearing financial assets rather than spending on consumption. This will result in total demand contraction and thus decrease the price level. On the other hand, low interest rate put more borrowing power in the hands of people to consume much more. In this case the economy tends to grow inducing inflation if there is not enough supply to satisfy rising demand for goods and services. That means short fall in supply against to increasing demand causes to inflation. This kind of inflation can be categorized under demand pull inflation.

Prices can also be increased based on the impact of interest rate on supply side of economy. Indeed, interest rate plays a pivotal role in not consumption or total demand but also production or total supply. Higher the rate of interest, higher is the cost of finance for investment and production in the economy. To some extent, business may than pass on this higher marginal cost of capital to prices in order to protect their profit margin. In other words, since higher interest rate augments the financing cost of production for firms, producers pass their production cost on to consumers in the form of increased prices, which called as cost-push inflation. On the other hand, a rise in the interest rate increases the cost of credit for entrepreneurs, which would be expected to reduce investment demand. This results in decreasing production and, in turn, total supply of goods and services. In conclusion, rising interest rate increases price level by creating of total supply constriction resulting excessive demand in the goods market. Thus, the interaction between the interest rate and the supply side of the economy provide a clear indication of the impact of the interest rate on price level.

Asgharpur (2007) examines the causal relationship between the interest rate inflation in panel of 40 selected Islamic countries using panel causality methodology over the 2002-2005 period. The results of study show a unidirectional causality from interest rate to inflation in all of the countries. It is also concluded that interest rate must be reduced in order to decrease inflation. Mahdi and Masood (2011) analyze the causality relationship between interest rate and inflation for the period 1989-2007 in Iran. The results of Johansen's cointegration approach and vector error correction model (VECM) approach concludes that there is a bidirectional relationship between interest rate and inflation. However, the relation from interest rate to inflation is more powerful than inflation to interest rate in Iran. Finally, Amaefula (2016) investigates the causality between interest rate and inflation in Nigeria. He employs Johansen cointegration test and vector error correction model (VECM) of Granger causality on data between 1995 and 2014. The results of analysis show evidence of long run equilibrium relationship between the variables from interest rate to inflation rate.

Looking at the Turkish case, Gül and Ekinci (2006) indicated the causal relationship from interest rate to inflation. They analyzed the interactions between nominal interest rates and inflation over the period of 1984-2003 and found that causality exist in only unidirectional relationship from nominal interest rate to inflation. Onur (2008) also examines the relationship between interest rate and inflation between 1980 and 2005 by using Cointegration and Granger Causality tests. Empirical results indicate that interest

rate has an impact on inflation. Finally, Bari (2013) researches the impact of interest rate on inflation by using Vector Error Correction Model over the period 2001-2012. According to empirical results, interest rate and output gap are main determinants of inflation in Turkey.

In conclusion, there are numerous studies indicating the validity of both Fisher Hypothesis (inflation-led interest rate) and "interest rate-led inflation" hypothesis in the literature. However, it seems that most of the studies confirm Fisher hypothesis along with the increasing application of inflation targeting monetary policy regime over the last decades. Therefore, economists recently devote much attention to analysing the developments of interaction between inflation and interest rate under the inflation targeting regimes in different countries. Turkey has also adopted Inflation Targeting as a monetary regime after 2001 – between 2001 and 2006 implicitly and then explicitly. Thus, economists also analyse the relationship between inflation and interest rate, in particular as Turkey moves to an inflation targeting regime. Findings concerning with the Turkish case suggest that there is a strong Fisher effect under inflation targeting monetary regime in a global trend-compatible manner. Accordingly, Köse et. al. (2012) and Tunalı and Erönal (2016) examine the relationship between inflation and interest rate and both studies indicate that Fisher effect is valid for Turkey since the beginning of the implementation of inflation targeting regime.

3 Data, Methodology and Empirical Results

In this section we examine the relationship between inflation (INF) and interest rate (IR) in Turkish economy between 2002 and 2016. We use monthly deposit rates and Consumer Price Index for the variables of interest rate (IR) and inflation (INF), respectively. Both data set sourced from the Electronic Data Distribution System (EVDS) of the Central Bank of Republic of Turkey.

Empirical analysis begins by checking the stationary statute of data set. We check whether time series of inflation (INF) and interest rate (IR) are stationary by using Augmented Dickey Fuller (ADF) and Philips Peron (PP) tests. Then, the long run relationship between inflation and interest rate is analysed by using Cointegration Test. In this framework, we perform Engle-Granger (1987) and Johansen (1988) cointegration tests**.** Finally, we examine the causality relationship between inflation and interest rate by operating Granger (1988) Causality Test.

Unit Root Test

The first step of the empirical methodology finds the order of integrations of the data. Accordingly, in order to indicate the stationary statute of data set we perform Augmented Dickey Fuller (ADF) and Philips Peron (PP) tests. The results of Unit Root Tests are presented in Table 1. Findings show that all variables are not stationary at level since test statistics is lower than critical values for both methods. However, by first differentiation all series become stationary since the calculated test statistics exceed the critical values. In conclusion, both inflation (INF) and interest rate (IR) series are integrated of the same order at I (1). That means data set is suitable for employing cointegration tests developed by Engle-Granger (1987) and Johansen (1988).

Table 1 Results of Unit Root Tests

	ADF (Augmented Dickey Fuller)		PP (Philips Peron)	
Variables	Level	First Difference	Level	First Difference
INF (constant)	-2,8343	-3,2509**	-1,9090	-6,6189*
DINF (constatnt+trend)	-2,0007	-3,8072**	-1,8510	-6,6439*
IR (constant)	-1,5291	-7,7514*	-1,3640	-8,9176*
DIR (constant+trend)	-2,2919	-8,1113*	-2,2967	-9,4555*

Not: * and ** indicate the significance level at 1 % and 5 %, respectively.
Maximum lag length is specified by considering Akaike Information Criterion (2).

Cointegration Tests

In this section we employ cointegration tests which are the standard tools in order to investigate the linear combination of time series variables. Thus, this method finds out the presence of number of cointegrating vectors indicating the long run relationship between variables. Accordingly, we perform Engle-Granger and Johansen Cointegration Tests to indicate whether inflation (INF) and interest rate (IR) have a long run relationship or not.

In the framework of Engle-Granger test for co-integration, we firstly run a regression of interest rate on inflation and then inflation on interest rate separately and save the residual for both regressions. Whether the residual series of regression equation are stationary or not are checked by Tau-statistic and Z-statistic. Second row of Table 2 shows the stationary statute of residual series of regression of nominal interest rate on inflation while third row of the Table 2 presents the stationary statute of residual series of regression of inflation on nominal interest rate. The tau-statistic and Z-statistic reject the null hypothesis of no cointegration (unit root in the residuals) at the 1% and 5% levels for both regressions. Thus, results clearly suggests that interest rate and inflation are cointegrated, which means that there is a long run relationship between them.

Table 2 Engle-Granger Cointegration Tests Results

Dependent Variable	Tau-Statistic	Prob.	Z-Statistic	Prob.
INF	-3.4646	0.0467**	-69.1130*	0.0000*
IR	-7.9927	0.0000*	-65.9941*	0.0000*

Not: * and ** indicate the significance level at 1 % and 5 %, respectively.

Presence of the long-run association between inflation (INF) and interest rate (IR) is also checked by performing Johansen cointegration test. This methodology is based on maximum likelihood estimation in which it allows for testing the long-run relationship between the variables by using the maximum eigenvalue and trace statistics. Thus, in the framework of the Johansen Cointegration Analysis, we used two different tests called Trace Statistic and max-Eigen statistic for deciding whether there is a long run relationship among the variables. Accordingly, the results of Johansen Cointegration analysis are divulged in Table 3. The null hypothesis examines the cointegrating vector number which is stated by the rank (r) equals zero of equal less than one. Findings show that the computed value of the both Trace Statistic and max-Eigen statistic are more than the critical value at 5% level of significance. Therefore, the null hypothesis of no cointegrating relationship or no long-run relationship between inflation and interest rate ($r = 0$) is rejected. That means there exists an equilibrium relationship between the variables. Thus, it can be concluded there is long run relationship between inflation and interest rate in Turkey.

Table 3 Johansen Cointegration Tests Results

Null Hypothesis	Trace Statistics		Maximum Eigenvalue Statistics	
	Test Statistic	% 5 Critical Value	Test Statistic	% 5 Critical Value
$r = 0$	54.5116	16.4947	32.6641	14.2646
$r \leq 1$	21.8400	3.8414	21.8475	3.8414

Causality Test

After indicating the presence of cointegration or long run relationship among the variables, in this part of study we analysed the causality between interest rate and inflation rate. Granger causality test based on the vector autoregression (VAR) model will be used in order to detect the direction of relation between the variables. The results of The Granger-causality tests are presented in Table 4. Findings reveal that causality runs from inflation rate to interest rate while the reverse causation is not confirmed. That means, unidirectional Granger causality is indicated from inflation to interest rate. In other words, the direction of the relationship between inflation and interest rate runs from inflation to interest rate. That means a variety in inflation affects the level of interest rate in Turkey.

Table-4 Granger Causality Test

Null Hypothesis	F-Statistic	*p*-Value	Decision
IR does not Granger cause INF	0.8956	0.4490	Accept
INF does not Granger cause IR	2.8500*	0.0453	Reject

Not: * indicates the significance level at 5 %. Maximum lag length is specified by Akaike Information Criterion (2).

In conclusion, empirical findings show evidence of long-run equilibrium relationship between interest rate and inflation. Furthermore, there is a unidirectional causality from inflation to interest rate. In short, the empirical results imply that inflation spurs interest rate in Turkey. These findings support Fisher hypothesis defining the inflation as a crucial integral part of nominal interest rate. Thus, empirical findings also give significant insights into monetary policy programmes for being effective in selection of the policy aims and tools. According to this, policy makers can manage the interest rate by controlling general price level in Turkey. In other words, to provide price stability is essential for managing interest rate well for Turkish economy.

4 Conclusions

The causality between inflation and interest rate has attracted substantial attention among economists. Accordingly, a lot of studies focusing on the link between inflation and interest rate have been made in the literature. However, the direction of relationship between inflation and interest rate has still been a quite controversial issue among the scholars. Some economists support Fisher hypothesis arguing that inflation is an important factor affecting the level of interest rate. Contrarily, other group of economists asserts that inflation is mainly influenced by the interest rate. This study aims to shed new lights on this controversial issue by examining the Turkish case. For this aim, we analyse the link between inflation and nominal interest rate by using cointegration and causality tests for the term of 2002-2016.

The findings from Engle-Granger and Johansen Cointegration tests indicate that there is a long run relationship between inflation and interest rate. Granger causality test result shows unidirectional causality running from inflation to interest rate while no causality from interest rate to inflation. The overall evidence proposes that inflation rate is a main factor affecting the integral part of nominal interest rate, which advocates Fisher Hypothesis. From the policy perspective, it can be concluded that stability of nominal interest rate firstly requires stability of price level in Turkey. Thus, policy makers should pay intensive attention to stability of general price level to control the level of interest rate. In other words, policy makers should follow a policy framework covering the measures supporting stability of price level in order to manage the rate of interest effectively in Turkey.

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The role of accounting in regard to information concerning the convergence of airline business models

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Abstract: *The objective of the research underlying this article is to present the role of accounting in supplying information relative to the trend toward convergence within the airline industry. The review of publications showed that accounting has only marginal value in providing the requisite data for the analysis of airline business models. The results of the study of the available information derived from financial statements of selected airlines partially confirmed the convergence of airline business models. The contribution of the article to the existing literature lies in its identification of the possible use of accounting in studying the business models of companies operating in the selected industry.*

Keywords: business model, financial statements, airline industry, full service carrier, low cost carrier

JEL codes: L93, M40, M41, N70, R40

1 Introduction

The primary business models adopted by airlines are based on full-service or low-cost strategies. The full-service carriers (FSCs) offer services such as flights to major airports and business class service. The low-cost carriers (LCCs) create value by focusing on cost containment and customers with less purchasing power. In recent years, however, a trend toward convergence in these business models has been observed within the airline industry.

The objective of the research underlying this article is to present the role of accounting in furnishing information concerning this convergence trend within the airline industry. The article poses the following theses:

- Accounting has only marginal value in providing the requisite data for the analysis of airline business models.
- The available information derived from financial statements partially confirms the convergence of airline business models.

2 Methodology and Data

In order to verify the theses, a review of pertinent literature was conducted as well as an empirical analysis. The aim of the study of relevant publications was to describe the trend toward convergence in the business models within the airline industry and to identify methods of evaluating this convergence. The empirical study was based on financial statements for the year ended in 2014 of selected airlines that follow either the FSC or the LCC business model, namely: 7 FSCs (Air France KLM SA – abbreviation: AIRF, Delta Air Lines INC. – DELT, Lufthansa Group – LUFT, SAS AB – SAS, Singapore Airlines – SING, Turkish Airlines, Inc. – TURK and United Continental Holdings, Inc. – UCH) and 4 LCCs (AirAsia Berhad – AIRA, easyJet Airline Company Limited – EASY, JetBlue Airways Corporation –JETB, and Ryanair Holdings plc – RYAN).

Three categories of indices were derived from the financial statements and were used to examine and compare the 11 airlines: profitability, labour and aircraft ratios. Based on accepted methods of evaluating business models and the convergence within the airline

industry, (as described in chapter 3), and considering the scope of information typically furnished in financial statements, the following indices were calculated:

- profitability ratios (net income to sales revenue and net income to total assets),
- labour ratio (employee expenses to total expenses),
- aircraft ratios (net value of aircraft to total assets, depreciation expenses to total expenses, lease expenses to total expenses).

3 Results and Discussion

Differences between the two primary business models in the airline industry

In the 1950s and 1960s most of the world's air transport services were provided by FSCs. By the 1970s, this was beginning to change. Charter carriers, especially in Europe, were serving a small but increasing share of the travel market, while in the U.S., Southwest Airlines began flying in the early 1970s. Following airline deregulation between 1978 and 1993, further expansion of the LCCs occurred in several countries. Ryanair converted to the LCC model in 1991, WestJet started service in Canada in 1996, and Virgin Blue began operating in Australia in 2000 (Tretheway, 2004).

The FSC model is based on a differentiation strategy (Hunter, 2006) enabling an airline to offer a tailored product for each customer segment at an acceptable price. This segmentation of passengers, or prospective passengers, according to the purpose of their air journey resulted in the creation of first, business, and economy class cabins (Flouris and Walker, 2005) and the offer of a variety of fare bundles, which meant diverse levels of service (Fageda et al., 2015). These carriers also introduced revenue management, a sophisticated system allowing them to determine the optimal number of seats on a flight to be sold at high fares with few if any restrictions, versus seats sold at low fares with restrictions (Tretheway, 2004), thereby filling any excess space left after premium demand is met (Wensveen and Leick, 2009). Other characteristics of FSCs are (Hunter, 2006): various aircraft types and moderate capacity utilisation (approximately 60%).

In contrast to the FSC, the LCC model is based on cost leadership or cost minimisation (Hunter, 2006), generated by operational efficiencies (Wensveen and Leick, 2009). To offer low fares, the LCCs have pursued simplicity, efficiency, productivity, and high utilization of assets (O'Connell and Williams, 2005). LCCs offer a straightforward pricing structure, online booking, unbundled fares and point-to-point service (Fageda et al., 2015). LCCs use less congested secondary airports (with cheaper landing charges), which helps to increase punctuality and reduce turnaround times. Staff remuneration in LCCs is competitive owing to a lower base salary plus productivity-related compensation. LCC pilots typically have a 60% salary base and are able to receive up to the remaining 40% according to their performance. This creates a highly incentivised workforce, which is further motivated through stock option plans (Flouris and Walker, 2005; Morrison and Mason, 2007). Other characteristics of LCCs are (Hunter, 2006; Morrison and Mason, 2007): a single type of aircraft, high capacity utilisation (approximately 70-80%), and low margins.

For the LCC, price decisions are linked to long-term costs, while FSC pricing decisions are based only on short-term costs or sometimes are divorced from cost considerations. The difference lies between revenue maximisation and profit maximisation. Over time, however, these FSC pricing and capacity responses prove to be unprofitable (Tretheway, 2004).

The trend toward convergence in the airline industry

A full understanding of trends in the airline industry would be helpful in comprehending its current position (Franke, 2007). It should be noted as well that trends do not develop without breaks and that new trends emerge (Wensveen and Leick, 2009). In an industry particularly sensitive to economic cycles, airline management were forced to take crucial

strategic decisions as to how to reshape their companies and adapt to emerging trends after the airlines' stock prices fell in 2008 (Jarach et al., 2009).

As a result of the foregoing, a transition toward convergence of business models can now be observed in the airline industry (Daft and Albers, 2013). Business models traditionally adopted by airlines, based on low-cost or full-service strategies, are inadequate in the new market reality (Pereira and Caetano, 2015). As Lohmann and Koo (2013) noted, airlines are no longer easily labeled as either LCCs or FSCs.

Faced with competition from the LCCs, the FSCs have attempted to fight back by adopting some of the LCCs' characteristics: more rapid turnaround times, reduced use of travel agents, and lower commission rates (Hunter, 2006).

Meanwhile, signs of a slowdown and limited organic growth forced the LCCs to change key principles of their business model: fare unbundling and point-to-point operations. The archetypical low-cost business model has evolved into an adapted business model that takes a hybrid approach (Fageda et al., 2015). Franke (2007) indicates that a company offering more specialized services at lower prices stimulates additional demand because the enhanced services are not primary in this sector (Pereira and Caetano, 2015). From a network perspective, the distinction between the archetypical LCC business model and the modified LCC business model with a hybrid approach is widening. Differences are also clear between hybrids offering connecting services and hybrids offering fare bundling (Fageda et al., 2015).

It seems that the FSCs and the LCCs are converging. For instance, easyJet is determined to be perceived as a legitimate substitute for the FSCs and it is driving its business model in this direction by focusing on core activities while offering differentiated products that add value for customers. These tactics are a clear sign of convergence between the FSCs and the LCCs, and strongly echo Lufthansa's strategy of offering differentiated products to multiple customers (Jarach et al., 2009).

Methods of evaluating business models and their convergence from the perspective of the airline industry

The available literature on business models was reviewed to identify methodologies for comparing and evaluating business models from the perspective of the airline industry. The following methods were identified to classify and relate key elements of airline business models (c.f. Nair et al., 2011; Fageda et al., 2015):

- the product and organisational architecture (POA) approach of Morrison and Mason (2007) and Mason and Morrison (2008),
- the conceptual framework for measuring airline business model convergence of Daft and Albers (2013),
- the airline business model spectrum of Lohmann and Koo (2013).

Mason and Morrison (2008) demonstrated differences in the business models adopted by different airlines (c.f. Nair et al., 2011). Figure 1 illustrates their general POA approach to defining a firm's business model and its competitive environment (Mason and Morrison, 2008).

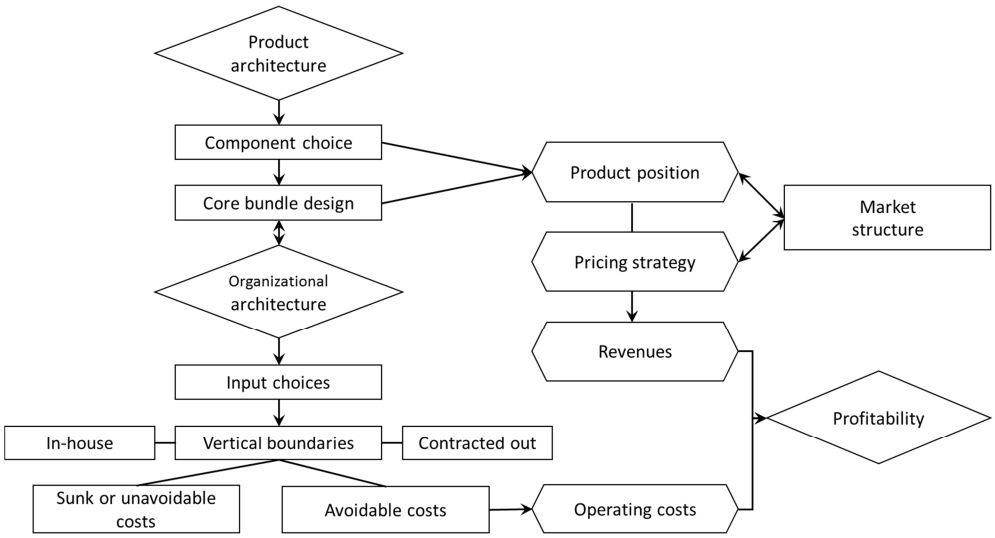
Product architecture is separated into three elements of service quality (Morrison and Mason, 2007):

- Connectivity implies a choice of network design that distinguishes point-to-point (passenger-supplied) from hub-and-spoke (airline-supplied connectivity) networks; as Flouris and Walker (2005) noted hub-and-spoke systems increase the number of connections between city pairs served by the same number of flights compared to a point-to-point system.
- Convenience is linked to airport location, punctuality, flight frequency, and baggage service.

- Comfort relates to on-board services, on-board service quality, seating comfort, and airport services.

The foregoing 3Cs define the product in relation to consumer preferences, which impact market demand within the competitive environment. The 3Cs, however, also impact the magnitude and avoidability of production costs, which in turn affects pricing flexibility and the airline's competitive position (Mason and Morrison, 2008).

Figure 1 General product and organizational architecture of a firm



Source: Mason and Morrison, 2008

Within the organizational architecture the size and composition of the fleet along with the organizational design are elements that follow primarily from the product architecture. In particular, the decision over network structure is key because the complexity of operating a hub-and-spoke network requires certain functions relating to coordination, yield management, etc. which implies a more vertically integrated organization. Similarly, Franke (2007) looked at competition between FSCs and LCCs, and mapped the different business models towards service level and complexity demonstrating that the current hub-and-spoke business model is widespread and entails complexity (c.f. Nair et al., 2011). In contrast, an airline operating a point-to-point network has relatively more opportunities to form a "nexus of contracts" organizational structure in which many functions are contracted out. In terms of carriage, all airlines take advantage of internet-based booking systems, yet even here point-to-point network carriers can offer more simplicity in the process with implications for both cost and benefit drivers (Morrison and Mason, 2007).

Based on the above analysis, Mason and Morrison (2008) suggest that the positioning of some airlines to offer increased comfort and convenience in a bid to achieve higher yields is marginally successful and is not as profitable as the pure low cost approach practised by Ryanair, for example.

The conceptual framework of Daft and Albers (2013) for measuring airline business models is based on three main components that fully describe an airline's value creation system:

- the corporate core logic as the strategic level,
- the configuration of value chain activities as the structural level,
- the assets of a firm as its resource level.

Table 1 shows an overview of the model consisting of three constituting components and their systematic distinction into 7 dimensions and 16 elements (Daft and Albers, 2013).

Corporate core logic is the essence of how a company intends to place itself within its industry. The internal policy choice defines the activities that should be done and by whom: airline's basic route design, and labour policy choices. The external value network refers to the company's links to the relevant actors in its environment, namely the customers and the external partners: the airline's mix of seat classes, whether the airline is involved in an extensive network of external partners or operates most of its activities autonomously (Daft and Albers, 2013).

Table 1 The airline business model framework for measuring airline business models

Components	**Corporate core logic**		**Assets**	
Dimensions	Internal policy choices	External value network	Tangible	Intangible
Elements	• Business policy • Labour policy	• Target product-market combination • Inter-organizational relations	• Fleet structure • Infrastructure	• Human capital • Property rights
Components	Configuration of value chain activities			
Dimensions	Inbound	Production	Marketing	
Elements	• Procurement design • A/C sourcing	• Route network • Cabin product • Ground product	• Distribution • Fare structure • Bundling concept	

Source: Daft and Albers, 2013

The configuration of value chain activities represents a firm's actual architecture that generates value for customers. Inbound activities cover all elements that refer to the allocation of input factors into the transformation stage. The production process of an airline is primarily determined by the specific route network, as well as the cabin product and the ground product visible to the customer. The marketing dimension is used to describe how the airline engages in the selling and promotion of its product portfolio (Daft and Albers 2013).

Assets covers the unique set of resources and capabilities of a firm: fleet structure and the infrastructure, human capital, the airline's staff and its service orientation and skills, other intangible assets that allow operations (such as slots at primary airports or patents) (Daft and Albers, 2013). Across all 49 Asian airlines, Pearson et al. (2015) identified the top three most important resources of advantage: slots, brand, and product/service reputation.

Lohmann and Koo (2013) established an airline business model spectrum to create an instrument that, while incorporating a number of product and operational variables, provides a simple representation of the complex reality of the various airline business models now in play.

Figure 2 Airline business model spectrum

Source: Lohmann and Koo (2013)

Looking along the LCC-FSC spectrum (figure 2), apart from confirming those airlines that are traditionally known as LCCs or FSCs, the spectrum helps define the nature of hybrid airlines that are at neither extreme (Lohmann and Koo, 2013).

The study of the convergence of airline business models based on financial statements

Table 2 presents profitability indices, a labour index and aircraft indices, showing the convergence of airline business models. These indices are also illustrated in Figures 3-5.

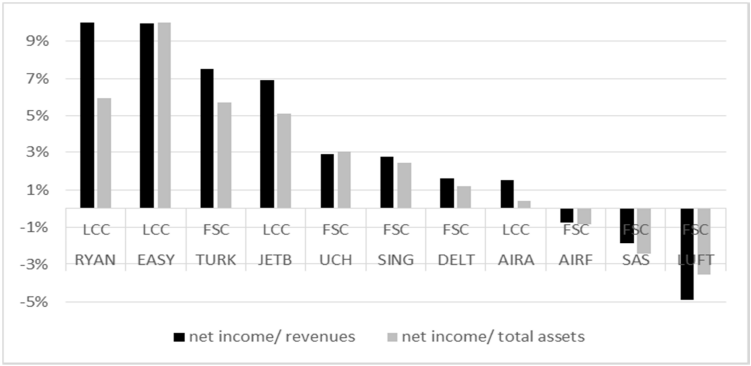
Table 2 Ratios which might indicate the convergence of airline business models

Airline	Type of business model	Profitability indices		Labour index	Aircraft indices		
		net income ÷ sales revenue	net income ÷ total assets	employee expenses ÷ total expenses	net value of aircraft ÷ total assets	depreciation expenses ÷ total expenses	lease expenses ÷ total expenses
AIRF	FSC	-1%	-1%	29%	38%	7%	3%
DELT	FSC	2%	1%	20%	41%	4%	1%
LUFT	FSC	-5%	-4%	16%	24%	2%	0%
SAS	FSC	-2%	-2%	24%	26%	4%	5%
SING	FSC	3%	2%	16%	59%	11%	4%
TURK	FSC	8%	6%	17%	57%	7%	5%
UCH	FSC	3%	3%	24%	48%	4%	2%
AIRA	LCC	2%	0%	13%	60%	13%	4%
EASY	LCC	10%	10%	12%	56%	2%	3%
JETB	LCC	7%	5%	24%	80%	6%	2%
RYAN	LCC	10%	6%	10%	57%	8%	2%

Source: own study

Figure 3 illustrates the profitability of airlines representing the two business models, from the most to the least profitable companies. Generally LCCs were found to be more profitable than FSCs (c.f. Mason and Morrison, 2008).

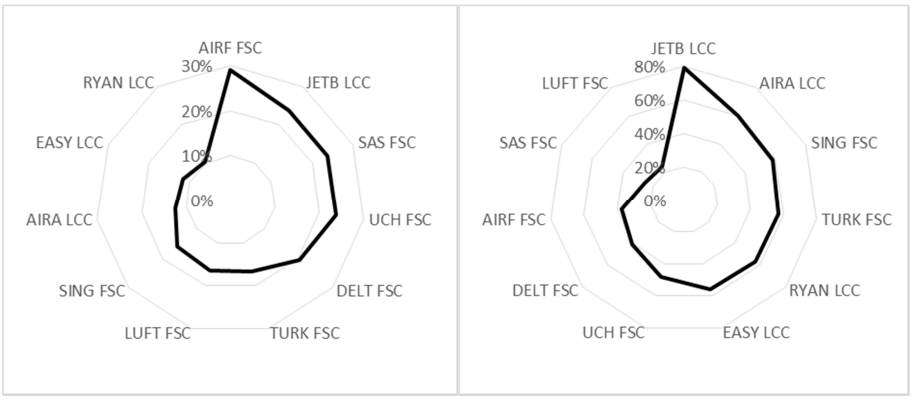
Figure 3 Profitability of airlines that pursue FSC and LCC business models



Source: own study

Figure 4 illustrates the labour index and one of the aircraft indices (net value of aircraft to total assets). With the exception of JetBlue, LCCs were rather less labour-intensive than FSCs. Considering the ratio of net value of aircraft to total assets, the ratio was higher among the LCCs.

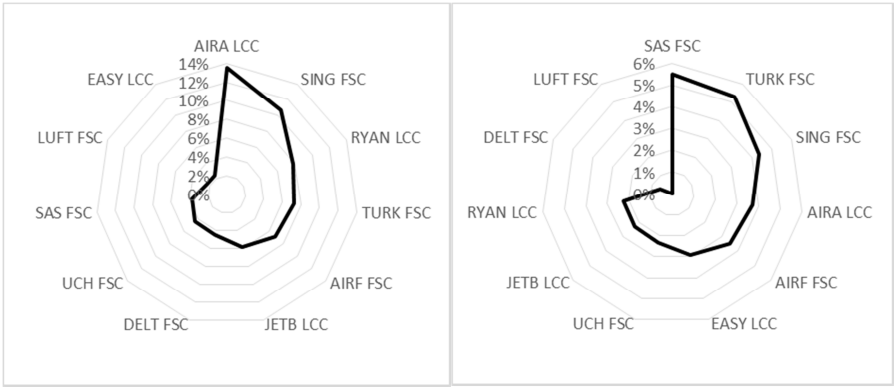
Figure 4 The ratios of employee expenses to total expenses (left figure) and net value of aircraft to total assets (right figure)



Source: own study

Figure 5 illustrates the two other aircraft indices (depreciation expenses to total expenses and lease expenses to total expenses). No relation between these indices and the type of business models was found, which confirms the convergence of the FSC and the LCC business models.

Figure 5 The ratios of depreciation expenses to total expenses (left figure) and lease expenses to total expenses (right figure)



Source: own study

4 Conclusions

The review of airline industry literature confirmed the existence of the trend toward convergence of two main airline business models:

- the FSC, which bears much heavier overheads necessitated by the hub-and-spoke system and generally higher operating costs due to the extra services provided, for which a premium price is charged (Hunter, 2006), and
- the LCC, which cut costs significantly by reducing overheads, providing no frills service, and often using secondary airports (Hunter, 2006; Morrison and Mason, 2007).

Utilising accepted methods of evaluating business models and given the convergence of the airline industry models, as identified in the relevant literature, it was found that accounting has only marginal importance in providing the data required for the analysis of airline business models (c.f. Karwowski, 2016). In the first method, product architecture includes the service quality elements that define the product relative to consumer preferences, and organizational architecture represents the vertical structure, production and distribution choices of the airline (Mason and Morrison, 2008). In the second method, based on financial statements, it is difficult to describe how the firm is

linked to its environment and how it intends to create value in this specific setting. This method also covers a distinction in the distribution of the product and its fare structure. Additionally, the specific bundling concept of the airline is considered, which refers to the approach of selling product elements separately (Daft and Albers, 2013). The third method recognizes that airlines are better represented along a continuum rather than by discrete categories, which enables the positioning of hybrid and regional airlines along an LCC-FSC spectrum (Lohmann and Koo, 2013).

The information derived from financial statements, such as profitability, labour and aircraft data, partially confirmed the convergence of the airline business models. Generally, the LCCs were more profitable than the FSCs. With the exception of JetBlue, the LCCs were less labour-intensive than the FSCs, while the ratio of the net value of aircraft to total assets was found to be higher among the LCCs. No relation was observed between two aircraft indices (depreciation expenses to total expenses and lease expenses to total expenses). Only these two last ratios confirmed the convergence trend in the industry.

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Impact of cost calculation quality on hospital performance

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Abstract: *Management accounting in hospitals has been an issue of growing interest in the management accounting literature in recent years. Managerial decisions should be based on reliable and credible cost information, whose source should be a correct and efficient cost accounting, since it is the quality of cost information that determines the value and effects of management accounting practices. It is worth adding, that management accounting practices require not only the knowledge about actual operating costs of the hospitals and health services performed by them, but also about their structure and reactions on changes in the range of services, or the number of treated patients. The aim of the article is to make an analysis and evaluation of the cost calculation quality and management accounting practices which are applicable hospitals. The article* attempts to *verify the hypothesis according to which the quality of cost calculation in hospitals foster the usage of cost information in managerial decisions, and it has a positive influence on the hospital performance. The empirical material was obtained from the analysis of legal Polish and English regulations, and empirical studies conducted in European hospitals. The method of the correlation analysis was utilized to analyze the data*. *The research confirmed that the quality of patient treatment process calculation has a positive influence on the use of cost information by the hospital's management, which further influence the hospital's performance.*

Keywords: cost accounting, cost calculation, hospital performance, management accounting practices

JEL codes: M41, M48, I18

1 Introduction

Public hospitals meet all the criteria of a non-profit organization, and medical care is of high humanitarian importance, which results in a reluctance to consider it economically. However, also in public hospitals, every action should generate revenue commensurate with the costs incurred. Due to the economic responsibility, hospital managers should take into account the limited resources available to these units. They must therefore be aware of how and where their hospital uses the resources at its disposal and whether the consumption is justified or not. For this purpose, they need tool that will allow them to monitor and evaluate what part of the resource is wasted and what part is used effectively (Stylo, 1999).

Such a tool is a cost accounting that provides the information needed to analyze and control the costs of medical care without losing sight of the quality of service provided. Cost accounting is the branch of managerial accounting that deals with the costs analysis. It aims to compute the cost of a product or service (Gentili, 2014). In health care, cost accounting predominantly aims to support managerial decisions and cost information can be useful in a number of areas. These include: management of department-level costs, pricing decisions in negotiations with a payer, strategic planning, profitability analysis, performance measurement, preparation of required external reports, monitor and control the resource consumption with respect to hospital service delivery and setting the range of services provided (Finkler, Ward, 1999). The cost information should therefore support the management of the hospital to improve the various management accounting practices. In addition, they may be the basis for managed care contract negotiation and oversight. However, there are a number of

barriers and limitations in hospital cost accounting, including the lack of established indirect cost accounting rules, the problems with valuation of medical procedures, homogeneous patient groups (DRG), or with the cost calculation of the whole patient treatment process.

The objective of this paper was to diagnose the degree of hospital cost accounting sophistication, especially concerning the quality of calculation of the process of patient's treatment, and the degree of using cost information by the management of hospitals and evaluate the impact of solutions used in the area of cost accounting system on hospitals' performance. In pursuance of achieving the stated objectives, following hypothesis was formulated: the quality of cost calculation fosters better usage of cost information by the hospital's management, and it has a positive influence on hospital performance.

The paper presents the results of empirical research conducted in Polish, English and Slovenian hospitals, concerning the solutions used in the area of the cost accounting, especially including the rules of cost calculation of the process of patient's treatment. The research encompassed features of patient's treatment cost calculation applied in hospitals and the degree of using cost information by the management of hospitals. Further in this paper it is evaluated how the quality of cost calculation influences the hospital's performance.

2 Methodology

For the needs of evaluation of the quality of hospital cost calculation at the level of hospitals functioning in Poland and other European countries which use the DRG system, empirical research was conducted using the technique of survey, interviews and own observations. The paper presents the introductory results of research conducted by a structured questionnaire in European hospitals in the years 2012-2013. The request for participation in the study was addressed to 100 Polish, 100 English, and 21 Slovenian hospitals. The research sample was 64 returned questionnaires (30 from Poland, 28 from England and 6 from Slovenia). The receiving response rates was almost 29% (Kludacz-Alessandri, 2016).

This research brought data necessary to evaluate the hospitals' performance and degree of using cost information by the hospitals' management. The study involved chief accountants regarding the rules of cost accounting and managers of hospitals who responded to questions regarding the use of cost information in management process and evaluation of hospital performance.

The objective of the study was therefore to investigate the effects of cost calculation quality on management accounting practices and finally on financial and medical performance of hospitals. The analysis of correlation was used in order to estimate the impact of the quality of cost accounting on management accounting practices and hospital performance.

In order to measure the relationship between the variables, the partial aggregation method of individual variables representing multidimensional constructs was used (Bagozzi, Edwards, 1998). This means that each construct was represented by a variable that was calculated as an average of the retained original indicators prepared in the form of questions in the questionnaire. They were based on a review of related literature and consultations with experts. In order to prepare the final elements of the mentioned constructs, a factor analysis was performed to combine the single indicators into constructs. In this way, the constructs were validated.

Particular attention has been paid to the multidimensionality of three analysed variables: the quality of cost calculation, the management accounting practices and hospital performance. The elements of the construct "quality of cost calculation" represent the features of a bottom up micro-costing approach. It was measured using a five-item, five-point Likert-scaled instrument anchored by (1) "to strongly disagree" and (5) "to

strongly agree'' (Pavlatos, O., Paggios, I. 2009). Respondents were asked to indicate the features of a bottom up micro-costing approach. Finally, one item was removed from the analysis because it produced the lowest level of factor loading. The construct "management accounting practices" was created on the basis of literature analysis regarding management accounting techniques usage (Guilding et al. 2000). Respondents were asked to indicate the extent of the management accounting practices on five-point Likert-scaled instrument anchored by (1) ''definitely not applicable'' and (5) ''(definitely applicable)''. A factor analysis revealed that all items from the questionnaire were finally loaded on two factors; the first factor corresponds to various management accounting techniques while the second has been labeled ''modern costing systems" (Kludacz-Alessandri, 2017). Finally "hospital performance" was specified as a two-dimensional construct comprising financial and non-financial performance (Chenhall, 2003). In accordance with previous studies, respondents were asked to indicate their hospital's performance relative to their competitors on a scale ranging from ''1" (below average) to ''5" (above average) (Hoque, James, 2000). The results of factor analysis confirmed that the quality of calculation process should be a four-dimensional construct, management accounting practice should be specified as comprising of two factors and performance as two factors (Kludacz-Alessandri, 2017).

3 Results and Discussion

In the first stage of the research conducted within a group of chief accountants, applied solutions in the area of the cost accounting system were analyzed. The answers of respondents regarding the features of patient's treatment cost calculation are presented in Table 1.

Table 1 Features of patient's treatment cost calculation

Features of cost calculation	**1**	**2**	**3**	**4**	**5**
tracing direct material costs (medicines, medical products) to the patients and medical procedures	10%	10%	17%	25%	38%
tracing other direct costs (e.g. labour) to the patients and medical procedures	12.5%	16%	5%	31.5%	35%
allocation of the costs of medical procedures to the individual patients	9.5%	13%	8%	22.5%	47%
allocation of the costs of man-days to the individual patients	12.5%	10%	12.5%	16%	49%
allocation of other indirect costs to the individual patients e.g. administration costs	19%	9.5%	9.5%	13%	49%

* the scale of assessment: 1 (strongly disagree) – 5 (strongly agree), MV – average

Source: author's own elaboration

Most surveyed hospitals, mainly from Poland, attempt to use a bottom up micro-costing approach and allocate some of the costs directly to the patient's treatment process. It involves the identification of all relevant cost components as detailed as possible and combine them in order to arrive at the healthcare service costs (Shuman, Wolfe 1992). Direct costs like drugs, medical materials are traced to the cost objects (e.g. medical procedures, DRG, patients). The hospitals create a detailed list of each component of a patient's care and calculate their costs separately. Moreover they take into account not only the direct costs traced to the patient treatment process but also the costs of intermediate products such as medical procedures, inpatient days and outpatient visits. The indirect cost pools (nurses, equipment) are allocated with a different cost drivers. This provides substantially greater accuracy than in the top-down gross costing approach, used by around ten per cent of surveyed hospitals, mainly English ones. They do not trace direct costs to the patient's treatment process and do not calculate the costs of each component of a patient's care, but value each cost component for average cost

object. Such a model don't allow to observe the connection between costs and treatment for specific patients or take into consideration some special patient characteristics (Raulinajtys-Grzybek, 2014).

Cost accounting is a tool focusing on cost information that facilitates decision making by managers of the organization. Information from cost accounting systems helps managers in using management accounting practices.

The second stage of the research conducted among the hospitals' management involved making an analysis of management accounting practices, which base upon the use of information about costs of health services. For the needs of verification of hypothesis it was necessary to examine to what extent do the managers of researched hospitals use cost information in different processes. The answers of respondents regarding the evaluation of the use of selected management accounting practices in hospitals are presented in Table 2.

Table 2 Evaluation of the use of selected management accounting practices in hospitals

Management Accounting Practices	**1**	**2**	**3**	**4**	**5**	**MV**
Planning and budgeting	-	11,1%	11,1%	16,7%	61,1%	4,28
Cost control	-	-	11,1%	22,2%	66,7%	4,56
Contract negotiations	**5.6%**	**27,8%**	11,1%	11,1%	44,4%	3,61
Profitability Analysis	-	16,7%	22,2%	27,8%	33,3%	3,78
Pricing decisions	-	11,1%	16,7%	38,9%	33,3%	3,94
Processes improvement	11,1%	11,1%	16,7%	27,8%	33,3%	3,61
Performance assessment	16,7%	-	22,2%	22,2%	38,9%	3,67
Change in the structure of services	11,1%	22,2%	22,2%	22,2%	22,2%	3,22
Decisions on the purchase of medical equipment	11,1%	-	22,2%	33,3%	33,3%	3,78
External reporting	**16,7%**	**5,6%**	22,2%	22,2%	33,3%	3,50
Benchmarking	22,2%	38,9%	11,1%	-	27,8%	2,72
Analysis of resource efficiency	11,1%	5,6%	22,2%	33,3%	27,8%	3,61

* the scale of assessment: 1 (definitely not applicable) – 5 (definitely applicable), MV – average

Source: author's own elaboration

The answers obtained from respondents suggest that hospital managers use management accounting practices in their daily operations. They use cost information primarily for internal hospital needs, especially in the planning, budgeting and cost control process, as well as for profitability analysis, pricing decisions and decisions on the purchase of medical equipment, performance assessment, and resource efficiency analysis. From the information gathered, managers can make decisions on where to cut costs to improve the hospital's profitability. Cost accounting information is also used as part of an organization's control systems to measure and monitor hospital performance. It also helps the managers to answer such important questions as: how to allocate resources to achieve their objectives? Respectively, how were used the allocated resources.

From the descriptive statistics it became clear that cost information plays the least important role in external processes such as benchmarking or external reporting. It regards mainly Polish hospitals that practically do not make any comparisons using cost information and don't use cost information to negotiate prices with National Health Fund (NHF). This is due to the fact that the NHF doesn't collect and process cost information, and the main issue affecting the value of DRG prices are financial resources of the payer and the prices from previous years (Kludacz-Alessandri, 2016). The best evaluation of external reporting regards mainly English respondents because hospitals operating within

the public health system are involved in the cost data provision for the purpose of pricing. It is obligatory for them. Prices are determined based on cost information 2 years in advance, because this time is needed for processing cost information (Epstein, 2006).

Respondents were also asked to evaluate the hospital performance based on three indicators. The answers of respondents regarding the hospital's performance indicators relative to competitors are presented in Table 3.

Table 3 Hospital's performance indicators relative to competitors

Indicators	**1**	**2**	**3**	**4**	**5**	**MV**
Gross margin on sales	6	11	33	44	6	3,33
Resource efficiency	**-**	5,5	39	39	16,5	3,67
Quality of care	**-**	**-**	22	39	39	4,17

Rating scale: 1 - definitely below average; 2 - below average; 3 - average level; 4 - above average; 5 - definitely above average

Source: author's own elaboration

The data provided shows that hospital performance is well evaluated by the managers. All indicators were rated by the respondents higher than the level of competition. The quality of care was best assessed (mean above 4).

Another purpose of the experiential research was to evaluate the influence of the quality of cost calculation on management accounting practices and hospital performance and to verify the following research hypotheses: the quality of cost calculation fosters a better usage of cost information by the hospital management and has a positive impact on its' performance. To verify this hypotheses, the analysis of correlation was used. The results are presented in Table 4.

Table 4 Correlation coefficients between the variables

	Calc	***MAP***	***Per***
The quality of calculation– *Calc*	1		
Management accounting practices – *MAP*	**0,42***	1	
Hospital performance – *Per*	**0,64***	**0,60***	1

* Coefficient is statistically significant at $p < 0.05$ level

Of the 3 relationships reported on in this table, all are positively statistically significant ($p < 0.05$) and consistent with what was hypothesized. The quality of the calculation has a positive impact on management accounting practices and both these factors have a positive impact on hospital performance.

4 Conclusions

In summary, it can be concluded that the quality of cost calculation is significant positively associated with the management accounting practices and both of these factor are positively associated with hospital performance. The research results show that the quality of patient treatment process calculation has a positive impact on the utilization of cost information by the hospital's management, which further influence the hospital's performance. Higher quality of the patient treatment cost information encourages managers to use it in administrative process which results in improvement of economic score and the efficiency of the patient treatment process (performance). Information indicating the possibility of cost rationalization without deteriorating the treatment quality enables spending saved funds on improving the quality and standards of the healthcare.

The results of the research confirm the findings appearing in the cost system design literature. For instance it was already indicated that the level of cost system functionality is significant positively associated with the extent of the use of cost data (Pavlatos, Paggios, 2009). Moreover, the costing systems are designed according to the needs of

the users of information (Nicolaou, 2001). On the other hand, some management accounting practices (e.g. pricing decisions, cost reduction efforts) affect the cost calculation system level (Al-Omiri, Drury, 2007). Also according to Pizzini the usefulness of cost data in the management process is positively correlated with the quality of cost calculation, meaning the extent to which systems can provide greater cost detail (Pizzini, 2006). The results also suggest a strong effect of the quality of cost calculation and the management accounting practices on hospital performance. Although the other findings indicate that costing system alone does not impact directly on organization performance, rather it affects performance via management accounting practices (Uyar, Kuzey, 2016). It suggests that management accounting practices could play a mediating role between calculation system quality and hospital performance, but this conclusion needs further investigations.

This study has many options for further continuation, both geographically, from the point of view of research methods and from the point of view of the subject of research. In further research it is possible to link mutual findings to enrich findings for international comparison and use.

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Market Concentration and Stability in European Banking

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Abstract: *Using aggregate balance sheet data from banking sectors across the European Union (EU) countries over the period from 2004 to 2014 this paper provides empirical evidence on the testing the links between the concentration and stability. The paper contains a theoretical definition of approaches used to test the relation between these two characteristics of the banking sector. We used selected methods to estimate the concentration and stability and to test the presence of concentration-stability or concentration-fragility paradigm in conditions of EU. The stability was estimated with Banking Stability Index (BSI) and Z-score and the market concentration was evaluated with Herfindahl-Hirschman Index (HHI) and Concentration Ratio (CR5). The presence of the paradigm was verified with the test of the Granger causality for panel data. As the result of our analysis, we can say, that in our study the only one-way relationship running from stability to market concentration was estimated.*

Keywords: Market concentration, Banking stability, Granger causality test for panel data, European Union countries

JEL codes: G21, C12, D40

1 Introduction

The banking system, as a part of the financial system, in recent years is affected by significant changes in deregulation, market globalization, innovation and technological progress, but also by the macroeconomic development (Soltes and Gavurova, 2014; Knezevic and Dobromirov, 2016; Miklaszewska and Kil, 2016). Changes mentioned above are the main factors that gradually reduce the cost of capital and significantly affect the performance, stability and competitiveness of the banking sector in the international context (Siddik et al. 2016). Competition (indirectly measured by market concentration) in the banking industry is important for the efficient production of financial services, the quality of financial products and the degree of financial innovations (Claessens and Leaven, 2004). Competition is also important for households and firms to access the financial resources, for proper functioning of the financial sector, for stability of the financial system, efficient management of financial intermediaries, improvement of monetary policy transmission through the interbank market rates, and for overall industrial and economic growth (Amidu and Wolfe, 2013). Another important aspect is the banking stability. The issue of banking stability is quite organically linked with financial stability. Banking stability is a yardstick to determine whether an economy is adequately strong enough to withstand both the internal and external shocks. On the other hand, financial stability is a by-product of stability conditions prevailing in the banking system, financial markets, and the real economy and amongst them, banking stability appears to be a vital ingredient to financial stability. Banking stability in itself depends on the efficacies of the several parameters of individual banks, e.g. asset quality, liquidity, capital adequacy, and profitability, etc. Since banking stability gets affected positively or negatively by the prevailing conditions in the financial market and the real economy; ultimately, it determines as to what extent financial stability is ensured in the economy by its ability to absorb the shocks. As such, banking stability can be treated as a forerunner of financial stability in an economy.

While the debate on whether competition influences bank stability continues (e.g. Berger et al. 2009), the question if the stability influences the level of competition is not often

discussed. Therefore the aim of this paper is to examine the relation between market concentration and banking stability in the European Union countries. In previous studies, the authors try to analyze this relation using the regression or correlation analysis. In our paper, we try to analyze this relation in term of causation. As the main contribution of the paper can be considered in the application of a panel Granger causality approach, which fills the gap in the existing literature. The aim is to examine the relative complexity of the relation between market concentration and banking stability, that causation running not only from concentration to stability but also from stability to concentration. To fulfil the aim mentioned above the paper is divided into next sections. In section 2 the relation between market concentration and banking stability is defined in form of concentration-stability and concentration-fragility paradigms. Section 3 describes the applied methodology and data set. The main findings and discussion are presented in section 4. The last section brings the main findings in form of conclusion.

2 Literature review

In the empirical studies, we can find inconclusive findings on the effect of increasing banking market concentration on banking stability. We can talk about two main group of results, which led to the formulation of two opposite paradigms (i.e. Berger et al., 2009; Uhde and Heimeshoff, 2009; Fiordelisi and Mare, 2014).

First one, concentration-stability paradigm, suggests that larger (monopolistic) banks in concentrated banking market may enhance profits and thus reduce financial fragility by providing higher capital buffers that can protect them against external macroeconomic and liquidity shocks (Boyd et al., 2004). Another aspect is, that larger banks tend to be more prudent in credit allocation. They usually provide loans with higher quality, which increase the return on investments and increase financial soundness (Boot and Thakor, 2000). They are also able to diversify loan portfolio risks more efficiently due to a wider network of branches and due to cross-border activities. From the point of view of regulation, the market with a few larger bank may be easier to monitor. Therefore the supervision of banks may be more effective and the risk of a system-wide contagion should be presumably reduced (Allen and Gale, 2000).

In contrast, the concentration-fragility paradigm, argue that larger banks are often more likely to receive public guarantees or subsidies, which is discussed as the "too big to fail" doctrine (Mishkin, 1999). As they assume, that government will not let them fall, they perform more risky activities. The negative effect of concentration on stability was defined also by De Nicolo and Lucchetta (2009) who claim that the considerable market power of only a few banks allowed them to raise the interest rate on loans, which can induce adverse selection (risky projects are financed) and moral hazard (risk shifting), with negative impact on the stability of the banking system.

In the empirical literature we can find papers aimed at study the relation between competition (or market concentration) and bank stability. Berger et al. (2009) tested the presence of paradigms by regressing measures of loan risk (the ratio of non-performing loans to total loans), bank stability (Z-score), and bank equity capital (the ratio of equity to total assets) on several measures of market power (Lerner index, HHI, log value of total assets), using bank-level data for 23 individual nation. They took account of the endogeneity of market power by employing activity restrictions, banking freedom, and the percent of foreign-owned and state-owned banks as instruments. They result suggested that banks with a higher degree of market power also have less overall risk exposure (in line with concentration-stability paradigm). However, the data also provided some support for one element of concentration-fragility paradigm, that market power did increase loan risk in these nations.

Uhde and Heimeshoff (2009) applied regression analysis and used aggregate balance sheet data from banks across the EU-25 over the period from 1997 to 2005 and found that national banking market concentration (CR3, CR5, HHI) had a negative impact on

European banks´ financial stability (Z-score) while controlling for macroeconomic, bank-specific, regulatory, and institutional factors. Furthermore, they found that Eastern European banking markets exhibiting a lower level of competitive pressure, fewer diversification opportunities, state-owned banks were more prone to financial fragility, whereas capital regulations had supported financial stability across the entire European Union.

Fiordelisi and Mare (2014) assess the relation between concentration (HHI, Lerner index) and stability (Z-score) in the European cooperative banking between 1998 and 2009. They obtained three main results. First, they support the concentration-fragility paradigm, when they found that bank market power negatively Granger-caused stability. Second, they provided evidence of negative impact of the 2007-2009 financial crisis on the individual risk exposure of cooperative banks although it did not change the relation between competition and stability. Third, they have shown that herding behavior affected positively bank stability.

3 Methodology and Data

The market concentration of individual banking sectors can be measured by various concentration indices. In literature, but also in the statistics of central banks, the most often used indices are Concentration ratio for 5 largest banks on the market (CR5) and Herfindahl-Hirschman index (HHI), usually from the total assets point of view. The starting point in the calculation of these indices is the calculation of market shares (r_i; $\forall$ i; i=1, 2, …, n) of individual banks operating in the banking market. The CR5 index is then calculated as the sum of market shares (r_i) of the 5 largest banks, which are arranged from highest to lowest value of the market share ($r_1 \geq r_2 \geq .. \geq r_m \geq .. \geq r_n$). The calculation of the CR5 index can be calculated as follows:

$$CR_5 = \sum_{i=1}^{5} r_i \tag{1}$$

The second, HHI index take into account market shares of all banks operating in the market. The value of HHI below 0.1 shows a very low concentration, in the range from 0.1 to 0.18 shows a moderate concentration, and value of HHI above 0.18 shows a very high concentration of the banking system, whereas the index value equal to 1 shows a full concentration. The HHI index could be calculated as follow:

$$HHI = \sum_{i=1}^{n} (r_i)^2 \tag{2}$$

The stability of banks can be evaluated by several methods, e.g. Banking Stability Index and Z-score. To approximate stability of banking sectors, the Z-score can be used (as, for instance in Berger et al., 2009; Fiordelisi and Mare, 2014; Capraru et al., 2016). The indicator is estimated as follows:

$$Z - score_{i,t} = \frac{ROA_{i.t} + \frac{E_{i,t}}{TA_{i,t}}}{\sigma_{ROA_T}} \tag{3}$$

Where $ROA_{i,t}$ is the return on assets for banking sector i in year t, $E_{i,t}/TA_{i,t}$ denotes the equity to total assets ratio for banking sector i in year t, and σ_{ROA_T} is the standard deviation of return on assets over the full sample period (T years). According to the Fiordelisi and Mare (2014), the Z-score provides a measure of bank soundness (in our paper banking sector soundness) as it indicates the number of standard deviations by which returns have to diminish in order to deplete the equity of a bank. A higher Z-score implies a higher degree of solvency and therefore it gives a direct measure of bank stability.

Another approach how the banking stability can be evaluated is the construction of Banking Stability Index (BSI). In our paper we used BSI suggested and described in detail in Kočišová (2016). In her paper, she brings the attempt to construct an aggregate BSI taking into account indicators of the financial strength of banks (performance and capital adequacy) and major risks (credit and liquidity risk) affecting banks in the banking system.

In order to test the Granger causality relation between variables, we will follow the concept of Granger causality developed by Granger (1981). Since the panel Granger causality model is computed by running bivariate regressions, there can take the following form:

$$y_{i,t} = \alpha + \sum_{k=1}^{K} \gamma_i^{(k)} \cdot y_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} \cdot x_{i,t-k} + \varepsilon_{i,t}$$
$$x_{i,t} = \alpha + \sum_{k=1}^{K} \gamma_i^{(k)} \cdot x_{i,t-k} + \sum_{k=1}^{K} \beta_i^{(k)} \cdot y_{i,t-k} + \varepsilon_{i,t} \quad (4)$$

Where $i = 1,2,\ldots,N$ denotes the cross-sectional dimension; $t = 1,2,\ldots,T$ denotes the time period dimension of the panel; a is intercept; $k = 1,2,\ldots,K$ are lags; ε is error term.

To test the Granger non-causality from x to y, the null hypothesis is:

$$H_0: \beta_i = 0, \forall i = 1, 2, \ldots N \quad (5)$$

The alternative hypothesis states that there is a causality relationship from x to y for at least one cross-unit of the panel:

$$H_1: \quad \beta_i = 0, \forall i = 1, 2, \ldots N$$
$$\beta_i \neq 0, \forall i = N_1 + 1, N_1 + 2, \ldots, N; \left(0 \leq \frac{N_1}{N} \leq 1\right) \quad (6)$$

Before proceeding with the panel Granger causality estimations, we test the stationarity of the series, using panel unit root tests: Levin, Lin and Chu test and ADF test for panel data (Próchniak and Witkowski, 2016). The optimal number of lags is estimated using Schwarz information criterion.

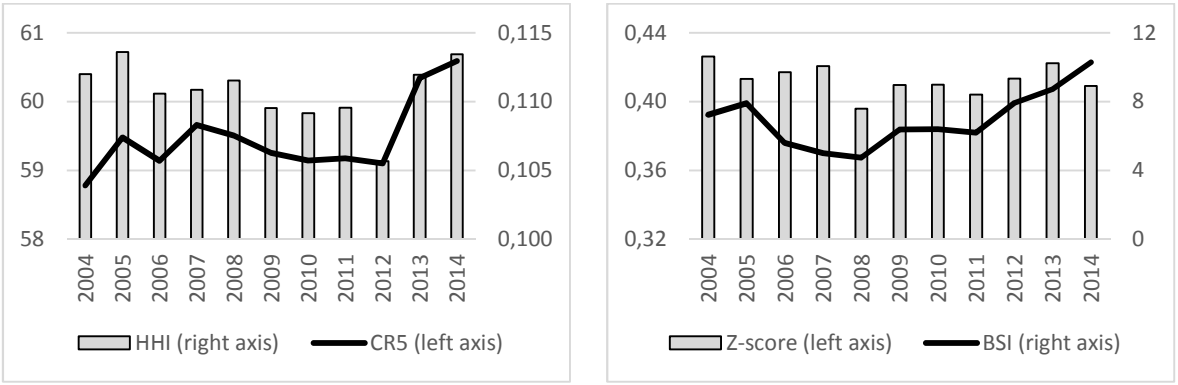
In this paper, we try to test the relation between market concentration and banking stability in the European Union countries using a panel Granger causality approach. The aim is to verify the presence of concentration-stability or concentration-fragility paradigms and verify if causation running only from concentration to stability, or also from stability to concentration. To fulfil the objectives in the first part we analyse the concentration and stability in the European Union banking sector. The concentration is analysed by CR5 index and HHI index according to the value of total assets. To analyse the stability, the Z-score and BSI are used. As the main data source will be used database published on the web page of European Central bank. The annual data on the country level (27 EU banking sectors) will be used during the period from 2004 to 2014. The calculations were done in MS Excel, R programme and in the Eviews.

4 Results and Discussion

The aim of this paper is to examine the relation between market concentration and banking stability in the European Union countries. To analyze market concentration, the CR5 index and HHI index were used. The development of these indices (EU average) can be seen in Figure 1. The value of CR5 index demonstrates that through the whole analyzed period the top five banks owned an absolute majority of the assets of the European banking market. At the beginning of analyzed period, the development can be regarded as relatively stable until 2012, when the values of both indices decreased. Since this year there was a significant growth of values for both indices. On the basis of Figure 1, we can see that HHI index showed the same tendency of development as the CR5 index. Based on the classification of HHI can be a market of assets during the analyzed

period as a moderately concentrated market. Both indices fell in 2012 and remain well above the pre-crisis levels. According to European Central Bank (2013), the dip in 2012 was mostly driven by large banks´ moves – especially in Germany, France, Belgium and Netherlands – to reduce assets to comply with forthcoming regulations. With regard to individual countries, concentration indices reflected a number of structural factors. Banking systems in larger countries, such as a Germany, France and Italy, were more fragmented and included strong savings and cooperative banking sectors. Banking systems in smaller countries tend to be more concentrated, with the notable exception of Austria and Luxembourg. In the case of Austria, this was on account of a banking sector structure similar to the one characterizing the larger countries, and in the case of Luxembourg, it was due to the presence of a large number of foreign credit institutions. Since 2013 there can be seen an increase, remaining at the pre-crisis levels. This increase was mostly driven by moves in the crisis countries where larger banks acted as consolidators in resolutions of non-viable entities – especially in Cyprus, Greece and Spain. Market concentration continued to increase, reaching a historical maximum at the end of 2014. The increase in market concentration reflected primarily the decline in the number of credit institutions and indicates a decline in quality of the competitive environment.

Figure 1 The concentration and stability in the European Union banking sector; EU average; 2004-2014



Source: Prepared by author

The banking sectors´ stability was analyzed using Z-score and BSI (Figure 1). The analyzed period (2004-2014) can be divided into two stages. The first stage covers the period from 2004 to 2008, when the stability indicators decreased to their minimal values in 2008. The lowest values in this year mirrored the negative effects of the financial crisis which hit the banking sectors in all EU countries. The second stage covers the period from 2008 until 2014 when can be seen a gradual increase in the average stability. A positive development in banking stability during this period was influenced mainly by the growing demand for rising capital adequacy, which was related to the gradual implementation of Basel III. According to the Olszak et al. (2016), the set of new rules covers substantial increases in regulatory capital ratios and in the quality of bank capital.

Focusing on the link between market concentration and stability, the theoretical and empirical literature doesn't provide a clear-cut conclusion about a direct relation between variables. As can be seen in the literature review there exist many paradigms about this relationship. While the concentration-stability paradigm suggests a positive relation between concentration and stability, the concentration-fragility paradigm favors a negative relation between these two variables.

We analyze the link between market concentration and stability in the European Union banking market in a panel Granger causality framework. As we believe that it takes time for the effect of concentration on stability and vice versa to become apparent, we adopt

yearly lags. The optimal number of lags is estimated using Schwarz information criterion (SC). As the optimal number of lags were appointed one-year lag (see Table 1).

Table 1 Lag order selection criteria

	0	1	2	3	4	5	6	7
SC	8.0872	0.2892**	0.5797	0.6725	0.8823	1.4607	2.0333	2.5877

*** significant at 5% level*

Source: prepared by author

Before proceeding with the panel Granger causality test, we test the stationarity of the series, using panel unit root tests: Levin, Lin and Chu test and ADF test for panel data. The first condition is, that the variables must be non-stationary at the level (there is unit root), but when we count into first differences they become stationary (there is no unit root). The null hypothesis in both tests assumes that all series are non-stationary. The results of stationarity analysis display in next table (Table 2) allows us to reject the null hypothesis at the 1st differences.

Table 2 Panel unit root test

Variable	Test	Level		1st difference	
		Statistic	Probability	Statistic	Probability
HHI	Levin, Lin and Chu test	-1.4817	0.0692	-8.6937	0.0000
	ADF test for panel data	61.9761	0.2130	152.841	0.0000
CR5	Levin, Lin and Chu test	-0.6781	0.2489	-7.6643	0.0000
	ADF test for panel data	35.1774	0.9779	142.266	0.0000
Z-score	Levin, Lin and Chu test	-0.5392	0.2949	-13.367	0.0000
	ADF test for panel data	43.2171	0.8533	206.914	0.0000
BSI	Levin, Lin and Chu test	1.11821	0.8683	-14.652	0.0000
	ADF test for panel data	26.4966	0.9994	219.030	0.0000

Source: prepared by author

In our panel Granger causality test we used panel ordinary least squares (OLS) estimations. The results are displayed in Table 3, both for the causality running from market concentration to banking stability and for causality running from stability to concentration. We test the null hypothesis that there is not Granger causality running between variables. In order to test the null hypothesis, F statistics is appointed. According to the results in Table 3, we cannot reject the null hypothesis if the probability is higher than 0.05 and rather we accept the null hypothesis. Therefore, we can say that there is no Granger causality running from HHI to Z-score, from Z-score to HHI, from HHI to BSI, from CR5 to Z-score and from CR5 to BSI. On the other hand, if the probability is lower than 0.05 we can reject the null hypothesis and we can accept the alternative hypothesis. Based on the results then we can say, that there exist Granger causality running from BSI to CR5, and at the significant at 10% level there exist Granger causality running from BSI to HHI, from Z-score to CR5. So we can say, that BSI causes CR5 and HHI, and Z-score causes CR5.

Table 3 Granger causality test – F statistics

Null hypothesis	F statistics	Probability	Result
HHI does not Granger Cause Z-score	0.68083	0.4100	Accept H0
Z-score does not Granger Cause HHI	0.36282	0.5475	Accept H0
HHI does not Granger Cause BSI	0.03474	0.8523	Accept H0
BSI does not Granger Cause HHI	2.72632	0.0999	Reject H0*
CR5 does not Granger Cause Z-score	0.71378	0.3989	Accept H0
Z-score does not Granger Cause CR5	3.72849	0.0546	Reject H0*
CR5 does not Granger Cause BSI	0.06098	0.8051	Accept H0
BSI does not Granger Cause CR5	4.03413	0.0456	Reject H0**

*** significant at 5% level; * significant at 10% level*

Source: prepared by author

In our research, we apply the Granger causality in VAR model and we use one-year lag. The result of Granger test and the coefficient of variables can be seen in Table 4.

Table 4 Granger causality test – Coefficients

	HHI	CR5	CR5
Intercept	0.0107**	1.8728***	2.9928***
HHI(-1)	0.9770***		
CR5(-1)		0.9782***	0.9854***
BSI(-1)	-0.0207*		-5.0371**
Z-score (-1)		-0.0426**	
R-squared	0.9742	0.9818	0.9818
Adjusted R-squared	0.9740	0.9817	0.9817
No. of observations	270	270	270

**** significant at 1% level; ** significant at 5% level; * significant at 10% level*

Source: prepared by author

The results showed that the stability (measured by Z-score and also by BSI) negatively caused the concentration (measured by HHI and also by CR5). It should indicate that the most stable banking systems were those that were obligated to compete in less concentrated markets. Based on the results we can see that there existed only one-way causality running from stability to concentration. The opposite way was not found, so the concentration could not cause the stability. Based on the R-squared and Adjusted R-squared values we can conclude that the results are statistically significant.

These results are in line with concentration-fragility paradigm, which suggests that there exists a negative relation between concentration and stability. This is in line with findings e.g. Fiordelisi and Mare (2014) or Capraru et al. (2016) who found a negative relation between market power and stability measured by Z-score in the European cooperative banking between 1998 and 2009. Thus we have come to the conclusion that the growth of stability in the banking sector will cause a reduction in the concentration. Conversely, with a fall in stability, there will be a rise in the concentration in the banking sector. As we know that concentration reflects the level of competition in the banking market, we can indirectly say, that the growth of stability in one year will lead to the improvement of the competitive environment in the next period. Conversely, if the stability of banks decreases, it will also lead to a worsening of the competitive environment with an annual delay. Thus, if the banking sector becomes more stable, it will act to increase the level of competition, whether in form of multiple banking entities on the market, a more even distribution of the market shares of existing banking entities operating in the banking market, etc.

5 Conclusions

Just a gradual process of globalization significantly affects the structure of the financial and banking system, their performance and stability (Sinicakova et al., 2017). It is therefore very important to focus on the examination of bank and banking systems performance and stability, under the purpose of investigation of their structure (the level of concentration), and it is important to follow these issues not only as isolated phenomena but also focus on the investigation of their relations. This paper contributes to the existing literature by analyzing the relation between market concentration and stability in European banking. Different methods were used to measure concentration (CR5, HHI) and stability (Z-score, Banking stability index).

The analysis of market concentration showed that at the beginning of analyzed period, the development can be regarded as relatively stable until 2012. Since 2013 there can be seen an increase, remaining at the pre-crisis levels. This increase was mostly driven by moves in the crisis countries where larger banks acted as consolidators in resolutions of non-viable entities. Market concentration continued to increase, reaching a historical maximum at the end of 2014. The increase in market concentration reflected primarily the decline in the number of credit institutions and indicates a decline in quality of the competitive environment. The analysis of stability in EU banking showed that the analyzed period can be divided into two stages. The first stage covers the period from 2004 to 2008, when the stability indicators decreased to their minimal values in 2008. The second stage covers the period from 2008 until 2014 when can be seen a gradual increase in the average stability. The positive development in banking stability during this period was influenced mainly by the growing demand for rising capital adequacy, which was related to the gradual implementation of Basel III.

As the main contribution of the paper can be considered the application of a panel Granger causality approach to examine the relative complexity of the relationship between market concentration and banking stability, that causation running not only from concentration to stability but also from stability to concentration. The results showed a one-way negative relation running from stability to concentration. This means that greater stability in banking sector enhances the quality of the competitive environment.

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The Development of Instrument Impact Scenarios with Respect to the Regulatory Policy Model

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Abstract: *The main purpose of the research is to suggest a cognitive model of factors that influence the regulatory policy and to develop impact scenarios based on the model under question. According to the goal, the algorithm of constructing cognitive models includes relevant stages that have been presented in the paper. The construction of cognitive maps has been based on a certain index-oriented graph (orgraph). The vertex (concepts) of the graph has been studied as components of the three populations. The paper presents a cognitive map of concepts of factors that influence the objectives and leverages of regulatory policy in Ukraine. Based on the research, the level of factors that influence the regulatory policy has been determined. The cognitive map presents all connections between the concepts that are only partly reflected in the given figure. The most active and interacting factors selected have been considered within the scenario modelling. Each of these factor-indicators has been analysed separately.*

Keywords: regulatory policy, government regulation, cognitive model, scenario modelling

JEL Classification: L51, B49, H11

1 Introduction

Overcoming the economic and political crisis in the country is a priority task of the state leadership and it is possible only in case of synergistic interaction between business, government and the public. This includes business development and growth of industrial capacity that will ensure the job creation, wage increase, and, as a result, improved standards of living. The catalyst of this chain reaction is establishment of conditions for doing business and stimulating consumption, which is effective demand for entrepreneurs. These tasks are important part of current regulatory policy that requires improvement of existing mechanisms of its functioning and implementation of new methods and management tools.

When searching for the best tools, a currently central method is modelling the object of research. The regulatory policy is a subsystem of state regulation of the economy, which is being implemented throughout the country in the macroeconomic dimension so that it is characterized by considerable complexity, which requires appropriate tools for analysis. Complex systems are studied by expert modelling methods which are subdivided into two groups:

- methods aimed at enhancing intuition and experience of experts;
- and methods of formalized representation of systems.

Group 1 includes "brainstorming", expert evaluation, "Delphi" scenarios, morphological analysis, graph relevance tree, etc. Group two is represented by analytical, statistical, semiotic, logical, linguistic, graphical, and other methods. Considering the complexity of the analysis it is reasonable to solve the problem by applying borderline methods between intuition and experience enhancement and formalized approach, one of which is the transition method of gradual formalization of decision-making — cognitive modelling.

Among the researchers, who have investigated economic development and economic tasks through the cognitive modelling, there are G. V. Gorelova (2010), V. V. Kulba, D.

A. Kononov, S. S. Kovalevskiy (2002), D. I. Makarenko (2008), F. S. Roberts (1986), S. S. Solohin (2009), E. A. Trahtenherts (1998), and others.

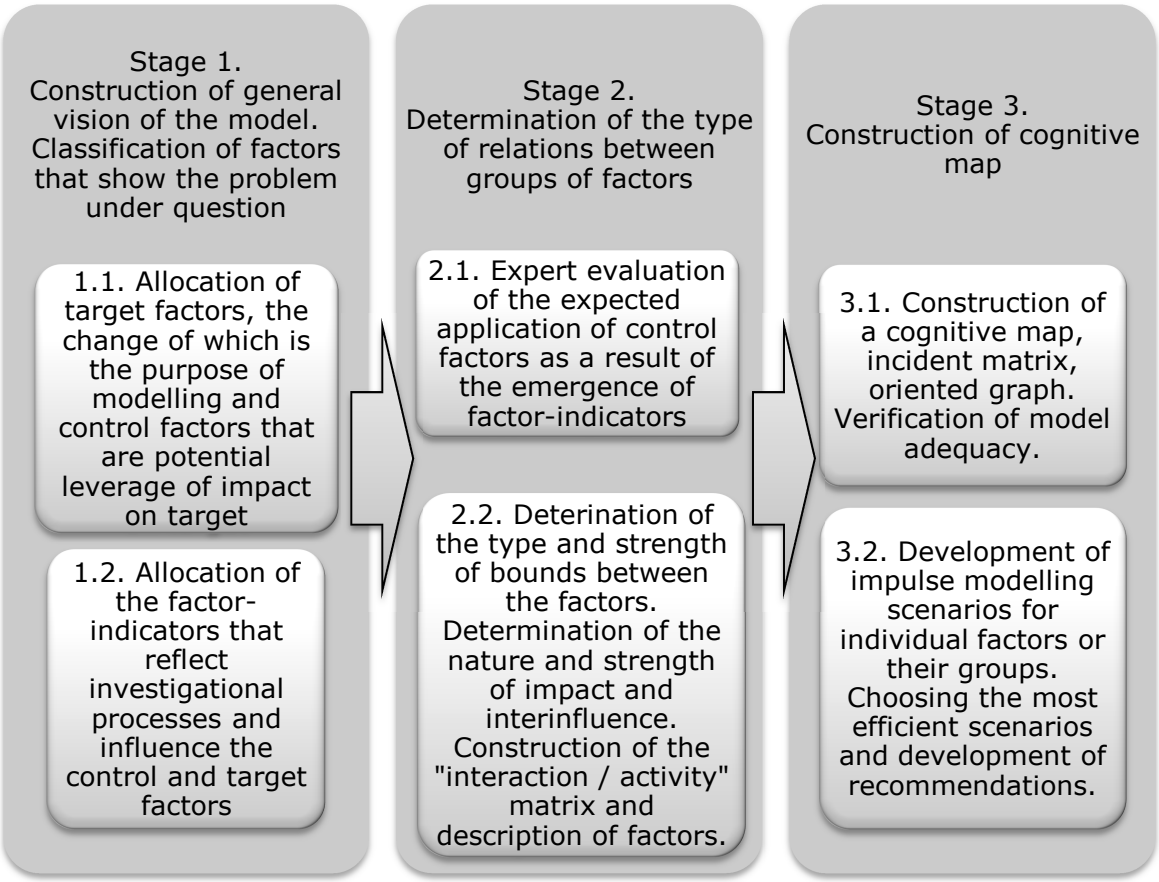
The purpose of the research

The purpose of the research is to suggest a cognitive model of factors that influence the regulatory policy and apply it as a basis to develop impact scenarios.

2 Methodology and Data

According to the goal established an algorithm of its accomplishment has been developed. The algorithm of constructing cognitive models includes relevant stages shown in Fig. 1.

Figure 1 The algorithm of constructing cognitive models



Source: Author's model based on the conducted analyses

The results obtained in the course of the first and second stages of the study are provided in the author's research papers (Kolupaieva, I.V., 2016). The third stage corresponds directly to the construction of a cognitive model.

The algorithm of implementing a cognitive approach can be presented as follows (Vandysheva, T. M., 2010):

- studying the problem and determining the goals and objectives of the study;
- constructing cognitive maps;
- constructing cognitive models and test their adequacy;
- analysing the distribution of excitation (pulses) on the graph;
- solving the problem of complexity, sensitivity and stability of systems;

The construction of cognitive maps has been based on certain index oriented graph (orgraph):

Φ_n<<V, E>, X, F, θ>

(1)

Formula Φ_n<<*V, E*>, *X, F,* θ> is finite sequence,

Where

G = < V, E>, V={v_i | $v_i \in V$, *i=1, 2,…,k };*

E={e_i | $e_i \in E$, *i=1, 2,…,k };*

G – index oriented graph (cognitive map), where: *V* – vertex set; sets («concepts») $V_i \in V$, $i=1, 2,\ldots, k$ – elements of the system;

E – set of arcs, arcs $e_{ij} \in E$, $i,j=1, 2, \ldots,N$ reflects the relationship between the vertices V_i and V_j;

$X:V \rightarrow \theta$, X – set of parameters of vertices;

$X=\{ X^{(v_i)} \mid X^{(v_i)} \in X, i=1, 2,\ldots,k \}$;

$X^{(v_i)} = \{x^{(i)}_g\}$, $g=1,2,\ldots,l$. $x^{(i)}_g$ – g-parameter of vertex V_i, if $g = 1$;

то $x^{(i)}_g = x_i$; θ – space of parameters of vertices.

In terms of the case under study V_i on V_j can have positive, negative or no impact. Like control factors the factor-indicators can have positive or negative impact on the target factors of the model, and on other factor-indicators and control factors, or they can have no connections with them, so that in mathematical terms this can be formulated as follows:

$$A_G = [a_{ij}]_{k \times k}, a_{ij} = \begin{cases} 1, \text{ if } V_i \text{ increases, then } V_j \text{ increases} \\ -1, \text{ if } V_i \text{ decreases, then } V_j \text{ increases} \\ 0, \text{ in case of no connection} \end{cases} \quad (2)$$

3 Results and Discussion

To build cognitive maps it is necessary to determine (before determination of index-oriented graph) the vertices (concepts) that are directly analysed within the model. The concepts are analysed as components of the three populations (see Tab. 1)

Table 1 Concepts of index-oriented graph

Groups of factors	Components of the group
Factor-indicators	V1 – participation of the state in the process of international economic integration; V2 – increased competition between multinational corporations; V3 – influence of certain international regulatory organizations; V4 – membership in international trade organizations; V5 – activities of governments of others countries; V6 – harmonization of tax legislation of Ukraine with the provisions of international law; V7 – impact of globalization in terms of providing access product to new markets, the search of new technologies and equipment; V8 – changes in the commodity structure of the world market to the advantage of high-tech products; V9 – rapid growth in trade of services; V10 – influence of political organizations; V11 – economic policy of government (strengthening of state regulation of economic relations along with market self-regulation); V12 – dominating ideology in society (socialism, liberalism); V13 – existing economic legislation; V14 – priorities of national security; V15 – political stability; V16 – public participation; V17 – activity of trade unions in the country; V18 – the dynamics of the national economy development; V19 – branch structure (growth of knowledge-intensive industries, increase in share of innovative products); V20 – potential of the national export; V21 – level of investment in the economy; V22 – inflation; V23 – share of high-tech innovative products; V24 – level of technical and technological base; V25 – the development of venture capital; V26 – offshore financial centres and "tax heavens"; V27 – economic crisis; V28 – level of unemployment; V29 – asymmetry in the labour market; V30 – level of corruption; V31 – level of social protection of the population; V32 – social tension in society; V33 – interstate and interregional migration; V34 – degree of agenda regulation for the development and adoption of regulations in the field of management; V35 – scientific apparatus of exact sciences (system tools, modelling, etc.); V36 – level of bureaucracy of the state system; V37 – information and automation of the systems for adopting regulatory acts; V38 – the effectiveness of regulatory acts; V39 – level of communication support of regulatory policy; V40 – responsibility and motivation of civil servants; V41 – volume of knowledge, skills and training of the subject of regulatory activities; V42 – the morality of public servants; V43 – level of spiritual education of the population; V44 – cultural level of the population;

Control factors	V45 – licensing; V46 – quotation; V47 – limited transactions (currency operations with securities, etc.); V48 – sanctions by regulators; V49 – tax burden; V50 – write-off and deferral of tax debt; V51 – ratio of local and state taxes; V52 – budget deficit; V53 – government debt; V54 – organization and legal regulation of activity; V55 – guarantee of protection and security; V56 – protection of resources; V57 – staff assurance; V58 – regulation of discount rate; V59 - money issue; V60 - public funding; V61 – optimization of number and value of taxes; V62 – international agreements on avoidance of double taxation; V63 – legalization of untaxed income; V64 - tax breaks / changes in terms of tax payment (deferral / instalment) / tax rebate; V65 – accelerated amortization; V66 – tax credit / rebate; V67 – alternative tax regimes (simplified system of taxation, special tax regimes); V68 – introduction of microloan system; V69 – preferential loans; V70 – leasing; V71 – strategic planning, foreign economic activity support; V72 – creation of a favourable legal framework; V73 – adjustment of prices and tariffs; V74 – information openness; V75 – areas / policy / programs monitoring; V76 – information activities; V77 – social standards (minimum pension, minimum wage, living wage); V78 – marketing and advertising activities; V79 – development of image strategies; V80 – grants; V81 – subsidies; V82 – subventions;
Target factors	V83 – economic growth; V84 – establishment of competitive national production; V85 – establishment of worthy conditions of life and work of citizens, implementation of the social objectives of society; V86 – integration into the EU.

Source: authors, based on the conducted analyses

The resulting data and values agree with those obtained by experts in government regulation. Each factor is correspondent to an individual symbol of graph vertex. Values in matrix represent the conditions of concept interaction in accordance with the formula (2). It is not possible to present index-oriented graph due to its cumbersomeness. The cognitive map designed on the basis of the research carried out is also very difficult for display as it presents 86 interaction factors. In previous researche (Kolupaieva I. V., 2016) we have determined a number of influential factors including increased competition of multinationals corporation, the influence of certain international regulatory organizations, state economic policy (strengthening of state regulation of economic relations along with market self-regulation and corruption). In particular, the impact of these factors has been given in Fig. 2 as a fragment of cognitive map to illustrate certain features of communication between the concepts of the model. The designed cognitive map and index-oriented graph only statically reflect the interdependence between the concepts of the model. The main advantage of the cognitive approach is the possibility of scenario development, which refers to the definition of level of target factors, reaction of control factors on factor-indicators and possibility of adjusting the model to achieve the goals.

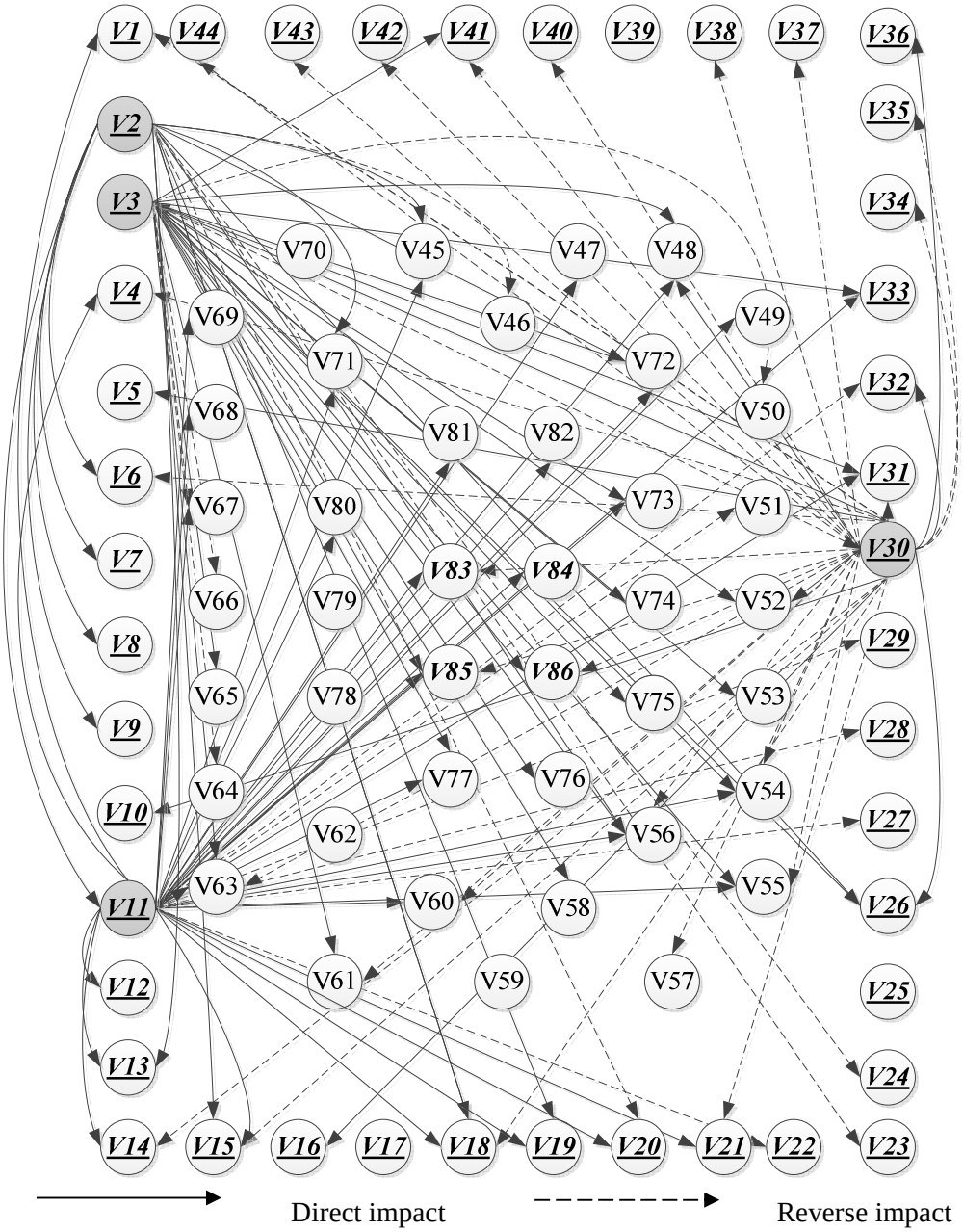
Scenarios have been developed on the basis of analysis of impulse processes of the graph, so that transition of the system from a state t-1 to t, t + 1, ... in accordance to the rule changes settings in the vertex graph in time t_n+1 if at the time point t_n the pulses P are coming into concepts. This process can be formulated as follows:

$$x_i(t_{n+1}) = x_i(t_n) + \sum_{v_j : e=e_{ij} \in E}^{k-1} f(x_i, x_j, e_{ij}) P_j(t_n) + Q_i(t_{n+1}) \quad (3)$$

where $Q_i(t_{n+1})$ – pulse of concept of index-oriented graph in the corresponding periods of time under certain values X0 and initial vector P0.

In order to study the nature of changes in target factors depending on the dynamics of these factor-indicators we need to construct these scenarios. The pulse has been directed to the selected concept of each scenario. (V1 – strengthening of competition of multinational corporations, V2 – the influence of certain international regulatory organizations, V3 –economic policy of the state (strengthening of state regulation of economic relations along with market self-regulation) and V5 – level of corruption. In mathematical terms pulse has been described as a matrix-vector.

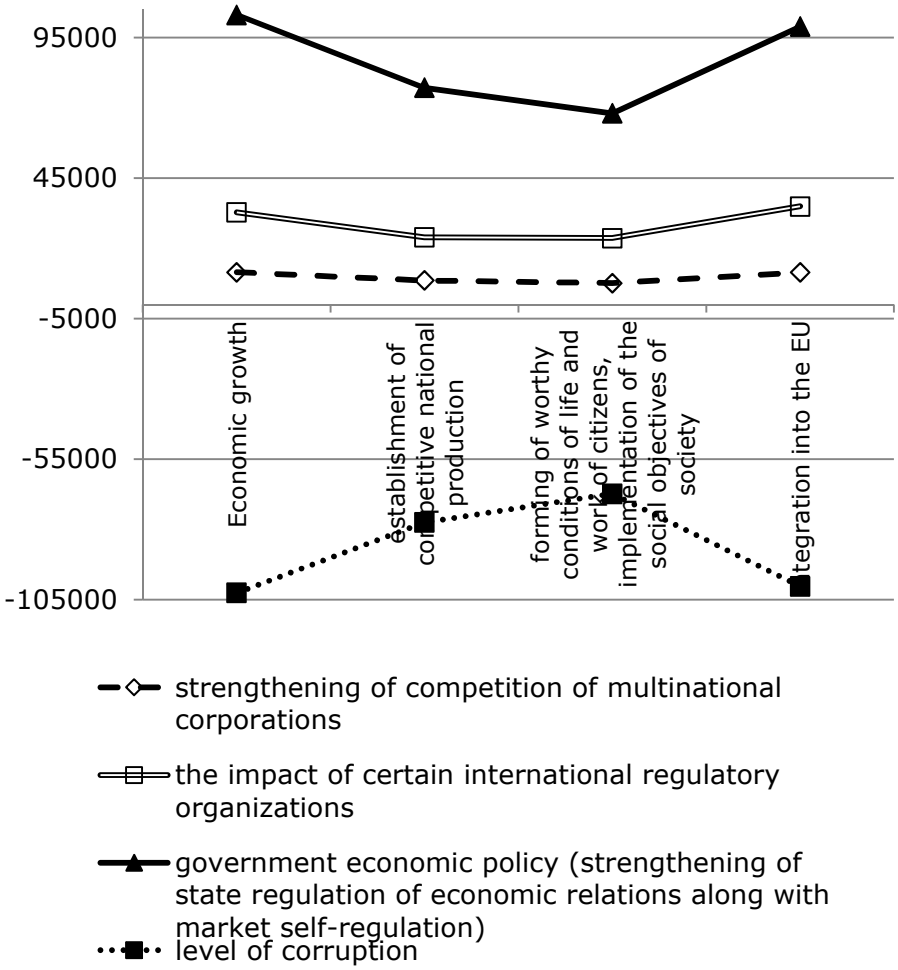
Figure 2 The cognitive map presenting the concepts of factors, which influence the objectives, and leverages of regulatory policy in Ukraine (fragment)



Source: Author's calculations

The results of tact modelling calculated as a result of multiplying the adjacency matrix by the index-oriented graph have been graphically presented in Fig. 3. These data reflect the sixth stage of the modelling, as this was the stage when a significant increase in the values of factors was observed.

Figure 3 The graph of changes in the values of target factors in the vertex V83, V84, V, V86 in terms of pulse q1=+1 at the vertex V2, V3, V11, V30



Source: Author's calculations

4 Conclusions

Based on the results of the research carried out the degree of influence that factors have on regulatory policy has been determined. It should be noted that the cognitive map presents all connections between above mentioned concepts that are only partly reflected in the given figure. The factors selected as most active and interacting have been analysed within the scenario modelling. Each of these factor-indicators has been studied in isolation. Thus, the factor of economic policy of the government (strengthening of state regulation) has had greatest influence that proves its dominating influence on the system of regulatory policy (in general and in particular) and on its leverage as the most effective components of the mechanism.

The target factors of international regulatory organizations have been significantly influenced. Smaller but also significant influence has factor multinational corporations.

Significant negative impact under the modelling has been obtained from corruption. Impact of corruption has the same strength as government economic policies, and is threatening results, because the implementation of mechanism of regulatory policy requires correct environment which cannot be created due to significant corruption component.

Regarding the level of target factors, the economic growth for the results is similar to the factor of integration into the EU. And the formation of a competitive national production is similar to the formation of decent living and working conditions of citizens. The results reflect the modern trends in the development and implementation of regulatory policy, which will be addressed in further research to develop scenarios of the influence of other factors.

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Correlation analysis between macroeconomic indicators and level of ratings in EU countries

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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. For many years now credit rating agencies have been an integral part of the financial market, impacting to an even greater degree the functioning conditions of countries, as their dependency on being able to finance their borrowing needs from external sources is continuously growing. Permanent budget deficits and public debt are inherent elements of contemporary public finances. The increased significance of the assessments made by the rating agencies refers closely to the dynamic 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 reflect country's ability to raise capital and its cost. The results of the analysis published in the previous article (Rólczyński, T., Kopyściański, T. (2016). Economic Condition of the European Union Countries and Level of Rating. European Financial Systems 2016, p. 654.), indicate that the ratings provided by the rating agencies are linked to the countries' economic condition. This conclusion has been drawn on the basis of Spearman's rank correlation coefficient between rating level and the aggregated synthetic measure of information provided by the individual variables describing economic condition of the country. It implicates another important research question whether there is a correlation between each macroeconomics indicator (which were included in creation synthetic variable) and the level of rating in the EU countries. Therefore the main purpose of the article is to identify which macroeconomic indicator closely refers to the level of rating in the EU countries. Within the framework of the research the macroeconomic data and the ratings issued by main credit rating agencies (Standard & Poor's, Fitch, Moody's) over the period 2014-2016 will be taken into account. To identify correlation between analyzed factors the tau-Kendall's correlation Coefficient will be used.*

Keywords: Ratings and Ratings Agencies; Economic Outlook; synthetic measure, Kendall's tau correlation coefficient

JEL codes: G240, E660, C1

1 Introduction

The contemporary financial market characterized by considerable dynamism and ever greater demand for information raises a necessity to look for universal indicators which would make the calculation, estimation and analysis of investment risk possible. In this respect, one of the more important instruments on the financial market are ratings given by rating agencies.

In literature rating is likely to be defined as an objective and independent assessment of credit risk of an entity running up debt (Dziawgo 2012). It determines the ability of a given entity to service payment obligations, thereby providing an assessment of the future investment risk related to the entity – to the issuer and instruments issued by it (Kaczmarek 2002). The assessment performed under the rating procedures is an indicator allowing one to determine the level of trust the entity enjoys. Rating is a dynamic category referring to the future and thus, as any other forecast, is burdened by some dose of uncertainty, which is why the ratings of the same entity may vary depending on the rating agency.

Rating agencies, there currently exist over 70 rating agencies worldwide, could be described as investment advice firms which, by conducting credit analysis of issuers and their issues, rate specific debts and standardize risk by bringing it down to a single comparable scale. Along with the financial market development and the popularity of obtaining capital through the issuance of debt securities, the rating agencies have become an integral part of the financial market. The most esteemed and popular are the so called Big Three rating agencies including: Fitch Ratings, Moody's Corporation and Standard&Poor's.

The increased significance of the rating agencies, in particular, for the financial viability assessment of countries has in recent years been noted at many levels. The market success of public debt securities issuance depends greatly on 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 been yet well established on the securities market. Moreover, the issuer credit assessment affects significantly the interest rates on public debts securities and consequently the public debt servicing costs. From the economic perspective, rating fulfills also a number of key functions for the participants of the financial market, particularly (Cantor R., Packer F. 1996; McClintock Ekins E., Calabria M. A. 2012):

- it enables one to estimate quickly current investment risk and by increasing investment safety it stimulates the financial market growth.
- it allows one to standardize investment risk on global financial market, thus supporting a wider application of transactions and their forms.
- rating allows entities-investors to reduce the costs of investment thanks to limiting their own analyses and facilitating diversification of their investment portfolio.
- from the issuer's perspective, rating makes it in the first place easier to win capital by issuing debt securities, as a higher rating means the debtor's greater creditworthiness.
- for an issuer having a rating (especially a high rating) represents an advancement on the international stage.

The ability to carry out all those functions is closely linked to reliability and credibility of the information included in the rating prepared. The controversies relating to the role of rating agencies in terms of the recent financial crises have given rise to numerous doubts as to to what extent rating corresponds to the country's current economic situation and to what extent it is the result of a subjective analysis carried out by the rating agencies. However, the findings based on the research presented in literature have more than once

confirmed that the assessments carried out by the rating agencies are certainly not formulated in isolation from the country's current economic condition.

Rating based on synthetic variables in econometric modeling takes into account numerous factors describing the economic situation of a particular country (McClintock Ekins E., Calabria M. A. 2012). Considering that for the participants of the financial market the function of the rating is informative, the issue that is being discussed, in theory as well as in practice, is whether the information provided by the ratings reflects the financial credibility of a country, as measured using general macroeconomic indicators (Arnoud Boot W. A. 2006). The question arising in this context is to what extent a rating reproduces the signals sent to the financial market through individual macroeconomic indicators depicting the country's economic situation. If so, does the value of a synthetic variable built on the basis of individual macroeconomic indicators shows a greater consistency with the level of ratings than the individual indicators themselves. In order to address this issue, the article makes an attempt to compare the ratings, as published by the three biggest rating agencies, of the countries examined with their economic situation within the period 2014-2016, which was adopted for the study.

2 Methodology and Data

For the purpose of this analysis, data were collected for the years 2014 – 2016 on the following variables:

Table 1 Variables used in the analysis

symbol	Variables
X1	Harmonised index of consumer prices (HICP)
X2	Budget outturn as % of GDP
X3	Public debt as % PKB
X4	the yield of 10-year-government bonds
X5	real change in GDP compared to last year, as %
X6	Unemployment rate, as %
M	Synthetic variable – country's economic situation
R1	S&P's rating
R2	Moody's rating
R3	Fitch's rating

Source: own study

The macroeconomic variables applied in the study (X1-X6) were chosen by using the expert method on the basis of the parameters most frequently considered by the rating agencies for the assessment of the financial credibility of a particular country. Based on the variables X1-X6, a synthetic variable was constructed describing the economic situation of the EU countries. The values of the M variable were obtained employing the method of standardized sums (Bartosiewicz, 1992), with the variable being constructed based on the assumptions outlined in the authors' another article (Rólczyński, Kopyściański, 2016). In line with the objective adopted in the study, the relationships between the variables X1-X6 and the variable R1-R3 (rating level), and the synthetic variable M with the variables R1-R3 will be examined with a view to determine which variable is related to the rating level to the largest degree.

The analysis will be conducted based on Kendall's tau correlation coefficient (Kendall, 1938):

$$\tau = \frac{2S}{n(n-1)}\ , \tag{1}$$

where: S is the sum +1 and -1 obtained from comparing all possible combinations of pairs in the ranking, determined in the following way: if a given pair of ranks for both variables is ordered in the same way (that is if $X_i > X_j$ and $Y_i > Y_j$ or $X_i < X_j$ and $Y_i < Y_j$) then this situation is assigned value +1. If the rank ordering is reverse (that is $X_i > X_j$ and $Y_i < Y_j$ or $X_i < X_j$ and $Y_i > Y_j$), then it has value -1.

Kendall's tau coefficient measures the degree of similarity between two sets of a series of data for the same set of objects (Abdi, 2007). Kendall's tau coefficient is based on the difference between the probability that two variables have the same ordering and the probability that their ordering is different.

Kendall's tau coefficient assumes the values inside the interval [-1; 1]. If there is a perfect agreement between the two rankings, $\tau = 1$; when it is reverse, then $\tau = -1$. Coefficient $\tau = 0$ means that there is no association between variables examined.

In order to check the significance of Kendall's tau coefficient, a relevant test (Abdi, 2007) will be applied with the following hypotheses:

$$H_0 : \tau = 0$$

$$H_0 : \tau \neq 0$$

Test statistic for the number of observations exceeding 10 (Abdi, 2007) can be transformed into Z statistic which has a normal distribution[3] and is given by:

$$Z = \frac{\tau}{\sqrt{\frac{2(2n+5)}{9n(n-1)}}} \tag{2}$$

On the basis of the determined test statistic Z, p value is read from the normal distribution which is then compared with the level of significance α. If $p \leq \alpha$, then H_0 is rejected. The test will be carried out with the significance level $\alpha = 0{,}05$. *If the null hypothesis is rejected, then the alternative hypothesis is adopted which says that the variables are dependent.*

3 Results and Discussion

The data serving as the basis for calculation and assessment of the economic situation of the EU countries were derived from the Eurostat data base, and the ratings from www.tradingeconomics.com. Calculations were made using Statistica 12 and Excell software.

Based on the data collected, the calculations were carried out in order to determine the level of the synthetic variable M describing the economic situation of the EU countries. The results are illustrated in Table 2.

Table 2 The values of the synthetic variable M for the EU countries in 2014-2016

	2014	2015	2016
Austria	0,595	0,557	0,614
Belgium	0,655	0,532	0,520
Bulgaria	0,547	0,514	0,655

[3] Z statistic has a normal distribution with a mean of 0 and a standard deviation of 1

Croatia	0,496	0,428	0,535
Cyprus	0,292	0,309	0,464
Czech Republic	0,783	0,699	0,748
Denmark	0,775	0,669	0,782
Finland	0,586	0,590	0,651
France	0,607	0,598	0,614
Germany	0,726	0,696	0,737
Greece	0,123	0,020	0,191
Hungary	0,718	0,604	0,631
Ireland	0,766	0,879	0,839
Italy	0,552	0,532	0,568
Latvia	0,678	0,638	0,751
Lithuania	0,773	0,555	0,676
Luxembourg	0,774	0,733	0,911
Malta	0,729	0,594	0,787
Netherlands	0,733	0,646	0,784
Poland	0,791	0,538	0,695
Portugal	0,512	0,444	0,468
Romania	0,604	0,575	0,688
Slovakia	0,716	0,591	0,710
Slovenia	0,672	0,502	0,705
Spain	0,486	0,383	0,555
Sweden	0,803	0,617	0,700
United Kingdom	0,648	0,646	0,633

Source: own study

Next, the values of the variables X1 – X6 and the synthetic variable M were compared with the rating level recorded for the EU countries at the end of each year and Kendall's tau correlation coefficient was calculated. The results are presented in Table 3,4 and 5.

Table 3 The values of Kendall's tau rank correlation coefficients between the synthetic variable M and the level of rating in 2014

	Kendall's tau Correlation Coefficients in 2014						
Asset symbol	**Underlined correlation coefficients are significant with p < 0,05**						
	X1	**X2**	**X3**	**X4**	**X5**	**X6**	**M**
R1	0,462312	0,014932	-0,216136	0,312668	-0,785724	-0,537433	0,429312
R2	0,456591	-0,048458	-0,258227	0,362387	-0,811869	-0,554066	0,414364
R3	0,477287	-0,021167	-0,230838	0,364830	-0,831603	-0,556198	0,422704

Source: own study

Table 4 The values of Kendall's tau rank correlation coefficients between the synthetic variable M and the level of rating in 2015

	Kendall's tau Correlation Coefficients in 2015						
Asset symbol	**Underlined correlation coefficients are significant with p < 0,05**						
	X1	**X2**	**X3**	**X4**	**X5**	**X6**	**M**
R1	0,365915	0,062915	-0,232013	0,252390	-0,771840	-0,471321	0,577059
R2	0,386013	0,018060	-0,289883	0,292818	-0,748409	-0,452552	0,522985
R3	0,396408	0,038947	-0,267708	0,279432	-0,789789	-0,453422	0,559212

Source: own study

Table 5 The values of Kendall's tau rank correlation coefficients between the synthetic variable M and the level of rating in 2016

	Kendall's tau Correlation Coefficients in 2016						
Asset symbol	**Underlined correlation coefficients are significant with p < 0,05**						
	X1	**X2**	**X3**	**X4**	**X5**	**X6**	**M**
R1	0,348405	-0,059373	-0,244991	0,112972	-0,815833	-0,373514	0,445707
R2	0,351947	-0,047571	-0,289710	0,125055	-0,778597	-0,415652	0,425697
R3	0,345401	-0,068279	-0,274508	0,118918	-0,821745	-0,370550	0,433900

Source: own study

In the light of the analysis a few key patterns emerge. First of all, the synthetic variable estimated is associated significantly with the level of ratings in each of the year under study, with the level of significance $\alpha = 0{,}05$. Apart from the synthetic variable, the following individual variables were related to the ratings in each of the years discussed:

- harmonized index of consumer prices (HICP)
- real change in GDP compared to last year, as %
- unemployment rate (X6)

It is worth pointing out that real change in GDP compared to last year expressed as % (X5) is associated with the ratings even stronger than the synthetic variable that was constructed. This observation is confirmed by the real actions of the rating agencies which are very likely to make decisions about changing the rating of a particular country in the wake of information on GDP current level and forecast for the next years. In comparison to the rest of the variables, the synthetic variable is associated clearly stronger with the level of rating. An interesting fact is that the role of the budget outturn for the assessment of the country's credibility, often addressed in the comments made by the rating agencies, shows no significant correlation with the level of rating that was given. This might, to some degree, be explained by the fact that in the analyzed years the situation became much more stable in terms of the countries' debt and current budget outturn.

4 Conclusions

The findings of the study presented here allow one to draw a few important general conclusions. On the one hand, they support the argument that the assessments made by the rating agencies are linked to countries' economic situation (Rólczyński, Kopyściański, 2016). One should, of course, 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 affect 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. On the

other hand, the strong association of the rating with one variable, i.e. the percentage real change in GDP in relation to the previous year found in the study leaves some doubts as to the advisability of constructing synthetic variables for a collective, rating-like assessment of the country's financial credibility. Considering the informative role, in particular in terms of the easiness and speed of application, it is much more convenient to use one variable than a synthetic variable constructed on the basis of the comparison of a series of mutually dependent factors. Settling this question would naturally require more in-depth studies based on the data scope covering a longer period of time, while taking into account a broader range of factors, not only quantitative but also qualitative, affecting the rating of the country's creditworthiness.

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Selected aspects of financial literacy of seniors in Slovakia

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Abstract: *The article analyses selected aspects of financial literacy of seniors in Slovakia. Financial literacy is a system of knowledge, skills and experience for effective management of personal financial resources and assets. The nature of financial literacy is to efficiently ensure adequate financial resources and effective asset management. Financial literacy is not a definitive state, but it must evolve and improve over time, and it also applies to a higher age. Knowledge, skills and experience are often conditioned by variable aspects such as age, education, personality, general outlook, culture or intuition. Pensioners with a low level of financial literacy, without basic financial knowledge and skills, cannot make good financial decisions and manage crisis financial situations. As a result of the low level of financial literacy are serious financial and property problems of many senior citizens, which are causing serious problems and crisis phenomena in the economy and across society.*

Keywords: Financial literacy of seniors, financial education, seniors

JEL codes: D14, O15

1 Introduction

The evidence of low financial literacy level of the Slovak population is a large number of deceived citizens. Many residents of the Slovak Republic, in particular seniors, believed the unrealistic promises of non-bank entities. Lot of seniors entrusted them their whole lifetime savings and eventually they lost the money. Many seniors unconsciously sign the unfavorable credit contracts with a high interest rate but even with higher penalties for delaying repayments from non-bank institutions.

As a result of inability to repay loans or increasing sanctions, is the situation when seniors possibly lose their flats and houses. Seniors are often executed. While in 2014 the number of executed pensioners was 28,000, at the end of 2017, the Social Insurance Agency in Slovakia performed up to 34,000 cases. Over the past three years, the number has increased by 6,000.

The reason for this unpleasant situation is mostly the insufficient financial literacy of seniors. Weak financial literacy could be a threat for citizens also in contact with renowned financial institutions, which often take more care of their profits than the security and satisfaction of clients. Some financial institutions and financial advisors offer to seniors so-called "sophisticated" financial products through massive advertising. Lot of seniors do not even understand that products or services very much, but when they are so "beneficial", they convince the clients. So, seniors with low financial literacy increase their debts excessively because they have chosen a loan or even a number of loans that are inconsistent with their income.

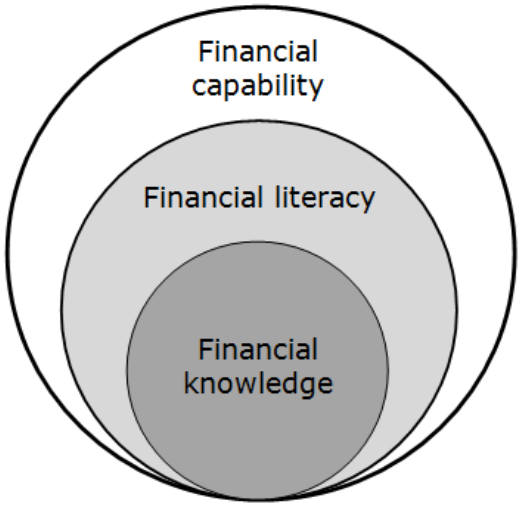
The aim of the paper is to analyze financial literacy of seniors in Slovakia and its comparison with other groups of inhabitants.

2 Theoretical background

Defining of financial literacy is relatively tough. Many authors concern with defining the concept of financial literacy. Bowen (2002) says there are three common terms in the world literature that are used as synonyms for financial literacy. These are the concepts of financial knowledge, financial literacy and financial capability.

Financial capability is a change in financial behavior through appropriate products and services that promote economic stability and long-term financial health. Individual ability based on knowledge, abilities and access to manage efficient financial resources, understanding financial products, services and concepts. Financial capability helps individuals make informed decisions, avoiding pitfalls, knowing where to go for help, and taking action to improve current and long-term well-being.

Figure 1 Relation of financial knowledge, financial literacy and financial capability



Source: own processing

Because of this relationship, there are many opinions in the world (especially in the US) that governments and educational institutions should not develop financial literacy but financial capability. However, there are also opinions standing opposite to this claim.

Financial literacy means „peoples' ability to process economic information and make informed decisions about financial planning, wealth accumulation, pensions, and debt. Endogenizing financial knowledge has important implications for welfare, and offers insights into programs intended to enhance levels of financial knowledge in the larger population." (Lusardi, Mitchell, 2013)

The definition of financial literacy according to the Ministry of Finance of the Czech Republic reads: "Financial literacy is a set of knowledge, abilities and value attitudes of citizen necessary to financially secure himself and his family in the present society and to actively perform in the market of financial products and services. Financially literate citizen orientates himself in money and pricing issues and is capable to manage personal or family budget, including management of financial assets and financial liabilities in face of changing living circumstances."

Financial literacy and financial intelligence have close links to money and financial investment. According to the first version of National Standard of Financial Literacy, (issued by the Ministry of Finance and the Ministry of Education of the Slovak Republic on October 30, 2008) financial literacy is defined as: "ability to use knowledge, skills and experience to effectively manage own financial resources to ensure lifelong financial security of an individual or household". It is a sum of abilities that are conditioned by age, family, culture, place of residence, and so on. Financial literacy is steady

development that enables each individual to respond effectively to new personal events and changing economic environment (Pavlík, 2012).

Financial literacy is a secret whose understanding and knowledge divide people into rich and poor. The essential principles of financial literacy must be understood as an entire. Its achievement it is not a one-shot act. It is not enough to complete a one-day seminar and you will be perfectly prepared. It is a life-long process that has its own stages of development (Zbojek, 2007).

Financial education is a process that improves people's understanding of different financial products and services. Financial literacy is defined as the ability to use individual knowledge and skills that people acquire to effectively manage resources providing financial prosperity (Hung, 2009).

Based on above definitions, financial literacy can be summarized into following 5 points:

- Ability to understand and evaluate numerical and financial data and information.
- Ability to create your own financial strategy, financial goals and budgets.
- Ability to know, understand and evaluate situation on financial markets.
- Ability to make good decisions and effective allocation of financial resources to assets and other assets (investing).
- Knowing, understanding and implementation of valid legislation - accounting, tax and levies system, directives, consumer protection law, etc.

For the purpose of survey Atkinson and Messy (2010) had defined financial literacy as „a combination of awareness, knowledge, skills, attitude and behaviours necessary to make sound financial decisions and ultimately achieve individual financial wellbeing".

3 Methodology and Data

Necessary data were obtained in the spring of 2017 by a questionnaire survey which identified:

- financial situation of seniors in Slovakia,
- level of financial literacy of seniors in Slovakia,
- level of financial education.

The questionnaire survey was carried out on a sample of 500 respondents, 85% questionnaires (***425 respondents***) were returned and correctly filled. Questions in the questionnaire were divided into three sets, each set of questions dealt with other issues of the survey. First set of questions was focused on financial situation; second set addressed financial literacy, and the last one concerned financial education. The questions in the survey were organized into four logically following areas:

1. demographic data (8 questions),
2. analysis of financial situation (3 questions),
3. financial literacy analysis (5 questions),
4. analysis of financial education (2 questions).

Respondents of the survey were citizens of the Slovak Republic addressed by interviewers directly in the streets. Their job was to fill in a paper questionnaire.

Frequency analysis was used to meet the survey objectives. Analysis classes the answers respondents in four basic groups. Respondents were divided into following groups: students, employees, unemployed and seniors. Group of students was made of ***103 university students*** under the age 25, in the second group were ***108 employees*** (economically active population aged between 18 and 62), third group was made of ***102 registered unemployed***, and the last group were ***112 seniors*** aged 62 and over.

4 Analysis of financial situation

In the second set of questionnaire survey was analyzed the financial situation of respondents. Four closed questions focused on financial situation of respondents. First question had identified the current financial situation of respondents. There was a choice of selection from five answers. Respondent was able to choose from: ***very bad***, ***bad***, ***average***, ***good*** or ***very good*** financial situation.

Table 1 shows that up to a quarter of Slovak seniors consider their current financial situation *very bad*, another quarter as *bad*. A *good* financial situation has only 18% of seniors and only 8% of them are *very good*. Worse results were reached only by the unemployed, where 47% of respondents are in *very bad* financial situation and almost 40% in a *bad* financial situation. According to the survey employees have the best financial situation, 13% are *very good* and 25% are in *good* financial condition.

Table 1 Present financial situation of respondents

Social group	Very bad abs. / per.	Bad abs. / per.	Average abs. / per.	Good abs. / per.	Very good abs. / per.
Students	10/9,7%	22/21,4%	33/32%	31/30,1 %	7/6,8%
Employees	21/19,4%	11/10,2%	35/32,4%	27/25%	14/13%
Unemployed	48/47%	40/39,2%	12/11,8%	2/0,02%	0 / 0%
Seniors	25/22,3%	31/27,7%	27/24,1%	20/17,9%	9/8%
All respondents	**104/24,5%**	**104/24,5%**	**107/25,2%**	**80/18,8%**	**30/7%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

The second question had find out how the financial situation will change for the future. Answer opportunities about expected future were the same.

Table 2 Future financial situation of respondents

Social group	Very bad abs. / per.	Bad abs. / per.	Average abs. / per.	Good abs. / per.	Very good abs. / per.
Students	0 / 0%	5/4,9%	31/30,1%	42/40,7%	25/24,3%
Employees	12/11,1%	17/15,7%	25/23,2%	33/30,6%	21/18,4%
Unemployed	36/35,3%	32/31,4%	18/17,7%	10/9,8%	6/5,8%
Seniors	31/27,7%	33/29,5%	21/18,7%	17/15,2%	10/8,9%
All respondents	**79/18,6%**	**87/20,5%**	**95/22,3%**	**102/24%**	**62/14,6%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

Table 2 shows the expected financial situation of respondents. There are pessimistic expectations from seniors; almost 60% of seniors expect *bad* or *very bad* financial conditions for the future. Group of students has the highest expectation, 65% of students expect a *very good* or *good* financial situation for the future. The most pessimistic group of respondents represents the unemployed, where almost 67% of them assume a *bad* and *very bad* financial situation.

The third question had find out how many respondents are able to save monthly money from their disposable income.

Table 3 Savings per month

Social group	Nothing abs. / per.	1 – 100€ abs. / per.	101 – 200€ abs. / per.	201 - 300€ abs. / per.	More than 300€ abs. / per.
Students	88/85,4%	12/11,7%	3/2,9%	0 / 0%	0 / 0%
Employees	38/35,2%	32/29,6%	20/18,5%	11/10,2%	7/6,5%
Unemployed	96/94,1%	5/4,9%	1 / 1%	0 / 0%	0 / 0%
Seniors	52/46,4%	28/25%	21/18,6%	9 /8,1%	2/1,9%
All respondents	**274/64,5%**	**77/18,1%**	**45/10,6%**	**20/4,7%**	**9/2,1%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

Monthly savings of seniors are relatively low, almost half of seniors (46.4%) save nothing. Only every third senior saves up to 100 euros. Over 300 euros savings dispose only 2% of seniors. Best savings have employed respondents. One third of employees save up to 100 euros, 18.5% of employees save from 101 to 200 euros. Up to 94% of people without work do save any money.

5 Analysis of financial literacy

In the third set of questions, financial literacy of survey participants was analyzed. The set contained 5 closed questions. First one was about financial literacy level in the opinion of respondents. Answers are summarized in following Table 4.

Table 4 Feeling level of financial literacy

Social group	Very bad abs. / per.	Bad abs. / per.	Average abs. / per.	Good abs. / per.	Very good abs. / per.
Students	5/4,9%	14/13,6%	35/34%	26/25,2%	23/22,3%
Employees	6/5,6%	13/12%	46/42,6%	27/25%	16/14,8%
Unemployed	14/13,7%	15/14,7%	42/41,2%	23/22,5%	8/7,8%
Seniors	17/15,2%	15/13,4%	54/48,2%	19/17%	7/6,2%
All respondents	**42/9,9%**	**57/13,4%**	**177/41,6%**	**95/22,4%**	**54/12,7%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

Next four questions from this set were aimed at identifying real level of financial literacy of respondents. Respondents had to answer questions about interest rates, bank products, investment funds and life insurance. If respondent answered all 4 questions correctly, his literacy was considered *very good*. Three correct answers meant *good* financial literacy, two correct answers *average* financial literacy, one correct answer was result *bad* and no correct answer meant *very bad* level.

Table 5 Real level of financial literacy

Social group	Very bad abs. / per.	Bad abs. / per.	Average abs. / per.	Good abs. / per.	Very good abs. / per.
Students	7/6,8%	16/15,5%	41/39,8%	22/21,4%	17/16,5%
Employees	8/7,4%	17/15,7%	48/44,4%	21/19,4%	14/13%
Unemployed	26/25,5%	29/28,4%	33/32,4%	13/12,7%	1 / 1%
Seniors	29/26%	37/33%	35/31,3%	9 / 8%	3/2,7%
All respondents	**70/16,5%**	**99/23,3%**	**156/36,7%**	**65/15,3%**	**35/8,2%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

Based on Tables 4 and 5, we can say there is a huge degree of disproportion between perceived and real level of financial literacy in Slovakia. Disproportion was most pronounced among seniors and unemployed. Only 15.2% of seniors feel that they have very poor financial literacy, but in real up to 26% of them have a very poor financial literacy. Only 13.4% of seniors feel they have poor financial literacy, but in real have a poor literacy up to 33% of them. A good and very good level of financial literacy is assumed by up to 25% of the seniors, but only less than 11% of seniors have a good or very good financial literacy.

The smallest disproportion between perceived and real financial literacy degree is in the group of students and economically active inhabitants of Slovakia. In their case, the perceived and real degree of financial literacy differs much less. For example, 18.5% of students think they have a bad and very bad level of financial literacy, but in real it is only 22.3% of students; 41% of employees think that they have average level of financial literacy; actually 32.4% of them belong to average level group.

6 Analysis of financial education

Fourth set of questions analyzed respondents' relationship to financial education. First question was focused on the importance of financial education in human life. The question was closed and the respondents had a choice of five options: ***certainly not, rather not, rather yes, certainly yes*** or ***I do not know***.

Table 6 Importance of financial education for life

Social group	Certainly no abs. / per.	Rather no abs. / per.	Rather yes abs. / per.	Certainly yes abs. / per.	I don't know abs. / per.
Students	3/2,9%	7/6,8%	27/26,2%	66/64,1%	0 / 0%
Employees	0 / 0%	11/10,2%	43/39,8%	52/48,1%	2/1,9%
Unemployed	17/16,7%	21/20,6%	25/24,5%	34/33,3%	5/4,9%
Seniors	12/10,7%	16/14,3%	28/25%	53/47,3%	3/2,7%
All respondents	**32/7,5%**	**55/12,9%**	**123/28,9%**	**205/48,2%**	**10/2,4%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

The objective of second questions was to identify frequency of financial education. How many times did respondents participate in financial education? The question was also closed and respondent had choice of five answers.

Table 7 Frequency of financial education during life

Social group	Never abs. / per.	1 times abs. / per.	2 times abs. / per.	3 times abs. / per.	4 and more times abs. / per.
Students	12/11,7%	56/54,4%	26/25,2%	6 /5,8%	3 /2,9%
Employees	53/49%	45/41,7%	9/8,3%	1 /0,9%	0 / 0%
Unemployed	69/67,6%	28/27,5%	5/4,9%	0 / 0%	0 / 0%
Seniors	87/77,7%	19/16,7%	4/3,6%	0 / 0%	2/1,8%
All respondents	**221/52%**	**148/34,8%**	**44/10,4%**	**7/1,6%**	**5/1,2%**

** abs. - number of respondents in absolute numbers / per. - percentage of respondents*
Source: result of own questionnaire survey

All population groups consider financial education to be important. Up to 72.3% of seniors think financial education is important to their lives. The importance of financial education was confirmed by 90.3% of students and 88% of employees. Somewhat surprising are the results for unemployed people where up to 37.3% of them think that financial education is not important for life.

Survey results about the frequency of financial education during respondents' life are alarming. Over 77% of seniors, 67.6% of unemployed, 49% of employees and almost 12% of students have not even once completed some financial education; 16.7% of seniors, 27.5% of unemployed, 42% of employees and almost 55% of students took part in financial education in any form.

7 Results and Discussion

Evidence from the whole world, but particularly available data about economic development of the EU States suggest that illiteracy in financial sector is one of the factors contributing to emergence of financial crises. The inability to make qualified financial decisions under current conditions increasingly negatively affects normal life of people. According to an independent agency Focus survey, the average level of financial literacy of Slovaks is 62.5%. We think that the poor level of financial literacy is firstly due to absence of general basic economic and financial education at elementary and secondary schools. As the basic principles of mathematics are taught, basic economic principles and the nature of financial processes should also be taught. Our survey supports these contentions.

Inter alia the survey results say, there is a clear trend that residents of Slovakia, including seniors (77%), consider financial education to be important, but only 48% of Slovaks have participated in some financial courses or financial education trainings. This situation is very unfavorable and requires prompt solutions.

Seniors in Slovakia could, in our opinion, be educated at least in the following areas:

- **Money** - money development and function, money market, demand for money, money supply, payment system.
- **Financial planning** - financial market institutions, product prices in the financial market, consumer protection in the financial market.
- **Bank system and bank products** - bank system in the Slovak market, commercial banks, types of banking activities, correct selection of bank products, Internet banking, payment by contactless card.
- **State pension scheme** - definition of pension and basic legal conditions for entitlement to old-age pension.
- **Loans** - institutions providing loans, forms of short-term loans, forms of long-term loans, risk of execution.
- **Savings and investing.**
- **Insurance** - insurance of persons and property, life and non-life insurance.
- **Taxes.**

8 Conclusion

Identifying the starting points for supporting financial literacy of Slovak citizens is relatively demanding and complicated. Long-term trends show that the complexity and intricacy of financial products and services are steadily increasing. Citizens are offered products and services by a wide range of subjects, especially banks, insurance companies, financial intermediaries and other financial institutions. Under the long-term impact of various factors and aspects, household indebtedness is rising steadily, poverty is rising, and the number of households with economic and existential problems is growing. People are affected by advertising and other marketing and media tools. Increasingly, they do not want to postpone their consumption in the future, so they buy

goods and services using mortgage and consumer loans, use hire purchase, financial and operational leasing.

If individuals are to avoid financial problems, they need to make qualified financial decisions; witch can have a significant impact on their budgets and financial stability, even across generations. Fast and good financial decisions are usually result of a sufficient level of financial literacy, financial knowledge, and skills of individuals and households. It is not only a chance. Building a society that supports and develops financial literacy of its population (of all ages) is very important and requires a long-term vision and strategy.

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Research of Public Financing Efficiency of Social Well-being in the Russian Federations' Regions

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Abstract: *In the knowledge-based economy, the main objective of public finance management is becoming the social well-being maximization that is achieved through the implementation of effective financial policy. It is based on the optimal structural distribution of financial resources between the industrial and non-productive sectors, combined with innovative techniques in public financial management. This policy is directed to well-being growth of the population and investing in human capital. So, the aim of the paper is to research the public financing efficiency of social well-being in the Russian Federations' regions. Author's technique has been developed for determining a consolidated standardized indicator, which assesses the social well-being level of territories. It is based on a specially formed system of indicators. A qualitative social well-being condition of the population is proposed to be quantified by a number of indicators included in the assessment criteria system. It consists of two indicators' groups: indicators of investing in human capital (health care, education, social protection, spiritual wealth), as a fundamental value of the modern society and indicators of financial provision in the spheres which determine social well-being. The methods of economic, system analysis and mathematical statistics are used in this research. Approbation of proposed technique is carried out on official statistical data for 2015 from open databases of the Federal State Statistics Service and the Federal Treasury of the Russian Federation. As a result, the rating of the regions is constructed on the basis of the developed technique for assessment of social well-being financing efficiency. The consolidated standardized indicator of investing in the human capital and the financial provision of the social well-being spheres allows to carry out a quantitative evaluation of leaders and outsiders among researched regions. It also makes it possible to develop effective administrative decisions in order to achieve the social well-being maximization.*

Keywords: social well-being, public financing efficiency, investing in human capital, consolidated standardized indicator, rating

JEL codes: I31, I38, H5, H75

1 Introduction

Systematic formation and development of the knowledge economy is based on the principles of value-oriented approach, where a human being is the main value. So, satisfaction of the total aggregate of human necessities, which is shown in maximization of the population social well-being level, becomes today the main direction of public financial investments. And due to dramatic limitedness and insufficiency of public resources, the relevance of researching and analyzing the efficiency of investing and using budgetary funds grows. Optimal industry specific and territorial distribution of public financial resources shall be based on the principles of result-oriented budgeting. Increase in the efficiency of using funds is also achieved by applying an innovative

approach to public finance management, which is expected to foster the population social well-being growth.

The basis of the long-term social and economic development of Russia till 2020 is implementation of a public policy oriented at the country's population social well-being. Thus, the society is formed based on trust to and responsibility of public and private economic institutions. A decrease in social polarization is expected due to social mobility and implementation of the social policy aimed at support of the vulnerable segment of the population. The middle class will comprise more than half of the population, while its significant part will be formed by people engaged in creating a new knowledge economy, technologies and ensuring the development of a human being.

The issues of studying social well-being and the efficiency of its financing are resonating widely in the scientific community. These issues are raised by many philosophers, political scientists, economists, psychologists, cultural scholars, healthcare professionals, religious figures, etc. in their works.

Population social well-being is determined by the economic development of a country, which directly depends on the level and quality of the human capital development. It explains why one countries are prosperous, while others are poor. As early as in the 18th century, A. Marshall stated that the most valuable of all capitals is the capital of investing in people. Exactly humans may and should foster growth in income by acquiring various skills and accumulating knowledge. Health care and education supplement to a full extent other aspects of progress, such as receiving income and fighting poverty. Human capital includes aggregate accumulation of investments in education, occupational training and health care, that increase people's productivity (Becker, 1975).

At the macro-level, investments in the human capital are 'growth engine' (Lucas, 1988). So, education may have an impact on economic growth, while developing the people' ability to make technological innovations and increasing the speed of technological diffusion (Nelson and Phelps, 1966). Improvement of the human capital will allow people to reach a wider set of opportunities to increase their well-being and welfare. In practice the human capital is typically measured by several indicators: literacy level, primary and secondary schools, life expectancy, higher education institutions, etc. (Clark, 2006). In the conditions of the knowledge economy the A. Marshall's words turned out to be prophetic, that is why there is no better investing for developing countries than investing in the human capital.

While focusing our attention at the well-being concept, let us look at the works dedicated to the subjective well-being of a human (Helliwell, 2003; Cracolici et al., 2012). The key aspect is to reveal the links between social capital, education and well-being. The use of large international samplings of individual respondents' answers allows to simultaneously reveal well-being determinants at individual and social levels (Helliwell, 2003). The importance of a 'comparative income' for individual well-being was noted by Ferrer-i-Carbonell (2005). The indicator of satisfaction with life is used as a measure of individual well-being. People are the more happier, the larger their income is in comparison with the income of a reference group. Financial stringency has an impact on subjective well-being, but the effect is weakened depending on the level of education and availability of a housing (Cracolici et al., 2012). Growth in people's income depends on the level of their education, which requires long-term and large-scale investments (Giziene, 2012).

A study of the efficiency of financing of public expenses for education and health care (Gupta et al., 2002) in 50 countries showed that an increase in public expenses for these fields is related with an improvement of both an access to schools, and their achievements, a decrease in infant and children mortality rates. The model of education regression are stable to various specifications, but the interrelation of expenses for health care and mortality is more weak.

An assessment of the efficiency of allocations to education in countries based on the data of UNESCO showed that the correlation of accumulation of the human capital and GDP growth is not high in countries with non-efficient distribution of expenses for education, but it is significant and positive in the countries with a better quality of management of allocations to education (Judson, 1998). Fostering higher education may increase the rates of accumulation of the human capital and mitigate negative consequences of a slow-down in the labor force growth (Annabi et al., 2011). However, this impact depends on the efficiency of public expenses for education.

The issues of fostering investments in the human capital and assessing their efficiency attract scholars' interest and have an ambiguous nature (Ahmed and Krishnasamy, 2013; Kozuń-Cieślak, 2013). An assessment of the efficiency of public investments in the human capital using the Data Envelopment Analysis (DEA) linear programming method was carried out in EU member states (Kozuń-Cieślak, 2013). The results show that among 25 EU member states (except for Cyprus and Malta) there are no significant differences in the efficiency of public expenses for building up the human capital. The DEA method allowed to identify a group consisting of 15 efficient economies, in which the human capital state corresponds to the financial funds allocated for its building up. The assessment using the DEA method showed the degree of conversion of the funds invested into the potential of a society's health and knowledge. So, 'the most effective' country does not necessarily coincide with the country with the highest levels of the health care and education system, and vice versa. This allows to suggest that public funds for health care and education in a country are not used in the best possible way.

Gromova and Shaftelskaya (2017) studied the interrelations of the public policy objectives and citizens' well-being. As a result, it was found out that the efficiency of the fiscal policy, and as a consequence, the improvement of the citizens' life quality and nation's well-being depend on performance of state obligations and responsibilities.

The author Hlushchenko (2016) suggested a method of assessing and measuring well-being stability approved on the basis of data on Ukraine. The well-being financing indicator includes the sum of assets financed out of the public funds for environment protection, health care, spiritual and physical development, education, social protection and financial assets of households. It was found out that there was a correlation between the sum of well-being financing and an average expected life expectancy at birth.

Within the framework of the study the social well-being of the territorial population should be understood as such qualitative state of the human capital development, when a society and each individual within the society in the existing social economic and regulatory legal conditions is timely and fully satisfied with the level and quality of his/her life and satisfies his/her basic needs (for support of material welfare, maintaining health, safety, education, cultural enrichment, etc.) or has such an opportunity.

The objective of this work is to study the efficiency of public financing of the population social well-being (using the examples of regions of the Russian Federation) by applying a developed author's method.

2 Methodology and Data

Under the circumstances of increase in the efficiency of spending budgetary funds, taking into account the reference points of the public policy implemented both in Russia and in the rest of the world, it is evident that one needs to study and develop methodological approaches to assess the social well-being level of territorial population taking into account a specially formed system of indicators.

The methodology shall comply with the ease of use requirement conditioned by the accessibility and reliability of source information. So, it is suggested to use in assessments official data from open databases of the Federal State Statistics Service and the Federal Treasury of the Russian Federation.

In the development of the methodology, the issue of selecting the implementation methods and initial set of indicators becomes non-trivial. So, unjustified use of complex methods and excess number of indicators may result in loss of simplicity and unambiguity when interpreting received results, as well as in difficulties related to repeatability of such results. That is why the basic principle is not to multiply beings without necessity. The result shall represent a summarized, unambiguous measurement, index. Depending on the index values one may easily put in order the multitude of the studied regions by the level of efficiency of financing the territorial population social well-being.

So, to achieve the study objective a methodology is being developed of determining a consolidated standardized indicator allowing to assess the efficiency level of financing the territorial population social well-being. It is suggested to quantitatively measure the qualitative state of the population social well-being by a number of indicators included in the criteria system used to assess the social well-being.

The selection of indicators is based on the principles of the balanced system of indicators (BSC) theoretical concept (Best practices Benchmarking Report, 1999): data reliability; data sufficiency (several dozens of indicators); data significance (use of indicators directly related to population social well-being); sampling diversity; ambiguity (the useful effect is expected to monotonically change along with an indicator value).

Two groups of indicators (in total more than 50) have been formed:

- indicators characterizing the efficiency of investing in the human capital (healthcare, education, social protection, spiritual wealth) as the fundamental value of the modern society development,
- indicators of financial support of the fields determining social well-being.

Model Specification

Calculated individual indicators allowing to assess social well-being may have various dimension, importance or weight. And carrying out a comprehensive assessment based on the whole set of indicators requires to bring them to a non-dimensional form, to a unified zero reference point, to a unified variation interval. It is suggested to standardize the indicators, which will allow to adjust the value range in accordance with the conversion functions for added convenience when comparing them. The authors use a method based on linear conversion of initial indicators, within which standardized indicators are determined according to the formulas (1) and (2), and their values fall within the specified interval from 0 to 1 (see Table 1).

Upon conversion the indicator dimension disappears, but a fine structure of changes in certain indicators remains. Now one has the possibility to compare them and display in a unified coordinate system, as well as to aggregate the calculated indicators in the context of the specified groups (Yashina et al., 2015).

Standardization is carried out taking into account the impact on the social well-being level of the territorial population. An increase in value of one indicators results in decrease (‘negative effect’, the lower the coefficient value, the better), and an increase in value of other indicators results in growth (‘positive effect’, the bigger the coefficient value, the better). As an example, a fragment of sampling of the indicators is shown in Table 1.

Table 1 Systematization of indicators by direction of impact on the comprehensive assessment of the population social well-being in regions of the Russian Federation

Indicator group name / indicators	
Group 1 'Efficiency of Investing in the Human Capital'	
'Negative effect' indicators (oppositely directed)	**'Positive effect' indicators (co-directed)**
Number of deaths per 1,000 people of the population	Number of births per 1,000 people of the population
Infant mortality per 1,000 live births	Surplus of births over deaths
Average number of visiting ambulatory and outpatient institutions per one resident a year	Sufficiency of medical personnel for 10,000 residents
Number of population with monetary income below the minimum subsistence level (in % of the total number of the population of a constituent entity)	Number of theater viewers and visits to museums per 1,000 people
Number of children with disabilities under 18 receiving social benefits per one resident in average	Library stock per 1,000 people
Group 2 'Financial Support of Social Well-being'	
'Negative effect' indicators	**'Positive effect' indicators**
Compulsory payments and various contributions in % of the total volume of monetary income of the population	Gross regional product per capita across the constituent entities of the Russian Federation, RUB/person
	Healthcare related expenses in relation to the number of population, RUB/person
	Ratio of average wage of doctors and health workers with higher education, %,
	Expenses for implementation of social support measures aimed at certain categories of citizens, RUB/person
	Amount of the monthly child allowance established in the constituent entities of the Russian Federation, RUB/month
	Actual amount of appointed pensions (in % to the previous year)
	Education related share of expenses in gross regional product, %

Source: prepared by the authors

Calculation of standardized indicators is carried out according to the formulas (1) and (2):

- 'Negative effect' indicators:

$$X_{ij}^{*} = \frac{X_{ij} - X_{i\,min}}{X_{i\,max} - X_{i\,min}},\ 0 \le X_{ij}^{*} \le 1. \qquad (1).$$

- 'Positive effect' indicators:

$$X_{ij}^{*} = \frac{X_{i\,max} - X_{ij}}{X_{i\,max} - X_{i\,min}},\ 0 \le X_{ij}^{*} \le 1. \qquad (2),$$

where X_{ij} is the calculated value of the i[th] coefficient of the system of social well-being level indicators among the population of the j[th] region, X_{ij}^{*} is the standardized indicator of the i[th] coefficient of the system of social well-being level indicators among the population of the j[th] region, $X_{i\,max}$ is the highest calculated value of the i[th] coefficient, $X_{i\,min}$ is the lowest calculated value of the i[th] coefficient.

Actual values of individual indicators may be applied to compare the levels of population social well-being in various regions in the dynamics over a number of years. They can

also be used to compare a specific state of a region with similar indicators of other constituent entities of the Russian Federation in the context of directions of investments in the human capital. The statistics of the coefficient data for a long period may be considered as a reference point to form standards when implementing a result-oriented budgeting policy. Subsequently, the state, when the coefficient values included in the criteria system used to assess the population social well-being are within the limits of standard values and are characterized by positive dynamics, is interpreted as a stable state of the population social well-being in a constituent entity of the Russian Federation.

The final position of a constituent entity of the Russian Federation is determined by the value of a consolidated standardized indicator allowing to assess the population social well-being level (X_{cons}^{*SW}). It is calculated as the sum of values of all individual standardized indicators of the assessment describing the efficiency of public financing of the population social well-being (3).

X_{cons}^{*SW} is compared with the pre-determined by an expert method threshold values of consolidated standardized indicators for 3 classes of regions based on the most and the least successfully developing regions, as well as based on the scope of variation of the coefficients within the whole set of 85 regions. The constituent entities of the Russian Federation are distinguished, which relate to the classes of efficient, poor and satisfactory management of public financing of social well-being.

$$X_{cons\ j}^{*SW} = \sum X_{ij}^{*} \quad (3),$$

where $X_{cons\ j}^{*SW}$ is the consolidated standardized indicator allowing to assess the population social well-being level in the j[th] region of the Russian Federation.

$X_{cons\ j}^{*SW}$ can be represented by integrating the enlarged (by summing up) standardized indicators of the j[th] region of the Russian Federation in the context of the key areas of the human capital determining the efficiency of public financing of social well-being. The enlarged standardized indicators are formed, of the efficiency of managing public financing of health care ($X_{\text{cons}\ j}^{*\text{HC}}$), social protection ($X_{\text{cons}\ j}^{*\text{SP}}$), education ($X_{\text{cons}\ j}^{*\text{EDU}}$), spiritual wealth — culture ($X_{\text{cons}\ j}^{*\text{C}}$) of the j[th] region (4).

$$X_{cons\ j}^{*SW} = X_{\text{cons}\ j}^{*\text{HC}} + X_{\text{cons}\ j}^{*\text{SP}} + X_{\text{cons}\ j}^{*\text{EDU}} + X_{\text{cons}\ j}^{*\text{C}} \quad (4).$$

The lower the value of a consolidated standardized indicator allowing to assess the social well-being level $X_{cons\ j}^{*SW}$, the more efficient public financial policy and the more qualitative management of public investments in the human capital of a specific region of the country is.

This methodology allows to build a rating of the constituent entities of the Russian Federation by size of the values X_{cons}^{*SW} taking into account the 'clipping' of regions by the classes of efficient, poor and satisfactory management of public financing of social well-being.

3 Results and Discussion

Practical implementation of this methodology was implemented based on the sampling of data of 85 regions of Russia in 2015. A comparative rating of regions by increase of the value of a consolidated standardized indicator allowing to assess the social well-being level is shown in Table 2.

Table 2 Rating of constituent entities of the Russian Federation based on the results of the methodology approbation, 2015 (a fragment)

Constituent entity of the Russian Federation	$X^{*\mathrm{HC}}_{\mathrm{cons}\ j}$	$X^{*\mathrm{SP}}_{\mathrm{cons}\ j}$	$X^{*\mathrm{EDU}}_{\mathrm{cons}\ j}$	$X^{*\mathrm{C}}_{\mathrm{cons}\ j}$	$X^{*SW}_{cons\ j}$	Place
1 Class 'Efficient Management of Public Investments in the Human Capital'	23.73	22.42	2.92	3.04	52.09	1
Yamalo-Nenetsk Autonomous District	32.84	25.42	4.67	3.66	66.59	2
Khanty-Mansiysk Autonomous District	33.28	25.01	4.92	4.50	67.71	3
Kamchatka region	32.50	26.34	5.56	3.84	68.24	4
Moscow	39.73	23.76	3.66	1.65	68.79	5
Magadan region	34.62	26.01	5.76	3.70	70.10	6
Saint Petersburg	38.59	29.16	4.65	1.08	73.48	7
	...					
Krasnodar region	41.72	34.67	5.36	4.00	85.75	26
Leningrad region	42.26	33.45	5.74	4.39	85.83	27
Republic of Dagestan	39.68	35.33	6.65	4.49	86.15	28
Perm region	41.46	35.26	5.73	3.75	86.20	29
Novosibirsk region	41.19	35.11	6.31	3.90	86.52	30
2 Class 'Satisfactory Management of Public Investments in the Human Capital'	42.55	34.25	6.10	3.86	86.75	31
	...					
Nizhny Novgorod region	44.91	34.89	5.72	3.22	88.74	43
	...					
Altai region	45.02	37.67	6.92	4.09	93.68	76
Kurgan region	44.98	37.69	7.23	4.06	93.95	77
Republic of Mordovia	46.43	37.08	6.69	3.85	94.05	78
	...					
3 Class 'Poor Management of Public Investments in the Human Capital'	50.84	41.46	8.13	4.88	105.32	83

Source: authors' calculations based on the data of the Federal State Statistics Service and the Federal Treasury of the Russian Federation

The leading positions in the 2015 rating are held by the regions where the public financial policy is the most efficient, but no representatives of the first class were revealed. The structural distribution of financial resources in the leading regions among the production and non-production branches is the most rational and close to the optimal variant. Flourishing regions are distinct for implementation of the best result-oriented practices, for managing public financing in the conditions of the knowledge economy. The policy of public financing of the population social well-being in these regions proves to be efficient. This is confirmed by the indicator values: high birthrate and life expectancy, high actual amount of pensions goes along with low mortality rates and large volumes of gross regional product per capita, low number of population with monetary income below the minimum subsistence level.

The numerical assessment has unambiguously shown that the first class and lagging regions are not necessarily characterized by all the best and all the worst indicators, respectively, regarding health care, social policy, culture and education. For instance, the Novosibirsk region and the Republic of Dagestan by the majority of the indicators fall within the 'poor' class of managing public investments in the human capital. Nevertheless, a comprehensive assessment allowed to determine them within the 'satisfactory' class. The Nizhny Novgorod region, according to its indicators in the field of education and cultural field, shall fall within the middle group of efficiency, but it turned out to be not enough to mitigate the adverse effect of other factors: health care and

social protection. The received results coincide with conclusions received by other researchers (Kozuń-Cieślak, 2013).

The defining moment is not the total amount of investments in the human capital, but the quality of satisfaction of the society's needs, implementation of socially-oriented programs taking into account the public investments: creation of opportunities for receiving modern education of various specializations and levels; receiving affordable and qualitative health care with the use of innovative methodologies and technologies; ensuring security of the citizens; having an opportunity of cultural development, enrichment, personal fulfillment.

Otherwise, a stable progressive development of the country in the conditions of the knowledge economy is not possible.

4 Conclusions

The developed consolidated standardized indicator of the efficiency of investing in the human capital and financial support of the fields determining social well-being allows to carry out a numerical assessment of the territorial leaders and outsiders, as well as to develop efficient managerial decisions to achieve the maximization of the social well-being. The authors have determined that a critical value of a specific indicator of the assessment system (of an enlarged indicator in separate fields of financing of the human capital) does not pose a threat to the population social well-being as a whole. However, this is a signal to strengthen control over spending funds in the corresponding field. So, competent public authorities shall primarily rely on the following: permanent monitoring of both each separate indicator and the whole system of indicators in their interrelatedness; in-depth analysis of separate economic objects and processes when the criteria dynamics deviate from the normal trajectory; orientation of taken managerial decisions at the value of humans.

The analysis of the results of the suggested methodology approbation confirms its consistency in whole. The formed system of indicators to a large extent characterizes the population social well-being in various regions and in the country as a whole. The actual level of the population social well-being in 2015 corresponds to the final rating of regions according to the comprehensive assessment of the efficiency of public financing of the social well-being, while truly depicting the human capital state and trends of non-production fields development.

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The impact of barriers in the access to financial products and services on the financial exclusion of the generation 50+ in Poland

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***Abstract**: Financial exclusion is defined by the European Committee as a situation in which a person encounters difficulties in both access to as well as the usage of financial products and services at the level required to meet his/her needs. The idea beyond is also to enable them to lead a normal social life. It is necessary to point out that the access to financial products is understood as a possibility to use them under reasonable economic conditions. Among those most endangered by financial exclusion are, inter alia, elderly people because their reluctance to accept new technologies and opportunities provided by financial markets is much bigger than that one of younger generations. There is much evidence for that statement, some of it being the ratio of underbanked elderly people which in Poland for the aged 55-64 and over 65 is 32% and 57% respectively, with the average for the whole country population - approx. 23%. The question arises as for the reasons for such a situation and that is why the aim of this paper is to analyse the existence of barriers in the access to financial products and to verify their influence on the diagnosed higher level of financial exclusion of the generation 50+. To analyse the factors influencing behaviours of senior citizens on the financial markets, the research in the form of questionnaire sent to the group of approx. 380 citizens of the Lublin region in Poland was conducted. The results indicate that, while cooperating with financial institution, elderly people are aware of the barriers they meet such as modern technology, a professional and incomprehensible language, extensive or scarce range of banking services ,etc. However, these barriers do not constitute statistically significant factors in the high underbanked ratio of this generation.*

Keywords: financial exclusion, usage of financial products, personal finance

JEL codes:D14, D83, G2

1 Introduction

The concept of financial exclusion was first described by A. Leyshon and N. Thrift in the 1990s in the context of lack of access to financial services due to geographical barriers. Only in subsequent years they began to be applied to describe the investigated phenomenon, also as an effect of a broader spectrum of restrictions on access to the banking sector (Polasik, Piotrowska, 2014).

For a profound study of these issues, the definition given in the EU Report (2008) seems to be essential. It goes as follows: ”Financial exclusion refers to a process whereby people encounter difficulties accessing and/or using financial services and products in the mainstream market that are appropriate to their needs and enable them to lead a normal social life in the society in which they belong”. A number of further studies on these issues either refer directly to this definition or largely reproduce it (Buckland, 2012).

The above-mentioned Report of the European Commission and the subject literature often refer to narrower areas of financial exclusion. Given the importance of the banking secto,most often indicated is banking exclusion or exclusion from particular banking

services, i.e. transactions, credits or savings. Less frequent is the research conducted in the area of exclusion from insurance services (Leeladhar, 2006; Byrne et al., 2005).

The subject literature expands and develops the knowledge on financial exclusion also in other areas.

There are different internal and external reasons for financial exclusion. Among them are the barriers in the access to financial products. This is the subject matter of this article as its aim is to analyse the existence of barriers in the access to financial products and to verify their influence on the diagnosed higher level of financial exclusion of the generation 50+.

2 Financial exclusion among 55+ in Europe

The first problem is identification of factors contributing to financial exclusion. The research in this area brought to the attention, among others, geographical factors and thus geographical access to banking services (Leyshon and Thrift, 1995), low incomes of market participants, and so, inability to use selected financial services (Gloukoviezoff, 2006) as well as the changes in the social area, which affects the lower financial independence mainly the one of the young (Anderloni and Carluccio, 2006).Relevant considerations regarding the subject were systemized in the Report of the European Commission which in a more detailed way distinguishes three groups of factors affecting financial exclusions: demand, supply and social. At the same time, on the basis of the research run in 2007 in 14 countries (The UK, the Netherland, Spain, Slovakia, Poland, Norway, Latvia, Italy, Ireland, Germany, France, Bulgaria, Belgium and Austria), some particular factors were identified and categorized by the number of states where a given cause was noted (Table 1).

Table 1. The reasons for financial exclusion in selected EU member states

Type of factors	Factor	Number of countries with identified cause of financial exclusion
Social factors	Demographic changes technological gap	10/14
	Labour market changes	8/14
	Income inequalities	8/14
	Liberalisation of markets - less attention to marginal market segments	6/14
	Liberalisation of markets - disappearance institutions targeted to low income	5/14
	Social assistance	5/14
	Demographic changes overindebted	4/14
	Money laundering rules/Identity checks	3/14
	Fiscal policy	3/14
	Demographic changes - young	2/14
	Demographic changes – migrants/minorities	2/14
	Cash is common	1/14
Supply factors	Risk assessment	8/14
	Marketing	8/14
	Geographical access	7/14
	Product design (terms and conditions)	7/14
	Service delivery (e.g. internet)	7/14
	Complexity of choice	7/14
	Price	4/14
	Type of product	1/14
a n d fa	Concern about costs	8/14
	Belief that not for poor / low self esteem	8/14

	Fear of loss of financial control	7/14
	Mistrust of providers	7/14
	Preference for alternative providers and cultural factors	4/14
Demand factors	Religion	4/14
	Opposition to use	4/14
	Bad past experience	1/14
	Fear of seizures	1/14

Source: Financial Service Provision and Prevention of Financial Exclusion, Report of the European Commission, March 2008, p. 45

The second area identified in the subject literature is the impact of knowledge on the level of exclusion from financial services. The research done in this respect underlines the rapid development of financialization, which, on the one hand, makes the society more dependent on financial industries, and, on the other, aggravates the problem of persons excluded; due to their financial knowledge, they are not able to function properly on the market. The problem is increased by financial institutions themselves as they do not have any policy measures targeting this very group of customers. Consequently, there appears an issue of the rationale for implementing educational programmes aimed at those groups with the highest risk of financial exclusion (c.f. Atkinson and Messy 2012; Buckland 2014; Solarz, 2013; Iwanicz-Drozdowska, 2011).

Another area analyzed in the literature is the impact of information technologies on the level of financial exclusion. This research indicates that the arrival of new solutions in access to financial services and their distribution systematically increase the level of financial exclusion, mainly for senior citizens (Salovaara et al., 2010). It should be pointed out, however, that not only technological development contributes to limited access to financial services in this very group. The elderly often feel to be outside the financial services sector also because of their psychophysical limitations or economic knowledge they hold. Equally important are the activities of banks themselves which make such exclusion even more intensified for these kind of persons (Czechowska, 2013). This situation gives rise to carry out profound research on factors determining a lower percentage of the use of financial services by elderly persons, and so, it is the subject of the studies presented in this publication.

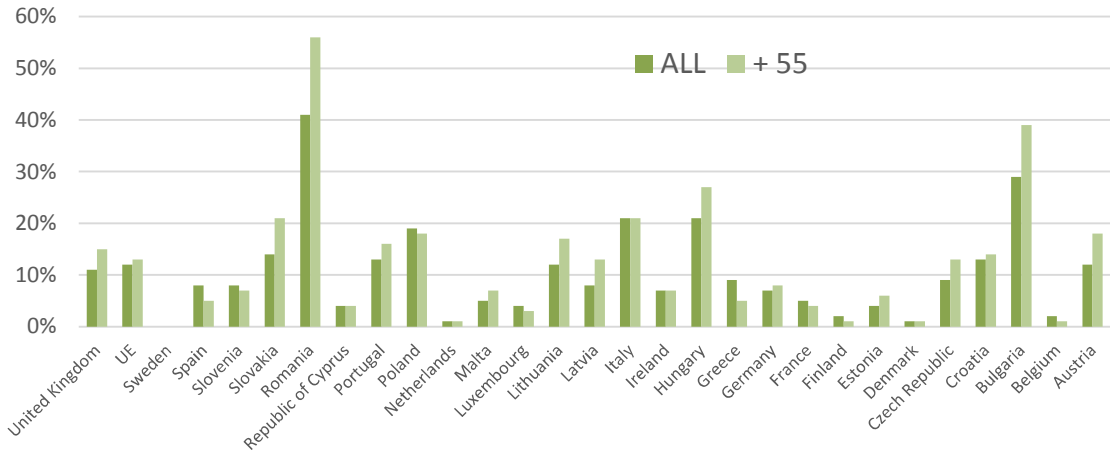
The level of financial exclusion of persons above 55 years of age in the individual Member States of the European Union

The analysis of financial exclusion was carried out on the basis of the results from the Eurobarometer survey of April 2016. The survey was conducted in individual EU countries and indicates the use of the following financial services: current bank account, savings account, mortgage loan, credit card, personal loan, shares or bonds, investment fund, life insurance, car insurance, private health insurance, other insurance products and services. The research will be analyzed separately for respondents aged 55+ and - for the sake of a better comparison - for the whole research sample. The level of financial exclusion will be verified in three areas: the percentage of persons not holding any of the above-mentioned instruments, the percentage of persons holding a maximum one instrument and the percentage of people holding a maximum two instruments.

As the data from Figure 1 show, there are noticeable inequalities in the banking penetration ratio for individual EU states, both for the whole research sample and the over 55s**.** The lowest number of persons aged 55+ ,i.e. those financially excluded in the first area, is in the countries which joined the European Union earlier. The lowest indicators were recorded in Sweden (0%), Finland (1%), Denmark (1%), Belgium (1%),

the Netherlands (1%), Luxemburg (3%), Cyprus (4%), France (4%), Spain (5%) and Greece (5%). It should be noted that these are the countries with a generally high banking penetration ratio of the whole populations. It is also important to note the fact that in these countries the percentage of persons over 55 who do not use financial services is similar, and sometimes even higher than compared to the one for the whole population. That means that a problem of financial exclusion of the elderly does not exist there.

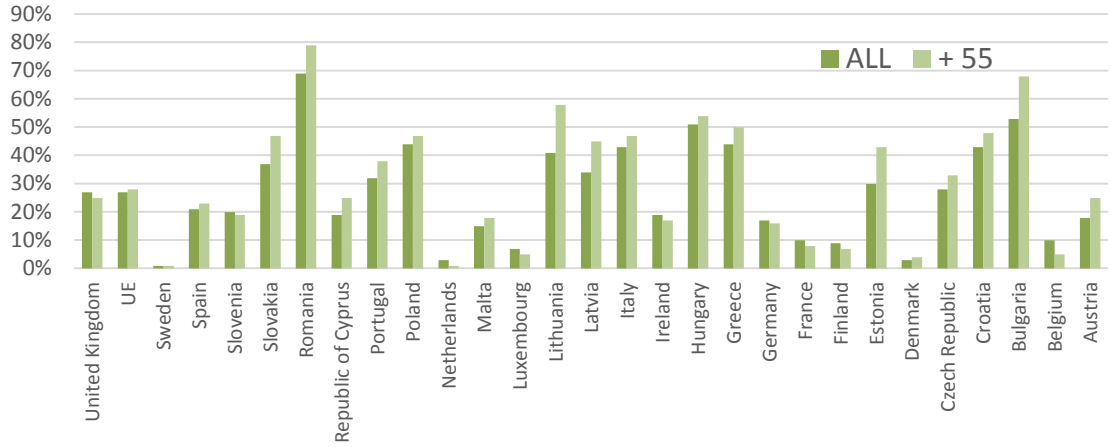
Figure 1 Percentage of persons claiming not to hold any financial product (the data for the whole researched population and persons 55+)



Source: Eurobarometer 2016

The situation is different in the case of countries which joined the European Union after 2000. The level of financial exclusion of the elderly in most of these Member States is well above the EU average which is set at 13%. The highest indicator was characteristic for such countries as Romania (56%), (Bulgaria (39%), Hungary (27%) and Slovakia (21%). Lower rates or similar to the EU average were recorded for Estonia (6%), Slovenia (7%), Latvia (13%) and the Czech Republic (13%). It is worth noting, however, that in both groups the percentage of persons aged 55+ non-users of financial services is far higher than the results for the whole population. Thus, these are those countries where a problem of financial exclusions of the elderly might be diagnosed. An interesting diagnosis was received for Poland, where although the percentage of persons aged 55+ not using financial services is at a high level (18%), it is still slightly lower than the one for the whole population (19%). This fact gives rise to carry out detailed research and to verify two other levels of financial exclusion.

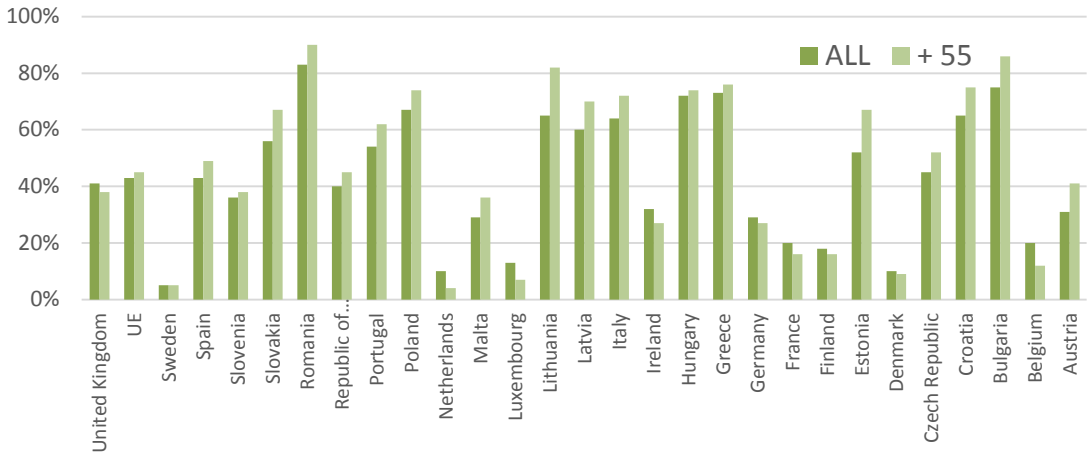
Figure 2 Percentage of persons claiming to hold a maximum one financial product (the data for the whole researched population and persons 55+)



Source: Eurobarometer 2016

The data in Figure 2 and 3 confirm earlier observations indicating a much lower banking penetration ratio among newly acceded countries to the European Union. It should be pointed out, however, that the analysis of these figures brought to light a problem of financial exclusion of the elderly in a larger group of states. Admittedly, the discrepancies between persons 55+and the whole test sample are much bigger in recently acceded EU states, but this phenomenon has become also apparent in such countries as Spain, Cyprus, Malta, Portugal, Italy, Greece and Austria. The comparative study of the data from respective diagrams indicates that along with the spread of the indicator of financial exclusion, a problem of financial exclusion of the elderly becomes more acute. The best example was provided by the analysis for Poland; at the first level no diagnosis of disparities appeared possible, there was a slight difference at the second level as it was just 3 percentage points, and at the third level -with 7 percentage points- it was quite significant

Figure 3 Percentage of persons who claim to hold a maximum of 2 financial products (the data for the whole sample and persons 55+)



Source: Eurobarometer 2016

3 Results and Discussion

The hypothesis of this paper assumes that elderly people are aware of the barriers they meet in cooperation with financial institutions; these are, e.g. modern technology, professional and incomprehensible language, too wide or too narrow offer, etc. However,

these barriers do not constitute statistically significant factors in the high underbanked ratio of this generation.

In order to verify this hypothesis there was the research conducted at the area of Lubelskie Voivodeship in Poland in the form of the questionnaire on the group of 388 respondents aged 50 plus, 99 of who was aged between 50 and 55, 148 respondents aged 56 to 65, 86 in the age 66-74 and 55 the over 75s. The research was conducted following the PAPI method and the sample was selected at random. The respondents were interviewed on their usage of financial products, their financial knowledge and financial standing. Other questions referred to barriers they meet in the access to financial products and trust in financial institutions. On the basis of the gathered information the statistical analysis was conducted with the help of IBM SPSS Statistic program. Using the Pearson coefficient it was determined that there is a very low statistically significant correlation between the usage of financial products and the barriers the respondents meet in their cooperation with financial institutions. It excludes the possibility to build a regression model so the simple statistics measures were used. In the majority of analyses presented below the group aged 55 minus was excluded in order to enable comparison of the results gained with those of Eurobarometer.

It must be pointed out that the usage of financial products decreases with the age of respondents (Table 2). But only in the case of four products - saving account, investment fund, mortgage credit and credit card - there is a statistically significant low negative correlation (from minus 0,122 to minus 0,192) between the respondents' age and the usage of this product. The important fact is that in the researched group only 8.5% of respondents declared not holding any financial products which is visibly lower result than calculated by Eurobarometer (see Fig. 1).

Although the evidence shows that age is not a significant factor in cooperation between customers and financial institutions, the next stage of this research refers to the barriers met by the surveyed respondents in this cooperation as well as to the assessment of financial knowledge possessed by them in relation to other persons. For this purpose, the respondents were ask to declare their views on the barriers in the six-step scale where 0 meant the barrier never met and 5 – the barrier met very often. In turn, for the knowledge the five-step scale was used where, 1 meant the knowledge far lower and 5 – the knowledge far higher in relation to others.

Table 2 The usage of selected financial product by respondents from different age groups

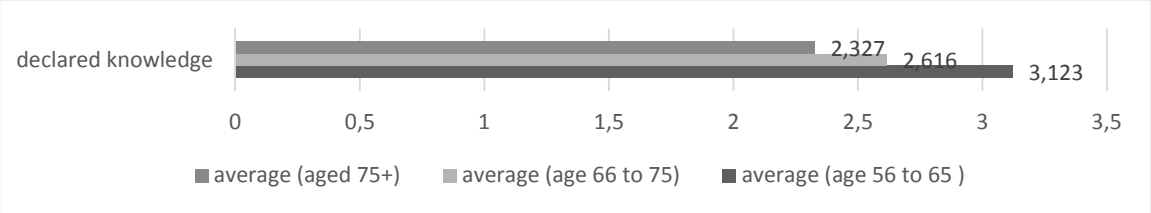
Financial product	Total	Age		
		56–65	66–74	75+
Private account	70,6%	68,2%	73,3%	72,7%
Saving account	29,1%	29,1%	17,4%	10,9%
Term deposit	49,3%	49,3%	36,0%	21,8%
Brokerage account	2,0%	2,0%	4,7%	1,8%
Investment fund	9,5%	9,5%	7,0%	0,0%
Individual pension account	6,1%	6,1%	4,7%	3,6%
Mortgage credit	7,4%	7,4%	0,0%	1,8%
Consumption credit	8,8%	8,8%	5,8%	7,3%
Credit card	27,0%	27,0%	8,1%	3,6%
Life insurance	49,3%	49,3%	46,5%	40,0%
Property insurance	27,0%	27,0%	25,6%	20,0%

Source: Korzeniowska and Misterek, 2017

During the analysis it was noted that there is a low statistically significant positive correlation between the declared knowledge and usage of financial instruments in three cases, namely, individual pension account, consumption credit and property insurance.

Additionally, a comparison of medians for various age groups was made. The result is to accept H0: which means that age groups in respect of their declared knowledge are quite similar. The average evaluation is between 2,327 and 3,123 and is decreasing over the age (Figure 4).

Figure 4 The declared average financial knowledge among the over 55s

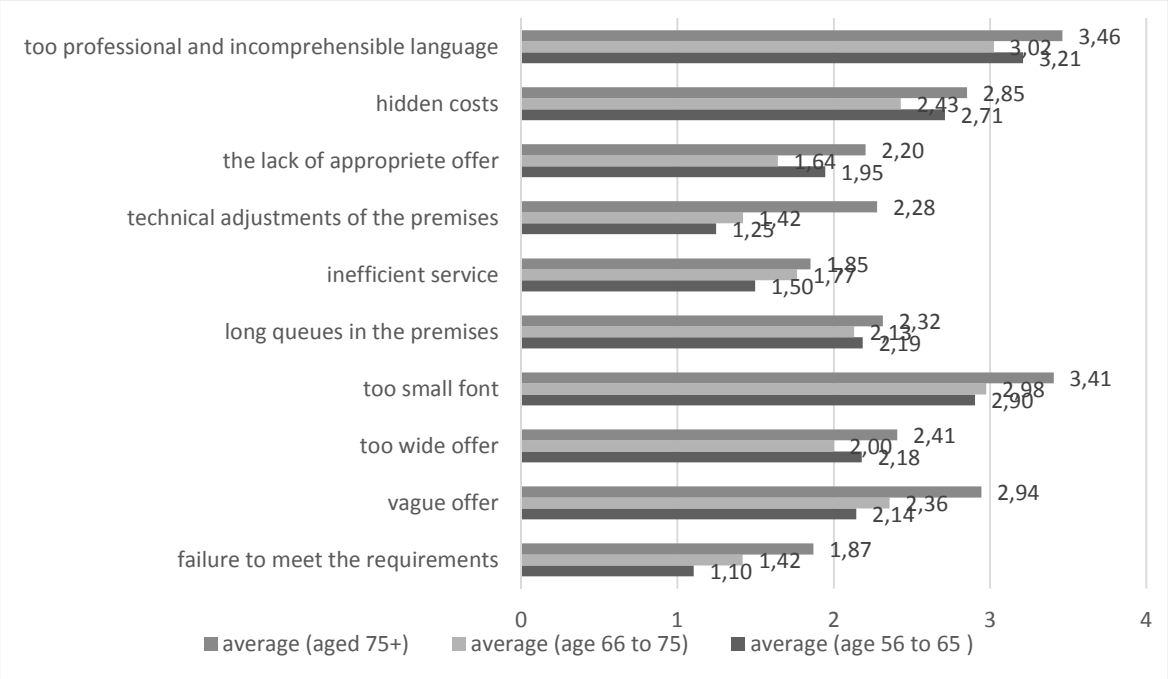


Source: own calculation

Among the barriers, the professional and incomprehensible language of documents as well as too small font appear to be the biggest one for senior citizens (Figure 5).

Meeting the requirements given by financial institutions appears to be the smallest problem. Although the rise in average evaluation of barriers corresponds with the rise of respondents age, only two cases showed a statistically significant difference in medians, i.e. a vague offer and lack of technical adjustments in premises with significant 0,002 and 0,003 respectively.

Figure 5 The barriers to cooperation with financial institutions (scale from 0 – barrier never met to 5 – barrier met very often)



Source: own calculation

4 Conclusions

Having analyzed the collected data, one may state that a lower level of using financial products by elderly persons is commonplace. This tendency is also true for Poland. However, based on the data gathered, it would be wrong to conclude that it results exclusively from such technical problems as the inadequacy of banking outlets or small print of bank documents. The analysis of the data collected in Lublin Voivodeship, Poland,

showed that the importance of barriers in co-operation with financial institutions grows along with the age of clients. Moreover, there are strong relations between those barriers which confirms the research presented in EU Report (see table 1).

However, the above studies also indicate a course for further research where the sample age group should be extended.

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The Brief Analysis of the Foreign Trade of the Czech Republic in International Comparison

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Abstract: *The Czech Republic is the country in the Central Europe, it is a member of different international organizations, such as the European Union or Visegrad Four. This country has strong relations with other member states of V4 (namely Poland, Slovakia, and Hungary), where Poland and Slovakia are neighbours of the Czech Republic as well, however, it has the strongest economic relations with other neighbour, namely Germany. As was already mentioned, the Czech Republic, Slovakia, Poland, and Hungary are members of Visegrad Four, and share similar history, geo-political ideas, and economic development. This article deals with the analysis of foreign trade development since 2000, because foreign trade is crucial for sustainable development for almost all countries around the world (it is part of GDP formula in open economy). The aim of this article is to analyse selected aspects of foreign trade in the Czech Republic in comparison with above mentioned countries. The analysis focuses on the development of foreign trade with goods and with services, where have been relatively surprising results (the weakest economy in terms of services has been Germany), but consequently the article analyses relations of the Czech Republic with all other analysed countries. The analysis shows surprising development again, where net balance with these countries has been growing despite the fact that GDP in these countries decreased. Detail description of results is in this article.*

Keywords: Central Europe, Czech Republic, export, foreign trade, import

JEL codes: F43, O11

1 Introduction

Foreign trade is very important for every state all around the world because it is, among others, part of macroeconomic Gross Domestic Product (GDP) formula. In other words, it can either improve the GDP level (in case that export is higher than import) or worsen it (in the opposite case). This basic theory has been explained in many books and articles, for example in Andrews, Bernake, & Croushore (2011), or Samuelson & Nordhaus (2010).

Nevertheless, foreign trade is important for every country because of other reasons as well. It helps to solve the proportionality problem in almost all countries worldwide, where only few countries have all necessary resources, such as labour force or raw materials, in quantities required for economic development. In other words, for most countries is necessary to ensure some products in the foreign countries for successful development. Foreign trade also has demonstrative effect, where the export program is kind of indicator of the level of economic development and it also helps create an image of developed country. Foreign trade has also other benefits, such as support of peaceful cooperation among partners, reducing of the risk of conflict, growth of education and others.

From above mentioned text is clear that foreign trade is very important for every country. The importance of foreign trade has been evaluated in other articles by other authors, for example Baier, Bergrstrand & Feng (2014), Cieslik, Bieganska & Sroda-Murawska (2016), Do, Levchenko & Raddatz (2016), Fracasso & Marzetti (2015), Giordano & Zollino (2016), Gladkov (2016), or Vannoorenberghe (2014). Authors themselves already analysed the topic of foreign trade several times, for example in Kovárník & Hamplová (2016).

The Czech Republic is a member state of Visegrad Four, and all other member states (namely Poland, Slovakia, and Hungary) are very important business partners for the Czech Republic. Situation in Visegrad Four countries has been also analysed by other authors, for example by Zdražil & Kraftová (2012). However, the most important business partner for the Czech Republic is Germany.

The aim of this article is to analyse the selected aspects of foreign trade in the Czech Republic in international comparison with above mentioned countries, namely with Germany, Poland, Hungary, and Slovakia. Firstly, this article analyse the development of GDP in selected countries, because of the importance of foreign trade for this indicator. The development of foreign trade in terms of goods and services in these countries is next topic for analysis. Consequently, the exports of the Czech Republic into all other countries and net balances with these countries are analysed as well. The aim is to verify the hypothesis whether the development of both GDP and foreign trade of these countries is similar or not, and also to verify whether there exists relation between the export into particular country and GDP in this country.

2 Methodology and Data

Covered period of time is 2000 – 2016, with one exception of Poland, where there were not available all data in the year 2016, therefore in case of Poland are some data analysed only in 2000 – 2015. The data were obtained in general available database Eurostat and calculated by authors (Eurostat a, 2017, Eurostat b, 2017).

Methods of comparison and comparative analysis have been used, moreover, for the verification of above mentioned hypothesis has been used the test of parallelism of regression lines. There exist a lot of different methods for evaluation of relations between two sets of variables, such as correlation, regression, etc., however, because of the limited space of this article has been used only above mentioned test. The authors plan to use other methods in next analysis.

The above mentioned test operates with linear regression functions, where it takes parameters *b* and *a* of these lines and uses following test criterion (Kubanová, 2003)

$$T = \frac{(b_1 - b_2) * \sqrt{n_1 + n_2 - 4}}{\sqrt{\frac{1}{\sum_{i=1}^{n_1} (x_i - \overline{x_1})^2} + \frac{1}{\sum_{i=1}^{n_2} (x_i - \overline{x_2})^2}} * \sqrt{(n_1 - 2)s_{e1}^2 + (n_2 - 2)s_{e2}^2}} \tag{1}$$

where

$$s_{e1}^2 = \frac{1}{n-2}\left(\sum_{i=1}^{n} (y_i^{(1)})^2 - a\sum_{i=1}^{n} y_i^{(1)} - b\sum_{i=1}^{n} x_i y_i^{(1)} \right) \tag{2}$$

Null hypothesis is about parallelism of regression lines, where alternative hypothesis is about divergence. Critical area is subset of the values of test criterion, where

$$W = \{T: |T| \geq t\alpha, n1 + n2 - 4\} \tag{3}$$

Critical value of Student's probability distribution on 0.05 level of significance and with 30 degrees of volatility is 2.0423 (2.0484 in case of Poland, where are no available data for 2016 and therefore there is only 28 degrees of volatility). If the test criterion in absolute value is within the range or accepted values, the null hypothesis about the parallelism is valid, and vice versa.

3 Results and Discussion

The Analysis of GDP Development

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, Poland more almost 38 billion, and Germany more than 82 billion, it is quite obvious that the level of GDP in billions of euro is the highest in Germany, second highest in Poland, next in the Czech Republic, in Hungary, and Slovakia is on last position.

However, it is better to use the level of GDP per capita for comparison. According to this, the highest level still has Germany, but the Czech Republic is on the second position, Slovakia is the third, Hungary on the fourth place, and Poland is the last. With respect to this information is good to add one interesting fact. Even if the development in the number of inhabitants in each country have not been steady, this number grew in the Czech Republic, Germany, and Slovakia (comparison of the number of inhabitants in the years 2000 and 2016), while in Hungary and Poland 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. However, the after crisis development is different. Germany has been growing since 2009 and it managed exceed pre-crisis year already in 2010. The Czech Republic was growing between 2009 – 2011, it was decreasing between 2011 – 2014, and it has been growing again since 2014. Moreover, it managed to exceed pre-crisis year one year later than Germany. Poland was on the last position in 2008, it has been growing since 2009 to 2015, it exceeded pre-crisis year in 2011, but it exceeded Hungary in 2012. However, it has dropped in 2016, where Hungary has exceeded this country again. Hungary has been growing since 2009 with one exception in 2012. It was on the fourth position before crisis and it is on the fourth position again in 2016. Slovakia has been growing, as well as Germany, since 2009, and it also managed to exceed pre-crisis year within one year already in 2010.

Following Tab. 1 shows the growth rate in GDP per capita, where this calculation has been made firstly from compared year 2000 to the year 2016, while the second growth rate describes only after-crisis development (2009 – 2016). It can be calculated also for example year-to-year growth rate, nevertheless, the authors have decided to use growth rate for these two periods with the aim to compare the development in the whole period and after economic crisis.

Table 1 Growth rate in GDP per capita

Country	2000/2016 growth rate	2009/2016 growth rate
Czech Republic	154.91%	16.16%
Germany	47.99%	27.06%
Hungary	128.14%	22.26%
Poland	129.59%	34.50%
Slovakia	260.44%	25.43%

Source: own calculations based on Eurostat a (2017), Eurostat b (2017)

Relatively weak position of Germany in overall growth rate described in Tab. 1 is of course result of significantly stronger position of Germany (in other words, of significantly higher amount of GDP per capita in 2000, where Germany had more than 25,750 euro,

while second Czech Republic had almost 6,500 euro). It is also reason, why Slovakia has so extremely huge growth rate (it had the lowest GDP per capita in 2000), nevertheless, the fact is that GDP per capita in Slovakia has been growing really significantly. More interesting is the analysis of after-crisis development. The highest growth rate in Poland is again the result of the lowest amount of GDP per capita in Poland in 2009. However, it is obvious that the Czech Republic has the lowest level of GDP per capita growth rate, while Germany has the second highest. It can be explained in that way that in spite of relatively strong position of the Czech Republic before crisis, GDP per capita in this country after crisis has been dealing with problems and the gap between this country and other V4 members has been closing. However, Germany is so strong economy that not only it managed to recover really quickly, but it also has had significant growth rate after crisis and the gap between Germany and V4 countries is getting wider.

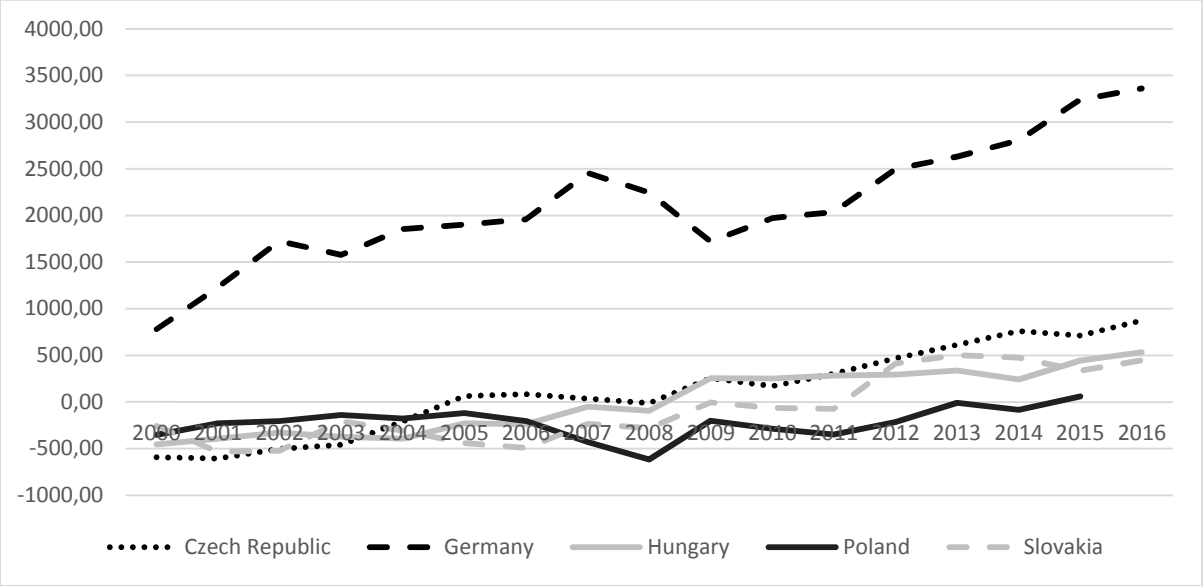
Foreign Trade Development – Trade with Goods

The analysis of foreign trade development shows relatively different results than the GDP development analysis. The development of net balance in terms of goods recalculated per capita is described in following Fig. 1.

First interesting fact is that in the first analysed year (2000) all countries except of Germany had negative trade balance, which means they had higher imports than exports. Even if current trade balance (in 2016, in 2015 in Poland) is positive in all analysed countries, the development has been quite irregular. The position of Germany is again, as well as in case of GDP, significantly stronger than in all other analysed countries. Germany had surplus more than 64,000 billion in 2000, and it has surplus more than 276,000 billion in 2016. The second highest surplus in 2016 has the Czech Republic, where this surplus is little bit more than 9,000 billion. For mutual comparison has been surpluses recalculated again per capita, but still has Germany significantly stronger position.

It is quite obvious that despite its irregular development, Germany has had the highest net balance from all analysed countries. However, the mutual comparison of V4 countries shows interesting results. The Czech Republic had the worst position in 2000 (the highest deficit per capita, while in absolute amount had Poland worse result), but it has been growing (with few exceptions) and currently the Czech Republic has the second highest surplus (after Germany). Exactly opposite development has been in Slovakia. This country had the best result from V4 countries in 2000 (both in absolute amount and per capita), but it has the worst result in 2016 in absolute amount and the second worst in terms of net balance per capita (in comparison with Poland in 2015). Really interesting fact is that in 2009, during the economic crisis, was net balance decreasing in Germany, while it was increasing in all other analysed countries.

Figure 1 Foreign Trade with Goods (Euro per Capita)



Source: own calculations based on Eurostat a (2017), Eurostat b (2017)

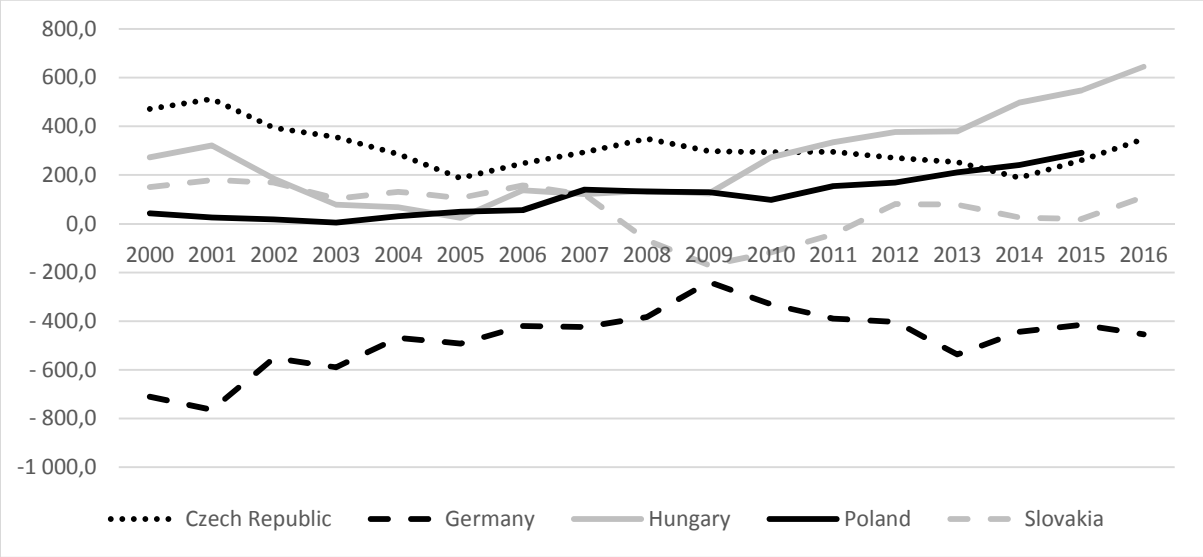
However, the export / GDP ratio shows that Slovakia has currently the highest value of this indicator. This indicator measures the openness of particular economy and it is relatively surprising that even if Slovakia has relatively bad result in terms of net balance with goods, it can be considered as really open economy, where this share is more than 84% in 2016. Another open economies are Hungary (more than 73%) and the Czech Republic (almost 68%), where Poland and Germany are relatively close economies (Poland had this share little bit than 40% in 2015, Germany has little bit more than 38% in 2016). This result is relatively surprising, because Germany is really strong economy with huge GDP growth, but it is relatively close economy. It can be explained in that way that there are other (domestic) parts of GDP formula which have been developing in Germany, while the Czech Republic, Slovakia, and Hungary are dependent on foreign trade. In case of Poland, this country is also relatively close, but because of low value of GDP, other parts of GDP formula are not as great as in Germany in this country.

Foreign Trade Development – Trade with Services

The analysis of foreign trade with services shows completely different results. Surprisingly, the only country which has been in deficit for all analysed period is Germany. All other V4 countries has been in surplus, with only few exceptions in case of Slovakia. However, the development is quite irregular in all countries, with several increases and decreases. Nevertheless, the deficit in Germany in 2016 is lower than in 200, but on the other hand, surpluses in the Czech Republic and in Slovakia decreased, while surpluses in Poland and in Hungary increased. The development (again recalculated per capita) is described in Fig. 2.

Interesting fact is that in 2009, where GDP in all analysed countries dropped, net balance with services increased in Germany (it dropped in case of goods), and dropped in the Czech Republic and Slovakia (where trade balances in terms of goods increased). The weak position of services in Germany is supported also by export / GDP analysis, where this ratio has been growing slowly, but it is still less than 8%. The highest share is in Hungary, where this ratio is almost 19%. The Czech Republic has this share currently around 12.4%, and the other countries less than 10%. However, the development in all analysed countries has been more or less irregular.

Figure 2 Foreign Trade with Services (Euro per Capita)



Source: own calculations based on Eurostat a (2017), Eurostat b (2017)

The Relation between GDP Development and Foreign Trade Development

As was mentioned before, one of the aims of this article is to verify the hypothesis, whether there exists relation between the GDP development and foreign trade development. According to the theory is net balance of foreign trade part of GDP formula, therefore can be expected that increase of net balance of foreign trade can lead into increase of GDP and vice versa. One of the possible way how can be verified this connection is thanks to the test of parallelism of regression lines. The authors are aware that other methods can be used, but these methods will be used in other analysis. Null hypothesis in this case reveal parallelism of regression lines, where alternative hypothesis means no parallelism. Results of this test (calculated based on (1), (2), and (3)) are presented in the following Tab. 2.

Table 2 Test of Parallelism of Regression Lines

Country	Result	Test Criterion	Null Hypothesis
Czech Republic	8.737632	2.0423	Denied
Germany	15.63847	2.0423	Denied
Hungary	5.956511	2.0423	Denied
Poland	13.1138	2.0484	Denied
Slovakia	14.69208	2.0423	Denied

Source: own calculations based on Eurostat a (2017), Eurostat b (2017)

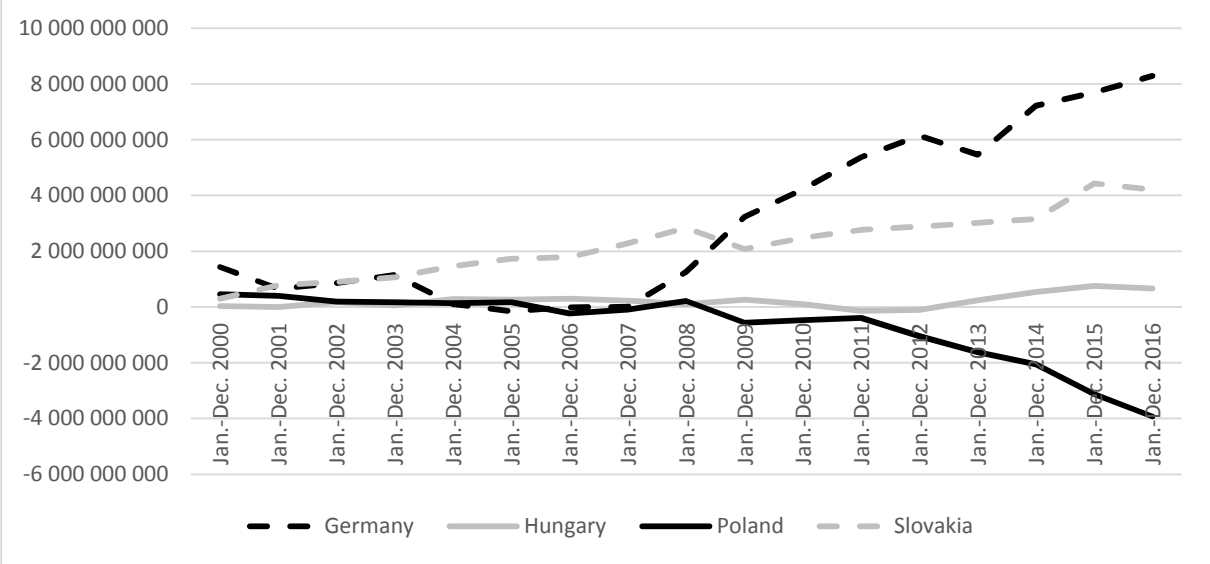
The results of test of parallelism show unexpected conclusion. In all analysed countries are regression lines for GDP and net balance of foreign trade divergent. There exist several possible explanations of this development. First of all, other (domestic) parts of GDP are probably significantly more important in all analysed countries, and therefore development in foreign trade has no influence on GDP. It is also possible that there exists some delay. In other words, the increase or decrease in net balance can have some influence on GDP, but this influence occurs not in the same year, but later. It can be verified for example thanks to Granger's test, however, it is not part of this article. There can be, of course, other possible explanation of this unexpected development.

Nevertheless, in this article is possible to make a partial conclusion that there exists no relation between GDP development and foreign trade development in all analysed countries.

The Analysis of Foreign Trade of the Czech Republic with Analysed Countries

As was already mentioned, all analysed countries are very important trade partners for the Czech Republic. The most important one is the Germany, where the share of turnover with this country on total turnover of the Czech Republic has been around 30% for the whole analysed period (32.54% in 2016). This share has been growing (with few exceptions) in case of Poland, where it is almost 8%, it has been relatively stable in case of Slovakia (little bit more than 7.6%), and almost 3% with Hungary. Fig. 3 describes the trade balance of the Czech Republic with analysed countries.

Figure 3 Foreign Trade Balance of the Czech Republic with Analysed Countries (Euro)



Source: own calculations based on Eurostat a (2017), Eurostat b (2017)

It is obvious that the trade balance with Germany has been growing since 2006 (with the only exception in 2013) in really fast pace, while the trade balance with Poland has been decreasing with several small exceptions since 2008. That means that Poland is important importer for the Czech economy, while Germany is really important exporting destination.

What is really interesting is the fact that in 2009, where GDP in all analysed countries dropped because of the economic crisis, trade balance with Germany significantly increased, while it decreased in case of Slovakia and Poland. Deep analysis shows that both exports and imports of the Czech Republic in this year decreased, but in case of Germany the trade balance increased.

Another interesting point is the connection between trade balance with particular country and total trade balance both in the Czech Republic and in that country. Germany was the only country where net balance decreased in 2009 (as well as GDP), while net balance increased in all other analysed countries (where GDP decreased). However, the net balance with Germany increased in 2009. That means that despite the worse situation both in Germany and in the Czech Republic was the decrease of exports of the Czech Republic into this country lower than the decrease of imports from this country, therefore the net balance increased. Moreover, in the year 2010 was the GDP increasing again in all countries, the net balance with Germany as well, but the total net balance of the Czech Republic decreased. That means that in spite of the fact that the trade with Germany was growing in 2010, the trade with the rest of the world decreased and overall trade balance of the Czech Republic decreased in this year (where GDP grew in this year in this country). The authors plan to analyse the connection between GDP development and export of the Czech Republic with statistic tools in the next articles.

4 Conclusions

The aim of this article was to analyse the GDP development and foreign trade development in the Czech Republic and in other selected traditional business partners of this country, namely in Germany, Hungary, Slovakia, and Poland. The analysis shows that all countries have been growing in terms of GDP per capita, however, after the world economic crisis (since 2009) has been the Czech Republic dealing with serious trouble, the development has been irregular, and the growth rate is the lowest one, while Poland and Slovakia have been growing really fast. It is important to add that the position of Poland is probably the result of the weak position of this country in 2009. However, the Czech Republic still has some lead from previous years before other V4 countries, but this lead is weaker every year because of the slow growth rate, and on the other hand, the gap between V4 and Germany is getting wider, because of the fast development of Germany after crisis (second highest growth rate).

The statistical analysis of relation between GDP development and foreign trade development shows relatively unexpected result. Net balance of foreign trade is important part of GDP formula of every economy, therefore it can be assumed that the increase of net balance can lead into increase of GDP, and vice versa. However, this hypothesis has been denied in all analysed countries, the regression lines created from GDP and net balance are not parallel, but divergent. It can be explained in such way that the other parts of GDP formula are more important in every analysed country. Moreover, there can be some delay (the increase of net balance can have influence on GDP in next years, not in the same one), however, this aspect was not analysed in this article.

In terms of goods, only Germany had surplus in 2000, while currently all analysed countries have positive net balance. The development has been irregular again, but interesting point is that in Germany in the after-crisis year 2009 the net balance decreased (as well as GDP), but in other V4 countries was increase in net balance. However, in 2010 was net balance growing in Germany again (as well as GDP), where the net balance dropped in V4 countries (in spite of the fact that GDP grew). In terms of services, it is possible to see very surprising results. The weakest country has been Germany, where the net balance has been in deficit for the whole analysed period, it was lower in 2016 than in 2000, but still in negative. V4 countries have been in surplus (with few exceptions of Slovakia), where only Hungary and Poland have higher surplus in 2016 compared with 2000.

The analysis of export of the Czech Republic into other countries shows the significant position of Germany, where the net balance with this country grew even in the years when GDP (both in Germany and in the Czech Republic) dropped. Interesting point is that net balance with Poland has been decreasing in last few years, which means that this country is important importer for the Czech Republic, while Germany is important exporting destination.

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Determinants for the development of supplementary pension schemes

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Abstract: *The accumulation of voluntary pension savings by households is a vital element of not only the household's finances, but also of the social security system. Being informed of the factors which are conducive to the accumulation of capital for old-age security is not only crucial for entities offering various pension insurance contracts, but also for the state, which often supports the development of these contracts. The aim of the article is to identify and evaluate the impact of the factors determining the development of the additional forms of pension provision. In the study, correlation analysis and factor analysis were employed to assess the influence of the selected factors (economic and demographic) on the development of some of the pension insurance contracts. The study's findings show clearly that the increasing life expectancy and the level of the household's income are important determinants in terms of the development of voluntary pension insurance contracts.*

Keywords: pension schemes, pension insurance, correlation analysis, factor analysis

JEL codes: H550, J320, C1, C3

1 Introduction

Pension schemes are one of the elements of social security. In most of the countries of the world, mandatory and voluntary schemes coexist. The mandatory part of the pension system (the so-called base part) is directly related to the state's obligation to provide apposite material support for persons past the age of retirement. The base part is typically complemented by the supplementary pension schemes, involving individual or collective accumulation of resources (both financial and material) for the duration of gainful employment, to be later used as a source of supplementary income at retirement.

The supplementary pension schemes as generators of additional pension benefits are a crucial element of the social security coverage (Pieńkowska–Kamieniecka, Walczak, 2016). At present, pension benefits from the base part of the pension system – in a decisive majority of pension systems in use globally – are not sufficient to provide their participants with pension benefits whose value would be equal to the level of earnings received prior to retirement. This negative trend can be attested by the net pension replacement rates. In 2014 the lowest net pension replacement rates (below the 50% threshold) were recorded in Ireland and the United Kingdom. Conversely, the highest net pension replacement rates (above the 80% threshold) were found in: Austria, Hungary, Luxemburg, Portugal, Spain, and Turkey (OECD, 2016). It must be noted that, as a result of the continued decline of demographic trends in many European countries, the net pension replacement rates will surely decrease in the years to come. The most important determinants of the present demographic challenge are the increased life expectancy rates and low fertility rates (OECD, 2015; European Commission, 2014). Another important factor is the present structure of migration patterns (mainly emigration) in the working-age population, particularly in those countries which place at

the bottom end of the average income spectrum. Those factors will surely contribute to the continued ageing of their respective populations.

The expected development of the negative demographic trends seems to elevate the role of additional pension schemes as sources of substantive addition to the existing pension benefits from the base part of the pension system.

The objective of this paper is to identify factors that determine the development of supplementary pension schemes and to evaluate their impact on the process under study. The evaluation of the impact of selected factors (both economic and demographic) upon the development of pension insurance contracts was conducted based on the use of correlation analysis and factor analysis.

2 Supplementary pension schemes

The demographic processes currently observed in the European economies have raised the need for reforming the existing pension systems. The changes introduced in most of the European countries have followed the pillar-based approach, with base (mandatory) pillar of the pension system supported by supplementary (voluntary) forms of pension plans (cf. Lannoo et al., 2014). In many European countries pension systems have been divided into three pillars: pillar one: public social security system, pillar two: mandatory/voluntary occupational schemes and pillar three: voluntary private schemes (cf. Eichhorst et al., 2011; Rocher and Stierle, 2015). Moreover, Holzmann and Hinz (2005) indicate a fourth pillar of the pension system such as family support, access to health care and housing. It is worth mentioning that not only European countries reformed their pension systems. Asian countries did so too. (see more: Hur, 2010)

The mandatory part of the pension system should, in theory, provide adequate support to ensure the satisfaction of basic needs and living standards for persons past the age of retirement. The supplementary part, on the other hand, serves as a source of additional benefits to complement the pension payouts received from the base pillar (Casey and Dostal, 2013). The lower value of pension benefits from the base part of pension system, the higher the demand for supplementary forms of pension security, as they offer the prospect of improved standard of living past retirement. Therefore, it is essential for the supplementary forms of pension security to be construed in such a way as to ensure their utility – in the long-time perspective – as important sources of household economy (Garman et al., 1985). For supplementary pension schemes to yield adequate returns, the system must be based on systematic saving schemes, continued preferably for the whole duration of gainful employment.

The supplementary part of the pension system is typically construed around capital-based solutions. Schemes of this type involve accumulation of additional voluntary pension contributions by a designated financial institution, to be invested on the financial market or on the alternative investment markets (including real-estate investment). Supplementary contributions can be held individually (e.g. in the form of an individual life insurance policy linked to capital investment funds) or collectively (for example, in the form of a collective pension scheme offered to all employees). In the case of occupational retirement provision the contribution is usually paid by the employer – as a defined absolute amount or as a (defined) percentage of the employee's remuneration or other relevant metrics such as the company's profit (Brauninger, 2014).

Individual (or private) pension plans should be designed in such a way as to obligate the participants to contribute on a regular basis. Personal savings assigned to support the basic pension plan can be managed by the participants individually, or by a dedicated and authorised financial institution of choice (insurance companies, investment funds). One example is Unit-linked insurance where the net premiums are invested based on the choice of the policyholder. This implies that throughout the entire period of savings the policyholder bears investment risk. Thus, in times of financial crisis the investment

risk may materialize with policyholders experiencing financial losses (see more: Ciumas et al., 2012). High potential profitability characterizes this type of insurance because the profit is based on capital investments (see more: Schrager, Pelsser, 2004). Such products like unit-linked insurance are among a group of products offered under a defined contribution pension plan, in which future pension benefits are not set out in advance, being dependent on a variety of factors. These include, in particular, the amount of the premium paid, risk aversion of the insured, lifetime expectancy, portfolio composition (see more: Konicz, Mulvey, 2015). It should be pointed out that making wrong investment decisions by the policyholders (in particular, among people whose education with respect to finances is rather poor) may result in the lack of sufficient retirement income (Blanc, 2011).

Two important aspects should be noted that distinguish voluntary private pension savings from general savings, namely (Lannoo et al., 2014): first - governments provide financial incentives to promote pension savings, second - withdrawal from voluntary pension savings is only possible after a certain age is reached, otherwise a penalty is charged.

Within the framework of broadly defined pension security, a natural person may also choose to invest in various types of assets to serve as sources of supplementary income past retirement. For example, they may invest in the purchase of a residential-type property at some point of their gainful employment period, to be later used as the basis for a reverse mortgage (or home equity conversion mortgage) agreement with a financial institution of choice. The reverse mortgage loan offers the conversion of capital held in the property into liquid financial assets. Solutions based on the above approach can be found not only in many European countries, but also in Australia (for more, see: Bridge et al., 2010) and the United States (for more, see: Bishop and Shan, 2008).

3 Identification of factors of impact upon the development of supplementary forms of pension scheme

Many factors influence the development of supplementary forms of pension scheme, with the most notable category being demographic factors. The steady increase in life expectancy (if not accompanied by a significant adjustment of the existing retirement thresholds) will have the effect of gradually diminishing the income from the base pillar of the pension system. The concurrent effects of waning fertility rates and the increase in the number of households with no child or one child will remove or largely reduce the potential for future financial support from the descendant generation. On the other hand, the growing share of old-age persons across the general population will have the effect of stimulating the competition on the market of individual pension plans offered by financial institutions (due to the relative shrinkage of the target group).

Next group of factors is connected with description of households; this may include:

- the number of persons per household – the more children (or other persons under custody), the greater share of the budget is allocated to cover the running cost of consumption,
- marital status (married couple or single),
- the region of residence (according to Stinglhamber et al., "the region of residence has a significant influence on participation in the third pillar systems"),
- household income and expenditures which affect the level of household wealth,
- savings and assets held by the household, including the immovable property intended for the residential needs of the household members,
- the household capacity to make independent financial decisions and the prevailing risk attitude (see more: Blanc, 2011). Households characterised by strong aversion to risk will make distinctly different financial decisions (also with respect to savings and investment) than those with a more lenient risk attitude.

The development of supplementary forms of pension scheme is also strongly influenced by the household's knowledge of financial matters. Financial education of households has

the effect of improving the quality of their financial decisions (Clark et al., 2006). Therefore, it seems in the best interest of the state to support the broad dissemination of practical financial knowledge among its citizens.

Another important factor to impact the development of supplementary pension schemes is the maturity of the local financial market, particularly the availability of financial products related to pension-type savings. The process is also strongly influenced by the potential to invest in various types of material assets other than the liquid financial assets (such as investment in gold, silver, wine, whisky, art, etc.), either directly or indirectly, e.g. in the form of redeemable securities (units) issued by investment funds as part of investment portfolios based on specific types of material assets (Kowalczyk-Rólczyńska and Rólczyński, 2016).

The provision of supplementary pension schemes is also largely determined by the involvement of state structures and companies in the formation of flexible and transparent products designed to serve the purpose of additional pension security. In this context, it is also important for the state to provide tax incentives (Lannoo et al., 2014), both to the institutions that offer supplementary pension schemes and to individual participants of such schemes. The growing state involvement in this area will have the effect of augmenting the structure of the pension system and inducing social motivation to participate in the supplementary pension schemes (Whitehouse, 1999).

The last category of major determinants is represented by economic factors, including, among other things: the level and the pace of economic development, the labour market situation and trends, the structure of state budget revenues, the interest rates and inflation.

4 Methodology and Data

The study was designed to examine the impact of the selected determinants upon the development of additional forms of pension scheme based on their measurable influence on the total value of assets held in the form of additional pension schemes.

For the purpose of this study, the examination was conducted of assets held in the form of pension insurance contracts[4]. The study involved the examination of the following determinants deemed important for the development of this particular form of pension security: household disposable income, unemployment, level of economic development, household expenditure, household savings, and selected demographic factors[5]. Variables associated with the above factors are presented in Table 1.

Table 1 Variables representing selected factors of impact upon the development of supplementary forms of pension security.

Symbol of variable	Variable
Y	Pension insurance contracts' assets in US dollars
$\mathbf{X_1}$	Average annual wages in US dollars
$\mathbf{X_2}$	Unemployment rate
$\mathbf{X_3}$	GDP, in constant prices, in US dollars
$\mathbf{X_4}$	Household saving rate (in %)
$\mathbf{X_5}$	Household final consumption expenditure (as % of GDP)
$\mathbf{X_6}$	Household disposable income per capita in US dollars

[4] An insurance contract that specifies pension plan contributions to an insurance undertaking in exchange for which the pension plan benefits will be paid when the members reach a specified retirement age or on earlier exit of members from the plan (based on: https://stats.oecd.org/glossary/detail.asp?ID=6290).

[5] Apart from purely substantive reasons, the selection of these factors was strongly influenced by the availability of relevant data for the period under study.

$\mathbf{X_7}$	Old age dependency ratio (in %)
$\mathbf{X_8}$	Fertility rate
$\mathbf{X_9}$	Life expectancy at birth

Source: own study (elaboration)

The study was conducted based on data for the period of 2001-2014 (with the exception of variables X_8 and X_9, which were only available for the period of 2001-2013), as published in the available reports of OECD and the Eurostat, for the five European countries: Denmark, Finland, Italy, Poland, and Spain. An objective of the study was to verify whether the same factors significantly affect the value of assets accumulated in the same form of pension security in the different countries. Of the selected countries, the highest average household income was registered in Denmark, and the lowest – in Poland. Furthermore, two of the countries under examination placed above the OECD annual wage average (namely: Denmark and Finland); with Italy, Poland, and Spain scoring below the threshold. Selected statistical information for the countries under examination is presented in Table 2.

Table 2 Selected statistical information for selected European countries in 2014

	Denmark	**Finland**	**Italy**	**Poland**	**Spain**	**OECD**
Average worker earnings (in US dollars)	64,654	51,965	36,891	11,978	31,683	40,007
Public pension spending (% of GDP)	6.2	10.3	15.8	10.8	10.5	7.9
Life expectancy at birth	79.3	80.5	82.3	76.3	82.0	80
Population over age 65 (% of population)	18.6	20.4	21.7	15.3	18.3	16.2

Source: own study based on OECD (2015)

The first phase of the research involved calculations of coefficients of correlation between pension insurance contracts' assets and the variables presented in Table 1. This was followed by tests for the significance of correlation coefficients, with the purpose of determining the statistical significance of the findings.

The next step of the study involved the application of the factor analysis with the aim to reduce the number of variables describing the phenomenon. The analysis also allows one to explore and specify the relationships between a large number of variables (Cattell, 1965). However, the factors isolated on the basis of this analysis have a different content-related interpretation while retaining most of the information contained in the original variables. In the literature, there is a two-fold approach to the factor analysis in that the factor analysis and the analysis of principal components are distinguished as two separate methods (Górniak, 1998), or they are regarded as alternatives of the same method (Walesiak and Bąk, 1977). The factor analysis was used in the study with the factors being singled out by the application of the principal component method. The assumptions of the method and the procedure are described in detail in the above publications.

In the case of the analysis carried out in this paper, an attempt was made to distinguish the factors from the variables indicated above for the countries in question. This makes it possible to group variables in various objects, that is to verify whether the same variables in different countries can be considered to represent comparable groups of factors.

5 Results and Discussion

The result of the first phase of the research are presented in Table 3.

Table 3 Values calculated for coefficients of correlation between variables X_1- X_9 and the pension insurance contracts' assets (Y), for selected European countries.

Country	Symbol of variable								
	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Denmark	0.932	0.640	0.667	-0.085	0.898	0.977	0.954	0.113	0.980
Finland	0.908	-0.689	0.880	-0.284	0.649	0.890	0.675	0.783	0.833
Italy	0.019	0.721	-0.512	-0.880	0.849	0.797	0.993	0.797	0.926
Poland	0.843	-0.684	0.897	-0.717	-0.762	0.921	0.919	0.391	0.882
Spain	0.545	0.609	0.767	-0.114	-0.502	0.916	0.585	0.662	0.842

The underlined values of correlation coefficient are significant at $p < 0.05$
Source: own study based on data from OECD and Eurostat, developed using the Statistica software.

The calculation results suggest that, for all the countries under study, the most significant impact upon the total level of assets held under pension insurance contracts can be observed with respect to the following determinants: household disposable income per capita, unemployment rate, old age dependency ratio, and life expectancy at birth. The remaining variables – depending on the country – were found to be either significant or non-significant. It should be noted that:

- fertility rate is found to significantly affect the value of pension insurance contracts' assets in Finland, Italy and Spain,
- household final consumption expenditure is significantly correlated with the level of pension insurance contracts' assets in all the countries under examination, with the exception of Spain,
- household saving rate is significantly correlated with the level of pension insurance contracts' assets only in Poland and Italy,
- both the GDP and the average annual wages were found to be significantly correlated with levels of pension insurance contracts' assets in all the countries under examination, with the exception of Italy; furthermore, negative correlation between the values of pension insurance contracts' assets vice versa GDP was only observed for Italy.

The results of the factor analysis are demonstrates in table 4. In particular, it was illustrated which variables produce "new" factors in the individual countries. The basis for the calculation were X_1–X_9 variables described in Table 1. After conducting the calculations based on the factor analysis, the variables were grouped into two factors for Denmark, Italy and Poland, while for Finland and Spain into three factors. The number of factors was separated according to Kaiser's criterion, that is, only those factors were retained for which eigenvalues exceeded 1[Kaiser, 1960]. The factor loadings indicated in Table 4 were greater than 0,7. One can observe that variable X_6 (household disposable income per capita in US dollars) and variable X_9 (life expectancy at birth) is included in the first factor in all the countries under study, while variables X_1 (average annual wages in US dollars), X_5 (household final consumption expenditure (as % of GDP) and X_7 (old age dependency ratio (in %) in the four countries (Denmark, Finland, Italy, Poland). One can thus suggest that the first factor is the factor associated with revenue (income) and demographics and this factor is present in all the analyzed countries. Variable X_2 (unemployment rate) is part of the second factor for three countries (Finland, Italy, Spain); variable X_3 (GDP in constant prices, in US dollars) is included in the second factor for Denmark and Italy, whereas variable X_8 (fertility rate) is part of the second factor for Denmark and Poland.

Taking this into consideration as well as the other information contained in Table 4, we can define the second factor differently, depending on the country. For Finland and Italy, the second factor was defined as economic factor; in the case of Denmark and Spain, this factor was named an economic and demographic factor, while for Poland, the second factor is a demographic factor. The third factor was distinguished only for Finland and Spain and it is made up of only one variable X_4 (household saving rate (in%)), thus for those countries the third factor is a factor related to household savings.

In addition to that, it should be noted that in line with the theoretical approach to the factor analysis every next factor will account for an increasingly smaller part of the total variance. Therefore, the first factor explains 53% of the variance for Spain and up to 78% for Poland. The second factor explains 13% for Poland and up to 29,9% for Italy.

The study demonstrated that the variables, being part of the individual factors, can be regarded as similar in the analyzed countries. An attempt to extend the study to other countries is limited by access to data.

Table 4 The results of the factor analysis for the countries under study

	Factor 1					**Factor 2**					**Factor 3**				
	DEN	FIN	ITA	POL	ESP	DEN	FIN	ITA	POL	ESP	DEN	FIN	ITA	POL	ESP
X1	X	X		X	X			X							
X2	X			X			X	X		X					
X3		X		X	X	X		X							
X4			X	X		X						X			X
X5	X	X	X	X						X					
X6	X	X	X	X	X										
X7	X	X	X	X						X					
X8			X		X	X			X						
X9	X	X	X	X	X										
Explained variation	5.49 4904	5.77 6089	5.59 5579	7.03 6544	4.79 3114	2.12 5558	1.91 7535	2.69 5909	1.17 3604	2.53 9318		1.09 4698			1.35 3514
Share	0.61 0545	0.64 1788	0.62 1731	0.78 1838	0.53 2568	0.23 6173	0.21 3059	0.29 9545	0.13 0400	0.28 2146		0.12 1633			0.15 0390

Source: own study, based on the results from Statistica software

6 Conclusions

The above findings suggest that the majority of the variables under study do have a significant impact upon the total value of assets held under a supplementary pension scheme, in this case: pension insurance contracts. However, depending on the country, the force of such impact may vary. Moreover, the application of the factor analysis in this study allowed one to single out the principal groups of factors which affect the value of the accumulated pension savings in a pension insurance contract. Therefore, it seems valid to conclude that the processes involved in the formulation of new solutions with respect to supplementary pension plans should place the focus upon those determinants that are found to be most statistically significant. It must be remembered that only some of such factors (e.g. unemployment, household income average) can be influenced through economic or political initiatives. The remaining determinants, most notably the demographic processes will – on the one hand – necessitate further savings under the regime of supplementary pension plans, and – on the other hand – stimulate the competitiveness of supplementary pension products on the market due to the steady decrease in the number of gainfully employed persons active on the labour market.

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New trends in banking sector

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Abstract: *The aim of this paper is to analyze the policy of banks in relation to their clients. Long-term systematic increase in deposits and a decline in interest rates in the economy bring new problems and questions how to cope with the increase. With the increase is linked to the management of assets and liabilities. It plays an important role and expected developments in key interest rates. The paper mainly deals with the impact of interbank PRIBOR 3M, which is considered crucial interest rate. Banks derive mainly from the interest rate loans to clients. Deposit growth not only in the banking sector, and has their subsequent rebound in banking policy and the creation of new banking products, with consequent impacts on the economy of the bank. Impacts vary according to the size of banks and their client segmentation. The basis is literature review, which is connected to the analytical part (using modeling Gretl), using data available in the system ARAD (Czech National Bank).In conclusion, it is assessed recent developments, future outlook and anticipated impacts of the financial sector.*

Keywords: Bank, deposits, revenue, liabilities, profit

JEL codes: C15, E37, G20

1 Introduction

Results management assets and liabilities are reflected in the overall results of banks. It plays a significant role and expected developments in key interest rates. The paper mainly deals with the impact of interbank PRIBOR 3M, which is considered crucial interest rate. Banks derive mainly from the interest rate of loans provided to clients Krajíček, J. (2016).

It is also possible objection that this rate is not important. Theoretically it is possible to consider the rate 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 PRIBOR 3M. For the decisive it is necessary to consider that this is a market rate, which is announced on the basis of quotations of reference banks. It is also possible objection that banks may have quotation manipulated according to your needs, but given that the system in the Czech Republic involved six banks (Czech spořitelna, CSOB, Komerčni banka, UniCredit Bank, Raiffeisenbank, and Expobank) they would have to handle agreed by all banks and it can be eliminated.

2 Methodology and Data

Bank Management

For the stable development of the bank is necessary qualified asset and liability management, which form the focus of bank management and is an essential part of the financial management of the bank. It's a method of management the balance sheet structure of the bank, which is an overview of the bank's assets and sources of its funding, with the aim of maximizing profits.

To bank management also reflect the macroeconomic effects of regulation of the banking sector in particular, as currently applicable Basel II and Basel III, banks are implanted Slovik and Cournede (2011).

The paper is mainly used data analysis, which is available in the system ARAD CNB (2016). 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, interest rates and risks in the banking sector. For purposes of evaluating risk development are again used data from ARAD CNB (2016).

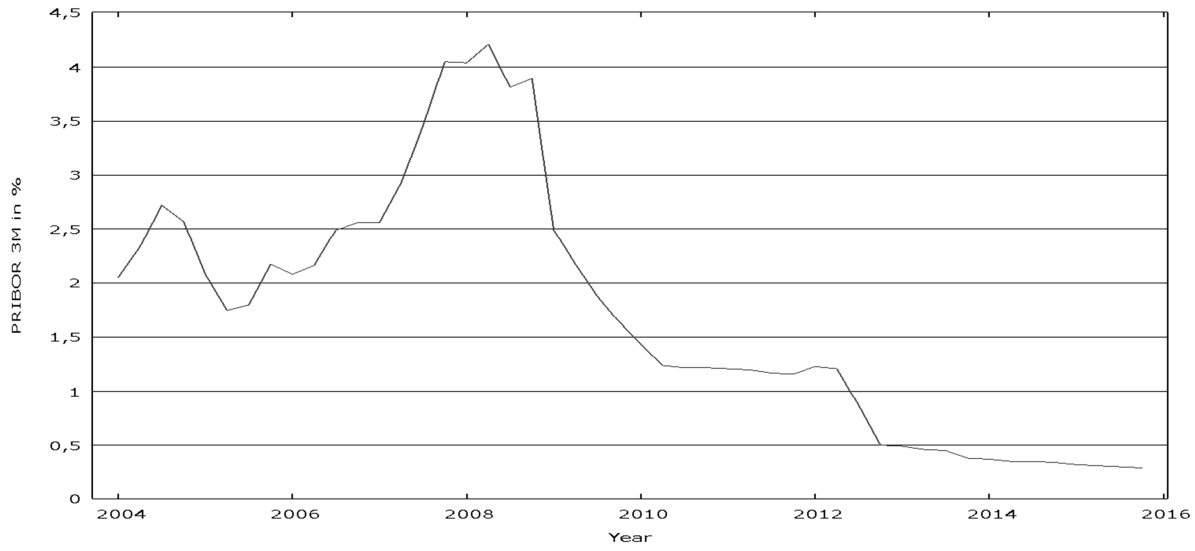
The crucial focus is not on how to analyze the current situation in the banking sector, especially the excess of liabilities reflected in the financial results of individual bank groups. As the basis for the analysis used data ARAD CNB (2016). Their classification is according to the size of banks on small, medium and large banks.

Analysis impacts interest rates

For the modeling and the analysis of data are used, which are available in the ARAD of CNB (2016). Evaluation 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.

Figure 1 Development interest rates PRIBOR 3M

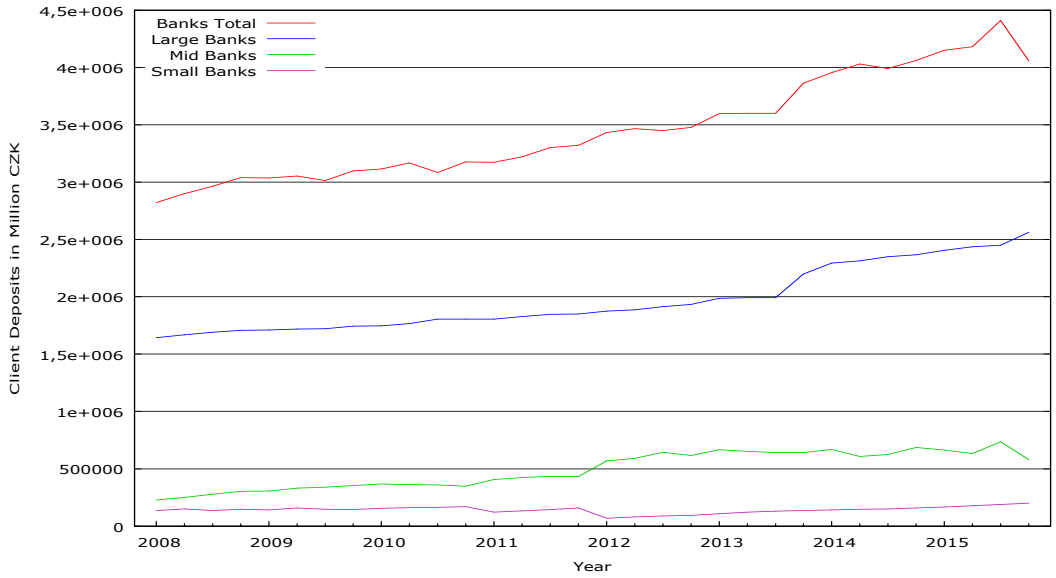


Source: Own processing on basis data ARAD CNB (2016)

Constantly falling interest rates. Figure 1 demonstrates how they have significant impacts on financial results in the banking sector. Together with the decline in interest rates significantly growing volume of client deposits. The sharpest increase in client deposits show large banks. Interesting is the decline in deposits at central banks at the end of 2015, which is due to their efforts to minimize clients' interest by depositing funds with them. Conversely, large banks have relatively stable growth in client deposits, which are increasing. It is primarily due to clients who they are looking for certainty and track clients, especially when large clients who have their accounts at major banks have imposed on them a large volume of funds.

Development of client deposits for individual categories of banks clearly documents the following graphical representation.

Figure 2 Development Client Deposits



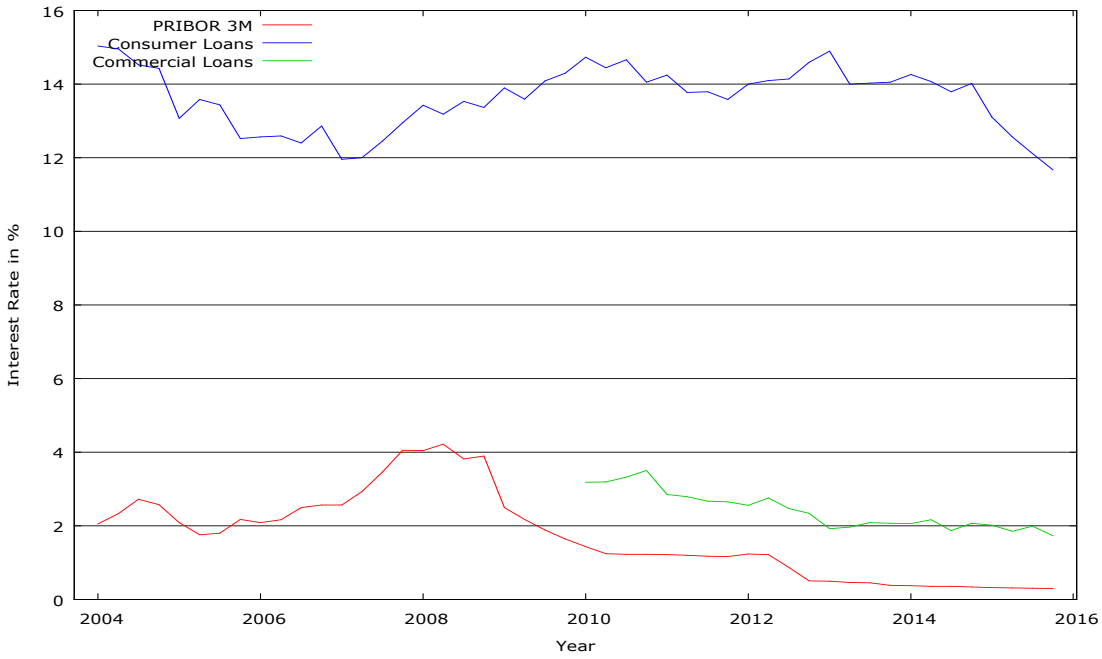
Source: Own processing on basis data ARAD CNB (2016)

Development of volume of customer deposits is one of the decisive criteria and has an impact on the overall orientation of the bank and its subsequent economic results.

With the development of interbank interest rates and client deposits is linked to the overall evolution of loans granted to clients. This development is not only affected client deposits, but also other resources that banks receive. The decisive influence, however, are primarily client deposits that banks are cheapest.

Crucial to the development orientation of the bank interest rates on loans provided to clients. Especially small and medium-sized banks, which are trying to increase their revenues, mainly focus on the most profitable client segments of the market. The following chart illustrates the evolution of interest rates on consumers and commercial loans.

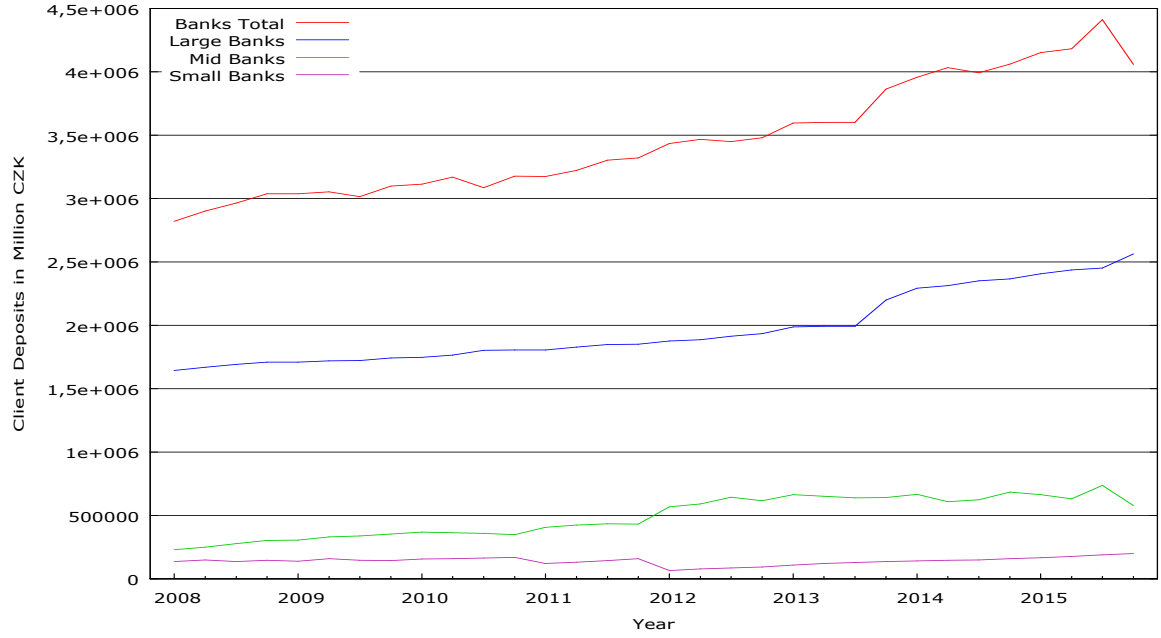
Figure 3 Interest rate developments consumers and commercial loans



Source: Own processing on basis data ARAD CNB (2016)

From the Figure 3 it is clear that the average bank interest rates for consumer loans are considerably higher than that of Commercial Loans. In particular, large banks have in its portfolio of large volumes of Commercial Loans, in contrast to the medium and small banks. Especially small banks focus on retail clients, for which achieve significantly higher margins.

Figure 4 Developments of ROE



Source: Own processing on basis data ARAD CNB (2016)

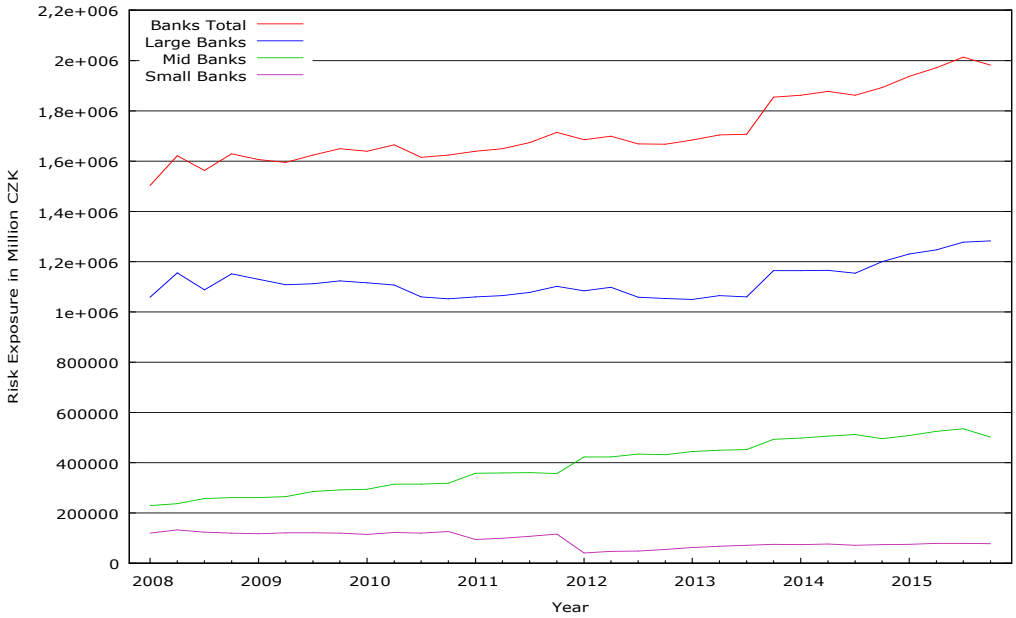
The figure shows how gradually progressive rapprochement with the ROE, thus improving the results for small banks.

Especially large and medium-sized banks are approximately the same results, although the observed increase in ROE for medium-sized banks. The decisive influence here is mainly oriented banks, where banks of medium size, which is focusing more and retail clients in practically the same results as the big banks.

But what is crucial for assessing the impact of interest rate developments, which is associated with an increase in deposits in the banking sector, the decline in aversion to risk. In general we can say that especially for large banks growing risk exposure. Small and medium-sized banks show a relatively stable development of risk exposures, while large banks can be traced growing trend, as shown in the following figure 5.

The increase in risk exposure of large banks may raise concerns about their future development. These are systemically important banks to tighter regulation. Deserves attention particularly significant decline in risk exposure in medium-sized banks by the end of 2015, which might affect both their credit policy and track clients, the banks provided new loans that did not exhibit such a high risk. The end of 2015 is associated with the stabilization of the risk exposures of large banks can be expected to impact the gradual application of Basel III into practice and the interest of banks to improve their results.

Figure 5 Development of Risk Exposure



Source: Own processing on basis data ARAD CNB (2016)

3 Results and Discussion

Management of assets and liabilities form the crux of bank management and is an essential part of the financial management of the bank. It's a way to control the structure of bank balance sheets, which are an overview of the Bank's assets and the sources of its funding. Financial institutions must manage its balance especially in relation to the defined needs and goals. Uncontrolled development of total assets affected mainly by client deposits has resulted in the need for the resulting cash resources to invest. Critical opportunities for banks are their investment through loans and credits. The lack of quality options for lending has as its consequence the deteriorating quality of their loan and credit portfolios.

It is also the basis for discussion, to which the contribution is going.

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

Management of assets and liabilities and the related management form the main focus 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. Financial institutions must manage their balance, especially in relation to the defined needs and goals. Uncontrolled development in total assets mainly influenced by client deposits and the decline in interbank interest rates, has resulted in the need for the resulting cash resources to invest. Crucial options for banks are their investment through loans and advances. The lack of quality options for lending has as its corollary the deteriorating quality of their loan portfolios.

The impact of the deteriorating quality of loans can be expected then, as will be repaid. Especially consumer loans are usually provided to maturity of five years. The same trend can be expected in the future, especially at 100 percentages of mortgages and commercial loans.

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Possibility of Accrual Accounting Application in Case of Active Reserve Forces of the Czech Army

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Abstract: *The article „Possibility of Accrual Accounting Application in case of Active Reserve Forces of the Czech Army" analyses the application of the accrual accounting by way of Active Reserve Forces example. Accrual accounting is considered as a potential tool of resource management system effectiveness increase in the Czech Army. The Active Reserve Force is monitored as a cost centre that is managed by actual and predetermined costs. The three training situation are simulated. The analysis takes into account only activities directly connected with training of the Active Reserve unit influenced by training type and military vehicles involvement. The data are displayed by synthetic and analytical accounts. The training price of separate Active Reserve soldiers is generated through the synthetic and subsidiary accounts under accrual accounting system. Each Active Reserve serviceman have assigned own analytical cost account. This account have displayed all cost items associated with his training. The closing balance of all analytical accounts provides the sum of total costs that were connected with Active Reserve member training.*

Keywords: accrual accounting, active reserve forces, cost centre, analytical accounts, synthetics accounts

JEL codes: M41, M480, M490

1 Introduction

Despite of worsened security conditions the national armies have to face a long term goal – continuous improvement of defence resource management with accent on effective allocation of scarce resources. (NATO, 2014) Provision of defence and national territory integrity are high-priority government responsibility. Defence is a public good and social need with the specific qualities of production and consumption resulting very often in tendency to an inefficient use of resources by department of defence and armed forces. (Olejníček, 2003) However, the governments have to spend considerable quantity of human, material and financial resources for preservation of action capacity and functionality of armed forces. Simultaneously, there is growing significance of the effective resource allocation, optimizing its usage and reduction of the production inefficiency or savings rise.

The process of continual groping towards more effective resource management is of great value. (Vodáková, 2012; Vodáková, Sglundová, 2016) Important is that economically scarce resources intended for defence is not possible to use without limits. The unsuitable exploitation of resources often results in wasting, and furthermore it is very influential on public opinion and armed forces economic performance assessment. (Krč, Golik, Vodáková, 2016) It has a logical implication that public expects value for many in the case defence and armed forces, too. (Olejníček, Kunc, 2012; Dušek, Horák, 2004) The general public is very interested in what is public funds treatment and effectiveness of its use. The problem of resource allocation in the army is understand as the area with best potential for improvement. (Krč, Golik, 2015) Further, it is evident that command and control system reorganization and use of proper economic instruments may have positive effect. It is essential to analyse the possible uses of accrual accounting for economic performance improvement within resource management system of the Czech Army. (Olejníček, Kunc, 2012) The potential benefits of accrual accounting use as an economic tool is examined and explained by way of example of military training of Active Reserve Forces of the Czech Army. To explore the serviceability of accrual accounting as an economic tool these methods were chosen: description, explanation and economic modelling.

Nowadays, the Czech Army has 16 troops of Active Reserve Forces available. However, there is a plan to extend the number of the Active Reserve Forces to 59 in 2025. It comprises the increase from today's 1250 servicemen to 5000 during next decade. This quantitative change creates ample scope for the effective application of the accrual accounting within the troops of Active Reserve Forces. (MoD, 2017; *RMH,2017*)

Using simple analysis of the Active Reserve Forces activities, only operations will be included that directly relate with training of the Active Reserve units influenced by training type and military vehicles involvement. The analysis do not take short term activities of the troops into account. The short term activities as funeral ceremony and publicity campaign which are formally considered as the training activities are excluded from analysis on the grounds of little influence on the preparedness and fighting efficiency of the units. The analysis takes into consideration only military training exercise that contribute to improvement of serviceman competences. The hypothesis is following: „Accrual accounting is suitable economic tool for rationalization of the Active Reserve Force training."

The Active Reserve is part of Reserves of Armed Forces of the Czech Republic according to the new legislation which has come into force last year (Law No. 585/2004 Coll, Law No. 45/2016 Coll). The Active Reserve members voluntarily undergo a military training lasting several weeks after that they continue to work for their civilian employers. Thus, they combine two careers: military and civilian. The Active Reserve is used for strengthening the Armed Forces active force under a state of emergency, state of war, and when non-military crisis situations occur in order to protect the lives and property of people in the aftermath of natural disasters, to include mitigation of their consequences. The present concept of the Armed forces of the Czech Republic is based on the principle of the possible smallest size of the army that is adequate for ensuring the defence of the Czech Republic. A non-crossable personal size of armed forces is determined by the government decision. For the Czech Army, the Active Reserve Force is practical way to ensure reserves in case of emergency. Increasing reserve forces importance is hot discussion topics in all NATO member countries including the Czech Republic. (NATO, 2015) There are several reasons for the reserve forces formation. In the train of failing security environment, states want to increase the numbers of troops and their armies' abilities. However, only professional soldier's investment there is not possible way. As a consequence of this situation, the countries create reserves forces which are activated and financed only during part of the year.

The Active Reserve Forces are important part of the Czech army. There is growing demand for well-trained soldiers capable to fulfill required function with increasing threat

of war. Keeping Active Reserve Force members during several weeks per year for active service (the members are drafted for military training exercise), it is necessary to monitor training costs these servicemen. The questionable is namely situation of increasing value more trained soldiers. For the time spent at the exercises or deployment, the member receives an additional compensation what is a percentage of his or her normal daily income in the civilian sphere, and moreover, they are paid on a daily basis according to their rank. Their civilian employers receive also remuneration depending on type and duration of an exercise or active deployment. To create the monitoring system of the real price of each member of Active Reserve Force, the accrual accounting is possible to use.

2 Methodology and Data

The fundamental micro form of the accrual accounting will be simulate by operation model of the Infantry Company of Active Reserve Forces of the Czech army. The data for our research were gained from real training plan of Active Reserve Forces provided by Regional Military Headquarters. The cost data were extracted from financial reports provided by Financial Agency of the Czech Armed forces. The accrual accounting is viewed as an accounting methodology that provided better overview of the current situation in the accounting (e.g. more complete and objective information about cost centre expenses and revenues).

Modelling of Active Reserve Forces Unit Activities – Starting Points

The model will be define by these characteristics:

a) the troop at about strength of 86 persons,
b) the troop takes part in military training exercise for duration of 21 days at the maximum,
c) plan of military training exercises include three main exercise
    - winter survival (three days duration in attendance of 25 persons),
    - major military exercise which take place in the military training area (nine days duration in attendance of 86 persons),
    - military exercise out of the military training area (small exercise with attendance of 50 persons),
d) the troop has three heavy trucks and one off-road light vehicle available.

In the article there is worked on the presumption that model troop of Active Reserve Forces will act as an independent cost center that is managed by actual and predetermined costs. A crucial prerequisites for creation of such cost center are:

- determination of its economic structure and internal relations,
- description of realized activities,
- determination of outputs passed mutually on internal element of cost centre,
- allocation of expenses and methods of calculation.

In this model of the cost centre, an approach to cost monitoring should be based on responsibility accounting and intercompany structure. Simultaneously, each serviceman should have budget of the suggestible costs available that are subjected to check. The cost control should be based on comparison the real costs with in advance planned costs converted into actual output of the cost centre. Subsequently, the causes of costing differences should be found (causes of planed and actual data difference).

During cost basis allocation on the real volume of activity, the subject of the cost distribution should be only variable costs per unit of measurable activity (1 member of Active Reserve Forces), the fixed costs should be accepted on the predefined limit. The economic interest of the troop members should be bound by real cost savings in comparison with planned costs. This approach has some limitation. The more accurate is

expenses determination, the harder is reaching the cost savings. As logical consequence we could begin to face the costs overrun.

The costs allocation would lie in the costs assignment to a relevant element. This element should be an object of the control. The main aim of cost allocation should be specification of the costs development of the selected element. The costs allocation could be possible to use in following situations:

- decision-making about the use of economic resources,
- calculation of the expenses related to output,
- budget negotiation and costs rationalization,
- retrieval of information about sources limitedness.

A crucial question is how does the costs allocation interconnect to object of calculation? To solve the problem it is recommended that causality principle was used. The causality principle means that each output should be burdened with only causally produced costs.

Accounting Entries within Operating Model of Active Reserve Forces Unit of the Czech Army Causally Related with Military Training

Case 1 - The winter survival exercise

The winter survival exercise used to be located in mountain terrain. The 25 soldiers were called up to the exercise. The soldiers and equipment were transported by bus to the mountain training area. The food was not secured – it was pay in the refund of expenses. All next cost resulted from the winter survival exercise:

- the hire charge for bus (12 000 CZK),
- the refund of food (7 125 CZK),
- the additional soldiers compensation as a percentage of their normal daily income (67 933 CZK),
- the basic pay for instructors (49 406 CZK).

Case 2 - The major military exercise

The major military exercise has taken place in the military training area. It lasted nine days in attendance of 86 soldiers. The soldiers and equipment were transported by trucks to military training area. The soldier´s meals were provided by field kitchen. All following cost resulted from the major military exercise:

- the ammunition costs (138 420 CZK),
- the pay for the provided food (49 872 CZK),
- the additional soldiers compensation as a percentage of their normal daily income (570 195 CZK),
- the basic pay for instructors (324 254 CZK),
- the fuel costs (14 023 CZK).

Case 3 - The small exercise

There were planned 50 soldiers for small military exercise. The soldiers and equipment were transported by trucks to military training area. The soldier´s meals were provided by field kitchen. All next costs resulted from the small military exercise:

- the ammunition costs (138 420 CZK),
- the pay for the provided food (23 570 CZK),
- the additional soldiers compensation as a percentage of their normal daily income (234 069 CZK),
- the basic pay for instructors (131 061 CZK),
- the fuel costs (35 549 CZK).

All military exercises activities and induced consumption of the resources are expressed by accounting transaction. Table 1 describes all account assignments of the realized exercises.

Table 1 The account assignments incurred during the military exercises period

No.	Description of Account Transactions	Amount (CZK)	DS	CS
1.	Fuel costs	12 000		
2.	Refund of food	7 125		
3.	Additional soldiers compensation	67 933		
4.	Basic pay for instructors	49 406,4		
5a.	Purchase order of ammunition, type 1	64 000		
5b.	Purchase order of ammunition, type 2	30 000		
5c.	Purchase order of ammunition, type 3	25 000		
5d.	Purchase order of ammunition, type 4	520		
5e.	Purchase order of ammunition, type 5	18 000		
5f.	Purchase order of ammunition, type 6	900		
6a.	Transfer in powder magazine, type 1	64 000		
6b.	Transfer in powder magazine, type, 2	30 000		
6c.	Transfer in powder magazine, type 3	25 000		
6d.	Transfer in powder magazine, type 4	520		
6e.	Transfer in powder magazine, type 5	18 000		
6f.	Transfer in powder magazine, type 6	900		
7a.	Distribution of ammunition, type 1	64 000		
7b.	Distribution of ammunition, type 2	30 000		
7c.	Distribution of ammunition, type 3	25 000		
7d.	Distribution of ammunition, type 4	520		
7e.	Distribution of ammunition, type 5	18 000		
7f.	Distribution of ammunition, type 6	900		
8.	Refund of food	49 875		
9.	Additional soldiers compensation	570 195		
10.	Basic pay for instructors	324 254		
11	Fuel costs	14 023,32		
12.	Refund of food	23750		
13.	Additional soldiers compensation	234 069		
14.	Basic pay for instructors	131 061,2		
15.	Fuel costs	35 439,84		

Source: own processing

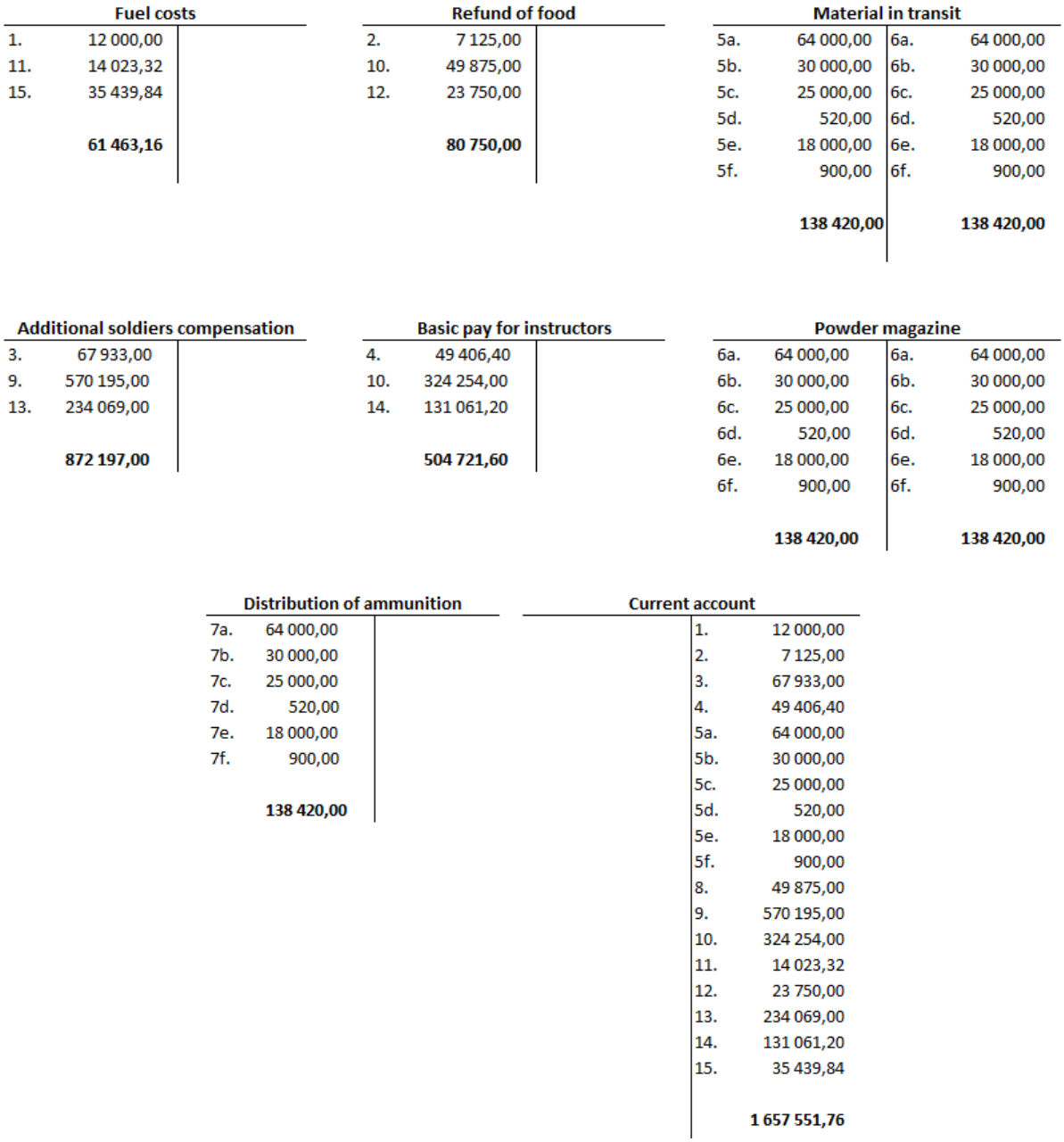
3 Results and Discussion

This chapter summarizes main findings concerning implementation of cost and managerial accounting on accrual basis within conditions of the active reserve forces cost centre. The first part of chapter describes synthetic accounts of cost centre. The second part devotes attention to analytical accounts usage.

Synthetic Accounts

Following Figure 1 shows the entering of the account assignments in the synthetic accounts as consequence of the military training of Active Reserve Forces Unit.

Figure 1 Displaying of the synthetic accounts of Active Reserve Forces Unit



Source: Own processing

Above displayed accountant assignments are not extraordinary in privete sector. However, these transactions are significant for managerial purposes in the area of the armed forces too. Via synthetic accounts, it is possible to gain the comprehensive and complete overview of the resources allocation, regarding fuel, food or wage funds and so on.

Subsidiary Accounts

The subsidiary accounts usage enable us rather accurately to determine a price of military training of each individual serviceman of Active Reserve Force. The price determination is possible by application of the subsidiary accounts, when each member of the Active reserve forces unit should assign own analytical cost account. These

accounts should display the single cost items that are causally related to the troops training. Subsequently, a closing balance of the each analytical cost account would suggest an overall costs that have been spent on training of the individual serviceman to date. Next Figure 2 displays six subsidiary accounts of the active reserve unit members.

Figure 2 Displaying of the subsidiary accounts of Active Reserve Forces Unit

Subsidiary account No. 1 (A.B.)	
1.	
2.	
3.	
4.	
7.	1 660,00
8.	665,00
9.	11 064,76
10.	3 770,40
11.	163,06
12.	
13.	
14.	
15.	
	17 323,22

Subsidiary account No. 2 (B.P.)	
1.	240,00
2.	285,00
3.	3 702,60
4.	1 976,26
7.	1 660,00
8.	665,00
9.	8 639,40
10.	3 770,40
11.	163,06
12.	475,00
13.	6 171,00
14.	2 621,22
15.	708,80
	31 077,73

Subsidiary account No. 3 (B.K.)	
1.	
2.	
3.	
4.	
7.	1 660,00
8.	665,00
9.	12 312,44
10.	3 770,40
11.	163,06
12.	
13.	
14.	
15.	
	18 570,90

Subsidiary account No. 4 (B.J.)	
1.	
2.	
3.	
4.	
7.	1 650,00
8.	665,00
9.	8 801,52
10.	3 770,40
11.	163,06
12.	475,00
13.	6 286,80
14.	2 621,22
15.	708,80
	25 141,80

Subsidiary account No. 5 (B.Z.)	
1.	
2.	
3.	
4.	
7.	1 660,00
8.	665,00
9.	6 976,20
10.	3 770,40
11.	163,06
12.	475,00
13.	4 983,00
14.	261,22
15.	708,80
	22 022,68

Subsidiary account No. 6 (B.M.)	
1.	
2.	
3.	
4.	
7.	1 650,00
8.	665,00
9.	7 814,80
10.	3 770,40
11.	163,06
12.	
13.	
14.	
15.	
	14 063,26

Source: Own processing

The selected subsidiary accounts, displayed above, give basic information about cost allocation against realized military exercises and participating soldiers (account No. 1 – 6). These accounts provide us not only with information about separate soldier consumption, but cost-efficiency of soldier (on condition that we are able evaluate the soldier performance).

The subsidiary accounts analysis is able to offer the crucial information for troop commander and economic decision-making process in general. The reasons are following:

- **Expensiveness** – an elementary analysis is able to point out the most expensive or the most inexpensive soldier. The commander or economic officer of the unit can use such information effectively. It is irrational to have "very expensive soldiers" (well-educated, skilled or capable) on position of rifleman. To the contrary it is crucial to use the potential of such unit members (language skills, driving licence, previous experience from electrical or mechanical engineering) for

qualification demanding positions (functions), preferentially for officer's staff. From economic and managerial point of view, it is necessary to transfer such soldiers to more suitable position. This measure is desirable on the grounds of the soldier's compensation system (the more educated soldier the more expensive soldier). This approach provide us better cost/benefit ratio in connection with optimal operation of active reserve force unit.

- **Benchmarking** - the sum of separate analytical cost accounts uncovers overall costs, at the same time allows to make comparison of the separate cost items.
- **Planning process** - it is possible to keep overview of the cost type consumption effectively. For example, this evidence allows to plan the demand for ammunition depending on the actual troop size. If the active reserve forces unit should dispose of it´s budget, fully decision autonomy, it should be able to secure a sufficient amount of ammunition and to correct the demand for future resource allocation in further period. In case of centrally fixed amount of sources (e.g. ammunition, vehicles etc.) and increasing number of new troops, the quality of training could be decreasing logically (e.g. decreasing number of ammunition per soldier).

4 Conclusions

The article points out the potential usefulness of the accrual accounting introduction into economic system of the Czech army. In the light of intended increase of the number of the Active Reserve Force units of the Czech army, it is essential to look for more effective way of their control and composition. The above mentioned simplified case study, on the active reserve forces cost centre, shows the possibility of transformation relevant financial accounting data by way of appropriate managerial tool (analytical accounts) to internal databases organized according to their specific needs. In addition to other things the former research (Olejníček, 2015; Olejníček, Kunc, 2012; Olejníček, 2011) has confirmed that they can also serve to monitoring of effectiveness, economy and efficiency. The real knowledge of the costs per solider (unit costs), the costs per military exercise (costs per output), the variance between estimated and actual value of costs and so on sets the scene for effective economic management including such specific area like the armed forces.

The presented operating model of Active Reserve Forces unit showed the possibility of the analytical accounts usage. The provided information by model can be used for both resource management and planning and decision-making process. So by means of the accrual, cost and managerial accounting can be achieved the optimal structure and composition of the Active Reserve Forces units of the Czech army not only from military-operational but also from cost-benefit and managerial point of view.

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Mergers of agricultural enterprises in the Czech Republic

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Abstract: *One of the conspicuous manifestations of the globalization of economic activities is mutual operations between enterprises whose aim is to achieve a higher valuation of them. These are transformations of companies and cooperatives whose use is steadily rising among businesses. Mergers occur throughout the entire economy, including agriculture. Agriculture is an important component of the economy although its share of gross domestic product shows a decreasing trend. In agriculture, the most common motivation for mergers is the simplification of the structure of a group of companies, as suggested by the study of merger projects. To evaluate the success and efficiency of mergers selected ratios are used and the measured period is three years before and three years after the merger. The study involves agricultural enterprises in the Czech Republic that were merged in the years 2010 – 2012. Also, a relationship between the number of transformations in the form of mergers in agriculture and the development of GDP in the years 2006 – 2016 is examined.*

Keywords: mergers, company transformation, agriculture, efficiency

JEL codes: G34, K20, M21

1 Introduction

The term "mergers" is now one of the most popular words. The reason is that with the ever-growing globalization of economy there is a trend towards consolidation in different production areas and in different markets. This trend is evident in all business areas, even in agriculture. Agriculture in the Czech Republic is a production sector with a long tradition. Together with fishing and forestry it belongs to Section A according to the classification of economic activities CZ-NACE. This group, together with mining and quarrying, is referred to as the primary sector, since producers are in direct contact with nature and when growing crops, they interact with natural influences (Homolka 2010). Agriculture has productive and non-productive functions (Boháčková, 2014). The non-productive function of agriculture is often supported by various subsidies from national and European funds (Synek, 2010).

In 2015, agricultural land accounted for approximately 53% of the total area of the Czech Republic. About 47,000 agricultural producers and processors of agricultural raw materials are currently engaged in this sector of economy, managing approximately 3.5 million hectares, of which 2.5 million hectares is arable land (71% of farmland). About 84,000 workers are employed in agriculture (eAgri, 2016). At present, agriculture, forestry, and fishing constitute less than 3% of GDP and it is the tenth-smallest sector in the Czech Republic (Kučera, 2014).

Agricultural production has some special characteristics which are described by various authors (Boháčková and Landová, 2014; Homolka, 2010; Dvořáková, 2012; Kučera, 2002), who concur that the basic differences are predominantly the biological character of agricultural production. Another specific feature is the seasonal character of agricultural production, dependence of the production cycle on natural conditions, high

demands for specialized equipment, large-area production, production of main and secondary products and many others. Agriculture is an indispensable part of the national economy even though its share of GDP is still decreasing. As in other sectors, also here there is a tendency towards concentration of businesses whose aim is to make production more efficient, to save costs in the hope of improving the market position, and to increase the competitiveness of the company, so mergers of companies and cooperatives occur quite often even here.

In the Czech Republic mergers are most often implemented with the aim of improving efficiency and the company's position in the market (Konkolski, 2011). A study of the motives for mergers in agriculture was conducted by Šuráň (2016), and the survey showed that the most common motive for mergers in agriculture is the simplification of the group structure (organizational administrative, personnel and logistics structures).

In the Czech Republic, the transformation of companies and cooperatives are mainly governed by Act No. 125/2008 Coll. on the transformation of companies and cooperatives, as amended. Besides mergers, which are the main topic of this paper, transformations are also divisions of companies, the transfer of assets to a shareholder and the change of the legal structure. The merger itself is defined in §§ 61– 242 of the Act. A merger is an operation in which at least one company disappears and the assets of the disappearing companies are transferred to a successor company which already exists or will be newly created for this purpose. By form, mergers can be divided into mergers by acquisition and mergers by the formation of a new company. The most common form is a merger by acquisition, because according to Salachová (2014) it is associated with less administrative and legal burden, so the costs of implementation are also lower. Nevertheless, it is an act which requires careful preparation of all documents, crucial decisions regarding the record date, and also a time management plan as this process will take several months.

As it is necessary to harmonize all legal, accounting and tax areas of this issue, the process makes a lot of demands on all stakeholders. This means that it is essential to respect more laws than just the aforementioned Act No. 125/2008 Coll. on transformation of companies and cooperatives, as amended, but also, for example, Act No. 563/1991 Coll. on accounting, Act No. 586/1992 Coll. on income taxes, Act No. 304/2013 Coll. on public registers of legal and natural persons, and Act No. 143/2001 Coll. on the protection of competition and amendments to certain acts, as amended, and others.

Despite the fulfilment of all legal requirements and recommendations, the success of the merger is not guaranteed and the increase in economic profit, which is often referred to as the main motive of mergers, or increased competitiveness need not be achieved. According to Kislingerová (2001) and Synek (2007), a merger is often beneficial to a disappearing company, whereas the successor company can be successful only if it is a strong company, the expected synergy is as big as possible and the size of merging companies is adequate – it is good if the size of the disappearing company is about one-third to one-half of the successor company. In such a case, the merger is expected to be the least problematic.

2 Methodology and Data

The aim of the paper is to evaluate effectiveness of the mergers of selected agricultural enterprises. These included agricultural enterprises in the Czech Republic where the merger took place in the years 2010–2012. The agricultural enterprises were divided into five categories on the basis of the financial volume of the mergers, as shown in Graph 1, and one representative was chosen for each category. Because the merger worth more than 1,000 million CZK took place only in the year 2016, it could not be included in the survey. For this reason, two representatives were selected for the category of 100–500 million CZK. This was the category in which the largest number of mergers went through

in the years 2010–2012. Thus, it was possible to assess selected ratios over the 3 years before the merger and 3 years after the merger. This time interval is determined on the basis of existing studies, e.g. Synek (2010), Martynova, Rennebook (2008). Data on completed mergers in agriculture were sourced from the Commercial Register, the Commercial Bulletin and from the website justice.cz. Effectiveness of mergers was assessed by ratios, which are preferred predominantly by investors because of their high explanatory power. The calculations were based on the financial statements, namely balance sheets and profit and loss statements of selected companies. The following indicators were examined:

- Return on equity (ROE), which measures the return on investment:

$$ROE = \frac{Net\ \ Income}{Equity} \tag{1}$$

- Return on sales (ROS), calculated as follows:

$$ROS = \frac{Net\ \ Income}{Equity} \tag{2}$$

- Total debt ratio:

$$Debt\ \ Ratio = \frac{Total\ \ \ Liabilitie\ s}{Total\ \ \ Assets} \tag{3}$$

- As mergers may impact the number of employees, it is good to include sales per employee:

$$Sales\ \ per\ \ Employee = \frac{Slales}{Total\ \ Employees} \tag{4}$$

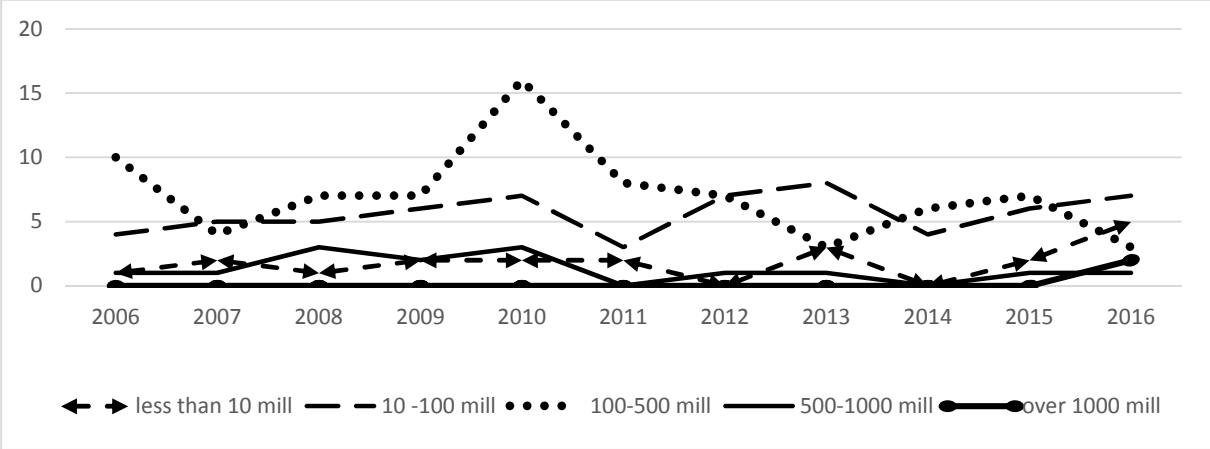
The paper also examined the relationship between the number of mergers and GDP development in 2006–2016. The number of mergers in relation to the macroeconomic environment is determined by correlation analysis. In addition to the basic scientific methods and correlation analysis, methods based on the principles of logical thinking, especially the method of deduction, were used. The results are given in tables and graphs. The synthesis method is used to draw conclusions

3 Results and Discussion

Development of mergers in agriculture in the years 2006–2016

From 2006 to 2016, a total of 191 mergers of different sizes were made. Graph 1 shows the development of the number of mergers categorized by size. Most mergers in this period amounted from 10 million CZK to 100 million CZK. The category of mergers worth more than 1 billion was represented only by one merger that took place in the year 2016.

Figure 1 Development of the number of mergers in agriculture by financial volume



Source: Own processing based on justice.cz

The number of mergers in agriculture out of the total number of mergers in the Czech Republic

Table 1 below gives the overview of all mergers in the Czech Republic between 2006 and 2016, and also the number of mergers in agriculture. Unlike Poland and Serbia, as reported by Luty (2016), the number of mergers in the Czech Republic was not affected by the financial crisis, as evident from the table.

The table shows that mergers in agriculture account for approximately 5%, whereas in the year 2015 they were less than 4% out of the total number of completed mergers. In the year 2016 they constituted 6%, which is due to the overall lower number of all mergers. The number of mergers in agriculture was almost the same as in the year 2015.

The table also shows that the number of mergers in agriculture is growing, but it is moderate growth, only in the year 2010 there was an increase in the number of registered mergers. The total number of mergers was 30, however the average number of mergers is 17 per year. In the reporting period, the total number of mergers was 191, of which only 4 were mergers by the formation of a new company, the others were mergers by acquisition.

Table 1 Development of the number of mergers in agriculture out of the total number of mergers in the Czech Republic

Member of mengers	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
agriculture	18	13	16	19	30	15
economy	256	214	342	335	359	399

	2012	**2013**	**2014**	**2015**	**2016**	**Σ**
agriculture	16	15	14	17	18	191
economy	346	444	321	438	293	3747

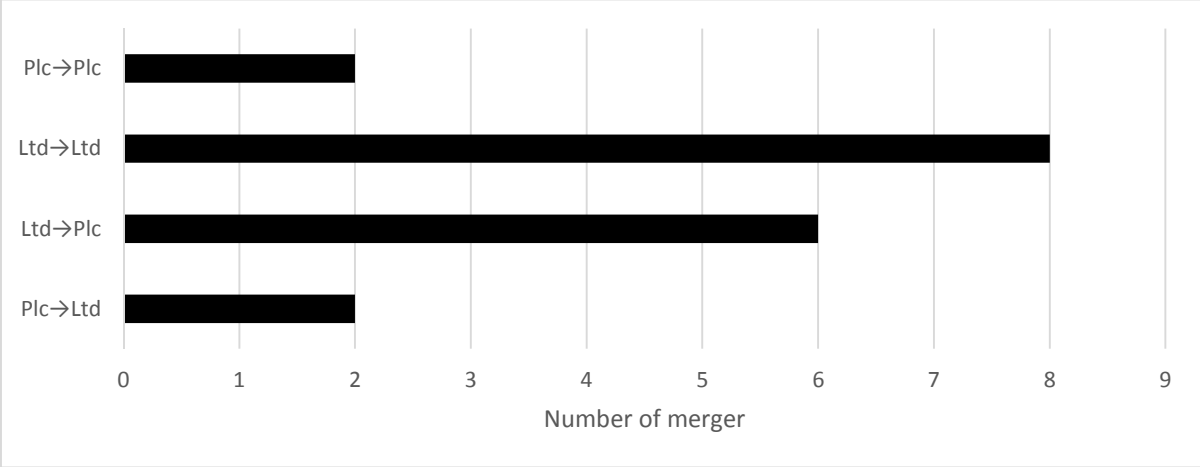
Source: Own processing based on justice.cz

Legal structures of merging companies

As for the legal structures of companies that went through mergers in agriculture, Graph 2 shows that in the year 2016 the most common type was a merger between two limited

liability companies, followed by a merger between a limited liability company and a joint stock company. The joint stock company becomes a successor company and the limited liability company is a disappearing company. This year there was no merger in which at least one cooperative would be a merging company.

Figure 2 Legal structures of merging companies in the year 2016

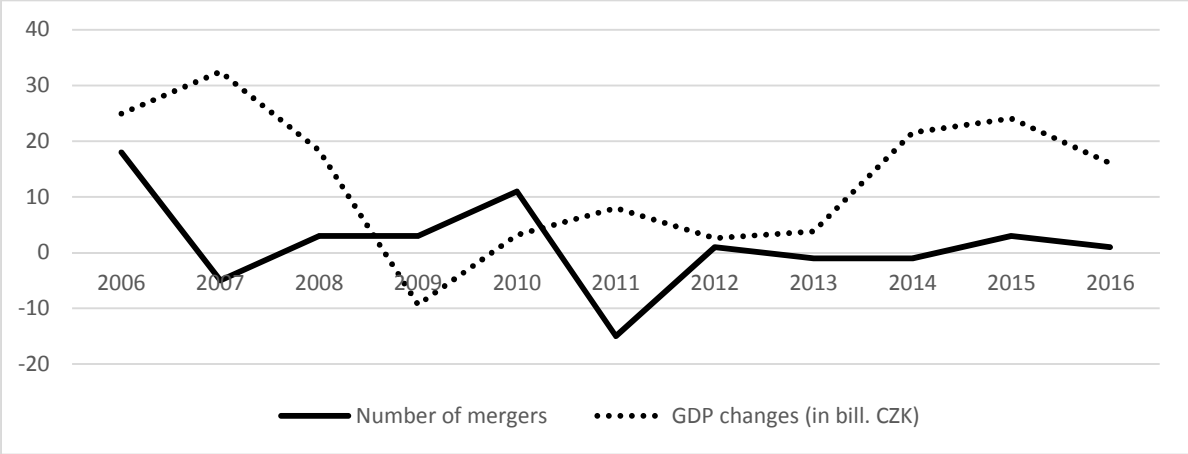


Source: Own processing based on justice.cz

The number of mergers in relation to the macroeconomic environment

Graph 3 clearly shows the connections between the number of mergers in agriculture and the macroeconomic environment, represented by one macroeconomic quantity – gross domestic product. There are two number series, one of them shows the values of the number of mergers in agriculture in individual years and the other the volume of GDP in the years 2006–2016. These number series were created using the formula X_t-X_(t-1). The number series thus shows changes compared with the previous year. When the pattern of these two curves is compared, there is no similar pattern evident until 2008. In the other periods, there is a delay in the number of mergers compared to GDP changes. A decrease in GDP is evident in 2009, but a decline in the number of mergers occurs in 2011, the pattern of curves is very similar but with approximately a two-year shift.

Figure 3 A relationship between changes in GDP and the number of mergers



Source: Own processing

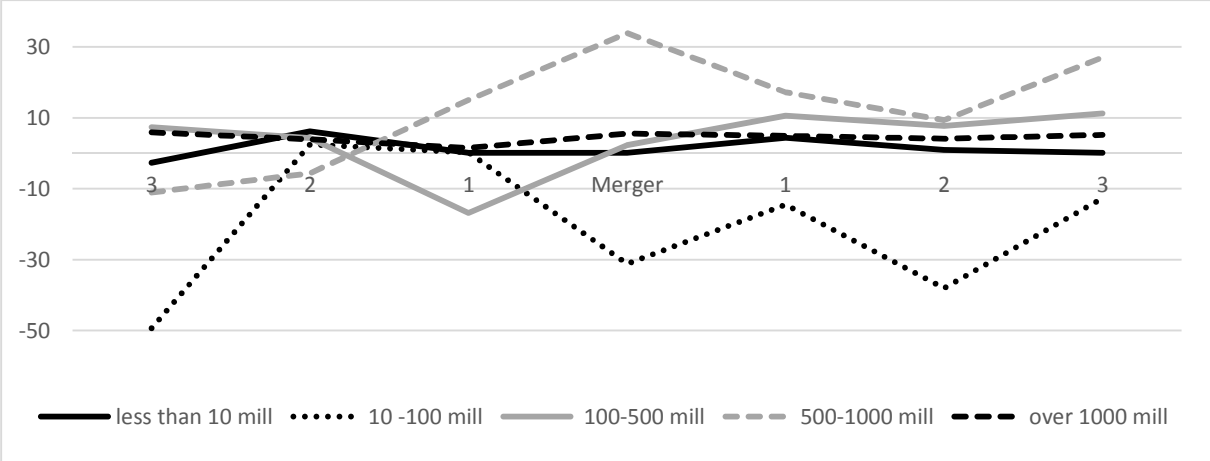
Assessment of merger efficiency

An assessment of merger efficiency was made in agricultural companies which merged in the years 2010–2012 using selected ratios.

Return on equity

The first indicator which was examined in the companies was return on equity (ROE). A positive development is documented by the increasing value of this indicator. In the companies under study, this indicator showed a declining trend after the merger, only in the third year after the merger the value of this indicator started to increase gradually.

Figure 4 Development of return on equity

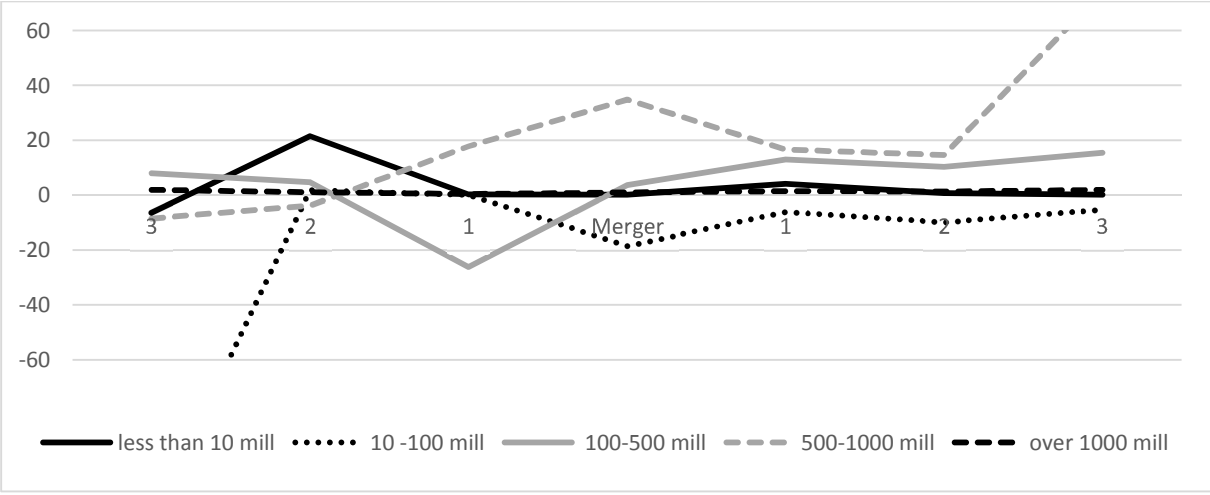


Source: Own processing

Return on sales

Figure 5 reveals that return on sales does not change much in the companies after the merger, only Company 4 shows larger fluctuations in the value of this indicator. In the other companies the value changes only slightly in both directions. So, it cannot be concluded that the merger contributed to increased return on sales, which can be described as a positive development.

Figure 5 Development of return on sales ratio

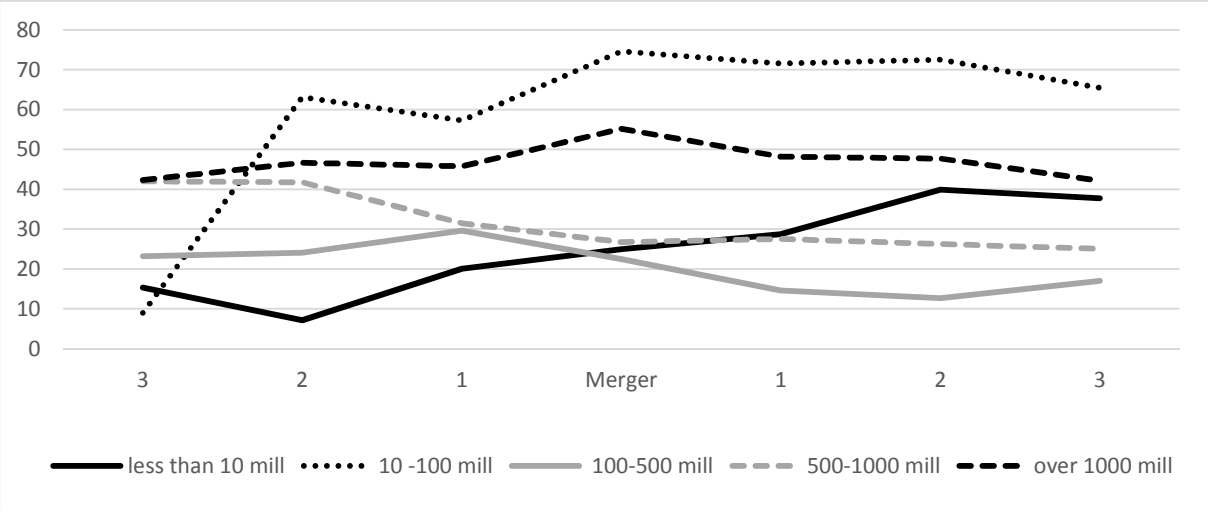


Source: Own processing

Company's indebtedness

After the merger, there was a reduction in the debt ratio of the companies, which indicates an increase in the company's financial self-sufficiency, only in one company debt was on the rise. From this viewpoint it is possible to say that for the companies that show a decline in this indicator the merger was beneficial.

Figure 6 Development of companies' indebtedness

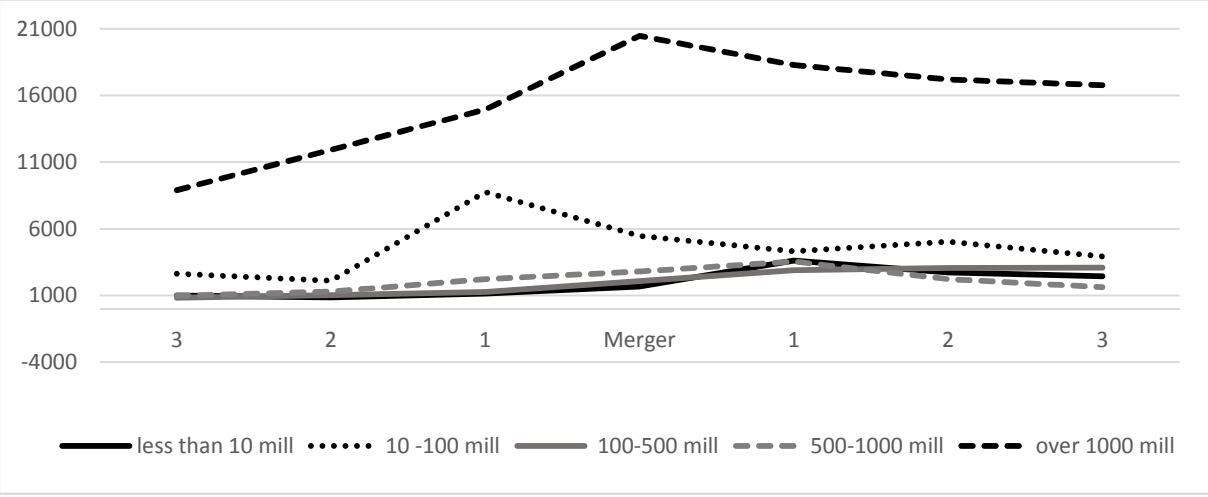


Source: Own processing

Sales per employee

The study revealed a decreasing trend in the development of sales per employee, which is undesirable from the viewpoint of the company. In the companies under study first of all there was an increase in the number of employees and in turnover (immediately after the merger), which was followed by an evident decrease in both indicators.

Figure 7 Development of sales per employee



Source: Own processing

4 Conclusions

According to a merger project survey, it was found that the most common motive for mergers in agriculture was the simplification of the group structure (organizational, administrative, personnel and logistics structures). This emerged from more than half of the merger projects under examination. Other often cited reasons were increasing

business efficiency and subsequently strengthening market position and also concentration of business activities. In every tenth merger, the motivation was an attempt to simplify interrelationships between the participating companies, which is a frequent reason for vertical mergers where suppliers merge with customers. The analysis of the mergers in agriculture indicated that also in this sector companies merge and of the total number of mergers in the Czech Republic mergers in agriculture accounted for approximately 5%. The correlation analysis of the dependence of the number of mergers and GDP over the years 2006 to 2016 showed that these two variables were positively correlated, but with about a two-year delay.

The results of ratios suggest that their values are not very favourable, which supports the view of many authors that the merger may not always be beneficial for companies. Favourable development can only be seen in the company's debt ratio, which suggests higher financial self-sufficiency.

The company's performance is, however, influenced by many factors and it is not clear from the company's statements whether variations in financial statement items are due to the effects and consequences of the merger or other factors affecting business. As already mentioned in the introduction to this paper, agriculture is, moreover, a specific sector which is influenced by economic factors and also by factors typical of agriculture.

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Reporting of Goodwill in Mergers & Acquisitions

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Abstract: *In the new economy, intangible assets have become the main value creators for a large number of companies and economic sector. Recent growth of the service sector and of the information technology-related business, along with the dramatic increase in the number and size of mergers and acquisitions, has made accounting for intangible assets very significant, especially in the field of reporting of goodwill. Comparative analysis is focused on the differences between IFRS, US GAAP accounting procedures and Czech accounting legislation. Main areas of analysis and synthesis are the identification of mehods for goodwill recognition and reporting. The result is to recommend more broadly voluntary disclosure in the reported financial statements of companies. Data disclosed and published on a voluntary basis are*

Keywords: goodwill, intangible assets, mergers and acquisitions, reporting

JEL codes: F36, L21, M41

1 Introduction

In the new economy, intangible assets have become the main value creators for a large number of companies and economic sectors. However, the valuation of these assets within the accounting framework raises several problems with regard to their identification, measurement, and control (Zeghal, D., Maaloul, A., 2011).

The relatively recent growth of the service sector and of the information technology-related business, along with the dramatic increase in the number and size of international mergers and acquisitions, has made accounting for intangible assets (IA) very significant (Lev, 2001). Context determines the value given to tangible assets and makes an even higher impact on the valuation of intangible assets. It is important to bear in mind that context affects the valuator's perception and that individuals assess intangible components subjectively (Axtle-Ortiz, M.A., 2012).

In view of their importance, the investor is made aware of the intangibles during various meetings with the entrepreneur (Smith, Cordina, 2014). At present the variability of recommendations for reporting elements that are not part of financial statements continues to grow. There is growing evidence that narrative disclosure is superior under a mandatory regime (Aerts et al., 2013, Beattie et al., 2008 and Li, 2010).

According to Kang (2011) are few comprehensive guidelines for corporations in either International Financial Reporting Standards (IFRS) or in United States Generally Accepted Accounting Principles (US GAAP) on how to report IA, other than for purchased goodwill and some development costs, in company financial statements. There is in the accoutancy of intangibles sometimes-large difference between accountig rules and guidelines implemented in different parts of the world.

Although accounting rules of different countries are converging, differences still remain also with regard to the treatment of intangibles. The most important progress made in the last years is that the intangible assets to be accounted for have been described extensively togeher with procedures for their impairment and amortisation. In order to calculate or valuate reliably a monetary value for particular intangibles different methods and procedures are followed. Another major obstacle is formed by the fuzzy character of

goodwill (Seetharanam et al., 2006), which is often described as an amount of money paid in excess of the goods acquired.

Given that goodwill is usually a significant part of the total purchase price and often the largest component, it is right that stakeholders should be told what it represents but two doubts remain as to whether accounting standards go far enough. Is a qualitative description, along the lines required in the revised standards, adequate for stakeholders' needs? And secondly, what happens if companies fail even to comply with this simple disclosure requirement? This article analyses in more depth what can be done in analysing goodwill.

2 Methodology and Data

Goodwill as a important part of intangible assets has been more and more interesting not only for researchers but mainly for company managers and owners. This article deals with differences in accouting treatments and reporting in financial statements pursuant to the IFRS in comparison to the US GAAP and the Czech accounting legislation. The rewiew also lists current trends, terms and definitions used in dealing with term goodwill in publications on intangible assets and mergers and acquisitions.

Our results are going to be a part of pilot project, its aim is to analyse accounting practices in reporting goodwill, identify the differences in procedures, and to evaluate their influence on the reported situation concerning equities and capital of the participating companies and investments of partners. This article is based on analysis and comparisons of relevant literature resources, mainly articles and conference papers, but also legislative acts and monographs.

3 Results and Discussion

Zanoni (2009) is providing a precise and accurate definition of goodwill, which allows to differentiate between goodwill emerging from a business combination recognized by standards and internally generated goodwill. From a theoretical perspective, the going-concern goodwill is the present value of abnormal earnings flows expected by the firm.

According to Reporting Goodwill Internationaly (2008) the recent issue of revised accounting standards for business combinations under US GAAP (SFAS14R) and IFRS (IFRS3R) has been a significant step down the road to convergence. One of the most interesting changes has been the adoption by the Financial Accounting Standards Board, in the US, of the IFRS requirement for acquiring companies to disclose and explain the nature of the goodwill arising from the purchase price allocation.

SFAS141R will require acquirers to disclose "a qualitative description of the factors that make up the goodwill recognized. It goes on to suggest that these might include expected synergies and intangible assets that do not qualify for separate recognition. The new US GAAP requirement remains noticeably weaker than the IFRS3 equivalent which is for "a description of the factors that contributed to a cost that results in the recognition of goodwill, a description of each intangible asset that was not recognised separately from goodwill and an explanation of why the intangible asset's fair value could not be measured reliably or a description of the nature of the excess recognised in profit or loss."

In the Czech Republic application of the International Financial Reporting Standards is compulsory for all accounting units issuing securities registered on the regulated securities markets of the EU Member States. The intangible asset area is settled in the Czech accounting legislation in Standard no 013 Long-Term Intangible and Tangible Assets (Křížová, 2008).

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. These include establishment costs, intangible results of research and development, software, rights of determinable value and goodwill. 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. According to Czech accounting legislation in Standard no 013 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.

According to Zanoni (2009) six components of goodwill emerging from a business combination are identified. Similar to other, this author breaks down the goodwill emerging from a business combination in overpayment, synergies between the target and the acquiring firm, reevaluation, newly identified intangible assets, and internally generated goodwill.

One of the reasons often given to why goodwill has not been described is that it cannot be done or is too difficult. The following are examples of what goodwill is comprised of and how to place a value on it and describe it. There are unlikely to be intangible assets which do not meet the recognition criteria stipulated in FASB 141 and IFRS 3. However, if there are such assets they should be allocated to goodwill. The standards require them to be disclosed and reasons given why they have not been valued. The standards prohibit the valuation of workforce as an identifiable intangible asset, therefore if one has any value it should be included within goodwill.

Table 1 Reasons mentioned in purchase price allocated to goodwill

Justification of goodwill	**Frequency mentioned**
Rights-related reasons	-
Technology related reasons	9
Customer-related reasons	20
Contract-related reasons	2
Cost-savings-related reasons	21
Expertise-related reasons	24
Other reasons	13

Source: Boekestein, B. (2009) p. 394

The value of a business is often greater than the sum of the individual components. This value increase is quantifiable and should be allocated to goodwill and described. Of course the reverse is true as well. Our research has seen no such analysis describing such underlying value attributed to goodwill.

The application of the breakdown approaches using the example of a business combination between two Italian banks (Unicredit and Capitalia) presents Zanoni (2009): Real goodwill, terminal goodwill, current and growth goodwill, businesses goodwill, as well as positional and system goodwill are identified.

One of the reasons often given to why goodwill has not been described is that it cannot be done or is too difficult. The following are examples of what goodwill is comprised of and how to place a value on it and describe it. There are unlikely to be intangible assets which do not meet the recognition criteria stipulated in FASB 141 and IFRS 3 (R). However, if there are such assets they should be allocated to goodwill. The standards require them to be disclosed and reasons given why they have not been valued. The

standards prohibit the valuation of workforce as an identifiable intangible asset, therefore if one has any value it should be included within goodwill.

Economy of scale creates significant cost synergies when businesses combine. This can be rigorously quantified and is often a key motivation for the acquisition (Sedláček at al., 2011). For example, a saving of annual head office costs might be quantified at £5m a year, equating to a capital value of £50m. Unit costs can also be greatly reduced through increased purchasing power, creating further cost synergies.

According to Goodwill Reporting Internationaly cross-selling opportunities create sales synergies which can be quantified. For example, Aviva's acquisition of the RAC enabled Aviva to sell RAC services to its existing customers as well as being able to sell Aviva's products and services to RAC's existing customers. The portfolio effect can also be created where two powerful portfolios combine, facilitating an increase in overall sales because of their combined attraction.

Examples of goodwill qualitative descriptions

In its 2006 annual report Mittal Steel Company discloses details of the acquisition of Arcelor for €29 billion, of which €6 billion was allocated to goodwill. In addition Mittal completed two earlier acquisitions in 2005 for a total of €8 billion, including €1 billion of goodwill. One note covers all three acquisitions and states that "Goodwill recorded in connection with the above acquisitions is primarily attributable to the assembled workforces of the acquired businesses and the synergies expected to arise after the Company's acquisition of those businesses. (3) Granted these acquired businesses are similar, as they are all steel producers, but is a generic disclosure that does little more than repeat the wording in IFRS3 really adequate to explain to stakeholders what €7 billion was spent on.

It is depressing how many large companies decide that the present, decidedly unchallenging, requirements of IFRS3 for disclosure of the components of goodwill are all too much, and choose to remain silent, with the acquiescence of their auditors. For example, Goodwill Reporting Internationaly states, that the acquisition of Allied Domecq by Pernod Ricard in July 2005 cost around €15 billion of which €3 billion was allocated to goodwill.

There are numerous other examples of a complete disregard of the requirement to disclose the components of goodwill. Alcatel allocated €8 billion to goodwill on the acquisition of Lucent in April 2006. In the year to September 2007, Siemens completed two major acquisitions at a combined cost of €7 billion, of which close to €5 billion was allocated to goodwill.

It may be too much to hope that an arcane accounting disclosure requirement might protect stakeholders from poor company managements but stronger disclosure requirements and a requirement to quantify, at least in broad terms, and have audited, the components of goodwill would bring improvements in information for stakeholders to assess for themselves significant business investments.

4 Conclusions

The following conclusion can be drawn from this study: discussions about the role and reliability of information of the basic financial accounting statements continue to be evoked by bankruptcies of large companies or by the past global financial crisis. Questions are often asked what causes the profound differences between the accounting and the market value of companies. Analyses and research results in this area often speak about very different ways of human capital management, differences in customer relationships, use of information technologies, employee knowledge or specific corporate organisational cultures. Due to the shift in the way investors and other stakeholders consider emerging economies and their companies, most of the international attention is

now on a select group of high-flying and top-performing emerging market companies (Smith et al., 2003). It may be naïve to assert that total transparency regarding IA would automatically enhance the quality of corporate information being distributed to external stakeholders.

Quantification and qualitative descriptions of goodwill brings may be a discipline to the acquisition process and management, knowing that their estimates would be subject to audit scrutiny, might be dissuaded from repeating some of the excesses of the past. Such a process would be effective even if the quantification of the components of goodwill did not have to be disclosed in the annual report itself. Data disclosed and published on a voluntary basis are typically provided by listed companies which also attached a business report to their financial statements, in theircase, the financial statements contain far more items than the required minimum.

It is unlikely that the investor becomes aware of the intangible assets whilst analysing the financial statements. In view of their importance, the investor is made aware of the intangibles during various meetings with the entrepreneur. At present the variability of recommendations for reporting elements that are not part of financial statements continues to grow. There is growing evidence that narrative disclosure is superior under a mandatory régime.

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Analysis of Insurance Distribution on the Czech Insurance Market

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Abstract: *In the insurance market, either internal or external sales method can be selected to distribute an insurance coverage. The external distribution channel (also called the intermediary channel) is represented by insurance intermediaries; the internal distribution channel (also called the employee channel) by employees of insurance companies. The new/forthcoming regulation of insurance distribution brings several changes, and alters a number of important fundamentals of the regulation of insurance distribution, in consequence insurance intermediaries, too. One of the goals of a comprehensive amendment, the introduction of a new categorization of insurance intermediaries and removal of differences in the external and internal distribution of insurance. This article is focused on the analysis of insurance distribution aiming insurance intermediaries in the context of insurance market development as well as the changes in regulation of insurance distribution as it comes to both the Czech and European law. The aim is to analyze the groups with the impact of the new regulation.*

Keywords: distribution of insurance, insurance intermediaries, insurance markets regulations

JEL codes: G30, G22, F36

1 Introduction

In the insurance market, various distribution channels can be selected to distribute an insurance coverage. The selection of those channels depend on many factors and specific criteria. The marketing strategy of insurance company and evaluation of distribution channel advantages serve as the basis when selecting the products distribution. Economic assessment and legal aspects of considered distribution channel are being evaluated. Further, particular criteria such as insurance company´s status in the market, organizational structure, territorial scope, competitive environment, costs, flexibility effectiveness, capacity and preparedness of the selected distribution channel are considered as well. The specifics of insurance company and offered insurance products becomes the important aspect of the selection – i.e. selection by the type of insurance company or customer (retail clients, entrepreneurs, public administration etc.), further by type of risk or e.g. by insurance product.

In the literature, distribution channels are divided into internal or external sales (Ducháčková, 2015, Mesršmíd, 2016). The external distribution channel (also called the intermediary channel) is represented by insurance intermediaries; the internal distribution channel (also called the employee channel) by employees of insurance companies. Insurance intermediaries are the entrepreneurs, either a natural or legal person, who, for payment, provide insurance intermediary activities on the basis of Act No. 38/2004 Coll., on Insurance Intermediaries and Independent Loss Adjusters and on amendment to the Trade Licensing Act (hereinafter the "Act on Insurance Intermediaries").

Employees of insurance companies are under employment of insurance companies and their own network offering insurance products. Employees were exempt from the Act (section 2) of the Act on Insurance Intermediaries, entry into effect of amendment 261/2014 Coll. The reason for employees' exemption is based on this Act, which regulated business activities, while employees are bound by employment relationship and thus the employer bears the responsibility for their actions. Insurance and reinsurance

companies were able to provide their employees with a training program to make them experts. Amendment of Act began to unify the regulation of internal and external sales of insurance products.

New Insurance Distribution Directive (in text IDD) changes the regulation of insurance distributors in the EU as well as insurance intermediaries. The IDD enters into force on 23 February 2016. Member States have 24 months to transpose its provisions into national law. By 23 February 2018, insurance distributors will be required to comply with the new rules. The IDD directive aims to improve the legislative modification of the retail insurance market in effective way. Its focus is to ensure fair conditions for all participants in the sales of insurance products and to strengthen the customer protection.

The paper focuses on analysis of concept insurance distribution, in more detail insurance intermediaries, in the context of developments in the insurance market and changes in the insurance distribution regulation in Czech and European law. The aim is to analyze the groups with the impact of the new regulation. The article therefore provides with a point of new categorization of insurance intermediaries.

2 Methodology and Data

Insurance distribution means to sell, propose the sale, give advice or carry out different activities in order to prepare an insurance contract. It includes dealing with claims after an insurance event. The Insurance Distribution Directive (IDD) regulates the activities of insurance intermediaries, insurance companies, their employees, ancillary insurance intermediaries as well as online distribution.

Distribution channels being used when selling the insurance are similar in particular countries; however, specifics exist as well. All EU members are obliged to deal with new regulation regarding the insurance distribution and transpose it into their laws. Some countries though express their objections the regulation as they have their own specifics when using the distribution channels mainly agents and brokers. For example, Ramharter (2016) examines a critical analysis of information requirements and rules on advice pursuant to the new Directive (EU) 2016/97 on insurance distribution (IDD). In his articles, Mesršmíd evaluates and analyses optimal options of transposing the regulation into the Czech law.

Insurance intermediaries in the Czech Republic are regulated by the Act No. 38/2004 Coll., on Insurance Intermediaries and Independent Loss Adjusters and on amendment to the Trade Licensing Act (hereinafter the "Act on Insurance Intermediaries"). The categorization of insurance intermediaries should be amended by the draft law Act on insurance and reinsurance distribution.

Rewarding of intermediaries is discussed area, too. Šindelář (2015) evaluates distribution and remuneration in life insurance. Browne, Ju, Tu (2014) offer a different view of contingent commissions, which are payments made by an insurer to brokers based on the volume and profitability of insurance placed with the insurer. Carson, Dumm, Hoyt (2007) review use of contingent commission compensation and the economic rationale for contingent commissions for independent agents.

Marano, Rokas, Kochenburger (2016) deal with new option of online sale of insurance. They focus on insurance sales, consumer protection, cyber risks and privacy, as well as dispute resolution.

Data used in this article are collected from annual reports provided by the institution of the Czech insurance market mainly Czech National Bank, Czech Insurance Association. For comparison, data from the OECD or the European Insurance and Reinsurance Federation (Insurance Europe) are used. These institutions publish an analysis of the insurance market from different views. Further, data of annual reports provided by

significant insurance companies operating in the Czech insurance market mainly used distribution channels are added.

3 Results and Discussion

Gross premiums increased worldwide in the life insurance and in the non-life insurance. (OECD Insurance Statistics). Insurance companies realize very clearly that the distribution is the key factor of their success. To sell their insurance products, they use a combination of different channels showed in Table 1.

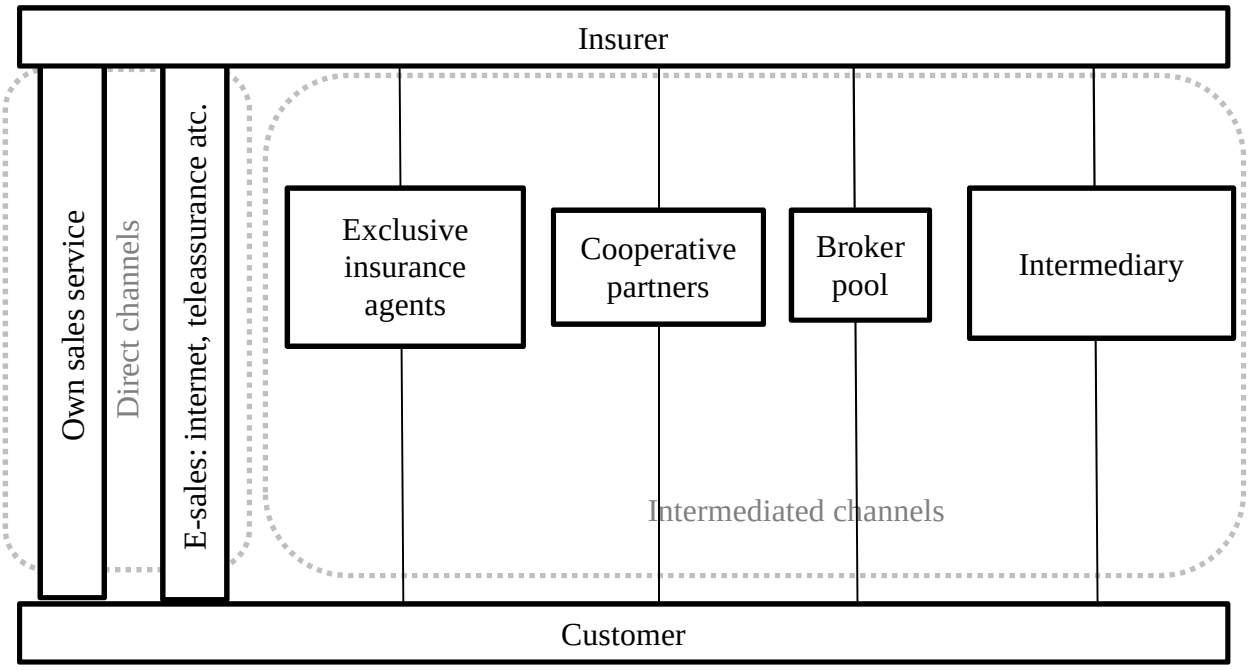
Table 1 Insurance distribution channels

Internal channels	External channels	Alternative channels
Employees (own business service)	Insurance intermediaries (not included in the internal distribution)	Direct internet marketing
Exclusive insurance agents	Brooker pool	Telcassurance
Intermediaries being controlled by insurance company	Cooperative Partners including Bancassurance, Cross-selling	

Source: own processing

In Figure 1 show model distribution channels from the perspective of direct distribution or intermediated distribution.

Figure 1 Direct or intermediated channels in insurance



Source: own processing

Internal distribution channels

Among traditional internal distribution channels, employees of branches nets of insurance companies (own business service) and net of exclusive insurance agents together with insurance intermediaries being controlled by particular insurance company are. Governmental bill as for distribution of insurance in accordance with the regulation influences also own business services of insurance companies. As the consequence of

those changes, some insurance companies made the changes in internal distribution model. For example, the Česká pojišťovna created 100 % subsidiary company ČP Distribuce s.r.o., into which internal distribution of the Česká pojišťovna will be transferred within 2017. (Česká pojišťovna, 2016). Together with the aim to ensure continual business services, it changes the way of rewarding as well as adds different benefits.

Table 2 Number of employees of insurance company and insurance intermediaries operating in the name and on the account of one insurer only (Czech Republic)

	2009	2010	2011	2012	2013	2014	2015
Total employees of insurance company	13985	13678	13314	13763	13397	13173	13018
- of which: staff underwriting insurance	3362	3035	2803	2811	2782	2668	2545
Total insurance intermediaries operating in the name and on the account of one insurer only	17994	18980	18788	16866	15232	14194	13264
- of which: exclusive insurance agents	11751	12606	12827	11443	11583	10657	9813
- tied insurance intermediaries	4768	4808	4216	3693	2763	2432	2150

Source: Czech Insurance Association, Annual report

External distribution channels

Among external distribution, insurance intermediaries belong being not included into own net of insurance company. The most often, insurance agents and insurance brokers are considered.

The current legislation dealing with insurance intermediaries allows an operation in the following six categories: a tied insurance intermediary, a subordinate insurance intermediary, a fixed insurance agent, an insurance agent, an insurance broker (see Table 3) and an insurance intermediary, whose home member state is other than the Czech Republic. (see Adolt, Suchánek, 2005).

Table 3 Categories insurance intermediaries (Czech Republic)

	2009	2010	2011	2012	2013	2014	2015	2016
Insurance intermediary	91219	109971	132543	141809	150418	157245	162956	167826
- broker	643	689	728	760	782	790	780	783
- agent	1193	1286	1367	1412	1452	1442	1393	1379
- fixed agent	23260	27970	32325	34565	36780	38709	40014	41448
- tied intermediary	11008	11822	12278	12421	12676	12751	12917	12823
- subordinate intermediary	55115	68204	85845	92651	98728	103553	107852	111393
- foreign intermediary	3741	4055	4704	4937	5570	5691	5802	5998

Source: Czech National Bank, Statistics

The established categorization of insurance intermediaries is to be changed by the government bill dealing with distribution of insurance and reinsurance. Instead of existing five categories of insurance intermediaries, there will only be two new categories: independent intermediaries and tied agents. They differ from each other by the fact whether the person concerned is responsible for his/her actions, or whether this

responsibility will be assumed by another entity. This division based on the principle of accountability reflects already established and proven regulation on the capital market.

The insurance intermediary will be able to register only in one position; a concurrence of both categories in a single entity will not be conceivable, which is the case under the current legislation. The category of insurance intermediary, whose home member state other than the Czech Republic, will remain unchanged (Foreign intermediary).

Gradually it shows how important it is to follow importance of brokers and agents in the distribution of insurance products. (see Eckardt, Räthke-Döppner, 2010). *The commissions-to-premiums ratio provides information on the relative importance of brokers and agents in the distribution of insurance products (relative to direct sales by insurance companies themselves)*. Kwon, Wolfrom, 2016. It is obvious that it is necessary to search for an optimal set of rewarding system to reward the employees of business sale as well as intermediaries themselves. For example, rewarding the sales over long-term retention or suitability of the products can result in unsuitable sales or the unnecessary replacement of life insurance and savings products. Therefore, some regulatory adjustments are made. The aim is to avoid the conflict of interests and always recommend such product being the most suitable for the client not considering the amount of commission or other reward of the salesman. (eg empirical analysis by Browne, Ju, Tu, 2014 or analysis in life insurance by Šindelář, 2015)

Among other options of external sale the sale by partners is - leasing companies, banks, savings and loan associations, car sale companies, real estates, travel agencies, the Czech Post, commercial chains etc. Also cross-sale is used. Those partners are also included into the Act on insurance intermediaries. Also these persons have to fulfill the requirements and conditions of the act and have to be registered in some of categories, also by the government bill.

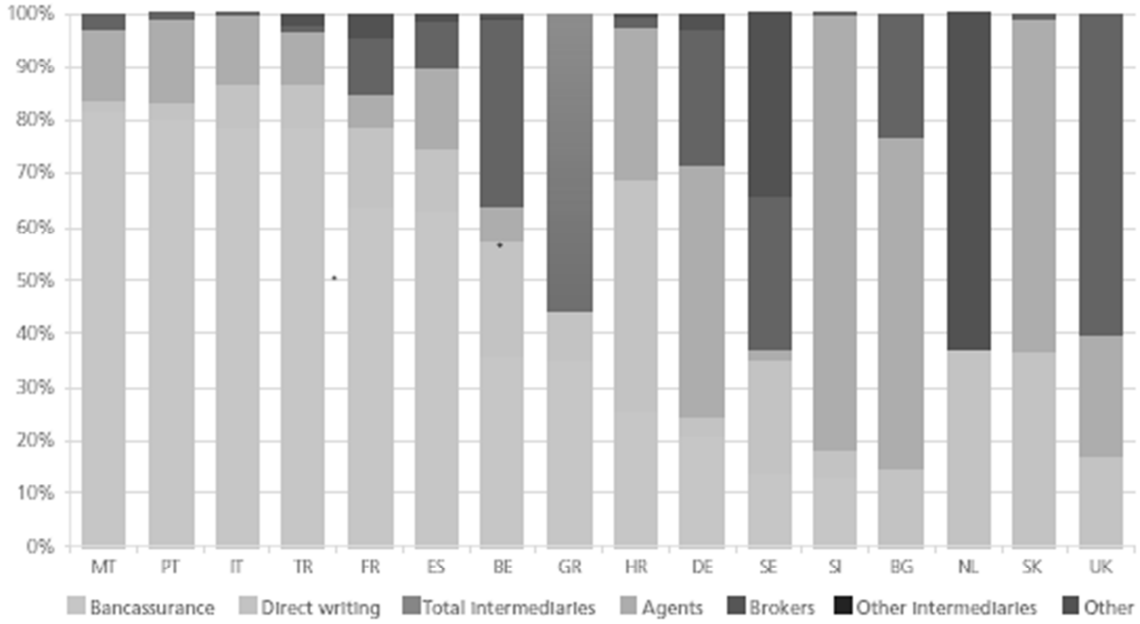
Alternative distribution channels

Insurance companies are increasingly using modern information technologies. That means insurance arranged on-line or by phone (by sending sms or call center) (see Marano, Rokas, Kochenburger, 2016). Only some determined products can be arranged on-line or by-phone; offers of insurance companies differs across the insurance market. Insurance companies add the alternative ways of sale by modern ones such as cashless payments, digital signature or mobile payment terminals. For example, as it comes to non-life retail products, Insurance Company Kooperativa intends to adjust insurance conditions, agreements and legislative aspects so that the agreements could be allowed to be accepted by payment receive. Client though would pay the insurance amount electronically and would not be obliged to sign the agreement. All needed documents will be sent to him by email. (Kooperativa, 2016).

Distibution channels

According to the Insurance Europe (2016) is bancassurance the main life distribution channel in many European countries. The most products were sold via bancassurance in Italy (79% of gross written premiums) and France (64%), while in the UK8 and Germany most life products were sold by agents and brokers (83% and 73% respectively). The market in which agents and brokers were most dominant was Bulgaria (85%). Agents alone were the main distribution channel in Slovenia (82%) and Slovakia (63%). (see Figure 2). (Insurance Europe, 2016).

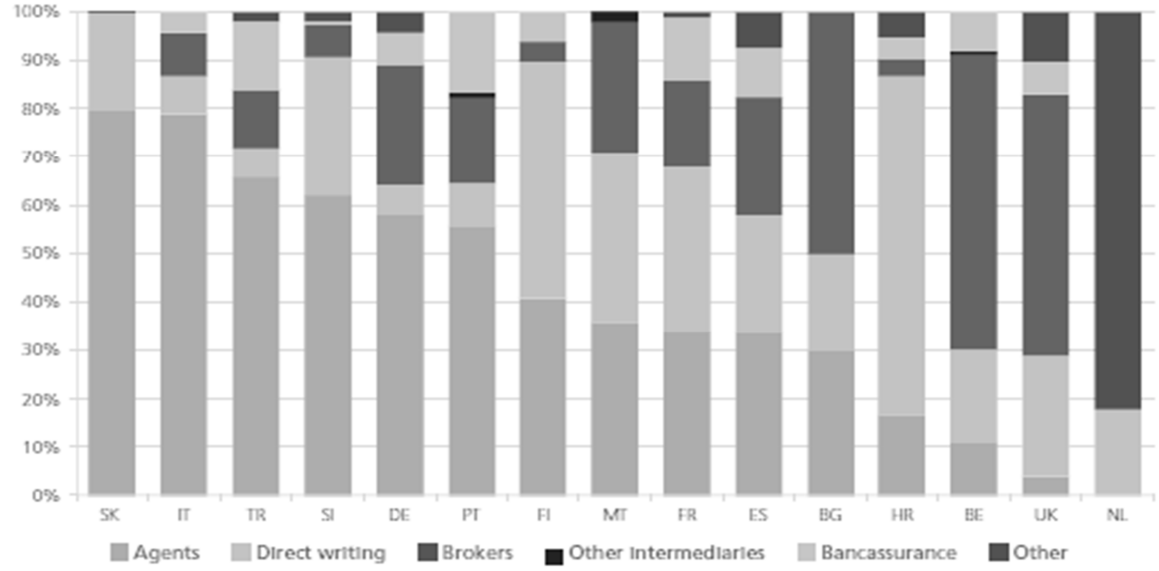
Figure 2 Life distribution channels (% of GWP), 2014



Source: Insurance Europe, European Insurance in Figures, 2015 data

Non-life insurance policies are mainly distributed through agents and brokers. Agents predominate in Slovakia (80%), Italy (79%), Turkey (66%), Slovenia (62%), Germany (58%) and Portugal (56%). Meanwhile, brokers account for 61% of non-life premiums in Belgium and 50% in Bulgaria. (see Figure 3). However, direct sales through employees or distance-selling are less developed in life than in non-life insurance. (Insurance Europe, 2016).

Figure 3 Non-life distribution channels (% of GWP), 2014



Source: Insurance Europe. European Insurance in Figures, 2015 data

Monitoring of the distribution method is not interest of the supervisory authority, therefore it is not possible to create objective time series for the Czech Republic.

According Czech Insurance Association the distribution of non-life policies in Czech Republic is mainly through intermediaries and direct sales by employees and distance-selling.

4 Conclusions

Insurance is inseparable part of the risk management of companies as well as financial portfolio of most of Czech homes. Insurance market is developing continuously, is innovated, new products occur as well as new risks. Distribution of insurance ensures significant competitiveness in the market so insurance companies permanently develop their distribution channels. The paper focuses on analysis of concept insurance distribution.

Among internal distribution, intermediaries belong being controlled by insurance company and insurance intermediaries operating on behalf of and on the account of insurance company. Intermediaries not included into the own net of insurance company belong to the external channels. As distribution channels have evolved over time, their financial compensation mechanisms change too.

The new European rules for insurance distribution will come into force on 23 February 2016. The bill on insurance distribution intended to transpose the European Insurance Distribution Directive (IDD) will be submitted in the Czech Republic. The bill to fully supersede the existing Act No 38/2004 on Insurance Intermediaries and Independent Loss Adjusters. New changes will be of contribution for insurance market aiming an improvement of market transparency, removal of differences in external and internal distribution of insurance as well as strengthening of credibility of insurance distributor´s profession (both external and internal one).

In terms of the changes in regulation, insurance companies have to adjust their distribution channels. Development of information technologies has its significant impact on it so insurance companies will search for more effective and newer approaches. However, personal sale or sale with advising will hold one of the most significant positions. In case the product is being sold without counseling, clients can be surprised by the result because the product could not match their requirements. Insurance companies monitor quality indicators – the way of the sale versus the result (expectation) for client (relation of determined sale and real duration of agreement). Evaluation of quantitative parameters of the salesmen (not volume of production) becomes the advantage – e.g. volume of cancellations, the results of clients satisfaction measuring, the number of rightful claims etc.

The emphasis will be put to the knowledge, skills and experience of advisors and sales staff. Both employees and insurance intermediaries have to possess of present knowledge about the products, sale practices and rules regarding the consumer protection. Otherwise, there exists the risk of improper sale. Insurance companies and intermediaries have to set internal controlling mechanism in order to manage the quality of distribution net.

Distribution channels being used when selling the insurance are similar in particular countries; however, specifics exist as well. According to the Insurance Europe (2016) is bancassurance the main life distribution channel in many European countries. Non-life insurance policies are mainly distributed through agents and brokers. However, direct sales through employees or distance-selling are less developed in life than in non-life insurance. In Czech Republic the distribution of non-life policies is mainly through intermediaries and direct sales by employees and distance-selling.

Insurance fraud as well as cyber-attacks are of consideration when choosing the distribution channel. Distribution channels can be of help in the fight against insurance fraud; advisors are the first and the most important defensive line. Customers are reliant

on advisors´ information, instructions and advice; it does not have to be stressed that advisors have to fulfil their duties in ethical way.

Acknowledgments

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The Governmental Policy of Budget Balancing in Ukraine

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Abstract: *The main aim of the paper is to identify distinctive features of the state Budget balancing policy realization, to define the internal and external factors that influence the State's Finance and to determine sources of the supplement and balancing of the Ukrainian State Budget. As the result, the paper provides crucial contradictions of the state policy implementation of the State Budget balancing in Ukraine. In the article, we group main influential factors, depends on the nature of the influence (external and internal), that define the negative state and misbalance the Ukrainian Budget. Herein, we offer the scientific approach for Ukrainian Budget's replenishment and balancing with main accent on activation of the internally related financial potential sources. Introduced approach will ensure the equalization of the expenditures and income, which will set up the basis for a long-term stable growth and resolving of the socio-economic issues. The results of the research are very important and can be applied for the anti-crisis plan development in order to ensure the additional incomes to the State Budget using the potential financial sources accumulation, as the basis for effective long-term execution of the Ukrainian state policy of the Budget Balancing.*

Keywords: Budget, state finance, state policy, Budget deficit, state debt

JEL codes: E02, E42, E52

1 Introduction

The primary policy of most developed countries during the deployment of the global financial crisis has become the strategy, which aims to balance the public finances. In practice, such a strategy determines not only the extent of social problems solving, but also stabilizes the economic fluctuations, primarily related to accumulation and redistribution of financial resources and helps to search for reserves to ensure the stabilization of the economic development. The issues of the stabilization and balancing of the State Budget, which are connected with worldwide crisis tendencies and local negative factors, have arisen in front of the Ukrainian government, and lead to unbalancing of the financial system. Thus, the question of the State finances replenishment is particularly relevant in the theoretical and practical investigations.

Taking into consideration the papers related to the public finance, we indicate that the issues of the formation and development of the financial system, the deficit of the State Budget and its balance, problems of monetary policy and the Government debt were revealed in the significant number of the Ukrainian scientific works. However, the rapid onset of the second wave of the financial crisis has strongly risen the issue of reducing the Budget deficit and public debt as the basis of balancing the State Budget. In this

context, the matter of determining the sources of the State Budget Balancing, as well as clarification, under what conditions they can be effective, is remain unsolved.

The questions of the State Budget Balancing, developing of the financial system, Budget deficit and monetary and debt issues have been revealed in numerous work of local and foreign scientists. Moreover, researches related to acquiring of the external financial sources and formation of the excessive debt leverage, as one of the reasons of financial environment worsening of developing countries are revealed by foreign scientists, such as Samuelson (1954), Rogoff (2003), Krugman (2012), Calvo (2014) and *Reinhart (2015)* etc.

The main aim of the paper is to identify distinctive features of the state Budget balancing policy realization, to define the internal and external factors that influence the State's Finance and to determine sources of the supplement and balancing of the Ukrainian State Budget. Therefore, this should be the key to identification of the replenishment sources and balance the State Budget of Ukraine.

2 Methodology and Data

In 2012 individual Western economies entered the phase of recession. On that moment, the main factors of the crisis deployment became the problems and imbalances in the systems of the public finance. Therefore, the current wave of economic crisis is based on disbalances of a State Budget. The income shrinking, the simultaneous rise of expenditures and financing of large-scale stimulus programs have generated significant deficits and forced Western Nations to expand the debt involvement. Nevertheless, such a policy in the face of further worsening of the global financial and economic crisis has led to rising the public debt servicing, the access difficulties to loans and the limitation of opportunities for the socio-economic arrangements financing.

Under these circumstances, the need to balance the system of public finances had been declared as a priority of economic policy, particularly by reducing the Budget deficit and national debt that forced the Governments of Western countries to cut spending and increase tax burden, adversely affecting the economic dynamics. Even though the Ukrainian economy has little to do with the developed countries of the West, it had also experienced the crisis trends due to the fact that the Government, on the one hand, carried out a similar policy by funding the anti-crisis programs with the sharp rise in the deficit of the State Budget, and on the other, inefficient use of existing financial resources.

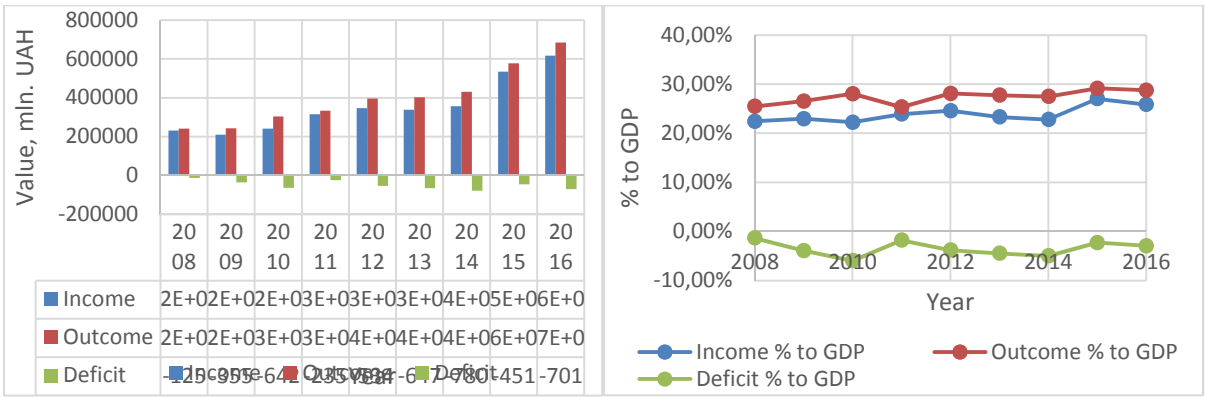
Ineffective management of public finances and their impact on the socio-economic dynamics of the national economy development has a threatening character. This character can be approved by analytical and statistical data. Thus, regarding the expenditures of the State Budget, according to reports the Accounting Chamber every third UAH has been spent ineffectively (PER, 2010-2014; Fedosov, 2009). Therefore, especially important for the stabilization of the national economy appeared the balancing of public finance and its effective usage (Moldovan, 2012; Rogoff, 1985; Rogoff 2003). The Government must define the priorities of the system of public finance improvement. The deepening problems in this area can lead to much more negative influence on economic stability than external factors (Calvo, 2014; *Reinhart, 2015)*. Imbalances in the public finances are dangerous as they produce negative macroeconomic trends, which, in turn, lead to further proliferation of the deficit and difficulties of access to the financial resources.

The need to improve the balance of the State Budget of Ukraine, as a main priority for improving the efficiency of State regulation of the socio-economic processes, has been indicated in the presidential Program of economic reforms for 2010 – 2014, which eventually transferred to the program of current President of Ukraine. It's a question of

countless debates through the national action plan for 2012, and moreover for 2014-2018.

Nowadays, the National Action Plan for 2016-2020 states the unbiased and urgent need to solve the issues of balancing the State Budget as a basis for building an effective system for managing public finances and its orientation to the socio-economic problems (RadaGovUa, 2016). Particularly, there are tasks directed on reducing the deficit and the growth of the public debt, increasing the efficiency and the flexibility of fiscal expenditure and optimizing the management of public finances (PER, 2014; RadaGovUa, 2013; RadaGovUa, 2016). However, despite the existence of regulatory, the issue of balancing public finances solving runs very slowly. In our opinion, this is due to the influence of external and own internal problems and contradictions. The internal reasons we include, firstly, a fairly high level of cumulative state deficit, which Ukraine faces from year to year and could not overcome with defined toolkits. Analysis of indicators of the deficit of the State Budget over the past nine years proves its growth (Figure 1) in the structure of GDP.

Figure 1 Changes in Ukrainian Budget deficit in 2008-2016 in millions of UAH (L) and in percentage (R)



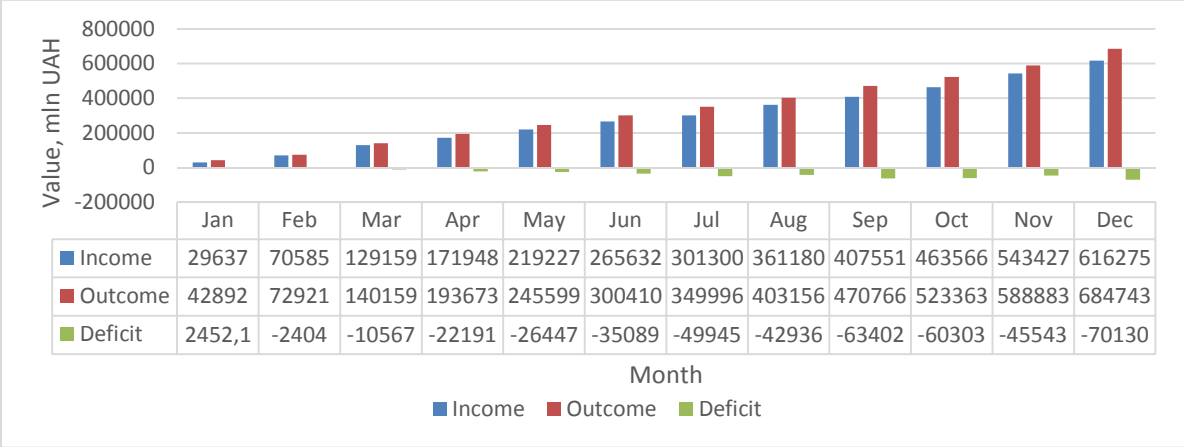
Source: introduced based on Ministry of Finance data (2017)

Talking about general debt, at the end of 2015 the governmental and state-guaranteed debt reached the point of 79% to GDP, which much higher than European level of 60% that creates problems for its maintenance. The average Debt Stability indicator for developing countries in 2015 was 39,4%, while Ukraine in January 2016 reached 79,4% that doubled the average level. To put it differently, the accumulated governmental debt not only reached the healthy defined level, but exceeded it, which influenced the Debt Stability level that leads to increasing the expenditures for the debt maintenance (Yakibchuk, 2016; MinFin, 2016).

3 Results and Discussion

It was not the exception, and last 2016 year we can observe the growth of Budget deficits month-to-month (Figure 2).

Figure 2 Changes in Ukrainian Budget deficit in 2016 in millions of UAH



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Income	29637	70585	129159	171948	219227	265632	301300	361180	407551	463566	543427	616275
Outcome	42892	72921	140159	193673	245599	300410	349996	403156	470766	523363	588883	684743
Deficit	2452,1	-2404	-10567	-22191	-26447	-35089	-49945	-42936	-63402	-60303	-45543	-70130

Source: introduced based on Ministry of Finance data (2017)

It should be noted that the growth of the Budget deficit can lead to a sharp decline in investment activity, increase of the indices of inflation, compounding the imbalances in the structure of national economy (Fedosov, 2009; Krugman, 2012).

Similarly, saddled with a commitment to service and responsible public debt (MinFin, 2017). Thus, over the past five years, the national debt increased 5.8 times in UAH (with 88.7 billion to 515.4 billion) and in 3.7 times in dollar equivalent (17.6 billion to 64.5 billion). The current year in the performance of the Budget of the planned indexes as part of State loans and guarantees to the Government public debt could reach 645 billion at the end of the year, will be 41% of the official GDP forecast for 2017 and more than 45% of GDP – in case of use of more real forecasts of GDP and the exchange rate. If we talk about the risks that arise in this case, for the country, the excessive debt levels could undermine the long-term fundamentals of the economic development and increase the vulnerability of the economy to reverse the movement of foreign capital, sharp changes in exchange rates.

Moreover, according to experts (Bohdan, 2016) in such circumstances, substantially increases the probability of debt crisis in Ukraine, which can trigger the promotion of Helix financial destabilization and exacerbation of the crisis in the real sector of the economy. The impetus it could become like a narrowing of the potential to attract new loans, and the insufficiency of budgetary resources for the implementation of already accumulated debt.

In addition, it is still open and remains the problem of imbalance of local Budgets, pension fund, NJSC "Naftogaz of Ukraine" (Moldovan, 2012).

The reformation of the Pension Fund is extremely important for the financial system stabilization as approximately 11% of the GDP goes to the Pension Fund where only half of it is covered by pension payments, and the rest of it financed by budget. The pension reform is important not only for budget stabilization, but for increase of the social protection. Almost 70% of the retirees live under the level of poorness. According to the State Budget in 2016, the expected deficit of the Pension Fund (together with State contributions) was at a level of almost 57 – 58 billion. Individual experts estimate that the real Budget deficit of the Pension Fund had a fold 68 – 70 billion USD (Rozenko, 2015; Yakibchuk, 2016). Negative expectations largely justified. According to the Professor of the National Academy of public administration under the President of Ukraine Puhkalo, in 2017, the Government will have to subsidize these pension fund at 83 billion (Yakibchuk, 2016).

Moreover, one of the most important reforms for the Budget stabilization is the reformation of the healthcare system, which is currently is considered as extremely not effective. Ukraine spends around 4% of the GDP on the healthcare – more than any of the countries with similar level of income – but the quality of the healthcare system remains very low (RadaGovUa, 2016).

We agree that the enhance of socio-economic standards of society is the main task of the State, so the economy (including Ukrainian) should work to ensure a higher level of well-being of the population. Nonetheless, this level of well-being is directly correlated with the level of economic development and currently and we can observe the misunderstanding of the dependencies between them.

If we talk generally about the factors ensuring socio-economic growth in part of balancing public finances, we will consider the external and internal factors. Firstly, to the external factors that affect the stabilization of public finance, it is necessary to include the increase of the risk of another wave of financial crisis. Low investment image of Ukraine and high risks of a loss of foreign capital, recession of most Western countries and, as a result, the deterioration of their economic and financial situation. These factors significantly complicate the access of Ukraine to the financial markets and block the international loans.

Introduced by the authorities, several legislative and institutional rules and regulations do not protect fully the rights of property and do not create an attractive for domestic and foreign capital investment environment. The existing imperfect system of protection of the rights of the lender, depositor and investor together with increasing the level of credit risk, as well as the lack of efficient mechanism of attracting investments, including international, are indicated in the governmental documents (PER, 2014) and international ratings.

Here, it is worthwhile to state the fact that the desire to solve the problem of balancing the country's Budget, primarily due to external sources (borrowing) can lead to rapid disruption of macroeconomic financial stability and the lead to the "trap" of long-term insolvency.

While the hope for the internal factors and high rate of economy growth of Ukraine, and the replenishment of the revenues of the State Budget are illusory, however, from our point of view with the situation that has developed in the Ukraine, it is required from the State to concentrate on internal factors. Now we can watch realistic predictions about the significant slowdown in the growth of the economy, and, respectively, and Budget revenues. Moreover, real GDP growth in 2016 amounted to just 0.2%, which does not match even the most pessimistic predictions. As a result, the World Bank significantly – from 3.5% to 2%, lowered its forecast for GDP growth in Ukraine in 2017 on the background of the general lowering of macroeconomic activity. Consolidated data (KreditProm, 2017) of foreign and domestic experts predict growth and Budget deficit within the limits of more than 3% (table 1). Therefore, we can talk about what the background bitmap improvements in certain areas of the overall dynamics of macroeconomic growth does not contain under a real thoughtful public policy and support.

Table 1 Macroeconomic forecast for 2017 year

Organization	GDP	Inflation	Budget deficit % to GDP
CASE Ukraine	2.50%	8%	3%
NBU	3%	9.10%	3.40%
IMF	2.50%	15.10%	3%
Fitch	2.50%	15.00%	3%
World Bank	2%	10%	3.10%
EBRD	2%	10%	3.00%
Consensus-forecast	2.10%	8.90%	2%

Source: based on Ministry of Finance data (2017) and KreditProm (2017)

In this situation, identified the problem of imbalance of public finances can become active factors in the decline in economic activity and lead to a dramatic strengthening of the fiscal pressure on the business through the returns of VAT and mobilization of advanced payments for taxes, "crowding out" the liquidity of the domestic market and, as a consequence, freezing lending; an uncontrolled devaluation; a sharp narrowing of the domestic demand; the fall of the investment; social depression (Moldovan, 2012), other negative socio-economic phenomena and processes.

The probability of such a deployment script for Ukrainian economy became apparent in 2012-2016 and 2017 is still quite high. Therefore, in our view, particularly important to the possible negative consequences of the crisis is to prepare effective Government plan that would have provided additional Budget revenues due to the accumulation of internal potential financial resources (in the background simultaneous arrangement policy the use of external sources). Thus, an important source of replenishment of the State Budget may be the shadow economy, the scale of which is estimated at more than 50% of official GDP. Just organize illegal import and circulation of excisable goods can bring tens of billions of UAH.

Perhaps knowing these problems, the President of Ukraine in 2012, has put the task in front of the State Customs Service (now the Ministry of revenue and fees) on the need for an additional increase in taxes to the State Budget. However, in 2013, the shadow economy not only holds the positions, but reinforces them more. Going further to 2016, according to the Ministry of finance by the end of the year, the Budget again lost 3 billion of excise only oil, and together with VAT and ecological tax losses will reach 7 billion (Ivanchenko, 2016). The following source is public procurement, which every year is growing constantly. They have, in fact, hidden huge financial opportunities. And given the domestic practice of spending and the size of the "sliding" tariffs, can with a high probability estimate that financial resources can be found in this area.

Another area of activity of the Government, which could bring the State coffers for more billions of UAH, are establishing an adequate rent for operation of national natural resources. In Ukraine, according to Ukrainian scholars and foreign experts, the level of taxation of the mining industry in the 8-10 times lower than in European countries, which leads not only to large losses, but also to the irrational exploitation of domestic bowels. In addition, the Ukraine does not receive rent for mining and industrial development of iron ore, manganese and uranium ore, coking coal, nonferrous metal ores and other minerals that are the property of the Ukrainian people. Therefore, the extension of the list of the above-mentioned minerals, extraction and realization of which charged rent significantly increase to the amount of Budget revenues.

An important source of replenishment of the State Budget is a considerable financial resources, which are hidden in the existing system of social benefits. According to

estimates of the World Bank on social benefits in this country spent about 21% of GDP and Ukraine according to this indicator takes the fourth place in the world (Rozenko, 2015). In this case, as evidenced by the statistics, processes that take place in this area in many cases are opaque not created a single register of beneficiaries, there is no targeting of receiving social assistance, and public funds that are allocated to cover the social programs, irrationally. According to estimates, only 23% of all social benefits in Ukraine get needy part of the society (Sokolovskyi, 2012). It is the President of Ukraine was speaking about the need to improve social standards, stressed the need to restore fairness and giving benefits and pay subsidies only to those who truly deserves it.

Direction of governmental action that may bring additional revenue to the State Budget, is the introduction of a tax on the wealthy (income, real estate, etc.), and the abolition of special tax regimes offshore areas. An additional source of replenishment of the State Budget can also be tools that will get the Government from undoing its decision about reducing rates of VAT from 20% to 17% and lowering the tax rate to 16%. In the first case the VAT tax rate cuts does not reduce the fiscal pressure on the business and will not lead to an automatic reduction of the retail prices. What regression to improve income, then it would be to introduce a reduction of tax rates is not the entire commodity group, and only the social goods, on which the majority of the population spends almost 60% of their income (Basova, Pokotylova, 2016).

On the standards of income tax rate cuts, it does not mean that the company immediately redirects released funds for investment in economic activity, and therefore more effective would be the introduction of a reduced rate of tax on the part of the profit the company reinvests in its development.

Review of government programs and plans shows that the authorities are aware of the many challenges of balancing public finances. Among the main issues, it is worth to indicate the possibility of establishing a tax on wealth and the extraction of minerals, amendments to legislation on offshore areas. But the Government's plans and above potential sources of replenishment of the State Budget is closely interrelated with the interests of the subjects of big business and shadow schemes of redistribution of the State Budget. These factors can block government action to improve State finances. Therefore, for the successful implementation of this problem requires political will in making such an economic policy that would be based not on short-term electoral purposes, and the national interest. Not the last role in the implementation of sound economic policies of these positions can be created by the Ministry of revenue and the meeting is intended to streamline customs and tax policy.

4 Conclusions

Taking into account the political, economic and institutional features of the Ukrainian governmental system we state that it can be put into the group of developing economies, institutional unbalanced and natural resources oriented economies. One of the main reasons of transformational processes failures and constant socio-economic crisis is the availability in the government of the business groups that using their capital determine and influence the governmental policy, and lobby their interests.

To stabilize the economy of the country the first priority of a government has to be the development of the healthy and balanced of public finances structure. To do this, the primary direction of State policy should be oriented to generation of the domestic financial sources, through the preparation and real implementation of Government effective anti-crisis plan with the foundation of the national interests, which could provide additional Budget revenues. The sources of replenishment of the State Budget can be the next the shadow sector, public procurement, the establishment of adequate rent for mining, objectivity policy provision of social benefits, a tax on wealth, the abolition of the preferential taxation of offshore zones, cancellation of the decision on reduced rates of VAT and income tax rates, the total tax recovery of the economy, etc.

Currently, we state that external financial sources of the Government Budget balancing should have a supportive character to minimize the risk of insolvency, long-term state of the macroeconomic distress and financial dependence. Therefore, the identified sources and directions of the State Budget Balancing can be used as the basis for further theoretical researches and practical implementations.

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IPO Non-Financial Factors Influencing the Investors Decisions

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Abstract: *This article describes the impact of non-financial factors on investor decision-making. The range of economic capital needs a funding system that is tailored to the requirements of the new context. The IPO decision is an essential strategic decision that needs to be seen from several angles of view. This article brings new point of view through non-financial factors. The entry into the stock exchange establishes the relationship between the company and a number of institutional and minor shareholders and here is the time to consider meaning of non-financial factors. The relationship between companies and investors need to be solve with the appropriate sense and knowledge about factors, that play the key role in the investors decisions. With the ever-increasing range of global investment opportunities, companies need to focus on building long-term investor relations based on trust and regular communication. Non-financial factors are thus one of the central points of this demanding process. High standards of the company and its quality management will significantly contribute to its long-term performance. The goal of the article is to confirm, that companies that develop their skills in non-financial areas, such as value creation, management enhancement, environmental care, and those who can demonstrate their performance through comprehensive reporting, will be much more attractive to investors than companies that are currently learning or have not yet done so. This article is focused in detail on the factors that influence investor decision-making and its inference is, that impeccable analysis of non-financial factors and its proper implementation can move company into the next successful phase of building its financial future.*

Keywords: Corporate Governance, investor decisions, IPO, non-financial factors

JEL codes: G11, G02, G34

1 Introduction

For many companies, IPO is an important business objective. For growing companies, entry to the stock market is more than just share offer. It is a signal to the business environment that they have reached a significant business goal. IPO does not only provide access to capital and liquidity for companies, but provides an unofficial approval stamp of a successful company in the public market (Marta Maretich, 2014).

Registered capital increased by successful public offer strengthens the ability to expand to the new markets. This can help the company attract new business partners and, last but not least, strengthen its "prestige" factor, which not only serves but also pledges.

At a stage when a company chooses to enter the stock market, it is no longer responsible for itself but also for its investors. They must be able to demonstrate that they are acting in the interest of their investors and the investors should demonstrate that they are acting in the interest of the company. This non-normative nature of a flexible and robust governance framework will provide the company with good prerequisites for a successful IPO. Quality standards of the company are a central precondition for attracting investors. Therefore, the goal of the company should be to create and to maintain a flexible, effective and efficient company framework that provides added value for investors (McMorrow 2012).

IPO is more than just an important milestone for the company. The entry into the stock exchange establishes the relationship between the company and a number of institutional

and minor investors. A public offer imposes a number of regulatory obligations and responsibilities between a broad investors group and exposes the company to unprecedented public control. All these aspects create a number of problems that need to be solved with the appropriate sense and knowledge.

The relationship between companies and investors become increasingly important, not only with regard to financial factors, but also in particular with regard to non-financial factors that will be further specified.

With the increasing range of global investment opportunities, companies need to focus on building long-term investor relations based on trust and regular communication. Non-financial factors are thus one of the central points of this demanding process. High standards of the company and its quality management will significantly contribute to its long-term performance. By properly preserving the issue of the seriousness of non-financial aspects and their regular development, it can be ensured that a company better applies its strategy and manages its growth regardless of macroeconomic conditions (McMorrow, 2012).

Non-financial factors and non-financial reporting of the companies are now gaining in their importance much more than they did in the past and across all industrial sectors. The trend of balancing non-financial and financial factors is becoming increasingly widespread and promoted (Padraig and Murhphy, 2010). This means that companies that develop their skills in non-financial areas, such as value creation, management enhancement, environmental care, and those who can demonstrate their performance through comprehensive reporting, will be much more attractive to investors than companies that they are currently learning or have not yet done so. Perfect analysis of non-financial factors and its proper implementation can move the company into the next successful phase of building its financial future.

2 Methodology and Data

This article is based on the analysis of the literature, articles and is based on the theory and previous empirical research. All non-financial IPO indicators analysed in this article have sufficient support in the professional domestic and foreign literature. The survey provides information of the most frequent non-financial factors that influence investor decision-making when buying shares and to what kind of criteria they give more weight.

For the primary research, a written controlled interview was used. When compiling the questionnaire survey, care was taken to determine the exact survey goal. The questionnaire included logically structured, comprehensible and non-suggestive questions, the evaluation of which was used to determine a comprehensive statistical set that was further processed using quantitative statistical methods. In addition, data files from the AMADEUS central database were used for primary research.

To answer the research questions, what are the non-financial factors which influence the investor decision, a questionnaire survey was produced, the results of which were presented. 35 respondents were interviewed by the structured questionnaire where they attributed corresponding percentage weight to each factor. These respondents were institutional investors, including portfolio managers, stock analysts and executives from the Czech Republic. Questionnaire was send and evaluated between October 2016 and February 2017.

3 Results and Discussion

According to the research, the non-financial factors have a major impact on investor's decision-making. These are, for example, the credibility, transparency, experience, the quality of the company's strategy, the market position and, last but not least, the quality of management and trust in management, which is cited as the most critical non-financial factor of IPO success.

Investors are increasingly focusing on a combination of financial and non-financial factors in their decision-making. Non-financial factors usually dominate the factors of credibility in management, especially their experience. This article is focused in detail on the factors that influence investor decision-making, respectively. To their sub-factors and activities, which, according to the author, are closely related to each other and are fully supported by factors that are superior to them.

The IPO requires a disciplined focus on the most influential key indicators. Creating systems through which employees across the company can reliably grasp IPO issues and understand its characteristics is an essential criterion for a successful IPO. This article is focused on the following individual factors and sub-factors that, according to the author, affect the investors decisions the most. To these factors investors placed a percentage of importance and results of the survey included detailed description of the factors, that play the most important role of the investors decisions, are given below.

Trust in management and its sub-factors

Transparency – one of the most important corporate governance adjustments should be compliance with disclosure legislation. Transparency in the IPO mechanism can have significant impacts on investor participation, IPO pricing and returns. Nowadays, when companies try to break the globalization of personalization and become more localized, transparency is another important aspect of marketing.

Achieving goals – focusing on strategic and long-term goals.

Vision and Strategy – the strategy tells how company will strive to achieve the goals set. Its mission is to show the direction that a company must take to achieve top performance in all areas. The company must be prepared to respond to unexpected successes and unexpected failures. This will prevent a strategic surprise. The company must be able to respond to changing needs and market requirements with existing sources. The strategy must be constantly subjected to periodic scrutiny. This research concerns its functionality in the framework of existing paradigms and the review of existing paradigms. The challenge of the strategy is therefore to constantly increase the value of the company. Therefore, the best employees available to company must be involved in the strategy. These knowledge workers need to create extremely good working conditions to build their loyalty to the company. (Kaplan & Norton, 1992)

Quality Team – company must use the latest knowledge of all disciplines. Qualified top management is aware that, due to technology mergers across different disciplines, unexpected emergence and exploitation of huge opportunities where no one expected them. There is also known from experience that the interdisciplinary teams, composed of workers with a wide range of knowledge, work most effectively.

Soul of the company – only talented, capable and ambitious people can create prosperous businesses. They are key components at any IPO stage. Employee retention and development is the most effective way to secure long-term sustainable success. Recruiting new employees may not always lead to greater productivity. Having the right team is considered to be one of the key factors of IPO success. They are always people who stand by the fall or rise of large societies (McMorrow, 2014). Building a strong management team with the right experience, skills, discipline and the art of focusing on long-term visions is one of the most important aspects of every business. If we make the right strategic decision, but the employees will not be properly motivated and misunderstood the vision of the company, the desirable results will certainly not occur and IPO implementation will be more demanding.

Table 1 Trust in management

	Average [%]	Deviation [%]
Soul of the company	10,7	5,3
Transparency	41,4	9,0
Vision and strategy	12,9	5,7
Quality team	23,6	4,8
Achieving goals	11,4	3,8

Source: own elaboration

Brand strength and market position and its sub-factors

It follows from Kotler's definition that the view of the brand value is twofold. On the part of the consumer, it is primarily about brand awareness stored in memory associated with the association. The owner of the brand then sees its value above all in a better differentiation from competition, higher customer fidelity, less vulnerability to crises and competition, higher margins, and the ability to extend the brand to other products. This is about brand awareness, loyalty to the brand, emotional association and financial value. Awareness is a core component of brand value, "it is important to realize that high brand value reflects high brand awareness." (David A.Aaker, 2003)

Story – investors becomes more influential and less manageable. It requires personal attitude, and the degree of responsiveness no longer rests in mass advertising, which draws on its prowess, but when the company reveals its true stories (remember, for example, Apple's story). Honesty and openness to the business environment will strengthen the competitive edge.

Individual Behaviour and Motivation - employees who are motivated by, for example, the acquisition of company shares can achieve greater engagement in the company and willingness to participate in further growth and development. The beginnings of implementing some strategies can be painful, especially if company is to make a fundamental turn in orientation. Employees typically have large victims in these cases, often leaving a comfortable and busy way of working and starting to behave completely differently. These impacts are demotivating, and it is therefore important for the vision to highlight the benefits.

Table 2 Brand strength and market position

	Average [%]	Deviation [%]
Diversity and enhancement of creativity	10,7	5,3
Individual behaviour and motivation	13,6	9,0
Story	23,6	6,3
Positive image	35,0	6,5
Visions development	17,1	9,9

Source: own elaboration

Corporate Governance and its sub-factors

Timely and high-quality reporting – early identification of information that may affect the running of processes and company plans is required at any time. Regular evaluation of the functioning of key core elements of organizational structure and processes, with respect to the company's vision and strategy, are key success factors.

Creating the future value of a company – the prospect of the company's future success is its sleekness, networking and broad knowledge base.

Communication between CG and shareholders – well-executed corporate governance increases ownership protection and reduces risk to owners. It also ensures proper communication between the views of the owners and the management of the company. Promoting investors' interests and transferring these interests to the company.

Operating and behavioural standards – operating management is manifested by the efforts of managers to lead workers to achieve the desired result in optimal time for the managed object and desirable levels in a competitive environment. It is based on a management strategy that can be defined differently. What matters is the role played by ethics in the goals of managers, or in the methods they are going to achieve. The goal is for managers to formulate specific real goals and ethical methods to achieve them. While respecting not only personal interests, but also social needs and standards that are related to the high quality of their business plan.

Setting up an IPO thinking – the company that decides for IPO must adopt a new context of responsibility and thinking because it brings with it a new set of obligations that were not needed in a period when the company was operating in the private sphere. It must be more flexible to respond to rapid changes. The company must be sure that all employees understand the difference between the private and the public sectors and that all employees understand all aspects of the company on the stock market.

Table 3 Corporate Governance

	Average [%]	**Deviation [%]**
Setting up IPO thinking	23,6	8,0
Operating and behavioural standards	17,9	2,7
Communication between CG and investors	30,7	12,1
Future value of a company	15,0	2,9
High quality reporting	12,9	3,9

Source: own elaboration

Quality of the strategy and its sub-factors

Structure and Process – a common goal of the company should be to optimize the organizational structure and processes, aligning the company's strategic goals with the roles, responsibilities and responsibilities of individual organizational units and employees. This is also directly related to the introduction of a system for monitoring organization performance and determining how working groups work together and mechanisms to increase their performance.

Flexible and Effective Management – quality management of companies knows how to get the necessary resources including capital and allocate them where they are best used. Quality management at the same time acts ethically, is open to new ideas and ideas, is transparent, focused on a longer period, and is also able to take a cautious risk. (Michael Mouboussin, 2016)

Ability to maintain and acquire new talent – this ability must be based on a participatory principle. Employee engagement is a prerequisite for adapting rating systems and remuneration systems to the desired behaviour. Employees work hard only on what they are valued and rewarded for. Rating and reward systems can positively influence business culture and contribute to its focus on collaboration and knowledge sharing, reducing employee fluctuations.

Common vision – company must be aware of what is important to it, where it is heading, what it wants to achieve, and what needs to be done. It has the rules and follows them. Employees identify with them. On the other hand, unsuccessful companies are characterized by internal fluctuations, partial interests prevail over fundamental goals, power ambitions over customer needs, individual prestige over strategic interests. It follows that the inner atmosphere of the subject that is typical for it has a large share in its success. The inner atmosphere should be in the symbiosis of shared opinions, attitudes, expectations, beliefs and suppositions that are not determined by anyone but affect the way people behave in an organization to achieve common goals. Employees must know every day how they contribute to the organization's goals.

Coordinated Intelligence – company levels should be intertwined to understand what they are doing and why. As mentioned above, everyone is unique in their understanding, and their recognition of the essential contexts can be various. That is why a coordinated intelligence is needed so the company can form a functional and, most of all, a coherent unit. Insufficient awareness and the existence of blurred goals and vague visions, whether due to poor information or worse, because of the unwillingness to familiarize their employees with the deeper meanings of their tasks, will lead to imperfect work. If each employee is to give maximum performance, he / she should identify with the **nature of his /** her work and know the reasons why he or she was entrusted or delegated to it.

Table 4 Quality of the strategy

	Average [%]	**Deviation [%]**
Coordinated Intelligence	13,6	5,6
Common vision	18,6	9,0
Maintain and acquire new talents	15,0	8,2
Flexible and Effective Management	35,0	9,1
Structure and process	17,9	4,9

Source: own elaboration

4 Conclusions

If a company wants to be attractive to the new investors, it is imperative that it be in line with its principles or at least be able to properly argue for any deviations between itself. Building a positive image in public will boost initial sales efforts and maintain investors interest in market shares. The company needs to create and strengthen this position towards those who are potential investors. Creating an image can include creating a business story and maintaining a positive external communication with investors.

The key non-financial factors as trust in management, brand strength and market position, corporate governance and quality of the strategy determinate successful operation and will make flexible, efficient and effective company. The company should

establish the most appropriate management methods based on its corporate culture, size and business complexity with respect to non-financial key factors that influence investor decision-making. Company must be clear about how it intends to meet its goals by using non-financial factors as the key tool of investors decision making and which direction it wants to evolve. It should be clear who is responsible for managing the company and who controls the achievement of the key non-financial factors. All the experts which were asked thought the questionnaire have agreed on a clear rule that the roles of company management must be clearly specified and determined. Achieving efficient and effective management is certainly a very costly business. It must be offset by increasing the value of the company in its quality of management (Padraig, Corin 2010)

There should be a common vision in the company to what kind of non-financial factors they should pay the most attention. Also, what wants the company to achieve by using them and what steps will be taken to meet all goals across all levels of the company. These visions must have a well-thought out story and form of communication, both internal and external.

The needs and objectives of the investors must be in communication between the board of directors and investors and must be set up in such a way that the two sides understand their needs and comply with their views. Particular interests should not be against the common goals. The company must maintain a full and open dialogue with the investors.

Another effective non-financial prerequisite for IPO success is an efficient management team. The investment community wants to be confident that there are good people in the company's leadership with experience and coherence that can work in the long run to develop the company's vision and achieve common goals.

The strength of the brand is among the key criteria for investor's decision-making. Brand perception and positive company presentation to the public is a key aspect for future development. Brand strength is a set of associations and behaviour of brand, distributor, and company customers that enable the brand to retain lasting and distinct competitive advantages. All the non-financial factors and sub-factors, which are influencing investors decisions from this article will be further tested on a larger sample to confirm the results and their importance.

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Some Considerations on the Green Bonds Market Development

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Abstract: *The article discusses current trends in the global bond market. Particular attention was paid to green bonds. The purpose of the article is to identify the conditions for green bonds issues in the context of changes in the environment and financial market conditions. More than 600 issues of such securities throughout the world were analyzed over the years 2010-2016. The analysis included the issuer's nationality structure, bond's maturity and yield to maturity, the currency the bonds were denominated in and bond's risk assessment. We also analyzed changes in NO_x and greenhouse gas emissions (GHG) and energy consumption. Data were obtained from the World Bank and Thomson Reuters's Eikon databases. Statistical study was supplemented with literature studies of green bonds reports. Using descriptive statistics analysis (arithmetic mean, median, standard deviation) and significance test of differences it has been shown that green bonds are primarily used to finance investments in highly developed countries. This means that their direct impact on the environment is difficult to be identified. Beneficiaries are mainly companies developing new technologies. In turn, issues from poorer regions are also targeted to the developed capital markets to reduce the cost of financing. This means that the "green nature" of these bonds is highly debated, and the environmental aspect seems to be only a lure for investors.*

Keywords: green bonds, eco-investments, global market, climate change, ecology

JEL codes: F21, G15, O13, O16, Q50

1 Introduction

Green bonds should be seen in the context of climate change and other sustainability challenges that have emerged in recent years. Transition to green, low-carbon economy requires shifting capital from traditional to sustainable investments. The UNEP Report adopted at the Earth Summit in Rio de Janeiro in 2012 stated that it was essential to invest 2% of global GDP in greening central sectors of the economy in order to shift development and unleash public and private capital flows into a low-carbon, resource-efficient path (UNEP, 2011). The Paris Agreement also highlighted the importance of green investments as a key to solve both climate change and other sustainability challenges (United Nations, 2015). Transition towards a climate resilient, resource-efficient and more broadly known green economy is now a motion and it seems unavoidable because of many international agreements in this regard. However, there is a lot of doubts, how to finance these sustainability targets.

In order to reach some environmental challenges new types of financial instruments related to climate change can be used, e.g., green bonds (Green Bonds Climate Capital..., 2015). They are bonds whose proceeds are invested in an environmentally friendly way (Ehlers and Packer, 2016) with projects producing sustainable benefits. A "green" bond differentiates from a "conventional" bond by its label, which signifies a commitment to exclusively use the funds raised to finance or re-finance in part or in full new and/or existing eligible green projects or business activities (ICMA, 2015). Since 2007 a market for green bonds has been growing rapidly, its integrity so far remains

robust (Ceres, 2015). The geography of the green bond market is expanding and diversifying (OECD, 2015), over the last years we can observe increasing numbers of specialized green bond funds as well as institutional investors and financial institutions, which have intended to increase green bond holdings. Green bonds, nevertheless, account for a small fraction of the overall bond market (Cochu et.al., 2016; Shishlov, Morel and Cochran, 2016), they represented about 1.4% of global debt capital markets issuances in 2016, and according to economists it was well below the scale needed to play a significant role in the transition to a green economy (Record year for..., 2017).

According to van Renssen (2014) and Clapp (2014) the main factor that drives the increasing demand for green bonds is that many organizations are also under intense pressure to be investing green and that future legislation is likely to benefit green investments. If a green bond offers the same yield as a conventional one, investors might choose the green alternative. Green bonds ensure that proceeds raised from the issuance will be spent on projects that bring environmental benefits with the issuer agreeing to publicly report on the use of proceeds. This commitment distinguishes green bonds from the non-green financial instruments. Analyses of the benefits offered by the projects a green bond finances must be combined with the assessment of their contributions to a low-carbon economy (Investing for a low..., 2013, p. 78; Climate Bonds Initiative, 2016). This financial instrument could be tied to mitigating the effects of climate change (e.g. climate bonds) or to a specific environmental issue or technology, such as wind and solar energy efficiency projects, energy retrofits and clean transportation (e.g. renewable energy bonds, energy efficiency bonds and green transportation bonds) (Green bonds: victory ...., 2013). Such initiatives also include renewable energy, construction of energy efficient buildings, reforestation, sustainable waste management, sustainable land use, biodiversity conservation, and other investments (Ahuja and Mackay, 2016; Chiang, 2017).

According to ICMA (The International Capital Market Association) there are currently four types of green bonds, in turn OECD has categorized green bonds into six distinct forms that can be issued as different structures or "types" (OECD, 2015). It means that additional types may emerge as the market will develop and grow. To promote green finance some principles and standards, as well as several green bond indexes were introduced (Green Bonds. Climate Capital..., 2015). Nowadays, green bonds face two key challenges: 1). they need to ensure environmental integrity in order to reduce reputational (green-washing) and legal risks of the market; 2). the number of climate-friendly projects needs to be expanded (Shishlov, Morel and Cochran, 2016).

Green bonds are an instrument to shift capital for green investments, but the question is whether green bonds really can increase and accelerate green investments. Certainly green bonds can be profitable for an issuer, because they can provide: 1). access to a broader range of investors, especially those focused on environmental, social and governance performance; 2). possibility to enhance his reputation by demonstrating issuer's green credentials and showing his commitment to the environment; 3). possibility to develop closer relationships between finance and sustainability professionals; 4). confirmation of his sustainability commitments; 5). more pricing benefits (i.e., lower yields) over traditional bonds (KPMG, 2015; Kim, 2015; Shishlov, Morel and Cochran, 2016; Cochu et.al., 2016).

The green bond market can offer several important benefits for green investment. They include e.g.: providing an additional source of green financing; enabling more long-term green financing by addressing maturity mismatch; facilitating the "greening" of traditionally brown sectors; making new green financial products available to responsible and long-term investors (Ross, 2015; Green bonds: country experiences ..., 2016). Green bond market is based on voluntary guidelines and standards, as well as more recently on rules and regulations in some jurisdictions such as China, India and France (Green bonds: country experiences ..., 2016). It means that the process for labelling a bond as green is rather unregulated, there is no formal approval or vetting process (An

Introduction to green bonds ..., 2016). Issuers must include only a declaration statement in documents indicating that the proceeds raised will be allocated to green projects.

The impact of green bonds on the environment is not easy to estimate, as it largely depends on the quality and performance of the underlying projects that are financed by the proceeds (www.unep.org, retrieved from 30.05.2017). The World Bank provides some data, e.g., two energy saving projects in China expect to reduce 12.6 million tons of CO_2 equivalent annually through USD 400 million of financing from green bonds (www.unep.org, retrieved from 30.05.2017). In turn Kfw Group presents data that evaluate specific environmental and social impact of its green bonds issued in 2014. KfW granted EUR 3.8 billion under its "Renewable Energies – Standard" programme and co-financed projects summing up to EUR 5.9 billion. With an investment of EUR 1 million, e.g., 1,271 tons of CO_2 equivalent in greenhouse gas emissions are saved per year and the costs of energy imports to Germany and that of fossil fuels are reduced by EUR 67,155 per year (www.kfw.de, retrieved from 30.05.2017). Many similar examples could be found in the World Bank Report (Green bond. Impact report, 2016). This means that, in many cases, the objectives pursued are achievable for the benefit of the environment.

Taking the above into consideration, the goal of our article is to identify conditions for green bonds issues in the context of changes in the environment and financial market circumstances. Despite the short time of the presence of these securities on the financial market, we will make an attempt to assess the impact of green bond issues on the reduction of environmental pollution. In addition, green bonds will be compared to other investment alternatives of similar risk. Such an approach will capture both the environmental and financial circumstances of the green bond market's development.

2 Methodology and Data

The analysis of determinants of green bonds market development was based on Thomson Reuters Eikon database. At the end of 2016, there were 625 green bonds registered in the market throughout the period 2010-2016, which value-wise represented USD 122.87 billion. The group of 288 green bonds was listed on almost all the major stock exchanges in the world. Only 173 were guaranteed. Almost half of the instruments (291) had an investment rating and 156 were rated as high-yield bonds. Other bonds were not given a rating. The value and number of issuances with the distinction of major domestic issuers is presented in Table 1.

Table 1 Value and number of green bond issuances with the distinction of major domestic issuers

Specification	2010	2011	2012	2013	2014	2015	2016
Value of issuances (in mln USD)	1 124	77	1 564	10 940	28 773	41 152	38 233
number of issuances	20	10	17	40	117	212	196
Including:							
Eurobonds	20	8	13	30	66	82	79
United States	-	2	1	6	15	96	42
Sweden	-	-	-	2	14	13	26
France	-	-	3	-	4	5	15
China	-	-	-	-	2	-	31

Source: own elaboration based on Thompson Reuters Eikon Database

Analyzing data in Table 1, we can see how green bond market developed both in terms of the amount of emissions and the value of instruments placed. According to the type of issuer the market is dominated by offers made by the private entities (over 20% of the issue) and international organizations (about 38% of the issue), although only the international organizations bonds have been issued since the beginning of the period

considered (mainly the World Bank, the African Development Bank, the Asian Development Bank, and the European Bank for Reconstruction and Development). In the group of companies the leading players were entities from the financial sector, especially banks. In terms of nationality, we can distinguish first of all: international consortiums placing bonds on the Euromarket and the US entities. The Euromarket choice is simply due to limited possibilities of raising capital in the domestic market (Schalatek et al., 2015). It is particularly important for issuers in developing countries because instruments offered in this way are more credible. Apart from numerous American projects, high activity of Swedish and French issuers is also remarkable. Last year, a large supply of green bonds was also made by Chinese entities. However all issues on the Euromarket were denominated mainly in local currencies, which limits their currency risk. Over one third of the issues were in USD.

The study of green bond issue determinants was divided into two steps. The first one was focused on analyzing changes in selected parameters of environmental pollution and energy consumption. It is difficult to expect an immediate and direct impact of green-funded investments on the environment, but it is worth asking a question about this link. A major difficulty in such analyses is the short presence of green bonds on financial markets and long delays in publishing environmental data by statistical offices. The article compares emissions of two major environmental pollutants - NO_x and greenhouse gas emissions (as CO_2 equivalent). The period of green bonds' presence in the financial market was taken into account. The study was conducted only for selected countries. However, both developed countries (especially France and Sweden, due to their active participation in green bonds market) and developing countries are considered.

The vast majority of green bonds issues were aimed at financing investments related to the acquisition or conversion of energy. Energy is a key development factor for both technologically advanced and developed economies, as well as for developing ones, based on less innovative industrial processing. Therefore, in the next stage of the study, changes in per capita energy use and changes in the share of renewable energy in energy consumption were analyzed.

Than the investment attractiveness of green bond was assessed by comparing them to similar debt instruments. The return rate (YTM) of all instruments issued so far has been analyzed. Statistical analysis was conducted using tests to assess the significance of the difference (t-tests). The selection of tests was not unequivocal, as the main assumption for the test was to analyse the results for pairs of bonds (green or non-green) with the same ratings. Hence, despite the fact that these are different subjects in physical terms, we used paired difference tests. Student's t-test is the basic test for comparing the two paired populations. In order to perform it, we needed differences between paired measurements, which represent normal distribution. The assumption was not always met in the case of examined companies, and in such cases we used the non-parametric equivalent of t-Student's test for paired samples, i.e. the Wilcoxon signed rank test. For both tests the null hypothesis assumes a lack of differences between both types of bonds (measured with the expected value of random variable for the t-Student test or the distribution function for the Wilcoxon test), and thus the alternative hypothesis is: there are differences. It was decided that the variable in comparable populations of bonds is statistically significant if the probability in the test, *p,* was below the assumed level of significance (α=0.05). Calculations were made in IBM SPSS Statistics 22.0.

3 Results and Discussion

Developing countries generally increased their emissions during the period considered (Table 2). However, the results were not so clear for Sweden and for the European Union. They managed to reduce average emissions of NOx and GHG, but this change was not particularly visible. A decrease in the average annual reduction of GHG emissions was observed. However, we have to remember that only US entities are fully identifiable

during the period. Other countries practically did not issue green bonds or they did so through international organizations. In the group of developing countries some doubts are raised about GHG emissions in Brazil since 2010. It explains the very bad situation of the country in the field of environmental protection in previous years. These doubts do not affect the overall assessment of the results, which indicate a reduction in NO_x and GHG emissions, especially since 2010. It must be stressed, however, that this is true regardless of the green bond issue. Therefore it is difficult to indicate their role in pollution reduction.

Table 2 Average annual change in Nitrous oxide (NO_x) and greenhouse gas emissions (GHG) in selected countries in 1990-2013 (in %).

Country	NOx		GHG	
	1990-2013	2010-2013	1990-2013	2010-2013
Brazil	1.724	4.133	8.013	0.001
China	2.562	3.627	5.521	5.489
European Union	-2.247	-2.361	-0.858	-0.387
France	-3.001	-4.879	-0.457	-1.796
India	1.619	1.913	3.612	5.014
Sweden	-1.288	-1.550	-0.643	-0.581
United States	-0.614	-1.758	0.187	-1.313

Source: own elaboration based on the World Bank Database.

The results of the study of electricity consumption changes are not surprising and close to pollution analysis (Table 3). Worldwide, a reduction in energy consumption is observed, especially in China, India and Brazil last years. What distinguishes between developed and developing economies is the use of renewable energy sources. Only these countries report drop in the share of renewable energy in energy consumption. In developed countries this share is growing. It is done without a clear connection to the issue of green bonds. Often it is the result of ecological policy of countries aimed at replacing traditional energy sources with renewable alternatives and reducing energy consumption. Similar trends are observed in developed countries (Germany, Canada, Japan) that do not issue significant amounts of green bonds. Again, Sweden (like other Scandinavian countries) records a different change. The share of renewable energy consumption is growing but with this non-renewable.

Table 3 Average annual change in energy consumption per capita and share of renewable energy in energy consumption in selected countries in 1990-2015 (in %).

Country	Energy use		Renewable electricity	
	1990-2015	2010-2015	1990-2015	2010-2015
Brazil	-2.134	-13.484	-0.660	-3.881
China	0.467	-12.726	-2.936	-2.440
European Union	-0.257	-0.410	4.057	5.827
France	-0.109	-0.931	1.291	3.703
India	-1.571	-14.077	-1.898	-1.982
Sweden	-0.226	0.869	1.776	2.047
United States	-0.470	-0.633	3.697	4.910

Source: own elaboration based on the World Bank Database.

Denomination of bonds in the currency of the country involved in a pro-ecological project is linked to the country's financial risk. Hence, there is a noticeable difference in both the bonds coupon and their YTM. Changes in the average value of yield depend on the share of bonds denominated in exotic currencies, which leads to assumptions about the key role of the currency as a determinant of yields of climate bonds. This is indicated by a significant excess of the arithmetic average over the median, which means that the observation significantly exceeds the average level of YTM (Table 4). This is particularly

evident in 2014 when many emissions from developing countries were placed. Generally, it is easy to see that green bonds' YTMs are low and close to yields of corporate bonds, as the major issuers are just companies. However, many of the issues are guaranteed by the state which slightly lowers their YTMs.

Table 4 Yield to maturity (YTM) of green bonds in 2010-2016 (in %).

Specification	2010	2011	2012	2013	2014	2015	2016
Average	4.972	1.367	2.426	3.692	10.815	4.057	6.681
Median	3.043	1.761	2.027	1.108	1.445	3.253	5.027
Standard deviation	4.438	1.080	2.493	5.410	39.187	3.146	1.494

Source: own elaboration based on Thompson Reuters Eikon Database.

Comparative analysis of US green bonds and corresponding US corporate bonds with the same risk indicates that green bonds are attractive financial instruments for investors. The bonds are paired up to have the same investment rating, similar issuer type and moment of issuance (Table 5). The observed differences show that, despite so many similarities, they are different, although not significantly. Green bonds have higher YTM, coupon and shorter payback period than their non-green counterparts. This means, despite a similar risk assessment, they can provide higher returns or cash flows to investor. Shorter payback period allows time commitment for a shorter time and more flexible management. However, it should be noted that higher investment attractiveness for investors means higher cost of capital for the issuer but if the risk of projects financed by green bonds is taken into account, this cost does not seem excessive.

Table 5 Selected features of American green and corporate bonds of the same risk in 2011-2016.

Specification	Type of bond	n	Arithmetic average	Median	Standard deviation	p
YTM (%)	Green	128	5.831	6.502	11.118	0.017**
	Non-green	186	5.824	6.443	9.394	
Coupon (%)	Green	128	3.451	3.527	2.009	<0.001**
	Non-green	186	3.298	3.401	2.632	
Payback period (days)	Green	128	2 485	2 193	780	0.063*
	Non-green	186	3 068	2 556	1 485	

The significance of differences was assessed using Mann-Whitney's or t test.
* - statistically significant differences at α = 0,05;
** - statistically significant differences at α = 0,10
Source: own elaboration based on Thompson Reuters Eikon Database.

4 Conclusions

More interest in green bonds among investors is a fact. Greater appetite for environmentally-aware investment products certainly increases the awareness of climate change or adverse effects of human impact on natural environment. Observing green bonds market development we may have a question whether it is accompanied by environmental improvements and whether it is due to issuing green bonds. It is difficult to provide clear answers to these questions because of the short time of observation. The study did not show this effect. If ecological effect of investment is immeasurable and remains only in the sphere of plans it is difficult to take it seriously in financial terms because it precludes accurate financial projections.

Even more uncertainty arises from the analysis of issuers by nationality. In addition to international projects, issuances from US entities and several European Union countries dominate. Raised funds go mainly to private companies. However, when analysing the prospectuses of these bonds, it can be seen that the green nature of bonds is fairly

contractual. More than two thirds of issuers only declare their environmental goals. However, it is not specified how much "ecological" a project is. The impression is that many entities, especially corporations, use green bonds status to improve the attractiveness of their issues. Beneficiaries of such practice are mainly companies developing new technologies. This is confirmed by the results from the US market. Analysed green bonds have comparable investment rating as the corresponding non-green bonds. Relatively higher returns and noticed share of high-yield bonds indicate a higher investment risk typical for high-tech companies that often have problems with low-cost financing. Issues from poorer regions also target developed capital markets to reduce the cost of financing. They therefore support the development of mature financial markets, often linked to regions with little environmental impact. It is also worth mentioning that private issuers often have direct or indirect government guarantees, which further increases the investment attractiveness of the instruments offered.

This means that the "green nature" of these bonds is highly debated, and the environmental aspect seems to be only a lure for investors. In fact, this capital is invested in countries relatively little affected by environmental degradation and a growing market of "green" debt does not substantially affect pollution reduction in the global perspective. Their impact on the environment, however, seems difficult to prove. Effects of investment, even if they do have "green" consequences, relate to advanced technology development rather than to anything else. Their impact on the environment is therefore a side effect. Of course, green investments are pro-ecological, but they do not stand out in terms of risk, as evidenced by the YTM differences. On the other hand, investments with higher YTM (even high yield ones) are considered to be less risky due to the international support and government-imposed constraints. It can therefore be presumed that the recently observed popularity of green bond issues will last as long as investors can be persuaded to support green investments. In developed countries this is already the case, in developing countries, especially the poor ones, it will still be necessary to wait. The growing need for environmentally efficient and clean energy and technologies may help drive the green bonds market forward.

On the other hand, there is a great need for funding environmental projects and governments lack financial resources to meet current and future requirements. The best solution is to attract private sector investment into environmental initiatives. Green bonds will need long term incentives that may provide targeted public support schemes to reduce the cost of capital. These measures may include various forms of subsidies, tax incentives, changes in prudential regulation and public guarantees. These factors may prejudice investment green bonds attractiveness and drive market development.

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The dynamic relationship between aggregate fund flows and share market returns: Empirical evidence from BRIC

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Abstract: *Already for more than twenty years investigation of dynamic relationship between aggregate fund flows and share returns represents considerable interest for both practitioners and academicians. The former may use such investigation as useful aid for volatility timing for their investment portfolios; the latter may use such evidence as a proof of efficient market hypothesis violation, which, if found, will have far-reaching implications for the theory of finance. In this paper we aim to investigate the dynamic bi-directional interaction between aggregate fund flows and excess share market returns in a group of emerging BRIC economies. Particularly, we investigate the possibility of a causality mechanism through which aggregate domestic equity fund flows may affect local excess share market returns and vice versa in short-term and long-term period by means of Engle-Granger causality test and VECM.*

Key words: equity fund flows, excess share market returns, Granger-causality, BRIC

JEL codes: G23

1 Introduction

Although studies on fund flows are ample, most of them focus either on fund flow-performance relationship or use fund flows as convenient instrument to investigate herding behavior of retail investors. And only small fraction of all existing studies deal with relation which exist between aggregate fund flows and share market returns. To large extent this situation is caused by the lack of global data on individual fund flows and/or short available time-series. The rare existing studies, dealing with share market returns and investment flows, in most cases investigate the role of different macroeconomic indicators including share market returns as determinants of investment flows, mainly in form of FDI and FPI. These studies provide evidence of positive relation between domestic financial conditions, given by size, liquidity and turnover of domestic share markets and domestic FDI (Portes and Rey, 2005). The studies which investigate the impact of various macroeconomic variables on FPI provide positive evidence that information asymmetries and cultural-institutional proximity are important for bilateral FPI (Mishra, 2007).

Finally, the studies which deal directly with aggregate fund flows and share market returns provide evidence of existence of a short-term unidirectional causality between fund flows and share returns: share returns cause equity fund flows to rise or fall, indicating herding behavior (Alexakis et al, 2005; Cao et al, 2008; Watson and Wickramanayake, 2012). However, except for evidence from Greece, the mentioned studies fail to find any evidence that excess share returns are caused by changes in aggregate fund flows. All these studies are based on data from developed markets (USA, Australia, Greece, and South Korea). As for studies which work with data from emerging markets, so they provide evidence that higher share market returns as well as better past fund performance have positive effect current fund flows (Pavabutr and Sirodom, 2010; Narayan et al, 2014; Lemeshko and Koncikova, 2015).

Here it is important to note that except last three mentioned studies all other studies are structured upon data mainly from the United States and several other developed markets (Australia, Greece and South Korea), thus there is a question, if obtained evidence is

equally valid for less developed markets or their groups. Thus in light of stated above in this paper we aim to investigate the dynamic bi-directional interaction between aggregate fund flows and excess share market returns in a group of emerging BRIC economies. Particularly, we investigate the possibility of a causality mechanism through which aggregate domestic fund flows may affect local share market returns and vice versa both in short-term and long-term period. Following established practice, dynamic relationship between aggregate fund flows and excess share market returns in a group of emerging BRIC economies is tested by means of Engle-Granger causality test and VECM using end-of-month data for BRIC economies gathered from Bloomberg for the period from 2005 till 2015.

2 Data and Methodology

Being the leading energy producers and world crude oil exporters, the seats of manufacturing and heavy industry already for quarter of a century BRIC economies power the emerging markets economic growth. In spite of slight decline in group's overall growth rate due to persisting recent recessions in Brazil and Russia, in comparison with other advanced and emerging economies BRIC economies are still pumping out growth and provide nice opportunities for international portfolio diversification and extra returns (Huij and Post, 2011). The modern BRIC's mutual fund industry is characterized by high concentration, imposing lower competition and higher operational costs and management fees, as well as highly volatile fund flows, leading to higher risks and frequent abnormal returns. The same as ten years ago currently the largest number of active equity funds is domiciled in India (241 funds) and the smallest number – in China (59 funds) (Table 1). Although in the recent years Russia and Brazil are experiencing recession and decline of foreign trade, nevertheless last ten years they hold top positions by level of their AUM's NAV - USD 18 164 and USD 4 761 in Russia and Brazil against USD 86 and USD 2 in India and China respectively. After last decline at the beginning of 2015 currently group's equity fund industry is experiencing growth in fund inflows, however based on evidence from previous group's fund flow cycles this growth is expected to finish by 2017 with sharp drop putting the beginning of the new cycle. (Deloitte, 2015) Constantly the main driver of fund flows is Russia (nearly 60% of total flows), followed by Brazil (35%), remaining 5% is splitted between India and China (Table 2). To conclude, since 2012 there is a growing competition between domestic equity funds from BRIC resulting in lower NAV and high fund flows which leads to higher risk-reward relation for BRIC-focused investors.

Table 1 Number of active and nonactive equity funds and their average NAV in BRIC economies during 2005-2015

	Q1/Y2005		Q1/Y2008		Q4/Y2015	
	N of funds	**NAV**	**N of funds**	**NAV**	**N of funds**	**NAV**
Panel A. Active funds						
Brazil	114	12 614.19	150	9 828.39	150	4 760.67
Russia	32	8 838.92	151	16 736.01	159	18 164.48
India	123	20.24	241	37.00	241	86.41
China	14	0.79	59	1.69	59	2.31
TOTAL	283	5 368.53	601	6 650.77	609	5 753.47

Panel B. Nonactive funds						
Brazil	9	1 324.76	12	3 321.70	NA	NA
Russia	14	2 146.35	60	3 362.33	NA	NA
India	5	14.62	13	27.305	NA	NA
China	0	0	0	0	NA	NA
TOTAL	28	871.43	85	1 677.83	NA	NA

Source: own computations based on data from Bloomberg

The paper aims to investigate the existence of a positive feedback process between managed aggregate equity managed *fund flows* and excess share market *returns* in short-term and long-term period using monthly data from BRIC economies for the time span from January 2005 to December 2015 and to perform subsequently international comparison of the obtained results with existing evidence from other regions or groups of advanced and emerging economies of the world. In total, initially data on 5 596 open-end active and non-active equity funds operating in BRIC economies has been collected for chosen time span via Bloomberg terminal. Further this sample shrank to 1 488 funds, which are domiciled in the chosen countries, are actively managed (i.e. non-index funds) and invest domestically. Further this sample was filtered for minimum required number of available observations: initial requirement was presence of any quantity of monthly observations for the chosen period but then this filtering criterion was narrowed by requirement of availability of at least 112 observations. As a result of all this filtering manipulations our initial database of 5 596 equity funds shrank to final 592 equity funds. Using this dataset we created one four TNA- weighted portfolios for country analysis.

Table 2 Equity fund flows in BRIC economies during 2006-2015

	Y06	**Y07**	**Y08**	**Y09**	**Y10**
Brazil	57.04	192.69	-330.76	251.49	8.62
Russia	314.29	-233.94	-362.79	445.76	211.22
India	-0.02	1.27	-1.61	1.11	0.58
China	0.032	0.09	-0.11	0.07	0.01
TOTAL	371.34	-39.88	-695.26	698.43	220.42
	Y11	**Y12**	**Y13**	**Y14**	**Y15**
Brazil	-130.44	73.94	-123.41	-109.84	-11.17
Russia	-196.48	-226.76	210.93	-56.36	31.01
India	-0.71	0.78	0.17	1.69	0.17
China	-0.04	-0.01	0.02	0.02	0.05
TOTAL	-327.65	-152.06	87.69	-164.49	20.05

Source: own computations based on data from Bloomberg

Following Watson and Wickramanayake (2012) monthly equity managed fund flows were measured as follows:

$$Flows_{it} = NAV_{it} - NAV_{it-1} \times (1+R_{it}) \quad (1)$$

where: $Flows_{it}$ – flow in equity fund *i* at the end of the month *t*; NAV_{it} and NAV_{it-1} – net asset value of equity fund *i* at the end of the month *t* and at the end of the month *t-1* respectively; R_{it} – returns of fund *i* at the end of the month *t.*

As proxies for share market returns we took times-series of returns of local MSCI indices and national stock indices (adjusted for dividends, share splits, bonus issues, etc.) -

MXBR and IBOV for Brazil, MXRU and INDEXCF (MICEX) for Russia, MXIN and NIFTY for India, and MXCN and SHCOMP for China - so we could compare the relationship between local fund flows and both local and international proxies for share market returns. Following Remolona et al. (1997) the excess share market returns are calculated as the changes in the logarithms of the end-of-month chosen share market indices and defined as follows:

$$Returns_{jt} = (\log P_{jt} - \log P_{jt-1}) \quad (2)$$

where: $Returns_{jt}$ – share market return for index *j* at the end of the month *t*; P_{jt} and P_{jt-1} – closing market price for index *j* at the end of the month *t* and the month *t-1* respectively.

Table 3 Summary statistics for aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Mean	**Median**	**St.dev.**	**Min**	**Max**
Panel A. Flows					
Brazil	10 686	11 182	635 090	-2 874 2	3 439 3
Russia	27 483	117 120	936 450	-3 793 7	2 999 8
India	280	339	2 069	-7 067	5 407
China	148	26	145	-417	528
Panel B. 1. MSCI returns					
MXBR (Brazil)	1.0048	1.0079	0.0957	0.6764	1.2426
MXRU (Russia)	1.0038	1.0057	0.1019	0.6472	1.3044
MXIN (India)	1.0124	1.0118	0.0706	0.7522	1.2866
MXCN (China)	1.0098	1.0215	0.0778	0.7709	1.1889
Panel B.2. Local index returns					
IBOV (Brazil)	1.0065	1.0059	0.0647	0.7520	1.1556
INDEXCF (Russia)	1.0118	1.0207	0.0797	0.7122	1.2206
NIFTY (India)	1.0128	1.0106	0.0697	0.7359	1.2807
SHCOMP (China)	1.0123	1.0145	0.0883	0.7536	1.2745

Source: own computations based on data from Bloomberg

Summary statistics on managed aggregate equity managed *fund flows* and excess share market *returns* for global sample and country samples is reported in Table 3.

Based on evidence provided by Alexakis et al (2005)., Cao et al (2008), Watson and Wickramanayake (2012) we expect that aggregate equity managed *fund flows* and excess share market returns are in equilibrium with each other, moving to restore it in case of shocks or disturbances such as recent global financial crisis and subsequent recession. In light of this in this paper we will test two pairs of hypotheses:

First pair of hypothesis: *H_0 states, that excess share market returns do not Granger-cause changes in aggregate equity managed fund flows in contrary to H_a, which states that excess share market returns do Granger-cause aggregate equity managed fund flows.*

Second pair of hypothesis: *H_0 states, that changes in aggregate equity managed fund flows do not Granger-cause excess share market returns in contrary to H_a, which states that aggregate equity managed fund flows do Granger-cause changes in excess share market returns.*

Testing for existence of bi-directional relationship between managed aggregate equity managed *fund flows* and excess share market *returns* in short-term and long-term period will include two stages: following established practice, first of all, Engle-Granger causality test will be used to check the existence of lead-lag causal relationship to test both pairs of hypotheses; and, in case of any, then we will run VECM to identify the speed at which fund flows and stock market returns move back to equilibrium after changes in each other.

Engle-Granger causality test examines the causality between two variables. X is said to Granger-cause Y if Y can be better predicted using the histories of both X and Y than it can by using the history of Y alone (Toda and Yamamoto, 1995). In context of our paper we will test for the absence of bi-directional relationship between managed aggregate equity managed *fund flows* and excess share market *returns* by estimating the following Engle-Granger causality test:

$$\begin{aligned} Flows_{mt} = \alpha_{1t} + \beta_{1i} Flows_{mt-1} + ... + \beta_{1p} Flows_{mt-p} + \\ \gamma_{1i} Returns_{jt-1} + ... + \gamma_{p} Returns_{jt-p} + e_{1t} \end{aligned} \quad (3)$$

$$\begin{aligned} Returns_{mt} = \alpha_{2t} + \beta_{2i} Flows_{mt-1} + ... + \beta_{2p} Flows_{mt-p} + \\ \gamma_{2i} Returns_{jt-1} + ... + \gamma_{p} Returns_{jt-p} + e_{2t} \end{aligned} \quad (4)$$

where: $Flows_{mt}$ and $Returns_{mt}$ – aggregate equity fund flows and excess share market returns in country *m* at the end of the month *t* respectively; $Flows_{mt-1}$ and $Flows_{mt-p}$ – aggregate equity fund flows in country *m* at the end of the month *t-1* and *t-p* respectively; $Returns_{jt-1}$ and $Returns_{jt-p}$ – excess share market returns for index *j* at the end of the month *t* and *t-p* respectively; e_{1t} and e_{2t} – error terms for both equations at the end of the month *t*. For each equitation a rejection of the null implies the existence of Granger causality.

3 Results and Discussion

Before running the cointegration test for aggregate equity fund flows and excess share market returns first we need to be sure that both pairs of time-series (fund flows - local MSCI returns, and fund flows – local share index returns) are stationary. To be sure that time-series are stationary we run ADF test for our samples of 131 observations to check null hypothesis, that time-series contain a unit root (Table 4). Based on obtained p-values we reject null hypothesis and conclude that our time-series are stationary.

Table 4 p-values for augmented ADF tests for time-series of aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Brazil	**Russia**	**India**	**China**
Equity fund flows	0.01651	0.00707	0.00001	0.00099
MSCI return	0.00657	0.00077	0.00006	0.00147
Local index return	0.00135	0.00061	0.00002	0.00728

Source: own computations based on data from Bloomberg

Having stationary time-series we run Engle-Granger cointegration regressions using aggregate equity fund flows as dependent variable for each pair of time-series – Flow-MXBR and Flow-IBOV for Brazil, Flow-MXRU and Flow-INDEXCF for Russia, Flow-MXIN and Flow-NIFTY for India, and Flow- MXCN and Flow- SHCOMP for China. Then we perform ADF test for residuals to check if time-series contain a unit root and, thus, are not cointegrated (Table 5).

Table 5 test statistic and p-values from ADF test for residuals from Engle-Granger cointegration tests for aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Brazil	Russia	India	China
Panel A. test statistic				
MSCI return	10.3529	4.22431	5.80191	3.99308
Local index return	3.82328	3.62547	3.78566	2.72829
Panel B. p-values				
MSCI return	0.00006	0.00235	0.00001	0.00728
Local index return	0.00001	0.00001	0.00741	0.00005

Source: own computations based on data from Bloomberg

Based on obtained test statistic the null unit-root hypothesis is rejected for all pairs of cointegrating regressions. We conclude that aggregate equity fund flows and excess share market returns are cointegrated of I(1). This means that there is at least short-term causal relation between aggregate equity fund flows and excess share market returns in BRIC economies.

For testing whether this relationship holds in the long-term period we write it in error-correction form. It will help to estimate the speed at which aggregate equity fund flows and excess share market returns restore their relation in case of disequilibrium in case of shocks and disturbances of each other. To run VECM we, first of all, create a time-series of residuals from cointegrating regressions and further test them for stationarity by means of ADF test (Table 6). Based on obtained p-values for residuals from cointegrating regressions we conclude about their stationarity and run VECM model using the obtained residuals as error correction term and using number of lags suggested by BIC information criterion from lag selection model (Table 7).

Table 6 p-values for augmented ADF tests for residuals from cointegrating regressions for aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Brazil	Russia	India	China
uhat_MSCI	0.00004	0.00031	0.00001	0.00571
uhat_Local_index	0.00001	0.00001	0.00001	0.00001

Source: own computations based on data from Bloomberg

Error correction term is statistically significant in all VECM where time-series of aggregate fund flows serve as dependent variable and, conversely, where dependent variable is given by excess share market returns (regardless if it is MSCI or local index) the error correction term turns to be statistically insignificant in all country samples (Table 8). This means that aggregate equity fund flows do move to restore the equilibrium with excess share market returns, while excess share market returns behave contrarily – they appear to be weakly exogenous, thus, they do not move to restore the disturbed equilibrium.

The obtained results are consistent with evidence provided by Cao et al (2008) and Watson and Wickramanayake (2012), that share returns cause equity fund flows to rise or fall, but not vise versa. In particular, for aggregate equity fund flows in Brazil it takes six months to correct 72% of disequilibrium caused by uprise of excess MXBR return and eight months to correct 58% of disequilibrium caused by uprise of excess IBOV return; for aggregate equity fund flows in Russia it takes ten months to correct 49% of disequilibrium caused by uprise of excess MXRU return and twelve months to correct 55% of disequilibrium caused by uprise of excess INDEXCF (MICEX) return; for aggregate equity fund flows in India it takes eight months to correct 82% of disequilibrium caused by uprise of excess MXIN return and eleven

Table 7 Number of lags suggested by BIC under VAR system (maximum lag order 24) for aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Brazil	Russia	India	China
MSCI return	12.501 *** (6)	14.712 ** (10)	0.3393 *** (8)	-3.4144 *** (10)
Local index return	11.727 ** (8)	14.042 *** (12)	0.5395 ** (11)	-4.2640 ** (12)

Source: own computations based on data from Bloomberg

Table 8 test statistic and p-values for ADF tests for residuals from Engle-Granger cointegration tests for aggregate equity managed fund flows, excess MSCI and local index returns in BRIC economies during 2005-2015

	Brazil	Russia	India	China
Panel A. Fund flows as dependent variable (flow-MSCI relation)				
MSCI_return_*BIC_lag*	-0.1505	-0.1691	-0.1045	-0.1026
e_*BIC_lag*	-0.6050 ***	-0.2468 ***	-0.8901 ***	-0.3256 ***
Flow_*BIC_lag*	-0.7273 ***	-0.4945 ***	-0.8287 ***	-0.9401 ***
Panel B. Stock returns as dependent variable (flow-MSCI relation)				
MSCI_return_*BIC_lag*	-0.2361	-0.1033	-0.0014	-0.1029
e_*BIC_lag*	-0.1569	-0.2388	-0.0051	-0.0654
Flow_*BIC_lag*	-0.5033 ***	-0.4519 ***	-0.4681 ***	-0.3767 ***
Panel C. Fund flows as dependent variable (flow-local index relation)				
Local_index_ return_*BIC_lag*	-0.0608	-0.2908	-0.0583	-0.1703
e_*BIC_lag*	-0.1061 ***	-0.175 ***	-0.1801 ***	-0.3535 ***
Flow_*BIC_lag*	-0.5830 ***	-0.5521 ***	-0.9012 ***	-0.9504 ***
Panel D. Stock returns as dependent variable (flow-local index relation)				
Local_index return_*BIC_lag*	-0.2474	-0.8067	-0.0026	-0.0782
e_*BIC_lag*	-0.1512	-0.9649	-0.0067	-0.0659
Flow_*BIC_lag*	-0.4111 ***	-0.4846 ***	-0.5341 ***	-0.5362 ***

Source: own computations based on data from Bloomberg. BIC lag stands for corresponding lag suggested by BIC from lag selection model (Table 4)

months to correct 90% of disequilibrium caused by uprise of excess NIFTY return; for aggregate equity fund flows in China it takes ten months to correct 94% of disequilibrium caused by uprise in excess MXCN return and twelve months to correct 95% of disequilibrium caused by uprise in excess SHCOMP return. Thus, on average, it takes nine months for aggregate equity fund flows from BRIC economies to correct 75% of disequilibrium between caused by uprise of excess MSCI return and twelve months to correct 75% of disequilibrium caused by uprise in local index return. Hence we can conclude that, on average, 75% of disequilibrium is overcome within one year period and the remaining 25% is overcome in the subsequent period, implying presence of both short-term and long-term uni-directional Granger causality between aggregate equity fund flows and excess share market returns in emerging BRIC economies.

The obtained results lead us to the rejection of first stated hypothesis – excess share market returns do Granger-cause aggregate equity fund flows - and confirmation of the second stated hypothesis – aggregate equity fund flows do not Granger-cause excess

share market returns. These findings are consistent with existing evidence for the US, Australian, and South Korean equity fund markets.

4 Conclusions

Being an innovative vehicle for international portfolio investments, for already half a century managed mutual funds flows represent considerable interest for both practitioners and academicians. Although studies on fund flows are ample, most of them focus either on fund flow-performance relationship or use fund flows as convenient instrument to investigate herding behavior of retail investors. And only small fraction of all existing studies deal with relation, which exists between aggregate fund flows and share market returns and, even then only for the United States and several other developed fund markets. Thus there is a question, if obtained evidence is equally valid for less developed markets or their groups. On general, the obtained results provide positive evidence of existence of short-term and long-term uni-directional relation between aggregate managed equity fund flows and excess share market returns in BRIC economies. The obtained results are consistent with earlier findings from developed economies. These results might be extended by inclusion of other fund types and analysis of impact of changes in country allocations on local share market returns.

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Environmental insurance in Poland – The notion, scope and legal determinants

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Abstract: *The potential insuring parties in Poland have recently started to identify the environmental risk. The environmental insurance products are relatively new as the part of insurers' offer. The article refers to the legal determinants of environmental insurance market's development. Firstly the author will explicate the term "environmental insurance" (taking into account Polish and international conditions as the background of analyses) and secondly, explain the influence, that the Polish insurance and environmental legal system have on the development of the market. The main purpose of the researcher is to answer two research questions: what attributes the insurance products qualified in Poland to the category "environmental insurance" have and how the structure of Polish legal system determines their scope. Preliminary results of the research indicate that all environmental insurance products can be divided into three groups (liability, property and personal environmental insurance). The identification and assessment of the environmental risk during the underwriting process are the criteria, which cause that the insurance product is classified as an environmental one. There are only few offers of stand-alone environmental liability products in Poland. Besides, there are environmental clauses in some general civil liability insurance. We expect the development of property and personal environmental insurance in future. They are predicted to fill the gaps in the liability regime. The regime of both administrative and civil liability law is enough to determine the scope of environmental liability insurance products. The property and personal insurance are influenced by the legal scope of freedom of contracting (as defined in Polish civil code), the definition of property and personal interests, which (according to law) can be the subject of insurance and the boarders created by the insurance classification (the list of non-life and life insurance classes).*

Keywords: environmental insurance, environmental law, polish insurance market

JEL codes: A12, G22

1 Introduction

The present article focuses on analyses concerning legal determinants of the environmental insurance market development. The subject of this paper is firstly, the explication of the notion of environmental insurance; secondly, explanation of the impact of legal regulations on its development. Environmental risk has been identified and named by potential buyers of insurance cover for a relatively short time. At the same time, environmental insurance products constitute a rather new element of the insurance market offer as well as a new subject of research analyses. Therefore it is indispensable to define precisely the scope of the research and then to clarify the impact that the evolution of legal norms has on the research subject.

The aim of the analysis is to answer two questions: what are the attributes of insurance products which belong into the category of environmental insurance in Poland and how the architecture of the Polish legal system determines its scope.

2 Methodology and data

Research findings presented in the paper are derived from the analysis of reference materials on the history of environmental law development (especially in the field of

environmental liability). For the research problem to be solved, it was indispensable to review the possible interpretations of the notion of environmental insurance in the Polish and foreign subject literature. The analysis of environmental law and the regulations of Polish civil code led to identification of legal incentives for development of environmental insurance products offer as well as its potential limitations.

The analysis of literary reference material and legal acts was conducted on the basis of inference as a method of logical reasoning. This enabled explication (narrowing a precise scope) and explanation (clarification) of the influence legal regulations exert on the spectrum of insurance products.

3 Results and Discussion

The scope of the notion of environmental insurance – a review of Polish and foreign literature

Analysis of the Polish subject literature presents at least three interpretations of the notion of environmental insurance. The first is based on the broad concept of environmental risk, the source of which may be seen in the whole of the interaction between a company and the environment. Therefore, the elements of cover against the consequences of environmental risk materialisation may be noticed in the design of almost all available products on the insurance market (Doś, 2011; limited scope: Borys, 2002). A moderate approach to defining environmental insurance leads to distinguishing between insurance against environmental damage liability and property insurance protecting the possessions of the insured against the impact of pollution (Maśniak, 2003; Rosiek, 2006; Żebrowska, 1997). This group also encompasses the idea of broadening the above to include personal insurance against pollution (Wójcik, 1998; Panasiewicz, 2008). The most limited perspective of environmental insurance narrows it down to insurance against ecological damage liability (Fiedor, 2003) and it is in line with the present economic practice in Poland.

Foreign literature, first of all, points at insurance against various types of legal liability – (civil, statutory, regulatory liability). They may result from the adverse effect on the elements of the environment due to the operations of the subject of the risk (the "polluter pays" rule) or from the mere ownership rights to the polluted area (Firms may face…, 2013; Minoli, Bell, 2002; Forrest, Wesley, 2008; Boyer, Porrini, 2008). Broderick, Lavoie and Perel (2000) have also rated financial insurance among environmental insurance. It guarantees protection when the entity fails to repay the loan secured by the mortgage on property where pollution which can be re-cultivated or remedied is identified in the course of validity of the mortgage. A broad product-wise approach is presented in the United Nations Environment Programme (UNEP). The products counted among environmental insurance are the ones which are linked to a particular, potentially polluted area – in terms of the costs of remedial actions as well as insurance against third party liability resulting from pollution; also, insurance products linked to transport of hazardous substances. Environmental insurance also refers, according to the UNEP concept, to some types of financial insurance which offer a cover for the costs incurred in the course of or after terminating the operations dangerous to the environment. It also encompasses products which protect against the costs exceeding the project targets referring to re-cultivation or insurance for service providers (including environmental consultants) against third party liability for environmental damage (UNEP 2007). The vast scope of the presented approach concerns only insurance products; with regard to the subject matter, all the mentioned products refer to insurance against environmental damage liability. OECD also uses the name "environmental insurance" (undefined as such) only to refer to insurance against broadly understood environmental damage liability (OECD 2003). A much more precise approach is presented in the European Commission documents where the notion of "environmental insurance market" refers

exclusively to insurance against liability resulting from the environmental liability directive (Directive 2004/35/EC; Bio Intelligence Service, Stevens&Bolton LLP, 2009).

The number of interpretations of the term originates from the evolving tendency to recognise the risk of environmental damage in insurance market practice. The above trend, in turn, does not only result from the traits of events leading to risk materialisation and the scope of its impact, but also from the large number and changeability of the regulations which determine liability of the entities affecting the environment (Szot, Maxwell, 2011). Until early seventies of the 20th century (the USA) and a decade later in Europe this risk was included in civil liability insurance without major exclusions. Similarly, property insurance did not exclude damages resulting from pollution. Since 1972, when the Clean Water Act was passed in the USA (Forrest, Wesley, 2008), regulatory activity with reference to environmental damage has been conducted to this day. Also, ever greater payables of insurers for environmental damages have given rise to a tendency to limit the scope of insurance. Originally, the process only took place with respect to cumulative damage (gradual pollution); next, other occurrences connected with entities' adverse effect on the environment were added. Due to the lack of experience in underwriting and quoting of environmental risk the environmental insurance market shrank and companies suffered because of numerous loopholes in the protection. This situation appeared to be conducive to development of specialised products. The first special environmental insurance was offered by Lloyd's of London in 1979 (UNEP, 2003).

The problem of financial security of environmental risk has repeatedly generated legislative work. The Lugano Convention on Civil Liability (1993), in articles 13-16 compels the parties to ensure – whenever necessary – participation of entities in guarantee systems or their purchasing appropriate preventive financial instruments (Hinteregger, 2008). Subsequently, the European institutions' activities resulted in a proposal for a directive on civil liability of entities for damages caused by waste management (Proposal for a Council Directive on Civil Liability for Damage caused by Waste, COM(89)282; Proposal for a Council Directive on the Landfill of Waste, COM(93)275), which provides for risk-based liability, a requirement for financial security and the *actio directa* rule (Coulson, Dixon 1995). Although the above directive never took effect, it inspired legislative interest in environmental damage. As a result, the environmental directive was passed in 2004 (Directive 2004/35/WE). Financial security is addressed there as desirable, although not obligatory (art. 14). The Commission reserves a directive-related right to introduce a system of obligatory security if this proves necessary.

Summing up the legal and scientific achievements, environmental insurance must be defined as an economic instrument by means of which an insurer undertakes to pay out a certain provision in the event of one or more of the following occurrences:

- materialisation of liability (civil or administrative) for impact on the environment (**environmental liability insurance**);
- damage to insured's property other than leading to materialisation of liability, caused by pollution or another factor deteriorating the quality of the environment;
- violation of the insured's personal rights due to pollution or another cause deteriorating the quality of the environment.

The recommended universality of liability insurance would profoundly reduce the importance of products mentioned in points 2 and 3. They will remain relevant only if the insured is the entity causing adverse impact on the environment. In numerous other cases the insurer will have a right of recourse towards the polluter.

Market practice shows that except for legal liability insurance there are no specialised environmental insurance products in Poland; in fact, the Polish market offer of the former type of insurance is meagre and environmental damages are usually covered by additional clauses of general insurance contracts to a very limited extent. In property and

personal insurance environmental damage is usually excluded from coverage under "all risks" insurance and it is not found as named risk in other types of products. Hence, the environmental traits can be found both in products which do not disclaim environmental risk from the catalogue of the causes of risk materialisation (e.g. critical disease insurance where the insurer does not identify the causes of the disease) as well as in the products which by naming the risk or due to a clearly specified clause make it possible to cover this risk.

For research purposes, it seems reasonable to narrow down the notion of environmental insurance only to the latter category. Identification of the environmental peril by the insurer in the course of developing the insurance product determines the importance of this peril in the completion of the underwriting process. Hence, one can assume that the criterion of the underwriting scope should be decisive when it comes to assigning the product to environmental insurance category. With this kind of approach, the future scope of this category is hard to predict. One should expect a broader market offer, including personal insurance and other financial products (connected with e.g. issuing securities linked to materialisation of environmental risk).

Environmental damage liability in Polish law

There are two terms referring to environmental damage in the Polish law *de lege lata*, pursuant to two legal acts: the act of 27 April 2001 – The Law on Environmental Protection, The Law Gazette of 2016, item 672 with further amendments, and the act of 13 April 2007 on environmental damage prevention and remedying, The Law Gazette No 75, item 493 with further amendments (the Act on Environmental Damage).

The term "damage inflicted by the impact on the environment" is used, but not defined in the Law on Environmental Protection. It is a vast notion and therefore it is often treated as a synonymous to "environmental damage". It is because the Act assumes implicitly that the damage is caused by an influence of an entity (a natural person, an entrepreneur) on all the elements of the environment, as well as on their interaction and impact on each other. Thus understood, damage does not have to be caused by adverse changes in the environment. It is always, however, the effect of unlawful influence on its elements. Damage may be of two-fold nature: on the one hand, it may violate personal rights or property of a given injured party, while on the other it may refer to the environment as common good.

Damages to the environment treated as common good are exclusively regulated by the latter of the aforementioned acts. The term has been defined in article 6 par. 11 of the Act on environmental damage. According to the approved definition, the Act limits its scope to the regulation of damages which materialise in three essential elements of the environment (protected species and habitats, land and water). Damage thus understood may be caused by an entrepreneur, a non-entrepreneurial organisational entity and a natural person (but only if she uses the environment in a manner which requires a permit).

Both acts present the entitlement to making claims against the entity using the environment both in connection with damage materialisation and merely with a threat thereof. However, in the case of the Law on environmental protection, the obligation to remedy the damage or eliminate its causes arises as soon as a claim is made by the eligible entities (individual ones, ecological organisations or the State Treasury), while the general rule of the Act on environmental damage includes *ex lege* the obligation for immediate restoration of the previous condition. Only if statutory action has not been taken by the entity using the environment, does the appropriate public administration body issue a decision which imposes the obligation to prevent or remedy the damage.

Environmental insurance vs. legal approach to damage and liability

The broadly understood regulations of environmental law (lex specialis) complemented by the regulations of the civil code (lex generali) are the basis for shaping the scope of

protective measures in civil or administrative liability insurance. A violation, pursuant to these regulations, of property interest of an entity which uses the environment may become the subject matter of insurance (Orlicki, Pokrzywniak, 2008; Ogiegło, 2011). The prerequisite of providing insurance cover is for the occurrence violating the property interest to meet the criteria for a random event. For this reason, the costs incurred by the entity using the environment, regardless of the damage or its threat materialisation, should not be covered by insurance (Molęda 2008).

The character of the above regulations is suitable for liability insurance products which are ancillary towards causative liability. These regulations, however, are not exhaustive in the context of the contractual freedom in other types of insurance. For property insurance, this freedom is restricted by articles 353^1, 821, 829 of the Civil Code and a list of insurance groups in Division I, added to the Act of 11 September 2015 on insurance and reinsurance activities (Law Gazette 2015, item 1844). According to the indicated regulations, the content and purpose of the insurance contract must not be against the nature of the contractual relationship, the law and the principles of social coexistence. The property interest – the subject matter of property insurance – must be additionally **eligible for pecuniary valuation** (Kubiak 2012). The acceptable subjective scope of personal insurance is not finite - according to the code regulations. Indeed, the legislator indicates that personal insurance may in particular refer to life, body injury or health impairment (art. 829 of the Civil Code). The doctrine emphasises the infinite subjective catalogue of personal insurance products, which makes it open to innovation and facilitates market development (Kęszycka 2010). It may be included in the category of personal rights which are also listed in an infinite way in art. 23 of the Civil Code. However, the problem may lie in alignment of insurance products with particular groups of personal insurance. This is because the statutory list encompasses only personal insurance in the form of life, annuity, accident and terminal disease insurance.

Designing a first party insurance product on the one hand requires identification of the possible extension of the cover to include situations when the law does not refer to causative liability. On the other hand, though, an analysis must be conducted of cases in which – due to the economic nature of the insurance relationship – the potential scope of the first party insurance will be smaller than the scope of the legal causative liability. The first area of differences between first party insurance and liability insurance is that the former plays a complementary role in in the damage remedy system. Shortcomings and loopholes in the principles of legal causative liability may be mitigated by the system of private insurance, as insurance makes it possible to offer compensation e.g. in the event of unidentifiable author of the damage, the author's insolvency or the author's lack of financial security as well as when the author has not fulfilled the premises of legal liability for the act causing damage. Lack of financial security especially occurs when no insurance contract has been signed against the author's liability. It may also result from imperfection of the insurer's liability which is ancillary to causative liability. The former is often limited by contractual statements, including, among other things - despite the lack of imperative objection from the legislator - the exclusion of the author's deliberate fault. Lack of full cover of the injured party may also be connected with a limited application of the risk-based liability system. Besides, the Polish system of civil liability is considered to be conservative as it is lacking in the cover of the so called pure economic loss i.e. financial loss the cause of which is not connected directly with the violation of the injured party's material goods or personal rights. Therefore, it may be essential to offer compensation in the system of first party insurance, like e.g. in the case of an oil spillage on the surface of the sea, which resulted in plummeting profits of the hotels located on the contaminated coast (Mikołajewicz, 2010; Kwiecień 2009) or damages materialised only in the entity's financial liabilities. The latter example seems to be meaningless to contemporary insurance practice of covering secondary environmental damage. Still, one might possibly assume that in the course of fostering the process of seeking various forms of financing the consequences of environmental risk materialisation (also those

unrelated to insurance) an element will emerge in the insured's financial liabilities, the level of which will be contingent on the materialisation of environmental risk and which will become, on its own, the subject matter of environmental insurance.

The basis for limitation of the scope of first party insurance will be sought in the nature of the insurance relationship. The economic character of an insurance contract is perfectly described in the literature. Nevertheless, the problem of risk insurability is tackled anew every now and then. Along with development of new methods of data storage as well as modern techniques of risk assessment and control, the range of unbiased insurability of risk is growing all the time. It is difficult, therefore, to point at the precise list of occurrences which might limit the contractual freedom. One of the unquestionable examples of a discrepancy within the nature of insurance relationship is the existence of speculative elements in connection with insurance contract. It seems that personal insurance concerning other personal rights than human life or health is particularly susceptible to this risk. There is no obligation in this case to act under the principle of indemnification which protects insurance against a violation of its nature in terms of property-related consequences of damage (Warkałło, 1975); also there is no natural psychological inhibition connected with an intrinsic need to protect life and health. In this context a question arises about legal (with reference to art. 353^1 of the Civil Code) basis at least for insurance against deterioration of living standards as a result of the change in the condition of the environment. The potential possibility for appearance of both the speculative element as well as the moral hazard and other elements of contracts which may violate the rules of unbiased insurability of risk has an effect (pursuant to law and considering the economic conditions) on narrowing down the first party insurance offer with reference to scope of protection in liability insurance which is ancillary to causative liability[6].

4 Conclusions

The subject of environmental risk and environmental insurance constitutes a very dynamic combination of research areas. This dynamics results from a continuous evolution in terms of identification and perception of environmental perils both in terms of legal regulations and economic practices. Changeability creates an obligation for researchers to evaluate this subject with the view to future developments and to distance themselves from the past concepts of environmental insurance. The criterion of environmental underwriting, being the distinctive feature of environmental insurance on the market, seems to suit the dynamics of this phenomenon. Therefore, it is possible to extend the scope of the term according to the changes in regulations and economy. Defining the notion of environmental damage (primary and secondary) and the object of this damage from the point of view of general law and insurance as well as determining the principles of legal liability for the damage constitute the basis for developing environmental insurance products. These encompass third party liability insurance along with first party insurance, with regard to protection of both property and personal interest. A precise definition of the scope of legal liability for environmental damage is not only a condition for building effective insurance protection for authors of damages but also a factor which determines due consideration for the interest of the injured parties. Moreover, the clear definition of liability for environmental damage contributes to financing the remedy of that damage, emphasising the absolute (according to the call for sustainable development) necessity for doing so (on condition of the fulfilment of completeness and universality of private insurance). Limitations of causative liability,

[6] Let us quote the example of the cover referring to an occurrence resulting in deterioration of living standards. Although in terms of first party insurance its legal insurability is rather questionable, it is still covered within the causative liability system, and consequently, within the liability insurance, which by its nature, tends to eliminate the speculative element on the side of the injured party.

besides the nature of the insurance relationship and the list of insurance groups, should be, on the other hand, the basis for development of first party insurance products.

The factors, presented in the article, which affect the process of designing environmental insurance products, are not the only essential determinants. Apart from the legal factors one must not forget about economic or technological impact on providing insurance services. These factors cause that insurance industry is not willing to independently cover all the types of environmental risks. This declaration concerns both liability insurance and first party cover.

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What drives agricultural commodities prices? Mixed-frequency analysis of the agricultural market drivers

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Abstract: *The importance of agricultural commodities markets is growing and their dynamics have changed substantially recently, especially in the period after the financial crisis of 2008. The aim of the paper is to explain agricultural commodities price movements by assessing an impact of multiple economic and financial factors. We study 6 agricultural commodities, 3 representatives of the grain market and 3 soft commodities, in a time span of 20 years ranging from 01/01/1997 to 31/12/2016. We identify 9 macroeconomic and financial drivers. The data are collected from Bloomberg. We use mixed-data-sampling methodology that enables us to study drivers of various frequencies (daily, weekly and monthly) simultaneously in a single linear model. We do not find a link between energy market and agricultural commodities markets suggested by previous papers and thus we conclude that the link is not linear. In addition, results show prevailing impact of the financial variables over the impact of the macroeconomic factors, which is in line with the hypothesis of the commodity market financialization. We also break down the studied period into two fractions divided by the 2008 crisis and we find that the financialization occurred after the crisis of 2008.*

Keywords: agricultural commodities, mixed-data sampling, market drivers, financialization

JEL codes: Q02, G15

1 Introduction

The importance of agricultural commodity markets is growing rapidly due to rising demand from the developing countries caused by their rising population. Increasing demand for biofuels even nourishes this trend. Additionally, substantial number of investors and speculators have entered the commodity market recently increasing both its liquidity and volatility. Clayton (2016, p.7) mentions that the interest in the markets by institutional investors jumped from $15 bn. to $200 bn. between 2003 and 2008. Moreover, the development of agricultural commodity markets became substantially turbulent after the food crisis of 2006. As a result, we choose the agricultural commodity markets as the subject of our research to shed more light into understanding of their dynamics.

As commodities lack an intrinsic value, investors willing to invest in them cannot conduct a fundamental analysis to determine in which direction the price will move. How should they decide where and when to invest their money in the commodity market then? There are numerous factors that drive the commodity prices linked with both their demand and supply. Moreover, due to the recent financialization of the commodity market (see e.g. Clayton, 2016 or Büyüksahin and Robe, 2014), commodity prices are driven by macroeconomic as well as financial factors. If we knew in which way each driver impacts the commodity prices, we would be able to base our predictions of the commodity markets development on the prediction of their drivers. We look for potential drivers and intend to measure their impact to make such predictions possible for the investors.

Although the literature attempts to cover this newly increased variance in the agricultural commodity markets, papers on the agricultural market focus almost exclusively on interdependencies with the energy market and its financialization. Koirala et al. (2015)

finds that agricultural commodity and energy prices are highly correlated and exhibit positive and significant relationship using the innovative copula econometric model. In compliance with these results, De Nicola et al. (2016) discover that the price returns of energy and agricultural commodities are highly correlated and that this co-movement increased in recent years. They also conclude that the stock market volatility is positively associated with the co-movement of price returns across markets (especially after 2007). In addition, Nazlioglu et al. (2013) find that oil market volatility spills on the agricultural markets (except for sugar), but only after the food price crisis of 2006–2008. Nazlioglu (2011) studies linear and non-linear relationship between the world oil and prices of corn, soybeans and wheat. He finds non-linear feedbacks between the oil and the agricultural prices and a persistent unidirectional nonlinear causality running from the oil prices to the corn and soybean prices. Wang et al. (2014) argue that whereas oil shocks can explain a minor fraction of the agricultural commodities prices variations before the food crisis in 2006–2008, the proportion of the variations explained by oil shocks after the crisis becomes much higher.

Concerning the financialization of the agricultural commodities markets, Jebabli et al. (2014) analyse shock transmission between international food, energy, and financial markets, using time varying parameter VAR (TVP-VAR). They discover that volatility spillovers between the three markets increase during crisis. Baldi et al. (2016) studied the commodity financialization and integration between commodity and financial markets arising from it. Their main finding is that volatility spillover from stock markets to agricultural markets increased significantly after the 2008 financial crises.

To complete the literature review on agricultural commodities markets with several miscellaneous remarks, Dimpfl et al. (2017) concludes that the prices of studied agricultural commodities are almost uniquely formed in the spot market. Contrary to this, Huchet and Fam (2016) confirm a positive impact of speculation in futures markets on returns of the underlying agricultural commodities. Finally, Nazlioglu and Soytas (2012) find evidence on the positive effect of a weak dollar on agricultural prices, besides other conclusions.

We address the topic in more complex way. The aim of the paper is to explain agricultural commodities price movements by assessing an impact of multiple economic and financial factors. We consider 4 macroeconomic and 5 financial variables. While macroeconomic variables are typically observed at monthly or quarterly frequencies, data about financial variables can be collected at much higher frequencies (for example daily stock index returns). We employ recently developed mixed-data-sampling (MIDAS) methodology that enables us to incorporate the mixed-frequency variables into a single regression model. Thus, we complement the existing literature with the assessment of as many potential drivers as possible in a single linear model. The drivers were predominantly investigated separately so far. Furthermore, impact of the variable of the commitment of traders was not studied before at all, to the best of our knowledge. Our usage of MIDAS model is also unprecedented for such purpose. We also break down the studied period into two fractions divided by the 2008 crisis to compare the results of the two sub-periods and to study a change that this crisis caused.

The rest of the paper is organised as follows. Section 2 describes the MIDAS framework and the data used in the research. Section 3 presents obtained results and discusses them with the literature to date. Section 4 concludes.

2 Methodology and Data

Main challenge that we face when studying various drivers of agricultural commodities prices is their mixed frequencies. Most of the financial variables are sampled daily, the commitment of traders reports are issued weekly and macroeconomic variables are observed predominantly monthly. Ghysels, Santa Clara, and Valkanov (2004) developed a framework of mixed-data sampling (MIDAS) that deals with such situation.

Mixed-data sampling

Normally, a researcher must time-aggregate the higher-frequency data to the sampling rate of the lower-frequency data, when he wants to study a variable sampled at a low frequency (e.g. quarterly) with an independent variable observed at a higher frequency (e.g. monthly). This can be achieved by simple or weighted averaging. However, such approach naturally leads to a considerable loss of information during the time aggregation. On the other hand, the MIDAS methodology incorporates all the information from the data in the model without a need of the aggregation of the higher frequency variable. This is achieved by so called frequency alignment procedure.

Frequency alignment transforms the time series of the high-frequency variable to a matrix formed by vectors of a length corresponding to the length of the low-frequency variable time series. Consequently, the number of vectors forming the high-frequency matrix is equal to the number of high-frequency observations falling into one low-frequency period. Coefficients for each vector of the matrix are then estimated by a regression.

Reverse unrestricted MIDAS

So far, we presented only basic features of MIDAS methodology considering a situation where the low-frequency dependent variable is explained by high-frequency independent variable (like it was originally developed by (Ghysels, Santa Clara, and Valkanov, 2004). However, the problem at hand in this paper is to explain daily observed agricultural commodity returns with variables of either same or lower frequency (weekly or monthly). Foroni et al. (2015) introduced a modified version of MIDAS, so called reverse unrestricted MIDAS, that enables one to incorporate a high-frequency variable as the dependent one.

The frequency of the dependent variable is here aligned with the lower frequency of the explanatory variable as well. Nevertheless, a system of equations is subsequently formed, where each vector of the dependent variable matrix (representing each part of the dependent variable data sample for respective part of the low-frequency period) is explained with the data on the low-frequency explanatory variable. It is particularly beneficial when investigating drivers of the agricultural commodities returns. We can choose which particular values of the high frequency variable we would like to explain (say, first, sixth and twenty-first day – values in the beginning of the month, after one week and at the end of the month) or examine only part of the period (say, from the first to the fifth day – the first week of the month).

Model specification

MIDAS model can be left either unrestricted or functional constraints can be employed. Leaving the model unrestricted can lead to substantially high number of parameters to be estimated. During the frequency alignment procedure, we divide the high frequency variable into k vectors, as was described before, and we need to estimate a coefficient for each of them. When we align a daily variable with a monthly one, the number of coefficients accounts for 21. Their number even rises when we consider additional lags of the variables (with contemporary month and the preceding one we need to estimate 42 coefficients). To reduce the number of parameters that are estimated, several ways of restriction were developed in e.g. Ghysels, Santa-Clara, and Valkanov (2005, 2006) or Andreou, Ghysels, and Kourtellos (2010).

Even though these functional constraints propose some useful properties, the model loses its linearity. On contrary, the approach of leaving the model unrestricted is greatly beneficial when forecasting a high-frequency variable, since the model stays. In addition, more explanatory variables of both low and high frequencies can be added to the model without any additional modifications (Foroni et al. 2015). Furthermore, we determine how many lags of the high-frequency explanatory variable are truly relevant using

autocorrelation tests to avoid the situation when we need to estimate too many parameters in the model.

To sum up, we align the frequencies of all variables to the lowest, monthly, one. We form the system of equations, each corresponding to a specific day in the month, in line with the RU-MIDAS framework. As the length of the paper is limited, we present only the results of the first equation in the paper. In other words, we only compute the impact of the drivers on the returns of the first day in a month. First, we include all 9 drivers in the model as it is shown in the following equation:

$$r_{a,t} = \alpha + \sum \beta_b x_{b,t} + \varepsilon_t \; ; \; a \in \langle 1; 2; \dots; 6 \rangle, b \in \langle 1; 2; \dots; 9 \rangle, \quad (1)$$

where a corresponds to each of the 6 examined commodities and b identifies individual drivers. Note that there might be additional lags of drivers included as well. Consequently, we reduce the model from insignificant variables in a standard manner (one after each unless the adjusted coefficient of determination is rising). Since the models are linear, we use standard OLS estimation. The time series are transformed to avoid their stationarity. In other words, log-differences are computed where necessary (for stock index returns etc.). Finally, *F*-statistic is computed for each model and they are tested for multicollinearity using variance inflation factor.

Data

Data are collected across the period of 01/01/1997–31/12/2016, which accounts for 240 monthly, 960 weekly and 5,040 daily observations. Data for all variables (commodities as well as drivers) are collected from Bloomberg. The econometric analysis is conducted in the R interface using following packages: midasr, lmtest and fmsb. To cover various classes of agricultural commodities, we consider three commodities from the group of grains (corn, wheat and soybean) and three from the soft agricultural commodities (coffee, sugar and cotton). Daily data on corn, wheat, soybeans, coffee, sugar and cotton are measured in dollars per bushel. We use the data of the spot market indices constructed by the Chicago Board of Trade (CBOT) for the grain commodities and by the Intercontinental Exchange (ICE) of the New York Stock Exchange for the soft commodities. We compute daily returns from the commodities prices using their log difference.

We consider 10 macroeconomic and financial variables in total as drivers that potentially have an impact on the commodities returns. Macroeconomic variables comprise inflation, industrial production, real GDP growth, and interest rate. Financial market characteristics include exchange rate, stock index, volatility index, crude oil prices, and commitment of traders. All macroeconomic variables correspond to the U.S. economy since it is considered world centre of the commodity trade.

Inflation and industrial production are sampled monthly. GDP growth data are collected quarterly. However, if we included quarterly variable in the models, they would become considerably less feasible, the results less precise and their interpretation more complicated. Hence, we assume that if a certain year-over-year growth rate is registered for the quarter, the equal year-over-year growth rate holds for each month of this quarter. The commitment of traders reports presenting a breakdown of each Tuesday's (resulting in weekly frequency) open interest for markets in which 20 or more traders hold position equal to or above the reporting levels established by U.S. Commodity Futures and Trading Commission (CFTC). They are issued by CFTC and they reflect investors' activity in the futures markets. The rest of the variables is of daily frequency. As a final point, interest rate is represented by the federal funds rate targeted by the Federal Reserve's Federal Open Market Committee (FOMC) as part of its monetary policy.

3 Results and Discussion

Autocorrelation analysis revealed that we should include the first lag of the stock market returns and first two lags of the VIX returns in the analysis. Furthermore, we include the first lag of the commitment of traders for wheat and its 5 lags for cotton.

We observe several interesting facts in the results for the overall time span presented in the Table 1. First, strong influence of the stock market index returns on the agricultural commodities returns is evident, with positive coefficients significant at the level of 1 % in 5 out of the 6 cases (with sugar being the exception). The link between the agricultural market and the stock market is also confirmed by the 5% significance of the VIX returns for half of the commodities. Second, the macroeconomic drivers are not found significant for most of the commodities. Only the sugar is significantly driven by industrial production (1% significance) in negative direction and by GDP growth in positive direction (however, it is significant only at 10 %). Third, apart from these variables, exchange rate positively drives the soybean returns and the commitment of traders negatively drive the wheat returns (both significant at 5 %).

Table 1 Agricultural commodities drivers 1997–2016

	Corn	**Wheat**	**Soybean**	**Coffee**	**Sugar**	**Cotton**
Constant	−0.003 (−1.39)	−0.001 (−0.75)	−0.005* (−1.94)	0.001 (0.70)	−0.011* (−1.87)	0.002 (0.87)
Inflation	1.2e−03 (1.27)	–	1.3e−03 (1.47)	–	2.6e−03 (1.27)	−1.4e−03 (−1.37)
Industrial production	–	−3.6e−04 (−1.21)	−6.4e−03 (−1.54)	–	**−2.4e−03***** **(−2.60)**	−3.0e−04 (−1.04)
GDP growth	–	–	1.1e−03 (1.14)	–	3.9e−03* (1.79)	–
Exchange rate	–	0.256 (1.50)	**0.292**** **(2.04)**	–	−0.483 (−1.53)	–
Stock index	**0.359***** **(3.47)**	**0.353***** **(2.99)**	**0.229***** **(2.65)**	**0.346***** **(2.85)**	**–**	**0.287***** **(3.03)**
Stock index (−1)	–	–	–	0.303** (2.42)	0.256 (1.35)	–
VIX	0.026 (1.24)	0.053** (2.28)	–	–	–	–
VIX (−1)	–	0.024 (1.24)	–	0.028 (1.07)	0.101** (2.54)	–
VIX (−2)	0.022 (1.29)	–	0.023 (1.47)	−0.045** (−2.00)	–	–
Crude oil	–	0.104* (1.88)	–	–	0.173* (1.78)	–
CoT	–	0.014 (1.08)	–	–	–	–
CoT (−1)	–	**−0.072**** **(−2.14)**	–	–	–	–
CoT (−3)	–	–	–	–	–	5.3e−03* (1.96)
F−statistic	4.08**	3.82***	3.44***	4.85***	2.37**	4.28***
R^2	0.065	0.118	0.082	0.077	0.067	0.068

Source: Own elaboration based on analysis in R and data from Bloomberg
Note: Interest rate was removed from all models during their reduction.

Results for the period before the financial crisis are substantially weak. The only case where we observe a significance of the driver higher than 10 % is inflation positively driving sugar returns at the level of 1 %.

Similarly to the overall results, the most obvious result for the after-crisis period is the strong positive impact of the stock market returns. In addition, coefficient for wheat is over 0.7, implying considerably close relationship between the two markets. Moreover,

positive influence of the contemporary stock market returns on the soybean and cotton market are supported by highly significant positive impact of the its first lag as well. Concerning macroeconomic drivers, inflation significantly drives sugar like in the period before the crisis, nonetheless the direction of the impact is opposite. Industrial production negatively influences the soybean returns. As a final point, exchange rate drives negatively sugar returns.

Table 2 Agricultural commodities drivers 1997–2008

	Corn	Wheat	Soybean	Coffee	Sugar	Cotton
Constant	−0.001 (−2.20)	0.004 (1.34)	0.005 (1.51)	0.002 (0.67)	−0.038*** (−3.69)	−0.003 (−1.37)
Inflation	1.4e−03 (0.97)	–	–	–	**0.013***** **(3.94)**	–
Industrial production	–	–	–	–	1.6e−03 (1.59)	5.7e−04 (1.19)
Exchange rate	0.178 (0.83)	0.219 (1.01)	0.377* (1.85)	–	–	–
Interest rate	−5.7e−04 (−0.71)	−1.2e−03 (−1.52)	−8.3e−04 (−1.08)	–	–	–
Stock index	0.152 (1.04)	−0.170 (−1.16)	–	0.310 (1.22)	–	–
Stock index (−1)	–	–	–	0.277 (1.64)	0.318 (1.20)	−0.132 (−1.13)
VIX	–	–	–	−0.050 (−1.17)	–	−0.038 (−1.30)
VIX (−1)	–	0.032 (1.29)	–	–	0.091 (1.57)	–
VIX (−2)	0.024 (1.05)	0.027 (1.18)	0.036* (1.70)	−0.050 (−1.48)	–	0.033 (1.41)
Crude oil	–	–	–	–	0.152 (1.11)	–
CoT (−1)	–	−0.026 (−0.72)	–	–	–	–
CoT (−3)	–	–	–	–	–	5.1e−03* (1.91)
F−statistic	0.86	1.45**	2.52*	2.18*	4.22***	2.72**
R^2	0.031	0.061	0.053	0.061	0.136	0.093

Source: Own elaboration based on analysis in R and data from Bloomberg
Note: GDP growth and contemporary commitment of traders were removed from all models during their reduction.

Table 3 Agricultural commodities drivers 2008–2016

	Corn	Wheat	Soybean	Coffee	Sugar	Cotton
Constant	−6.6e−04 (−0.30)	0.004 (1.35)	−0.009** (−2.34)	0.001 (0.50)	0.014*** (2.85)	0.006* (1.96)
Inflation	–	−3.3e−03* (−1.86)	2.7e−03 (1.54)	–	**−0.010***** **(−4.10)**	−3.0e−03* (−1.72)
Industrial production	–	–	**−1.4e−03**** **(−2.04)**	–	–	–
GDP growth	–	–	2.3e−03 (1.42)	–	–	−1.1e−03 (−1.03)
Exchange rate	–	–	–	–	**−1.076**** **(−2.46)**	−0.305 (−1.12)
Stock index	**0.431***** **(3.21)**	**0.739***** **(4.85)**	**0.366***** **(3.47)**	**0.267*** **(1.85)**	**0.536**** **(2.42)**	**0.499***** **(3.06)**
Stock index (−1)	–	–	**0.446**** **(3.02)**	0.457** (2.44)	0.328 (1.16)	**0.505***** **(3.14)**
VIX	–	0.062* (1.91)	–	0.036 (1.11)	–	0.046 (1.57)
VIX (−1)	–	–	0.051* (1.96)	0.065** (2.01)	0.052 (1.11)	–

VIX (–2)	–	–	0.033 (1.50)	–0.044 (–1.55)	–0.063 (–1.49)	–
Crude oil	–	–	–	–	–	–0.087 (–1.07)
CoT	–0.132 (–1.35)	0.049 (1.13)	–0.051 (–1.06)	–	0.103 (1.07)	–0.051 (–1.06)
CoT (–1)	–	–0.118* (–1.80)	–	0.080* (1.69)	–	–
CoT (–2)	–	–	–	–	–	–0.078 (–1.18)
CoT (–3)	–	–	–	–	–	–0.062 (–1.24)
CoT (–4)	–	–	–	–	–	–0.078 (–1.61)
F–statistic	5.61***	6.54***	3.14***	3.49***	3.74***	2.64***
R^2	0.106	0.264	0.222	0.191	0.227	0.257

Source: Own elaboration based on analysis in R and data from Bloomberg
Note: Interest rate was removed from all models during their reduction.

Discussion

Opposed to Koirala et al. (2015), De Nicola et al. (2016), Nazlioglu (2011), and Wang et al. (2014), we do not find any evidence on the impact of the crude oil returns on agricultural commodities markets. Since we used a linear framework unlike the aforementioned papers, we can imply that the linkage is non-linear. Furthermore, we find that agricultural commodities markets were financialized in the period after the crisis of 2008 and that they are strongly linked with the returns in the stock market. This is in line with findings of Clayton (2016), Büyüksahin and Robe (2014), Jebabli et al. (2014) and Baldi et al. (2016).

Furthermore, we may draw several partial conclusions from the results. First, macroeconomic variables have only little impact on the agricultural commodity returns (we find a significant influence of industrial production, inflation and to a limited extent of GDP growth almost exclusively for sugar). Second, the activity in the futures market represented by the commitment of traders drives the returns with a significance higher than 10 % only in a single case of wheat (in the overall time-span). We suggest that the negative coefficient at the variable's second lag implies, that elevated activity pushes the market closer to its equilibrium and thus, reduces the returns. Finally, we find a positive impact of the exchange rate on the soybean returns in the overall time span. This results from the fact that the U.S. is the largest producer of soybeans in the world and thus, exports vast proportion of its production

4 Conclusions

We assessed an impact of multiple economic and financial drivers on the agricultural commodities price movements. We considered 4 macroeconomic and 5 financial variables and we employed the framework of mixed-data sampling to include all the drivers in a single linear model. Our main finding is a strong evidence of the agricultural commodity market financialization after the financial crisis of 2008. We do not confirm the link between the agricultural commodities markets and the energy market suggested in the previous research. We also observe a significant (negative) impact of the activity in the futures markets (represented by the commitment of traders) only in the case of wheat in the overall time-span.

The further research may be extended on more days in the month, whereas there were presented only the results for the first day in a month in this paper. One can also use the presented results as a ground for the prediction of future values and their comparison between the commodities. Finally, the models can be complemented with additional drivers when there are identified some.

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Effect of zero lower bound on large firms financing in the Czech Republic

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Abstract: *The effect of monetary policy might be analyzed using several channels. One of these channels is known as the balance sheet channel and shows how monetary policy affects the credit portfolio of financial intermediaries as well as other economic agents. For instance, a contractionary monetary policy would affect banks' ability to grant loans, leading to credit rationing. This has implications for credit availability to borrowers, especially small-scale borrowers with less sophistication and collateral to back-up their loan demand. Most of the current studies aiming to analyze the balance sheet channel during the monetary tighten period. The purpose of our study is to investigate the changes in financial structure of Czech blue chips traded in the PSE during the period of zero lower bound. Firm-level financial data for Czech firms are gathered from Bloomberg terminal and Amadeus database and panel regression is employed to determinant how financing indicators react to monetary policy changes.*

Keywords: monetary policy, interest rate, transmission mechanism, balance sheet channel

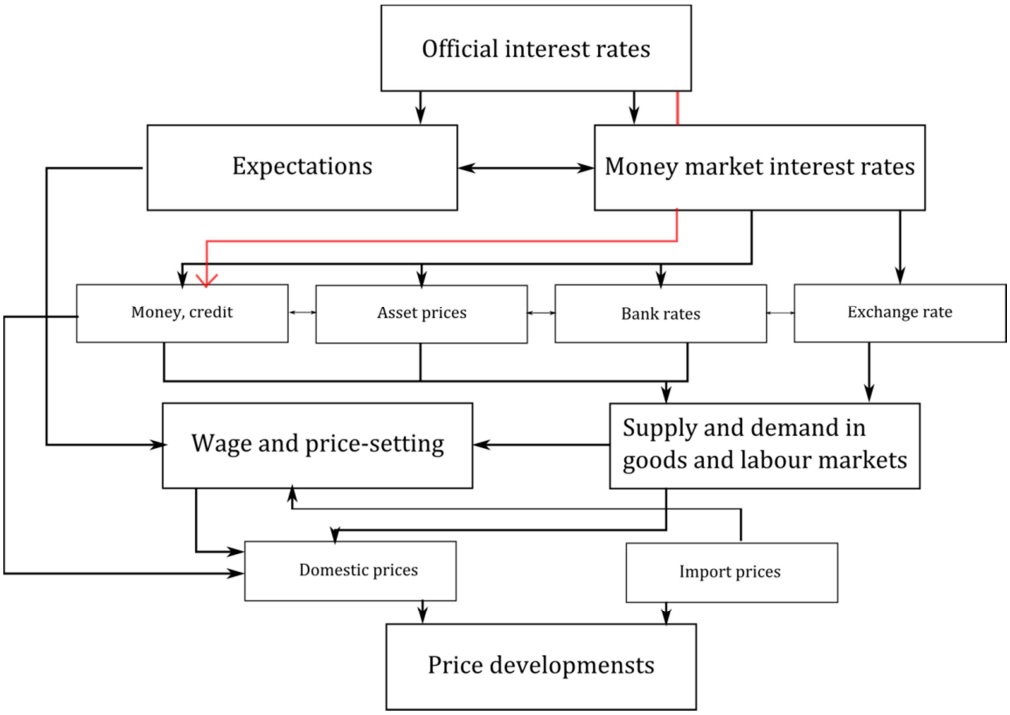
JEL codes: E32, E44, E51

1 Introduction

The financial crisis, which started in August 2007, affected several parts of global financial systems and influences the financing conditions of both the financial and non-financial sectors. Since the beginning of the crisis, the ECB followed by other central banks have introduced a wide range of unconventional measures in order to meet its inflation objective, including low or negative deposit facility rates, targeted long term refinancing operations, and asset purchases.

The aim of monetary policy is to determine economic activities. The transmission mechanism might affect economic aggregates such as inflation, output, interest rates, exchange rates or employment. Monetary policy can be transmitted in the economy in several channels: the interest rate, the bank credit, the balance sheet, the exchange rate, the asset price and the expectations channels. The transmission mechanism of monetary policy is described in Figure 1.

Figure 1 Transmission mechanism of monetary policy



Source: Authors´, ECB (2017)

The central points of financial conditions of private sector are developments in benchmark interest rates (key ECB or central banks interest rates, money market rates and government bond yields). These rates are the main determinants of the conditions of direct financing in financial markets for both non-financial and financial corporations.

In the EU area, bank-based financing is the predominant source of external debt financing for the non-financial private sector (ECB, 2012).

According to the credit channel theory, the effects of monetary policy on interest rates are boosted by changes in external finance premium which represent the difference in costs between funds raised externally (issuance of debt or equity) and funds generated internally by retaining earnings. A change in monetary policy that raises or lowers open-market interest rates tends to change the external finance premium in the same direction (Bernanke and Gerter, 1995).

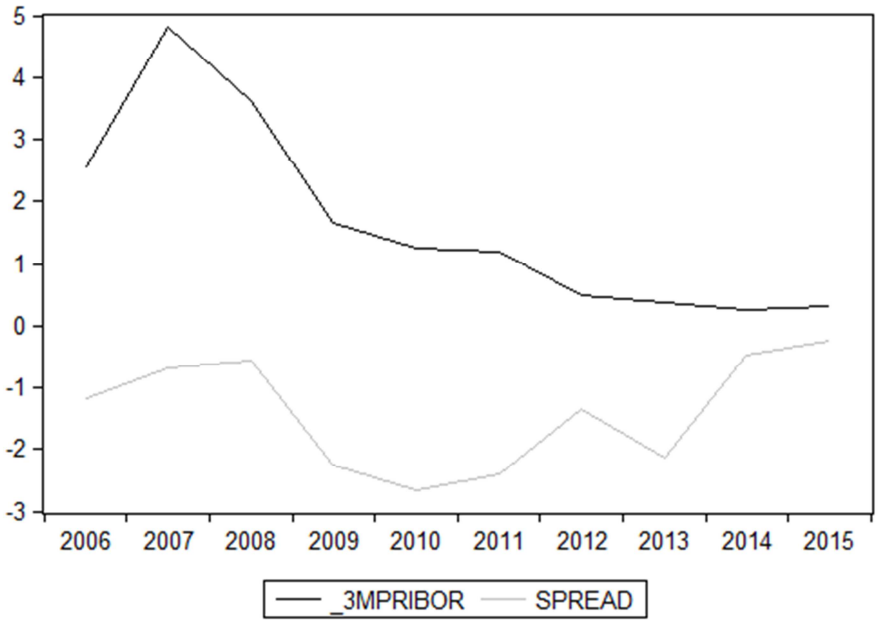
Regarding the balance sheet channel stresses the positional impact of changes in monetary policy on borrowers' balance sheets and income statements. A contractionary monetary policy such as sale of treasury instruments would affect banks' ability to grant loans, leading to credit rationing. This has implications for credit availability to borrowers, especially small-scale borrowers with less sophistication and collateral to back-up their loan demand. Also, low credit leads to an increase in interest rates thereby raising the cost of credit to small users with low collateral. Only firms with healthy balance sheets are able to borrow from the capital market, Under-capitalized firms are forced either to borrow from banks and raise funds at higher interest rates that reflect the cost of monitoring, or self-finance their projects. Monetary policy can affect the access of firms to external finance because it alters the costs of funds, Bougheas et al. (2006).

The aim of the paper is to investigate the existence of the balance sheet channel for Czech very large and large firms in the very low interest rates environment. We take into account firm characteristics to find the effect of monetary policy on the access of firms to external finance.

2 Methodology and Data

Using yearly data our data set gathered from Amadeus database contains 9 017 very large and large Czech firms, Bloomberg was used to obtain market and macroeconomic data. The analyzed period was chosen from 2009 to 2015, the development of 3M PRIBOR as monetary policy proxy and the spread between 3M PRIBOR and 10year Czech government bond yield is demonstrated in Figure 2.

Figure 2 3M PRIBOR Rate and Spread



Source: Authors´in Eviews, data Bloomberg

The summary statistics of variables are reported in Table 1. For our companies short term debt represented 58.13 percent of total debt and total debt represents 20.18 percent of total liabilities of Czech firms on average.

Table 1 Descriptive statistics

	Mean	Median	Max	Min	Std.Dev
Short-term debt/ total debt	0.5813	0.6692	3.4355	-0.5360	0.4044
Total debt/ total liabilities	0.2018	0.1639	3.7781	-0.0934	0.1736
MP in %	0.7983	0.5000	1.6500	0.2700	0.5183
Size	9.3282	9.2336	17.0463	1.8124	1.3744
Collateral	0.3863	0.3666	5.6202	-0.5236	0.2634
Gearing	2.0273	0.3923	3815.251	-0.3670	41.6510
Profit	11.2429	10.0575	936.7920	-996.1540	54.3106
Age	14.8580	16.0000	70.0000	-0.0000	7.1174
GDP growth in %	0.9755	1.3000	4.0000	-3.6000	2.4722
Sentiment growth in %	0.0347	0.0632	0.1454	-0.1288	0.0840

Source: authors´, data Amadeus, Bloomberg

The logarithm of total assets is used to indicate the impact of SIZE and it is the key proxy for capital market access in Gerter and Gilchrist (1994) Bougheas et al. (2006). Monetary policy is represented by 3M PRIBOR development and reflects credit supply (Atanasova and Wilson, 2004). The GDP growth rate controls for cyclical effects, as an increase in the GDP growth rate encourage firms to shift from debt to non-debt liabilities. Following Bougheas et al. (2006) these measures of firm-specific characteristics are chosen. AGE measures the importance of firm history for access to external financing, COLLATERAL measures the support for borrowing, PROFIT is represented by ROE and GEARING is indebtedness of a firm with the respect of its equity. SENTIMENT measures confidence of economic agents about current and future economic situation and it is aimed for the Czech Republic. A characteristic of variables is summarized in Table 2.

As dependent variables that represent financial choice are used ratios: short term debt to total debt and total debt to total liabilities reflecting short and long term time horizon. The first dependent variable states for access to market finance versus bank finance, where the majority of short-term debt is bank finance, the second measure refers the overall availability of external debt.

Table 2 Variable characteristics

Abbreviation	Variable	Description
MP	3M PRIBOR	Proxy for monetary policy
SIZE	Logarithm of total assets	Proxy for capital market access
AGE	History of a firm	Importance of track records for the change in the composition of firm external finance
COLLATERAL	Tangible assets/ Total assets	Support for borrowing
PROFIT	ROE	Profitability scaled by capital
GEARING	Total loans to shareholder funds	Indebtedness of firm in relations to their equity
GDP growth rate	YoY change in GDP	Trade of between debt and non-debt liabilities
SENTIMENT	Economic Sentiment indicator for the Czech republic	Proxy for market participant anticipations

Source: authors´

Investigate the relationship between the financial choices of firm and their firm-specific characteristics standard panel model is employed. The formal equation is following:

$$y_{it} = \alpha_i + X_{it}\beta + \epsilon_{it} \quad (1)$$

Where $i = 1,2,\dots,N$ refers to cross-section firms, $t = 1,2,\dots,T$ refers from time period, $y_{it}$and X_{it}state the dependent variable and the vector of explanatory variables from firm *i* and year t, ε_{it} is the error term and α_i is a vector of firm-specific intercepts. The Hausman test was used to compare estimates from random effects model against a fixed effects alternative. Rejecting the hypothesis of no systematic difference between coefficients obtained from the models, the fixed effects model was chosen.

The results are demonstrated in Table 4. The theoretical impact of firm-specific characteristics into dependent measures is summarized in Table 3. The ratio short-term debt to total debt (variable for bank lending) will increase for small, with higher level of indebtedness and lower level of collateral and profitability. Total debt to liability is expected to increase for larger, less risky and more collateralized firms with higher ROE.

The increase in the GDP growth rate encourage firms to use mode non-debt capital, thus expected effect is negative for both measures.

Table 3 Expected effects

	Expected effect Short-term debt/ total debt	**Expected effect Total debt/ total liabilities**
Size	Negative	Positive
Profit	Negative	Positive
Collateral	Negative	Positive
Gearing	Negative	Positive
GDP growth	Negative	Negative

Source: authors´

The SIZE measured as logarithm of total asset is a significant factor affecting the debt ratios. The firms with higher share of total assets have better access to long term debt (positive sigh of coefficient) and reduce their short term debt (coefficient is negative). This results support finding of Gertler and Gilchrist (1994) or Bougheas et al. (2006) that firm size is important factor influencing the access to debt and bank loans. Further, Oliner and Rudebush (1996) and Bougheas et al. (2006) we find that small firms use mostly short-term bank loans.

The size of COLLATERAL support access to long-term debt, firms with higher value of tangible assets to total assets could reduce the portion of short term debt in the favour of long-term debt. The same effect was found for GEARING that support longer form of debt financing. GDP growth rate supports in short run short term form of debt financing, in the long run encourage firms to orient toward equity financing. The ROE lower level of debt financing, AGE support using of long-term debt, older firms have easier access to long-term financing. The effect of SENTIMENT is taken into account only in the short period but this findings correspond with the construction of this indicator. In the long run the role of SENTIMENT is irrelevent.

The findings for monetary policy are ambiguous but support the existence of balance-sheets channel. In the period 2009 - 2015 decreasing PRIBOR rate positively influenced the level of total debt to total liabilities for the Czech large and very large firms at the same moment the impact on short-term debt to total debt is negative. Same finding for Germany manufacturing firms were confirmed in Kajurova and Linnertova (2017). This can be explained by the construction of dependent variables, when the effect of low interest rate disappears, as we use ratios.

Table 4 Results for Short-term debt/ total debt and Total debt/ total liabilities (2009 - 2015)

	Short-term debt/ total debt	**Total debt/ total liablities**
Constant	1.5683*** (19.3577)	-0.1414*** (-9.9886)
Monetary policy	-0.0548*** (-5.2428)	0.0054** (2.1758)
Size	-0.0799*** (-12.4571)	0.0205*** (27.0741)
Collateral	-0.3052*** (-14.1299)	0.1424*** (31.6480)
Gearing	-0.0002* (-1.8055)	0.0003*** (12.2496)

Profit	-0.0001*** (-2.6336)	-0.0001*** (-6.4829)
Age	-0.0052* (-1.6602)	0.0008 (1.0302)
GDP growth	0.0026*** (2.8350)	-0.0011*** (-4.9156)
Sentiment	-0.1062*** (-5.0558)	0.0023 (0.4508)
R-squared	0.7534	0.8188
Adj. R-squared	0.6873	0.7823
Prob(F-statistic)	0.0000	0.0000
D-W stat.	1.6185	1.2662
Number of obs.	23 252	43 230

Source: authors´in Eviews

4 Conclusions

The paper investigates the impact of monetary loosing on financial position of large and very large Czech firms. We take into account firm-specific characteristics to determine the access to short term and long term funds. We found out that small, young firm with low collateral are oriented on short term debt financing. The large, well-established firms with higher level of collateral might be founded by long-term debt or open to equity financing. The monetary policy affects the structure of company debt in long and short run. We suggest in zero lower bound the large firms replace short term debt by the long term debt.

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Assessment of Impact of Items Reducing Tax Base and Tax on Total Amount of Corporate Income Tax in the Czech Republic in Selected Periods

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Abstract: *A tax policy as an important part of a fiscal policy influences many financial and operational decisions of enterprises. Regarding a corporate income tax, the aim of this paper is to state a value of tax savings with respect selected items reducing a tax base and with respect tax credits as items decreasing enterprises` a final tax liability. It means that attention is devoted the first of all to impact of tax losses, research and development expenses, expenses connected with donation activities of companies and investment incentives. As a source data are used data provided by Ministry of Finance of the Czech Republic connected with a selected period between years 2005 and 2015. We concentrate our attention not only on total summarized data but moreover on selected sectors. To be able to express and to compare changing of above-mentioned items, we firstly use base and chain indexes. Moreover, a method of a pyramidal decomposition of a top indicator i.e. the final tax liability is used, so that we could calculate and find out an impact of selected items on this value. In case of identified multiplicative relationship among individual items, a functional method is applied. Regarding results of our research, we may confirm that impact of above mentioned items changes in a selected period and especially in case of tax losses, we can identify a significant influence in determining of a final tax liability. Respecting research and development expenses, we may state that their impact grows up in observed period. When it comes investment incentives and donation activities development of these items is stable growing.*

Keywords: corporate income tax, tax base, tax savings, pyramidal decomposition, functional method

JEL codes: H20, G30, K34, H25, G39

1 Introduction

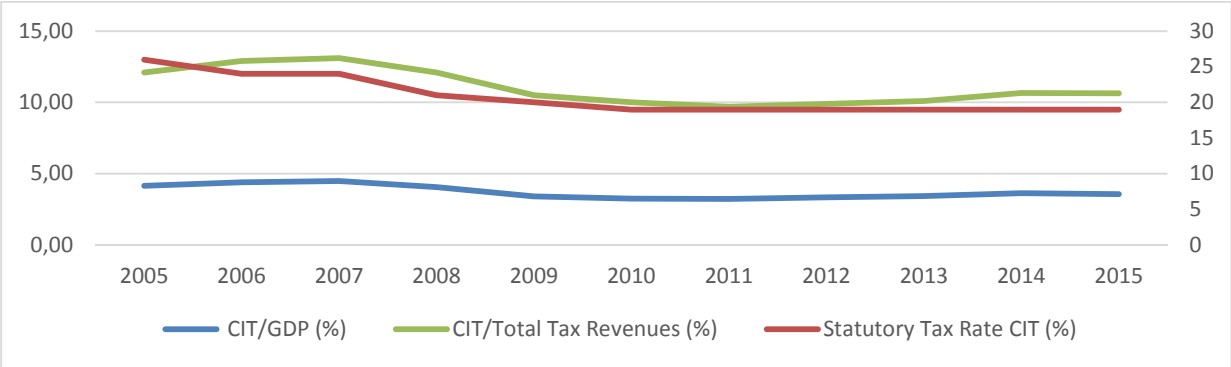
A tax policy is considered as an important part of a fiscal policy of countries. A final form of individual tax systems must be convenient with main tax principles, i.e. fairness, effectiveness, flexibility, political transparency and legal perfection or administrative simplicity (Kubátová, 2015). Moreover, a good a tax system eliminates substitution and distortion effects of a taxation and supports desirable behaviour of tax subjects respecting stimulating function of taxes. There are different ways to create the kind of a tax system and there are different possibilities how to adjust individual taxes to these requirements.

Four tax objects exist – head, property, consumption and income. The last one, the income concentrates attention on a value of the income of the individual subjects. We can find not only individual persons among these subjects, but non-financial enterprises, financial institutions or non-profit enterprises that can be levied with this kind of the tax as well. The aim of this type of the taxation is to tax a taxable profit but also to support desirable activities of the enterprises. Consequently, these intentions can be observed

not only in individual adjustments of accounting profit to the taxable profit. The corporate income taxation may use further aspects influencing a final tax liability of the tax subjects. For example, individual items reducing tax base or tax reliefs may be applied. Regarding these facts, the aim of our paper is to concentrate on development of the main items reducing the tax base and the tax reliefs of the corporates during a selected period and evaluation of the impact of these items on corporates` final tax liability.

The individual tax systems can be described as a mix of direct and indirect taxes. The corporate income tax of the Czech Republic as a direct tax is regulated by the Act. 586/1992 Coll., on Income Taxes. The tax quota and the ratio revenues of this tax to total tax revenues (OECD) are presented in figure 1.

Figure 1 Changes of tax quota, tax revenues and statutory tax rate

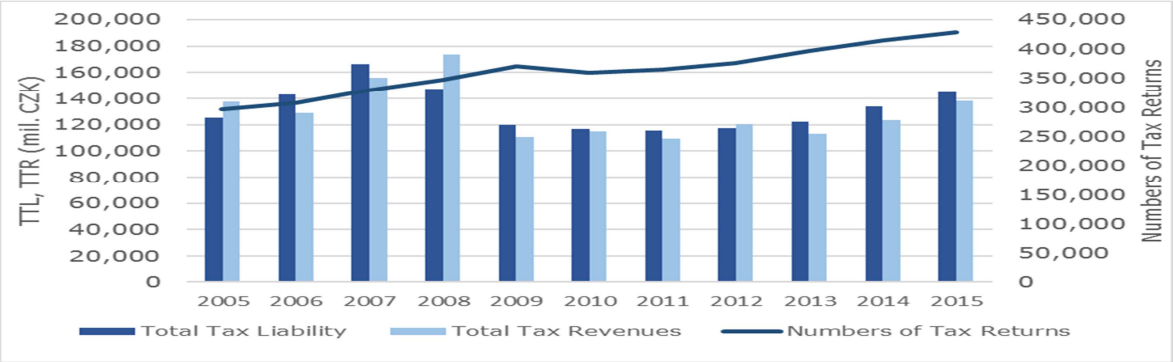


Source: OECD and Act no. 586/1992 Coll., on Income Taxes

As can be seen the statutory tax rate of the corporate income decreased in selected period. This rate has been decreased from the value 26 % to 19 %. On the other hand, the tax quota has not changed significantly at all and can be stated that its value was higher than 3 % and lower than 5 %. The development trend of the ratio between the corporate income tax revenues and the total tax revenues was variable, but average value was 11.06 % and mean value 10.63 %. Regarding data presented in this figure is clear that the impact of the statutory tax rate reduction on these ratios was not important.

The following figure 2 expresses in more detail information describing a relationship first among the development of value of the total tax liability, the total tax revenues and the numbers of tax returns (Finanční správa). It is clear that the total tax liability was affected by a reduction of enterprises` earnings. Nevertheless, the number of tax returns increased in spite of the fact that economy crisis influenced the profitability of companies. It is interesting to compare differences between the value of total tax liability and the value of total tax revenues of the Czech Republic. These items differ, because the tax revenues include actually paid tax amount and tax advances.

Figure 2 Changes of tax revenues, tax liability and numbers of tax returns in selected period



Source: Finanční správa

The Act. 586/1992 Coll., on Income Taxes has been amended more than hundred times since its inception. The changes of individual parts of this act are not only related to a definition of tax base, tax rates, tax exemption or others key aspects. The changes can be determined in the area of the items reducing tax base or in the tax reliefs as well.

The tax subject, the tax base, the tax exemption, the tax period, the deduction from the tax base, the tax rate and the tax relief can be considered as the main construction elements of the taxes and the taxation influencing a level of a final tax burden. In the case of the corporate income tax, the tax subjects are entities that are obliged to tolerate and pay the tax. The tax base is a difference between the taxable incomes and the taxable expenses, the tax exemption is part of the tax base that is not taxed, the tax period is a period for which the taxable profit is determined and the tax rate is an algorithm that determines a basic value of the corporate income tax (Kubátová, 2015). Reductions from the tax base are closely linked with the stimulation function of the taxation, concentrate on supporting of specific purposes and decrease the adjusted tax base (Široký, 2008). It can be claimed that the items reducing tax base (IRTB) cuts down the taxable profit whereas the tax reliefs (allowances) influence the calculated tax.

Respecting legislation of the Act. 586/1992 Coll., on Income Taxes the relationship among the tax base, the deductions of the tax base, the tax reliefs and the final value of the tax can be expressed by following formula:

, (1)

where *ATB* is the adjusted tax base, *STR* is the statutory tax rate, *IRTB* is the items reducing the tax base, *TR* is the tax reliefs and *TTL* is the total tax liability. The following formula (2) defines a rule of an application of the items reducing tax base and the tax reliefs respecting long-term decisions:

(2)

The items reducing tax base of the corporate income tax has been changed for several times over the last twenty-five years. Comparing a different period only the one kind of deductions can be used all the time - the tax loss. The carry forward tax loss refers of applying a previous year`s loss to reduce the current year`s profits for tax purposes (Act. 586/1992 Coll., on Income Taxes). The period that may apply this type of the deductions has been decreased from seven years to five years.

The deductible item to support research and development expenses of enterprises was used in the year 2005 (Act. 586/1992 Coll., on Income Taxes) for the first time. A specific attribute of this item is possibility firstly as the taxable expense to decrease the taxable earnings and secondly as the item reducing tax base. This reality means that this

expenses influence the final tax liability twice. The taxpayers can reduce their tax base by implementing projects, which are in the form of experimental or theoretical works of design or construction work, calculations, designs, technologies, a production of functional samples or product prototypes. This deductible item can be applied for up to three tax years immediately following the taxable period in which the deduction was incurred.

Third item reducing the taxable amount is the value of gratuitous transactions (donations) determined to the specific purposes (Act. 586/1992 Coll., on Income Taxes). The aim of this reduction of the tax base is to support financing of education, culture, social, medical, environmental, humanitarian or charitable purposes. The value of the donations decreases the tax base in the taxable period in that the gift was demonstrably provided. Moreover, the tax law specifies the minimum value of the donations.

Comparing the items reducing the tax base and the tax reliefs, the tax allowances affect the final tax entirely different way as has been mentioned above. The tax reliefs respecting the Czech tax law of the corporate income tax are connected first with investment incentives. The incentives are one of the form of a public business support and can be applied up to the amount of the tax liability. This kind of the tax reliefs can be used for five consecutive tax period. First taxable period for which the reliefs can be applied is the tax period in which the taxpayer fulfilled the general conditions under the legislation connected with the investment incentives and the special conditions set out in the Act. 586/1992 Coll., on Income Taxes.

Finally, this tax act stipulates the possibility of applying the tax reliefs of the taxpayers, who employ just persons with disabilities (Act. 586/1992 Coll., on Income Taxes). According to this, employers may reduce their tax liability for each employee with a disability.

2 Methodology and Input Data

Respecting information mentioned above the items reducing tax base and the tax reliefs are an indirect form of business` support. Intensity of usage of these kinds of supporting changed during a period in the Czech Republic. Our attention is concentrated on expression a value of this support in period between years 2005 and 2015. As a source information, we used data provided by Finanční správa that contain total annual information about the earnings before taxation (EBT), the value of the tax base, the items reducing tax base, the tax reliefs and the total tax liability. The following table 1 describes not only the changes of the tax reliefs and the items reducing tax base, but also the changes of the total tax liability (TTL), the statutory tax rate (STR) and the adjusted tax base (ATB I.). The item of the adjusted tax base I. represents corrected accounting profit respecting adjustments mentioned in section mark 23, 24 and 25 ot The Act. 586/1992 Coll., on Income Taxes.

Table 1 Changes of selected items within period 2005 – 2015 in v %

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
TTL	100.0	114.1	132.7	117.5	95.7	93.4	92.4	93.6	97.9	106.8	115.9
STR	100.0	92.3	92.3	80.8	76.9	73.1	73.1	73.1	73.1	73.1	73.1
ATB I.	100.0	118.3	134.3	139.5	121.8	124.9	128.5	126.2	143.1	151.2	152.6
Tax Loss	100.0	81.5	69.1	107.7	105.7	97.9	125.0	84.5	105.6	84.3	85.9
R&D	100.0	131.7	160.1	147.9	157.2	213.4	305.2	325.3	385.2	375.9	421.5
Donations	100.0	116.2	116.2	111.9	110.4	114.0	122.5	121.8	171.5	170.4	172.0
Reliefs	100.0	118.6	139.5	88.7	85.4	108.4	127.1	167.0	413.5	431.1	171.0

Source: authors` calculation according data of Finanční správa

As can be seen in the table 1 that use the base index and the input values are data of the year 2005 of individual items, the final total tax liability changed during selected period.

Table 2 Year-on-year changes of selected items within period 2005 – 2015 in %

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
TTL	100.0	114.1	116.3	88.5	81.5	97.6	99.0	101.3	104.5	109.1	108.5
STR	100.0	92.3	100.0	87.5	95.2	95.0	100.0	100.0	100.0	100.0	100.0
ATB I.	100.0	118.3	113.5	103.8	87.3	102.5	102.9	98.2	113.4	105.6	101.0
Tax Loss	100.0	81.5	84.9	155.9	98.1	92.6	127.7	67.6	124.9	79.9	101.9
R&D	100.0	131.7	121.6	92.3	106.3	135.8	143.0	106.6	118.4	97.6	112.1
Donations	100.0	116.2	100.0	96.3	98.7	103.2	107.5	99.4	140.8	99.4	100.9
Reliefs	100.0	118.6	117.6	63.6	96.3	126.9	117.2	131.5	247.5	104.2	39.7

Source: authors` calculation according data of Finanční správa

The data stated in the table 2 differs from the data of the table 1 because expresses the continuous year-on-year changes. The main question is, if it is possible to express, respecting public published information provided by Finanční správa, the power of influence of the individual elements affecting this value. We used methodology of pyramidal decomposition so that we could find out the answer this question. The pyramidal decomposition of individual indicator is derived from an idea that a top indicator can be decomposed on partial indicators (Dluhošová, 2010). Moreover, it is possible mathematically to identify the certain operations among these individual indicators. Finally, can be stated that the change of the top indicator can be explained through the changes of the individual indicators:

$$\Delta y_x = \sum_i \Delta x_{a_i}, \tag{3}$$

where x is the analysed indicator, Δy_x is increment in the influence of the analysed indicator, a_i is the indicator by which Δy_x can by partially explained, Δx_{a_i} is the influence of the indicator a_i on analysed indicator x.

In such systems, two types of the operations can be identified - aditive or multiplicative. The additive operation is stated as:

$$\Delta x_{a_i} = \frac{\Delta a_i}{\sum_i \Delta a_i} \cdot \Delta y_x, \tag{4}$$

where $\Delta a_i = a_{i,1} - a_{i,0}$, $a_{i,0}$, and $a_{i,1}$ is the value of the indicator i respecting starting (0) and ending (1) state.

The multiplicative operations can be stated by different methods. One of them is the functional method that expresses the combined simultaneous impact of the all indicators explaining of their influence on the top indicator (Zmeškal, Dluhošová, Tichý, 2004). As input information, the relative changes of the items are used. Respecting the multiplicative operation between two indicators, the influences can be formulated as:

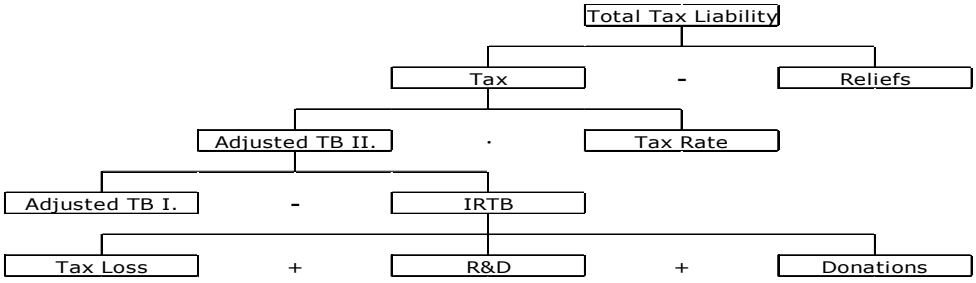
$$\Delta x_{a_1} = \frac{1}{R_x} \cdot R_{a_1} \cdot \left(1 + \frac{1}{2} \cdot R_{a_2}\right) \cdot \Delta y_x, \tag{5}$$

$$\Delta x_{a_2} = \frac{1}{R_x} \cdot R_{a_2} \cdot \left(1 + \frac{1}{2} \cdot R_{a_1}\right) \cdot \Delta y_x. \tag{6}$$

where R_{a_i} and R_x are relative changes of indicators.

We created the following pyramidal decomposition (figure 3) so that we could calculate the power of influences of the changes of the individual items on the changes of the total tax liability. The main aim of this decomposition was to state the influences of the changes of the items reducing tax base, the tax reliefs,the tax rate and the adjusted tax base I. on the total tax liability.

Figure 3 Pyramidal decomposition of total tax liability



Source: Authors` processing according data of Finanční správa

3 Assessment of Influence of Individual Indicators

The following tables 3 and 4 show results of our analysis. Data mentioned in these tables describe power of inluence of the individual indicators in selected periods in mil. CZK and as percentages. The changes of the total tax liability between two following periods are main input information. Then the impact of the individual items is expressed as increasing or decreasing of the total tax liability. It means that the total sum of changes of the individual items is equal to the change of total tax liability. Regarding presented data is clear that increasing of the total tax liability was not only influenced by increasing of all items. That is caused by usage of the functional method as a tool of evaluating of the final impact of the partial indicators on the top indicator. Ultimately, it means that the changes of the indicators` influences were positive or negative.

Table 3 Power of influences of individual indicators in mil. CZK

	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15
Δ TTL	17,662	23,335	-19,143	-27,202	-2,928	-1,203	1,512	5,300	11,206	11,326
Reliefs	-731	-820	1,994	129	-902	-732	-1,569	-9,672	-689	10,206
STR	-11,112	0	-21,481	-6,664	-6,268	0	0	0	0	0
ATB I.	26,392	22,169	6,700	-20,921	3,466	3,942	-2,524	18,514	8,835	1,623
Tax Loss	3,449	2,202	-6,465	308	1,137	-3,829	5,723	-2,979	3,000	-223
R&D	-249	-215	87	-60	-345	-549	-120	-359	56	-273
Donations	-87	-0.21	21	6	-15	-35	3	-204	4	-7

Source: authors` calculation according data of Finanční správa

Table 4 Power of influences of individual indicators in %

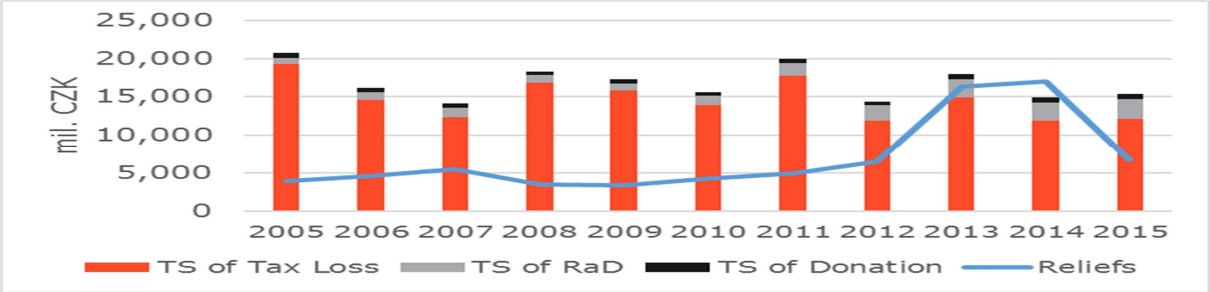
	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15
Δ TTL	100	100	100	100	100	100	100	100	100	100
Reliefs	-4.14	-3.52	-10.42	-0.47	30.81	60.83	-103.76	-182.50	-6.15	90.12
STR	-62.92	0.00	112.21	24.50	214.06	0.00	0.00	0.00	0.00	0.00
ATB I.	149.43	95.00	-35.00	76.91	-118.34	-327.75	-166.93	349.32	78.84	14.33
Tax Loss	19.53	9.44	33.77	-1.13	-38.83	318.36	378.46	-56.21	26.77	-1.97
R&D	-1.41	-0.92	-0.45	0.22	11.79	45.66	-7.97	-6.77	0.50	-2.41
Donations	-0.49	0.00	-0.11	-0.02	0.51	2.91	0.20	-3.85	0.04	-0.06

Source: authors` calculation according data of Finanční správa

Then we more concentrated our attention on the development of the individual items reducing tax base and the tax reliefs in period 2005 – 2015 as can be seen in the following figure 4 as well. This figure ilustrates the comparison of the tax savings of the total tax liability arising thanks to the application of the tax reliefs and thanks to

application of the total items reducing tax base. The value of the tax savings connected with the items reducing tax base was derived from the total value of these items and the actual valid value of the statutory tax rate.

Figure 4 Comparison of tax savings of tax reliefs and IRTB



Source: Authors` calculation according data of Finanční správa

Data mentioned in figure 4 doubtless show that mostly the total sum of the tax saving connected with all items reducing tax base was higher than the tax saving applied through the tax reliefs. The following figure 5 further extends our analysis respecting the ratios of individual items reducing tax base on the total value of the tax savings.

With regard data of above mentioned figure 4 is clear that the tax loss were the most important indicator that brought the highest value of the tax savings. The total ratio of donations respecting the value of the total tax savings does not change significantly and can be stated that its development is the approximately same. The item that requires our attention is the tax saving arising thanks to the deductible item to support research and development expenses of enterprises. As can be seen, its ratio on the total value of the tax savings increased especially in the last five years. This increasing can be explained, for example, respecting the changes made by Ministry of Finance the Czech Republic that research is not only subject of interest of research-development organizations, but can also take place in ordinary businesses. Ministry of Finance the Czech Republic in the year 2010 also identified other aid criteria for the assessment of the R & D activity, and thanks to this the taxpayers are not obliged to meet all these criteria at the same time. Moreover, can be claimed (Hamáček, 2011) that the administrative burden of this deduction is much lower compared to direct grant.

4 Conclusions

Respecting the value of the impact we determinated the total order of all indicators.

Table 5 Total power of influences of individual indicators

	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15	Sum	% of sum	Order
	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	mil. CZK	%	
Reliefs	731	820	1,994	129	902	732	1,569	9,672	689	10,206	27,444	0.1247	4
STR	11,112	0	21,481	6,664	6,268	0	0	0	0	0	45,525	0.2069	2
ATB I.	26,392	22,169	6,700	20,921	3,466	3,942	2,524	18,514	8,835	1,623	115,084	0.5230	1
Tax Loss	3,449	2,202	6,465	308	1,137	3,829	5,723	2,979	3,000	223	29,315	0.1332	3
R&D	249	215	87	60	345	549	120	359	56	273	2,314	0.0105	5
Donations	87	0.21	21	6	15	35	3	204	4	7	383	0.0017	6
											220,066		

Source: authors` calculation according data of Finanční správa

We evaluated the indicator with the highest absolute value as the indicator with the most power of influence. Regarding data mentioned in table 5 is clear that in the observed

period the most important indicator that influenced the changes of the total tax liability was the adjusted tax base I. followed by the changes of the statutory tax rate. The final impact of the tax loss and the tax reliefs were not so important. The changes of R&D and the donations were connected with the least impact on the change of the total tax liability in the observed period. Comparing the impact of the tax reliefs and the individual items reducing tax base, the power of the influence of the tax loss was the highest among all items reducing tax base and was higher then the final impact of the tax reliefs. The changes of donation amount the least affected the changes of the total tax liability.

Thanks to results mentioned in our paper was confirmed that is possible to assess the changes of total tax liability of the corporate income tax with usage of the pyramidal decomposition of stated top indicator. It was verified that our scheme of individual relationship among indicators is able to determine the final impact of selected items on the total tax liability within tested period. In case of determined multiplicative relationship between the indicators the functional method was used, because only this one is able correctly without distortion to identify impact of indicators in case when the values of changes of items are negative.

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Brexit Implications on the Czech Republic via GNI Based Contributions to the EU Budget

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Abstract: *After activation of Article 50 on 29th March 2017 Brexit will become reality within next 2 years with all its consequences and implications. UK was significant contributor to the EU budget with its net contribution of 11,2 billion Euro in 2015. Leaving EU will hence significantly reduced incomes to the EU budget. There are several options how to close this gap- increase contribution per each member state, decrease receipts per each country, define new revenue streams to the EU budget or simply reduce overall costs. Czech Republic is clearly net receiver of EU funds with its net positive position of 5,6 billion Euro in 2015. As Czech Republic is more receiving than contributing, choice of solution how to close Brexit gap will influence its current net position. Paper is studying all theoretical options and their impact on Czech Republic. Losses in net balance of Czech Republic due to Brexit might be in year 2020 from 0,2 to 0,9 bil. Euro according to different scenarios to close UK contribution gap. Relates study of OST EU estimated worsening of cumulative net position of Czech Republic due to Brexit vote till 2020 from 0,8 bil. Euro to 2,1 bil. Euro.*

Key words: Brexit, Czech Republic, European Union, GNI, contribution, budget, gap

JEL code: H68

1 Introduction

UK voted to leave from EU in referendum on 23rd June 2016. On 29th March 2017 British prime minister Teresa May activated Article 50 of EU Constitutions which started 2 years negotiations prior to UK exit. UK government announced hard Brexit. The UK makes its contributions to the EU budget in the same way as all member states (Morgan, 2017). However, the UK receives a rebate on its net contribution (Irwin, 2016). The rebate was introduced in the mid-1980s to address the issue of the UK having relatively large net contributions to the EU budget. The UK's contribution to the EU budget, after the rebate was applied, was an estimated £12,9 billion in 2015. The UK received total public sector receipts from the EU budget of £4,4 billion. Estimated net contribution was £8,5 billion in 2015. From Czech Republic standpoint, Brexit will bring weakening of position of Czech Republic as a net EU funds receiver, as EU budget income will be significantly reduced.

2 Methodolgy and Data

The EU's spending is organised around a seven-year period, known as the multiannual financial framework (MFF). The MFF sets out the EU's spending priorities and sets spending limits for the seven years (Oliver, 2015). The current MFF covers the period 2014-20 and allows the EU to commit to spending of €960 billion (2011 prices). This is a real terms reduction on the previous MFF 2007-13.

There are several possible scenarios and funding strategies after Brexit regarding EU budget and its recovery after UK stop contributing. In analysis bellow is shown possible implication on Czech Republic which is currently clearly positive in balance and hence net receiver with prevailing receipts over contributions.

Table 1 is showing receipts, contributions and net balance for Czech Republic (*current prices, exchange rate 0,76 GBP/Euro). Calculated are also ratios of each parameter to

the EU budget. It is important to highlight obvious difference in ratio of contribution to the EU budget and receipts to the EU budget which is a key in context of impact on net balance and after Brexit EU budget creation.

Table 1 Contribution and receipts of CR to the EU budget in 2015

	bil. Euro*
CR contribution	1,6
CR receipts	7,2
CR net balance	+5,6
Calculated ratios	%
CR contribution/ EU budget	**1,1**
CR receipts/ EU budget	**4,9**
CR net balance/ EU budget	**3,8**

Source: Keep (2016), own elaboration

Table 2 is showing contributions, receipts and net balance of UK (*current prices, exchange rate 27,01 CZK/Euro). It is obvious that UK more contributed than received which was one of key factor for Brexit.

Table 2 Contribution and receipts of UK to the EU budget in 2015

	bil. Euro*
UK contribution	17
UK receipts	5,8
UK net balance	-11,2
Calculated ratios	%
UK contribution/ EU budget	**11,6**
UK receipts/ EU budget	**4,0**
UK net balance/ EU budget	**7,7**

Source: Keep (2016), own elaboration

Table 3 is showing UK contributions and receipts to the EU budget in period of 2009 to 2015.

Table 3 Contribution and receipts of UK to the EU budget

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Total contribution (bil. Euro)	11,4	16,1	16,1	16,6	19,1	18,9	17
Total receipts (bil. Euro)	5,8	6,3	5,4	5,5	5,3	6,1	5,8
Balance (bil. Euro)	-5,7	-9,7	-10,7	-11,2	-13,8	-12,9	-11,2

Source: Keep (2016), own elaboration

Table 4 is showing prediction of EU budget before Brexit vote. There is obvious 2,7 % average growth between the years.

Table 4 EU budget prediction

Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Budget (bil. Euro)	143	146	150	154	158	163	168

Source: Keep (2016)

3 Results and Discussion

As mentioned before there are several options how to solve gap in the EU budget created by Brexit vote and UK stop contributing.

A) Keep EU budget constant as planned

a. Decrease receipts per country, do not change contributions

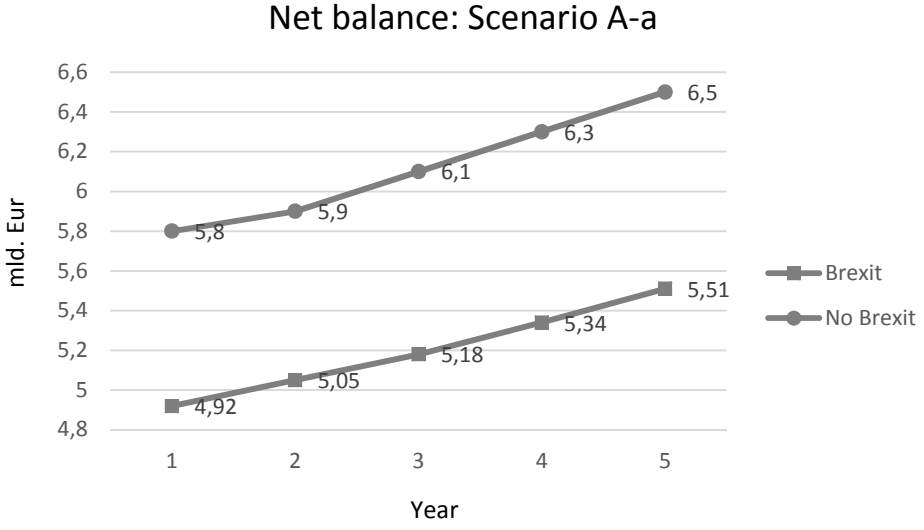
First option is to keep EU budget constant as overall costs might not be possible to reduce. This goal can be reached by increase of contributions per each country (scenario A-b) or decrease of receipts (A-a) per each country, possibly combinations of both options to fully offset missing contributions from UK. Table 5 is showing calculations for reduction of receipts of Czech Republic which was calculated as a % proportional decrease of receipts which was equal to % proportional decrease of EU budget given by UK contributions gap. Net balance is indicating possible overall losses for Czech Republic. Indication „na" means „not applicable" not realistic scenario as UK has 2 years to leave EU since announcement to leave. Possibly realistic might be prediction since 2018. Assumptions were constant ratios of parameters shown in table 5 (year 2015) for full observed period (2015-2020). Visualisation of change of net balance is shown in figure 1.

Table 5 Change of net balance of CR for scenario A-a

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
EU budget, bil. Euro	146	150	154	158	163	168
UK contribution, bil. Euro	17,0	17,5	17,9	18,4	19,0	19,6
CR receipts if no Brexit, bil. Euro	7,17	7,37	7,56	7,76	8,01	8,25
CR receipts reduction to cover Brexit, bil. Euro	na	0,86	0,88	0,90	0,93	0,96
CR receipt total after Brexit, bil. Euro	na	6,51	6,68	6,86	7,07	7,29
CR net balance if no Brexit, bil. Euro	5,6	5,8	5,9	6,1	6,3	6,5
CR net balance after Brexit, bil. Euro	na	4,92	5,05	5,18	5,34	5,51
Difference, bil. Euro	**na**	**0,86**	**0,88**	**0,90**	**0,93**	**0,96**

Source: Keep (2016), own elaboration

Figure 1 Net balance for scenario of decrease of receipts per country and not changing contribution



Source: Keep (2016), own elaboration

b. Increase contribution per country, do not change receipts

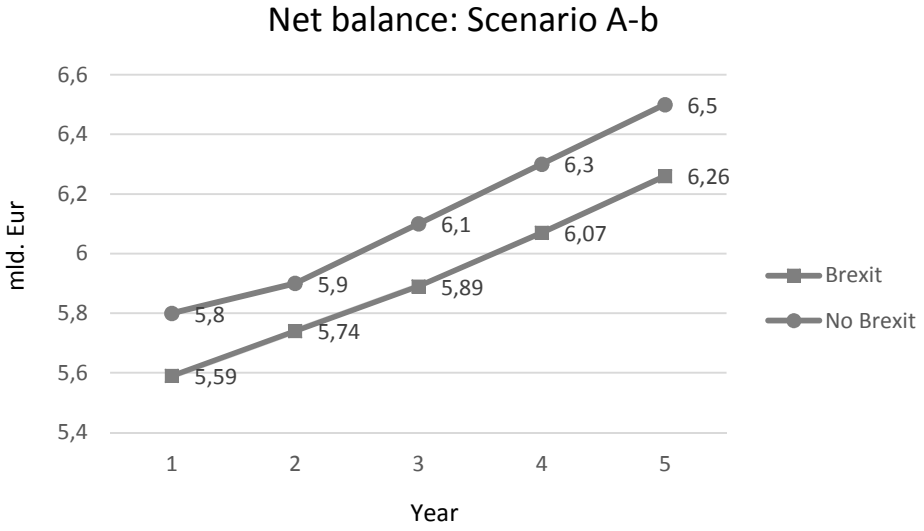
Option A-b is showing calculation of change in net balance in case required contribution per country will increase and receipts will remain constant. Assumptions were again constant ratios of parameters shown in table 6 (year 2015) for full observed period. From the calculations of net balance is obvious that losses are much lower than in scenario A-a. Results might be explained by the fact that ratio CR contribution/ EU budget is 1,1 % vs. ratio of CR receipts/ EU budget is 3,9 % and hence proportional decrease of receipts has much stronger effect than proportional increase of contributions resulting in differences of final net balance for both cases. Figure 2 is showing visualisation of net balance.

Table 6 Change of net balance of CR for scenario A-b

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
EU budget, bil. Euro	146	150	154	158	163	168
UK contribution, bil. Euro	17,0	17,5	17,9	18,4	19,0	19,6
CR contribution if no Brexit, bil. Euro	1,55	1,59	1,64	1,68	1,73	1,79
CR contribution to cover Brexit, bil. Euro	na	0,19	0,19	0,20	0,20	0,21
CR contribution total after Brexit, bil. Euro	na	1,83	1,87	1,93	1,99	1,78
CR net balance if no Brexit, bil. Euro	5,6	5,8	5,9	6,1	6,3	6,5
CR net balance after Brexit, bil. Euro	na	5,59	5,74	5,89	6,07	6,26
Difference, bil. Euro	na	**0,19**	**0,19**	**0,20**	**0,20**	**0,21**

Source: Keep (2016), own elaboration

Figure 2 Net balance for scenario of increase contribution per country and not changing receipts



Source: Keep (2016), own elaboration

B) Decrease overall budget

a. Decrease both- contributions and receipts and keep current ratios of budget split

Option B means decrease of overall budget which can be caused by increasing of current contributions and decreasing of current receipts. Ratio of current contributions and receipts to the EU budget can remain the same for each country or might also change. Option B-a is assuming constant ratio as current. Results of net balance losses are in-

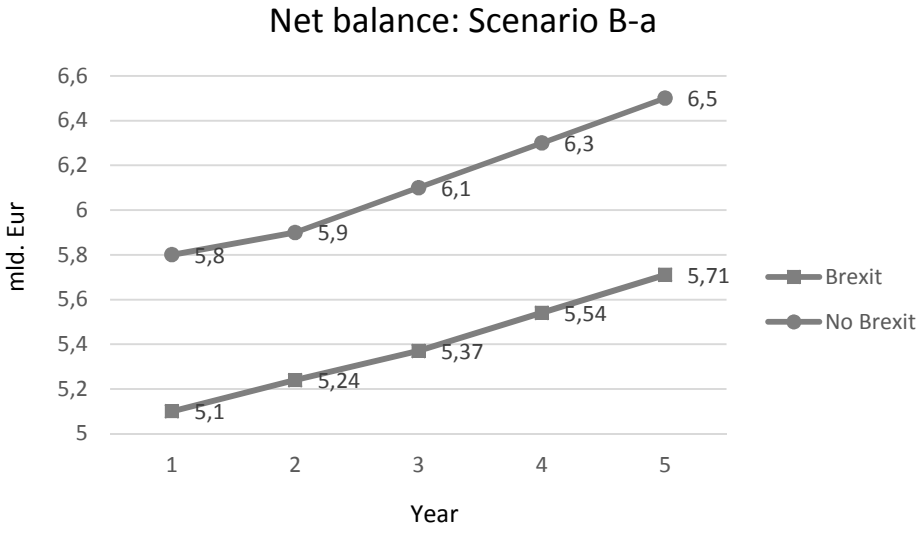
between A-a and A-b scenarios which are reasonable results as touched and contributions (with lower significance to final net balance) and receipts (with higher significance to final results). Net balance change for scenario A-b is shown in table 7. Figure 3 is showing differences in net balance for Brexit and No- Brexit scenario.

Table 7 Change of net balance of CR for scenario B-a

	2015	**2016**	**2017**	**2018**	**2019**	**2020**
EU budget if no Brexit, bil. Euro	146	150	154	158	163	168
UK contribution, bil. Euro	17,0	17,5	17,9	18,4	19,0	19,6
EU budget after Brexit, bil. Euro	na	132,5	136,1	139,6	144,0	148,4
CR contribution if no Brexit, bil. Euro	1,55	1,59	1,64	1,68	1,73	1,79
CR contribution to reduced EU budget, bil. Euro	na	1,41	1,45	1,48	1,53	1,58
CR receipts if no Brexit, bil. Euro	7,17	7,37	7,56	7,76	8,01	8,25
CR receipts from reduced EU budget, bil. Euro	Na	6,51	6,68	6,86	7,07	7,29
CR net balance if no Brexit, bil. Euro	5,6	5,8	5,9	6,1	6,3	6,5
CR net balance after Brexit, bil. Euro	na	5,10	5,24	5,37	5,54	5,71
Difference, bil. Euro	**na**	**0,67**	**0,69**	**0,71**	**0,73**	**0,75**

Source: Keep (2016), own elaboration

Figure 3 Net balance for scenario of decrease both- contributions and receipts and keep current ratios of budget split



Source: Keep (2016), own elaboration

b. Decrease both- contributions and receipts and change current budget split (with higher probability to decrease receipts of member countries with positive net balance)

There are possible also changes in ratio of contribution and receipts to the EU budget which might cause mix of obtained results. In this case, highest probability is to decrease more significantly receipts of countries in positive net balance as for example Czech Republic, Poland or Slovakia (EIU, 2016).

C) Define new incomes

a. Reduce overall costs

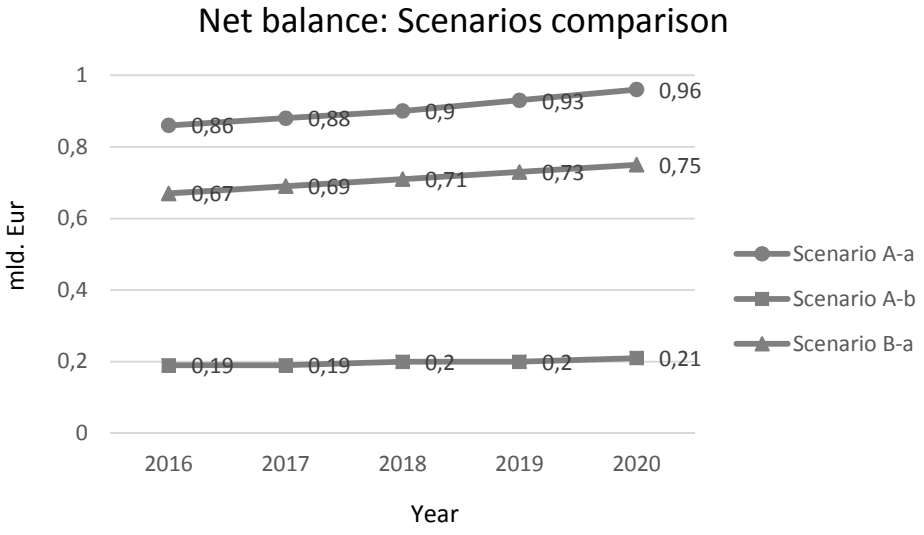
b. Extend other revenue streams

a. Possible solution might be also decrease of the EU costs or increase of efficiency and productivity which could be helpful to close UK contribution gap (Brutton, 2014). Most probably final decision of the EU budget recovery will be mixture of all mentioned alternatives. Results might change significantly according to ability of Czech Republic to raise and utilize EU funds. Possible is also scenario that UK will partially contribute to EU budget same as Northern Europe countries which can influence final balance for budget creation however likelihood is very low as per announced hard Brexit (Woodford, 2016).

b. Euro budget will face a big gap after UK stop contributing. GNI based contribution counts for 69 % of total revenues to EU budget (European Commission, 2015). Rest of the revenues is coming from member states VAT, sugar levies, custom duties, EU staff salary taxes, non- EU countries contribution, surplus or previous budget, interest on late payments, interests earned on bank accounts, fines for companies breaking rules and donations. Some of the revenues are paid from internal EU countries and some of them are not. EU has opportunity to increase revenue streams from external resources mostly in custom duties, fines for company breaking rules, interests on late payments or donations and non- EU countries contribution (Ferrera, 2017).

Chart at figure 4 is showing comparison of scenarios A-a, A-b and B-a discussed above. From the picture is obvious that different solutions can have different implications on Czech economics and overall net balance. Scenario A-a is the most positive option because it is having highest net balance from all the options. As it was discussed before ratio of CR contribution/ EU budget is 1,1 % (related to scenario A-a) while ratio of CR receipts/ EU budget is 3,9 % (related to A-b) and hence proportional decrease of receipts has much stronger effect than proportional increase of contributions resulting in differences of final net balance for both cases. Scenario B-a is having position in-between A-a and A-b due to the fact that it is proportionally decreasing.

Figure 4 Impact of Brexit on EU budget and implication on Czech Republic for different scenarios



Source: Keep (2016), own elaboration

4 Conclusions

Decrease of incomes to Czech Republic from Euro funds due to elimination of one of the key European Union budget contributor can switch prevailing position of Czech Republic from EU receiver to contributor- losses in net balance of Czech Republic due to Brexit

might be in year 2020 from 0,2 to 0,9 bil. Euro according to scenario of the EU budget creation in order to close UK contribution gap. For comparison, study of OST EU estimated worsening of cumulative net position of Czech Republic due to Brexit vote till 2020 from 0,8 bil. Euro to 2,1 bil. Euro (OSTEU, 2016).

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PREFACE

Dear readers,

It is my pleasure to introduce you a collection of papers from the 14th annual international scientific conference The European Financial Systems 2017 organized annually by Department of Finance of the Faculty of Economics and Administration, Masaryk University in Brno, Czech Republic. This year's conference was focused especially on the current issues related to accounting, banking sector, insurance, new regulations of financial markets, different tax systems, corporate finance, public finance, financing of non-profit organizations and financial literacy.

Because the collection of papers presents the latest scientific knowledge in this area, I believe you will get a number of new insights usable both for your scientific, and educational or practical activities. I would also like to express my conviction that we meet each other in occasion of the 15th year of this conference held in 2018.

I wish you pleasant reading

Petr Valouch

Chairman of the Program Committee

CONTENTS

Markov chain sensitivity analysis of expected paid/unpaid overdue receivables – SME case study

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Abstract: *The paper uses existing Markov chain theory to estimate expected paid/unpaid overdue receivables, and is focused mainly upon sensitivity analysis of calculated estimations. Since such calculations depend upon fundamental matrix of absorption Markov chain chosen, the particularly important role plays data and algorithm for its composition. As a case study, we selected a SME ranked company which provided us its accounting records with payment pattern details of related receivables. First, the available data are sorted to extract overdue receivables, which serve to estimate transition probability matrices of absorption Markov chains having several transient states and two absorption ones representing paid and unpaid overdue receivables. Based either on number of overdue receivables or their financial volumes we build different transition probability matrices. The sensitivity analysis of expected paid/unpaid overdue receivables concerns influence of different overdue threshold and tolerance accepted, conditional probabilities between transient and absorption states, as well as distribution of financial volumes in particular transient states registered. The results are discussed in detail showing their practical importance in financial management and providing deeper insight into overdue payment processes thus contributing to risk management, too. All computations and graphical issues are performed by sw Mathematica.*

Keywords: accounts receivable analysis, fundamental matrix, absorption Markov chains, sensitivity analysis

JEL codes: C65, G35

1 Introduction

Financial management in any company and cash flow management in particular, are vital to its health. Accounts receivable are the amounts owed to a business by its customers, and are comprised of a potentially large number of invoiced amounts. Accounts receivable constitute the primary source of incoming cash flow for most businesses. Gross amount of receivables and the allowance for doubtful accounts should be reported by accounting reports in detail.

Payment condition patterns and timing of claim payments play significant role in financial management. First, the corresponding data reported in usual accounting reports are extracted to yield records of delayed payment structures. Departments will also need to provide the necessary uncollectible account information in order to prepare the necessary accounting entries for prospective reserves and write-offs.

A schedule is prepared in which customer balances are classified by the length of time having been unpaid. Since emphasizing time, the schedule is called an aging schedule with corresponding accounts receivable aging analysis within well-established accounting framework, whereas in stochastic framework it might be called after-payment-due process analysis, as well.

In general, financial management of company ought to establish an acceptable percentage relationship between the amount of receivables and expected losses from uncollectible accounts. Hence, an estimation of such relation between collected and lost payments is very significant indeed, and it plays very important role in company life cycle. Especially, when the real economy slips into recession, business faces an additional

risk of customers running into financial difficulty and becoming unable to pay invoices, which all together can push a company over the edge.

After the accounts are arranged by age, the expected bad debt losses are to be determined. The most promising instrument for such task is application of absorption Markov chains. The sensitivity analysis of average amount of delayed claims paid stands in focus of financial management, too, since it enables to estimate effects of various after due diligence collection efforts.

Usage of Markov chains for accounts receivable analysis is not new. Standard textbooks of operations research and quantitative methods in management cover the topic in theoretical platform with transition probability matrix given a priori as usual, see for example Anderson et al (1988), and Render et al (2003), too.

The main topic in framework of existing absorption Markov chain theory concerns with detailed analysis of claim payment delayed process and construction of transition probability matrix from raw accounting data sources. This data serves to estimate distribution of paid/unpaid claims after payment due, and also to calculate average amount of delayed claims paid. Sensitivity analysis presented in the paper adopts an absorption Markov chain example excerpted from Lukáš (2009), and Hofman and Lukáš (2014), too. The theory of Markov chains is explained in Yin and Zhang (2005). Other aspects of delayed payment of claims are further discussed in Garmichael and Balatbat (2010), in particular from contractor's point of view. In Sopranzetti (1999), links between selling accounts receivable and underinvestment problem is discussed thoroughly.

The paper is organized as follows. After a brief introduction, the second section gives a theoretical framework of delayed payments analysis. The third section brings description of our procedure for estimation of fundamental matrix of absorption Markov chain well-suited for analysis of after-payment-due process. Further, the results of our case study are presented including the sensitivity analysis upon length of payment delay tolerance.

2 Analysis of delayed payments – theoretical framework

Let us consider an absorption Markov chain with discrete state space. There is well-known that transition probability matrix **P** of any absorption Markov chain has a canonical form

$$\mathbf{P} = \begin{bmatrix} \mathbf{I} & \mathbf{0} \\ \mathbf{R} & \mathbf{Q} \end{bmatrix}, \tag{1}$$

which provides a fundamental matrix **N** of size (*s*,*s*) of following form

$$\mathbf{N} = \sum_{n=0}^{\infty} \mathbf{Q}^n = (\mathbf{I} - \mathbf{Q})^{-1}, \tag{2}$$

here the **P** has size (*N*,*N*), the **Q** has size (*s*,*s*), the **R** has size (*s*,*N*–*s*), the **I** is unit sub-matrix of size (*N*–*s*,*N*–*s*), and **0** is null sub-matrix of size (*N*–*s*,*s*), where *N* denotes the total number of system states, *s* defines the number of transient states, and *N*–*s* gives the number of absorption states, in general.

Considering stochastic Markov chain analysis of paid/unpaid claims with after maturity pending payment, we get two absorption states, i.e. paid, and unpaid claims, hence *N*–*s* =2, thus providing *s* = *N* – 2, directly.

Now, our goal is to estimate distribution of considered quantity, e.g. financial amount, or number of pending credits, etc., in absorption states assuming the volumes of considered quantity in all transient cases are given, and being denoted by vector **t**. In matrix form, we have to compute

$$\mathbf{y}^{\mathrm{T}} = \mathbf{t}^{\mathrm{T}}\mathbf{B}\,, \quad \mathbf{B} = \mathbf{NR}, \tag{3}$$

assuming a system considered quantity balance condition to hold

$$\sum_{k=1}^{N-s=2} y_k = \sum_{i=1}^{s} t_i. \tag{4}$$

3 Estimation of transition probability matrix and case study

Let a_j, $j = 1,..,J$, denote a sequence of additive components which collection defines an event observed from M all possible realizations. As usual, the estimated probability of the event occurrence is given by adopted frequency fraction in following way

$$\pi_e = \sum_{j=1}^{J} a_j / M \ . \tag{5}$$

Case study

We have selected a particular company from West Bohemian region being ranked within the SME category. The company financial management provided us standard accounting reports of the period 2014Q1 – 2015Q2 in order to perform the accounts receivable analysis for the year 2014 thereof. First, in order to keep the company reports anonymous, we convert all financial data given in [CZK] into equivalent encrypted ones measured in a fictious monetary unit selected by company financial management and abbreviated [FMU].

First, using our Java application, we read accounting reports containing encrypted data imported in the MS-Excel csv format, and next, filter the data in order to get our problem-oriented dataset D_0 having the following structure

$$D_0 = \{m_k, {}_d d_k, {}_p d_k\},\ k=1,..,K \ ,$$

where m_k gives a payment amount in [FMU], and the couple ${}_d d_k$, ${}_p d_k$ determines the due-date and paid-date, all registered within the k-th invoice record. Further, K denotes the total number of invoice records processed by Java application.

The dataset D_0 is further transformed into dataset D_1, having the compact structure

$$D_1 = \{m_k, \delta_k\},\ k=1,..,K \ , \quad \delta_k = |{}_p d_k - {}_d d_k|_{\text{calendar}} \ ,$$

where the function $|{}_p d_k - {}_d d_k|_{\text{calendar}}$ yields the usual calendar time distance of dates ${}_d d_k$, ${}_p d_k$ in [days], respectively.

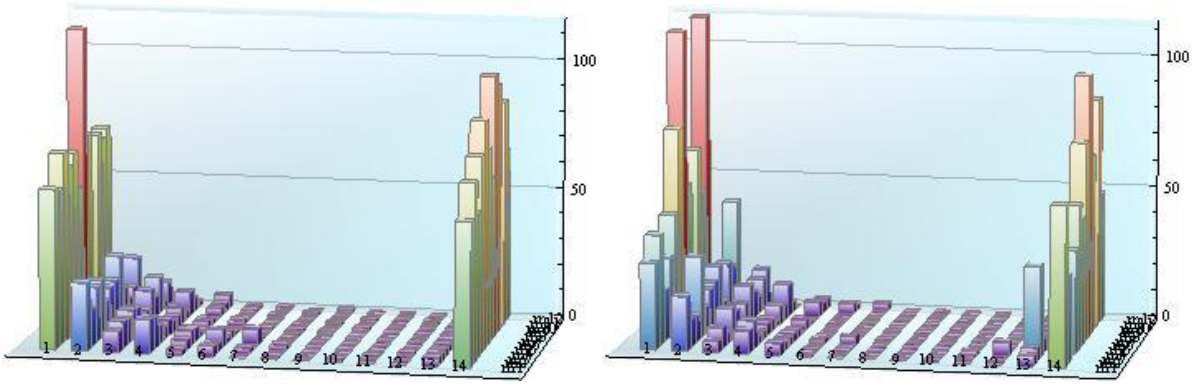
We adopt usual bucket length of $\Delta = 30$ days for sorting our datasets. Hence, we introduce states s_1, …, s_{14} so that to catch correctly any data within D_1

$$s_i = [(i-1)\Delta+1,\ i\Delta] \ ,\ i = 1,..,12, \quad s_{13} = [i\Delta+1,\ +\infty[,$$

and s_{14} for due date paid receivables, i.e such that having $|{}_p d_k - {}_d d_k|_{\text{calendar}} \le 0$.

Sorting of D_1 with respect to defined states s_i, $i = 1,..,14$ provides two different data denoted p_i, q_i, respectively, denoting accumulated financial amounts, and accumulated number of due date paid invoices which belong to particular state s_i.

Figure 1 Sorted receivables into s_i, $i = 1,..,14$, and months $j=1,..,12$. Left panel: number of invoices $q_i(j)$; Right panel: accumulated financial amounts $p_i(j)$.

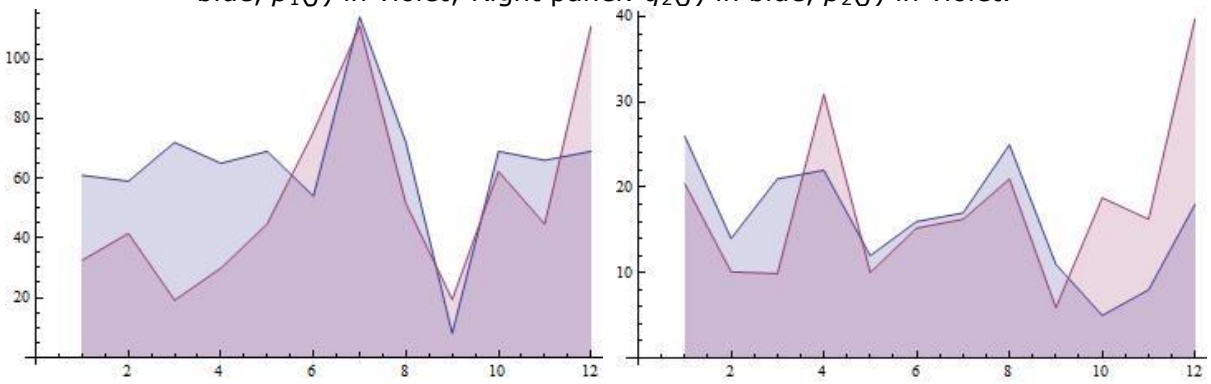


Source: own calculation.

The results of sorting D_1 are depicted in Figure 1, where horizontal axes keep s_i, lateral axes keep months in 2014, and vertical axes keep corresponding sorted amounts, i.e. in the left panel: the number of invoices sorted, while the right panel: accumulated financial amounts in [FMU].

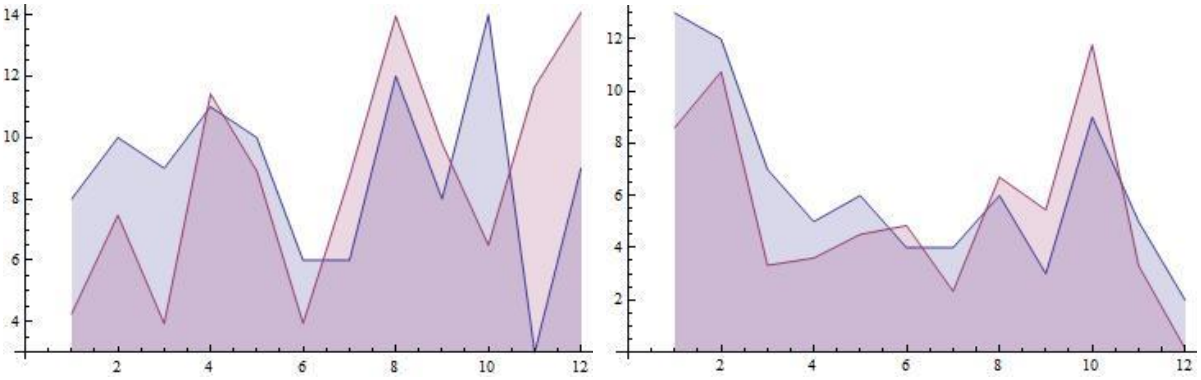
Inspecting Figure 1, we may conclude the states s_1, .., s_4 play very important role within delay payment structure. In the following figures, i.e. Figure 2 and Figure 3, respectively, we show the corresponding results. The horizontal axes keep months, j = 1,..,12, whereas the vertical axes keep proper scales for values $q_i(j)$, and $p_i(j)$, i = 1,2,3,4, preserving the units used already in Figure 1, i.e. numbers for $q_i(j)$, and [FMU] for $p_i(j)$, respectively. The values of $q_i(j)$, i = 1,2,3,4, are plotted in blue color, whilst the values of $p_i(j)$, i = 1,2,3,4, are plotted in violet one.

Figure 2 Sorted receivables into s_i, i = 1,2, and months j=1,..,12. Left panel: $q_1(j)$ in blue, $p_1(j)$ in violet; Right panel: $q_2(j)$ in blue, $p_2(j)$ in violet.



Source: own calculation.

Figure 3 Sorted receivables into s_i, i = 3,4, and months j=1,..,12. Left panel: $q_3(j)$ in blue, $p_3(j)$ in violet; Right panel: $q_4(j)$ in blue, $p_4(j)$ in violet.



Source: own calculation.

All results of sorting procedure collected, i.e. $q_i(j)$, and $p_i(j)$, i = 1,..,13, j = 1,..,12, provide sufficient material for construction of two transition probability matrices, denoted $\mathbf{P}_n$ and $\mathbf{P}_f$, respectively, which are built from $q_i(j)$, and $p_i(j)$, separately.

In general, we assume the states s_i, i = 1,..,12, to represent transient states of the absorption Markov chains considered, whereas s_{13}, and s_{14}, represent absorption states, in general. Noting in principle that we neglect within s_{14} all the due date paid receivables collected from the raw datasets, i.e. such that having $|_p d_k - _d d_k|_{\text{calendar}} \leq 0$, thus considering receivables paid during after-payment-due process course only.

Keeping in mind the structure of any transition probability matrix (1), we get the sub-matrices $\mathbf{Q}_n$ and $\mathbf{R}_n$, and vector $\mathbf{t}_n$ from $q_i(j)$ data, whereas the sub-matrices $\mathbf{Q}_f$ and $\mathbf{R}_f$,

and vector $\mathbf{t}_f$ from $p_i(j)$ data, respectively. Knowing matrices $\mathbf{P}_n$ and $\mathbf{P}_f$, the main purpose of the absorption Markov chains considered is to estimate an amount of paid/unpaid accounts receivables with delayed due date payments.

Due to logical structure of the transition probability matrices considered, the population of zero and non-zero transition probability entries in $\mathbf{Q}_n$ and $\mathbf{Q}_f$ is the same, and in $\mathbf{R}_n$ and $\mathbf{R}_f$, as well. Denoting $\pi_{m,n}$ a generic transition probability located at m-th row and n-th column, we can write the non-zero entries of either $\mathbf{Q}_n$ or $\mathbf{Q}_f$, in following way, ${}_u\pi_{i,i+1} > 0$, $i = 1,..,\ s-1$, $u = n,\ f$, when keeping s to denote the number of transient states of absorption Markov chain

$$ {}_n\pi_{i,i+1} = \sum_{j=1}^{12} q_i(j)/N\ , \quad N = \sum_{i}^{s-1}\sum_{j=1}^{12} q_i(j), \tag{6a} $$

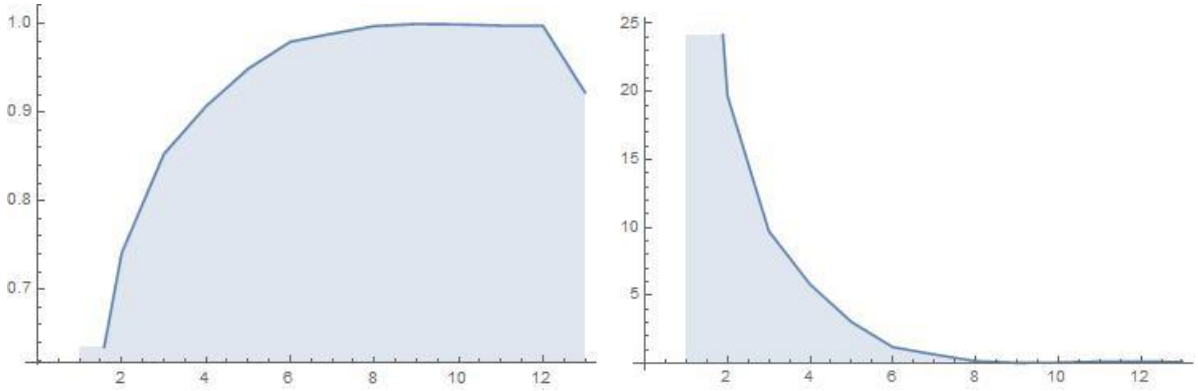
$$ {}_f\pi_{i,i+1} = \sum_{j=1}^{12} p_i(j)/M\ , \quad M = \sum_{i}^{s-1}\sum_{j=1}^{12} p_i(j). \tag{6b} $$

All entries of sub-matrices $\mathbf{R}_n$ and $\mathbf{R}_f$ can be expressed in following form

$${}_ur_{i,1} = 1 - {}_u\pi_{i,i+1} > 0,\ {}_ur_{i,2} = 0,\ i = 1,..,\ s-1, \text{ and } {}_ur_{s,1} = 1 - {}_u\omega > 0,\ {}_ur_{s,2} = {}_u\omega > 0,$$

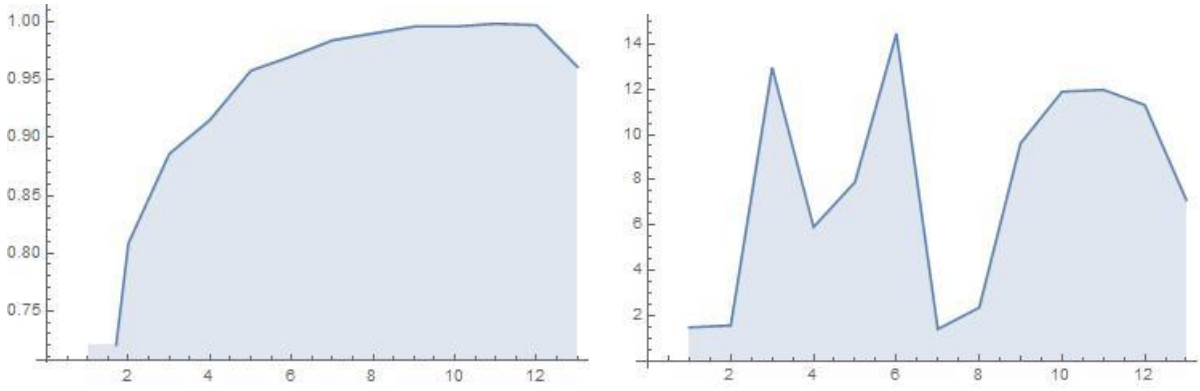
where ${}_u\omega$ denotes conditional probabilities of not-paying a claim within the last transient state s, when considering either $q_s(j)$ data, in correspondence with $u = n$, or $p_s(j)$ ones, in correspondence with $u = f$, respectively.

Figure 4 Transient states data. Left panel: first column of sub-matrix $\mathbf{R}_f$, $({}_fr_{i,1},\ i=1,..,\ s)$; Right panel: vector $\mathbf{t}_f$, i.e. distribution of averaged financial amounts in [FMU].



Source: own calculation.

Figure 5 Transient states data. Left panel: first column of sub-matrix $\mathbf{R}_n$, $({}_nr_{i,1},\ i=1,..,s)$; Right panel: hypothetic vector ${}_h\mathbf{t}_f$, i.e. distribution of averaged financial amounts in [FMU] generated by pseudo-random number generator U(0,1) in total volume of 100 [FMU].



Source: own calculation.

In Figure 4, we show the transient states data computed from $p_i(j)$ values, both transition probabilities, which are given as complementary values ${}_f r_{i,1} = 1 - {}_f \pi_{i,i+1}$, $i = 1,.., s-1$, and ${}_f r_{s,1} = 1 - {}_f \omega$, and components of vector $\mathbf{t}_f$, precisely.

In comparison with the previous figure, in Figure 5, we show another transient states data computed from $q_i(j)$ values. First, the transition probabilities ${}_n \pi_{i,i+1}$, given as complementary values $1 - {}_n \pi_{i,i+1}$, which occupy the first column of sub-matrix $\mathbf{R}_n$, again. Second, a hypothetic vector ${}_h \mathbf{t}_f$, giving simulated distribution of averaged financial amounts being generated by pseudo-random number generator having the uniform distribution U(0,1).

Now, given the sub-matrices $\mathbf{Q}_n$ and $\mathbf{Q}_f$, we may compute the corresponding fundamental matrices, denoted $\mathbf{N}_n$ or $\mathbf{N}_f$, respectively, using formula (2)

$$\mathbf{N}_n = \mathbf{N}(\mathbf{Q}_n), \quad \mathbf{N}_f = \mathbf{N}(\mathbf{Q}_f). \tag{7}$$

Table 1 Estimated total values of paid and unpaid/lost receivables in [FMU]

	Paid receivables	**Unpaid/lost receivables**
$\mathbf{y}_f(\mathbf{Q}_f)$	99.725	0.275
$\mathbf{y}_f(\mathbf{Q}_n)$	99.445	0.555

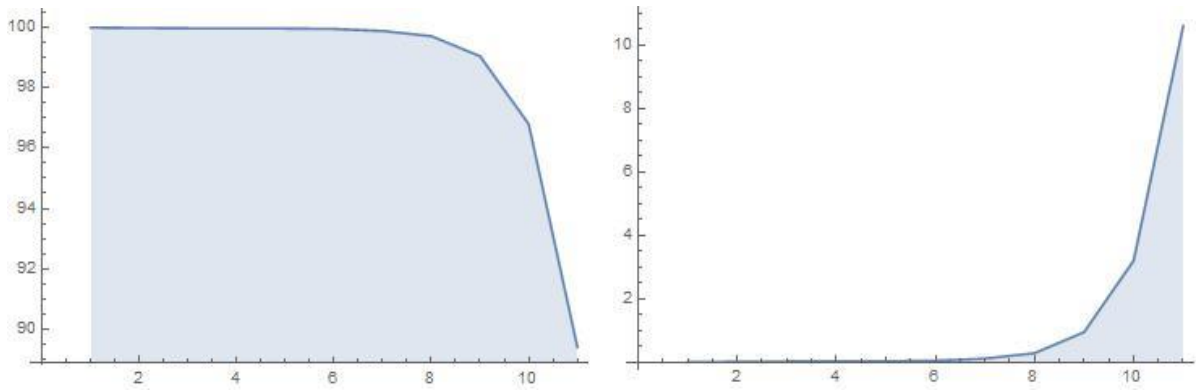
Source: own calculation

Using these matrices $\mathbf{N}_n$ and $\mathbf{N}_f$, we are able to get two different estimations of total paid and unpaid accounts receivables generated by stochastic stream of delayed due-date payments, respectively. The corresponding values are summarized in Table 1. We can observe just a slight difference between them so that $\mathbf{N}_n$, being constructed from $q_i(j)$ data yields more pessimistic estimation.

Rather interesting is sensitivity of estimated volumes of paid and unpaid accounts receivables with respect to payment delay tolerance, which is denoted δ, and given as number of Δ periods being expressed in months. The values presented in Table 1 are calculated assuming the payment delay tolerance of δ =12 months, precisely, which is rather long.

The results of numerical calculation obtained by our Mathematica notebook developed for paid/unpaid accounts receivables analysis are summarized in Figure 6.

Figure 6 Sensitivity of absorption states data upon payment delay parameter γ.
Left panel: expected paid receivables in [FMU] depending upon γ = 1,..,11;
Right panel: : expected unpaid receivables in [FMU] depending upon γ = 1,..,11.



Source: own calculation.

The payment delay tolerance is defined as follows

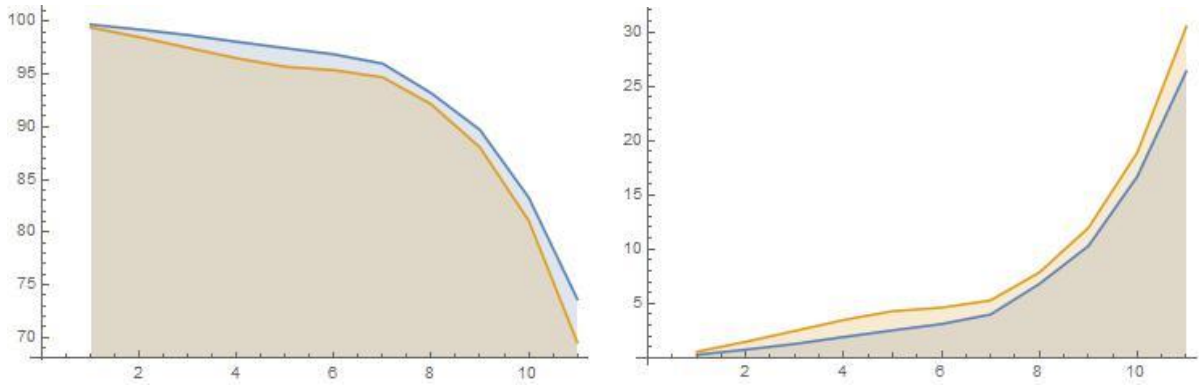
$$\delta = (s+1-\gamma)\,\Delta \ \text{[month]}, \tag{8}$$

where γ is payment delay parameter selected.

Inspecting both panels in Figure 6, we can conclude that rather progressive increase of unpaid accounts receivables appears for payment delay tolerance δ to be less or equal than four months, i.e. for $\gamma \geq 9$.

Having at disposal our Mathematica notebook, we may calculate another examples investigating sensitivity of paid/unpaid accounts receivables, too. In Figure 7, we present the corresponding results calculated for the hypothetical vector ${}_h\mathbf{t}_f$, giving distribution of averaged financial amounts in transient states having been generated by pseudo-random number generator U(0,1), and already depicted in Figure 5, Right panel.

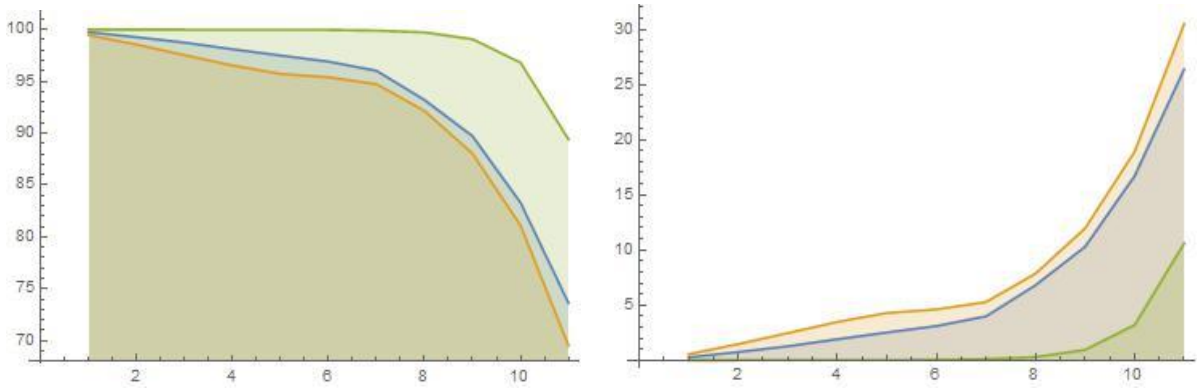
Figure 7 Sensitivity of absorption states upon payment delay parameter γ, for ${}_h\mathbf{t}_f$ given. Left panel: expected paid claims calculated by $\mathbf{N}_f$, (blue color), and $\mathbf{N}_n$, (light-red one); Right panel: expected unpaid claims calculated by $\mathbf{N}_f$, (blue), and $\mathbf{N}_n$, (light-red).



Source: own calculation.

Inspecting Figure 7, we may see two interesting facts. First, the progressive increase of unpaid accounts receivables appears already for $\gamma \geq 7$, i.e. for payment delay tolerance less or equal of a half of year. Second, the estimations calculated by fundamental matrix $\mathbf{N}_n$, i.e. constructed from $q_i(j)$ data, are more pessimistic than those ones calculated by similar procedure but with $\mathbf{N}_f$.

Figure 8 Sensitivity of absorption states upon payment delay parameter γ, ($\mathbf{t}_f$, ${}_h\mathbf{t}_f$ given). Left panel: expected paid claims; Right panel: expected unpaid.



Source: own calculation.

In Figure 8, we present all calculated results of absorption states data in sensitivity to payment delay tolerance represented by the parameter $\gamma = 1,..,11$. In Left panel, we may compare sensitivity of estimated paid accounts receivables upon γ being calculated by following expressions: $\mathbf{N}_f(\mathbf{t}_f(\delta);\delta)$ in green color, $\mathbf{N}_f({}_h\mathbf{t}_f(\delta);\delta)$ in blue one, and $\mathbf{N}_n({}_h\mathbf{t}_f(\delta);\delta)$ in light-red one, where we point out generally that both construction of

fundamental matrices and vectors of financial amounts registered in transient states depend upon payment delay tolerance δ. In Right panel, we may compare sensitivity of estimated unpaid accounts receivables upon γ being calculated by similar expressions.

4 Conclusions

In our paper, we have discussed usage of absorption Markov chains for stochastic analysis of paid/unpaid accounts receivables. Upon real life study case but with encrypted financial data, we described our procedure for construction of problem-oriented database from standard accounting reports data. We also discussed two basic possibilities of construction of fundamental matrix that plays crucial role within the absorption Markov chains theory. In general, we may collect and process either pending financial amounts, or numbers of pending receivables. Both data are closely related each other in their logics but may yield two different fundamental matrices. We use both of them for our numerical calculations. All results are calculated by our Mathematica notebook we developed for paid/unpaid accounts receivables analysis based upon absorption Markov chains theory. Forthcoming research will be focused on two challenging topics:

Further development of sensitivity analysis within the framework of collection possibilities of outstanding claims and its implementation in Mathematica;

Connection of account receivable advanced analysis with credit risk procedures.

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The Development of Debt Financial Markets – the Case of Selected CEE and Latin America Economies

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Abstract: *This article deals with loans and other debt sources provided to non-financial sector. Naturally, especially in perfect market conditions, all of the debt sources are substitutes to each other. However, in real economy the choice between loans and other debt (e.g. bonds) depends on many variables. Some studies state that the choice among variety of debt sources depends on the development of the financial market respectively of the economy as a whole. For example, it is quite well known that European market is rather bank-based, while US one rather capital-based. The aim of this paper is to characterize and compare the development of selected Central and Eastern European (CEE) and Latin America financial loan markets. For this purpose we analyzed the data from the Bank of International Settlements (BIS), which gathers these data from the reporting economies (e.g. advanced, emerging market and other economies). The method that was used for the data analysis was time series correlation analysis. From the conducted research there can be stated that there are no significant differences between the development of CEE and Latin America markets at aggregate level as well as among each analyzed country separately. The only notable exception is the development in Argentina, which still suffers from the consequences of state bankruptcy.*

Keywords: Debt, credit, corporate finance, financing policy, financial market.

JEL codes: G10, G32, O57

1 Introduction

It is quite natural that financial markets develop over time. Healthy financial system brings stable economy; it has a positive effect on international trade, and even on the development of society as a whole. There are many studies that seek to reveal which factor influences past, present as well as future characteristics of particular financial market the most. In this paper we are focusing on the development of debt financial markets from the perspective of the ability to switch between credit and other debt sources in selected Central and Eastern European (CEE) countries and Latin America economies. We have chosen these two regions because CEE is our home region and the European Union seeks to negotiate free trade agreement with Mercosur and Mexico (negotiations were (re)started in 2016). And that is why potential exporters, importers and investors from both regions need as much information as possible – including development and flexibility of debt. Our main aim is to characterize the development and potential changes within the the debt market of each analyzed economy and subsequently to compare these economies, respectively their development among themselves. We also want to discover if there are differences in mutual relationship between bank loans on one hand and other debt on the other hand provided to private non-financial sector (i.e. corporations plus households). The ability to switch among bank credits and other debt sources brings additional stability and thus reduced risks to the particular market (see Greenspan, 2000). For this purpose we analyzed the data from

the Bank for International Settlements (BIS) on total credit and bank credit to the private non-financial sector (i.e. corporations plus households).

We assume that due to in some aspects relatively similar recent historical events (communism, dictatorship, transformation and growth) there will not be significant differences in the recent development of analyzed debt financial markets. On the other hand, uncertainty of the political situation in some countries (especially Brazil, Poland and Hungary), negative economic circumstances in Argentina and potentially different market reactions to the Global financial crisis may result in different than expected results.

Literature Review

In accordance with the focus of this article, this part deals with the development of the debt market as a whole and with mutual development of bank credit and other debt (in the case of corporations mainly bonds). For example, Calza, Gartner and Sousa (2003) states that behavior of real loans is mainly influenced by short-term and long-term interest rates and by the development of the economy measured by real GDP. While the relationship between loans and interest rates is negative, the relationship between loans and GDP is positive. Jakubik (2011) points out that in the case of households there can be observed certain time lag in the development of credit affected by negative economic scenario. The impact on households is more persistent than in the corporate sector. Braun and Briones (2006) on the case of bond market development showed, that "*A big part of the degree of development of bond markets was shown to be explained by general economic development. Even after controlling for this, significant cross-country variation remains. This variation is not easy to be explained with differences in the macroeconomic context, or the quality of institutions and the policies that have been shown to correlate with the development of banking systems and stock markets. Demand in the form of the importance of institutional investors was shown to be a critical part of the story*" (Braun and Briones, 2006, pp. 27). There can be added, that continental European banks were historically protected from competition from capital markets and that is why bank financing plays significant role (Hawkins, 2002).

Some researches concentrate directly to certain economic periods, for example financial crises like Asian financial crisis or the Global recession (e.g. Jiang, Tang and Law, 2002; Yoshitomi and Shirai, 2001; Cowling, Liu and Ledger, 2012). Cowling et al. (2012) concludes that especially larger and older British firms had easier access to external financial sources throughout the Global recession. Jiang et al. (2001) and Yoshitomi and Shirai (2001) dealt with Asian financial crisis and Asian debt markets. In their conclusions they highlight that overreliance on the bank sector; especially on bank loans denominated in foreign currencies makes local financial market as well as the whole economy very fragile and prone to a crisis. That is why Yoshitomi and Shirai encourage the development of the bond market. On the other hand, Levine (2002) argues that it is almost irrelevant whether the financial market is rather bank- or market-based. The maturity of the markets institutions is important, i.e. who and how to offer the service. At first sight, this is a bit contrary to the Grennspan's speech. Greenspan (2000) states that in time of crisis in the bank market, capital market act as a "spare tire" and vice versa. However, both the banking and the capital markets are highly developed in the USA.

The richness and maturity of the economy also affect the debt market. Beck, Demirgüç-Kunt and Levine (2000) point out that richer countries (measured by GDP per capita) have larger bond market and issue more equity and especially private bonds. This is in line with the Yoshitomi and Shirai's scheme (2001, pp. 32). Yoshitomi and Shirai states that developing countries are rather bank-based, while developed countries (in other words rich countries) are rather bond market-based; at least as far as corporate financing is concerned.

There are also several studies that seek to reveal mutual development on the debt market among debt sources of corporate financing. Bank loans and corporate bonds are significant sources of business financing. As Miles (2000), Hyblerová (2014) or Mačí and Hovorková Valentová (2017) states these two financial instruments are in fact substitutes to each other. This statement is especially true under perfect market conditions. However, perfect market conditions can hardly be reached and that is why several researchers studied mutual behavior of these two financial instruments as well as the behavior of companies and their attitude to these sources of debt financing. Hale (2001; 2005; 2008) points out that small companies can hardly obtain a loan from a bank and that is why these companies issue bonds, more precisely junk bonds (very small and young companies are even excluded from the debt market because they are too risky for investors). Medium-sized companies obtain a loan from the bank and large companies prefer to issue bonds. Again, this behavior and attitude is primarily connected to riskiness of the enterprise for investors. Almost the same conclusions made Machnes (2010). In his study he points out that companies chose between bonds and loans according to the rating that these companies may obtain on the market. The higher the rating, the higher the probability that companies would prefer bond financing rather than loans. In other words, the more it is in the economy of large wealthy companies, the greater the development of the capital (bond) market. De Fiore and Uhlig (2011) studied differences between US and European attitudes to bond and loan corporate financing. They conclude that most differences can be explained by "*a relatively low level of disclosure of information about firms' credit risk in the euro area relative to the US*" and "*a higher need of European firms for the flexibility and information acquisition role provided by banks*" (De Fiore and Uhlig 2011, pp. 20). Miloš (2004) adds that relationships between banks and corporations as well as market regulations and overall quality of institutions plays significant role whether corporations prefer loans or bonds (this is consistent with the aforementioned Braun and Briones (2006)). Koziol (2006) concludes that companies should choose between bank loans and issuance of corporate bonds with respect to potential financial distress. Loosely speaking, if a company is in financial distress and have enough project with positive net present values, one creditor (bank) might be interested in rescuing the company while multiple creditors not. This is usually because of a lack of information on the side of multiple creditors. Altman, Gande and Saunders (2010) confirm that secondary loan market is informationally more efficient than secondary bond market.

Although the most of the studies presented above seems to be quite old, they are not obsolete. On the contrary, it is useful to apply them to the current shift in markets, whether these changes are economic, political or other. All of the above sources help solve the puzzle how the debt markets are likely to evolve.

2 Methodology and Data

The data used in this research come from the Bank for International Settlements (BIS). Time series of credit to the non-financial sector were used; more specifically time series of bank credit to the private non-financial sector and total credit to the private non-financial sector. By subtracting bank credit from total credit, we obtained the data about other debt. We used the Global Table provided by the BIS, which contains information about the countries we are interested in analyzing (Latin American countries and Central and Eastern European countries) over a period of 15 years, covering the years 2000 to 2015. The countries of Latin America analyzed were Brazil, Argentina, Mexico and Chile, and the countries of Central and Eastern Europe analyzed were the Czech Republic, Poland and Hungary (unfortunately, the data from Slovakia, which would definitely fit in our research scope, were unavailable).

Generally, a time series correlation has been applied. This means Pearson product moment correlation coefficient is calculated and consequently Durbin-Watson test used to reveal possible autocorrelation of residuals. The Durbin-Watson test is constructed in

simple linear regression model where the dependent variable (y) is expressed by the other credit instruments (mostly bonds) to the private non-financial sector time series and the independent variable (x) is the bank credit to the private non-financial sector time series. The parameters are estimated based on ordinary least squares method and the common significance level taken into consideration is 5 percent.

For correlations the null hypothesis consists in no significance of correlation between the bank credit to the private non-financial sector and other credit to the private non-financial sector. Alternative hypothesis is both-sided opposite. In Durbin-Watson test the null hypothesis expresses not significant serial correlation in the residuals.

3 Results and Discussion

In this section, there are presented and discussed the results of our analysis. In Table 1 there are the results from CEE countries, in Table 2 from Latin America countries and in Table 3, there are compared those two regions as a whole.

CEE Countries

The results of individual countries in Central and Eastern European area are shown in the next table (Table 1).

In Middle Europe environment there is strong positive correlation between bank credit to non-financial sector and other credit instruments. We reject both stated null hypothesis. Thus there is a possible serial correlation in the residuals.

Table 1 Results of correlation analysis in Central Eastern European area (Bank credit vs. other debt in 2000-2015)

Country	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
Czech Republic	0.6086	0.9662	0.0000	1.1196	0.0132
Hungary	1.1779	0.9297	0.0000	0.2744	0.0000
Poland	0.4740	0.9837	0.0000	0.7086	0.0004

Source: own calculation based on data from BIS (2017)

From the results presented in the Table 1 there can be also observed that the intensity of mutual development of bank credit and other debt differs. The strongest bond is between bank credit and other debt is in Poland, while in Hungary is the lowest. As far as the slopes are concerned, there can be stated that the lowest growth of other debt in relation to the bank credits is in Poland, while in Hungary other debt is growing faster than bank credits. Both correlation coefficients and slopes signalize very similar development of these debt sources of business financing. It is therefore obvious that these sources might be not only substitutes (as e.g. Miles (2000) states), but complements to each other as well. In the Czech Republic, there is the highest value of D-W test, which can be partly explained by the results presented in Mačí and Hovorková Valentová's study (2017). These authors showed that in the period they analyzed, long-term corporate bonds and bank loans provided to non-financial corporations are substitutes to each other.

Latin America Countries

As we can see from the Table 2, the results of Latin American Countries relatively copy the results of countries in our CEE region.

Table 2 Results of correlation analysis in Latin American area (bank credit vs. other debt in 2000-2015)

Country	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
Argentina	-0.1365	-0.3906	0.1347	0.1866	0.0000
Brazil	0.0484	0.8767	0.0000	0.8383	0.0016

Chile	0.6393	0.9473	0.0000	0.3345	0.0000
Mexico	0.8707	0.9573	0.0000	0.4183	0.0000

Source: own calculation based on data from BIS (2017)

Correlation coefficients only reach slightly lower values. However, there is one notable exception – Argentina. Argentina's results show insignificant correlation between two examined phenomena. One of the reasons, which may explain such result, is Argentina's state bankrupt in 2002. In 2002 bank loans dropped sharply. This event brought turbulences to the local financial markets and unfortunately the threat of further bankruptcy is still up to date in Argentina. Slopes presented in Table 2 shows different results among analyzed Latin America countries. Again, very different situation is observed in Argentina, where other debts are not significantly dependent on the growth of bank credits and vice versa. In relation to other observations, it can be concluded that in Argentina had to prevail a different element influencing the development of both time series than GDP and interest rates (cf. Calza, Gartner and Sousa (2003)). In Brazil, which suffered by drop in commodity prices and political instability because of presidential affairs, there is also positive but with comparison to other analyzed economies very low value of the slope. The values for Chile and Mexico are rather similar to those in CEE.

CEE Region versus Latin America Region

Finally, there are presented the complex results of both analyzed regions in Table 3 below. We can see that both parts of the world seems to have strongly and positively correlated bank credit and other debt instruments markets but these correlations also indicate a non-random pattern in the residuals. Thus there may be a third variable that influences credit options of companies in both analysed regions. This is consistent with the conclusions of e.g. Calza, Gartner and Sousa (2003) and Braun and Briones (2006) who states that the development of financial markets is mainly influenced by development of the economy measured by real GDP or general economic development. From this point of view, bank credits and other debt are rather complementary, not substitutes, to each other.

Table 3 Results of correlation analysis for the sum of Central Eastern European (CEE) region and sum of Latin American region (bank credit vs. other debt in 2000-2015)

Region	Slope	Correlation Coefficient	P-Value	D-W Test	P-Value
CEE	0.6396	0.9880	0.0000	0.8013	0.0011
Latin America	0.1506	0.9044	0.0000	0.4260	0.0000

Source: own calculation based on data from BIS (2017)

The interesting fact about the global tendencies is that Central and Eastern European area has rather higher slope than Latin American region. The overall increase of alternative instruments (mostly bonds) related financing is therefore relatively higher in CEE.

4 Conclusions

In this paper, there was analyzed the development of debt markets in selected Central and Eastern European and Latin America countries. The analysis was based on time series correlation analysis between bank credit (loans) and other debt provided to non-financial sector. Our main aim was to characterize the development and potential changes within the debt market of each analyzed economy and subsequently to compare economies, respectively their development among themselves. From the literature review, from some historical similarities mentioned in introduction and from current state of economic development, despite the fact that these two regions are relatively far away from each other, there could be anticipated that there will be no significant differences

among the observed economies. The results presented in this article confirmed our expectations, i.e. the volume of bank credits and other debts are developing in very similar ways. And at the same time, bank credits are growing rather faster than other debt in the analyzed period. On our research sample and associated data about credit to private non-financial sector thus cannot be applied what e.g. Miles (2000) observed that since 1980 bond financing, which is one financial tool among other debt sources, is being pushed forward at the expense of bank loans. This can be explained by the differences in the research samples in which we on the one hand excluded government and on the other hand we included households. While nowadays governments rather use bond financing, households mostly use bank credits. The only notable exception is the development in Argentina, which still suffers from the consequences of state bankruptcy. A little bit different development can be also observed in Brazil that was hit by falling prices of raw materials and some negative political affairs.

The challenges for further research consist in exclusion of time factor, decomposition of time series. This research also omits deeper possible interpretation of the results. We would also like to add into our study not only emerging markets, but developed economies as well. And last but not least, we would like to exclude households from the data and focus directly on corporations and their financing strategy.

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Interrelation of personal characteristics with financial literacy as a guide to financial behavior of Russian students

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Abstract: *The research is aimed at analyzing influence of various personal characteristics of young students along with financial literacy on their expected financial behavior. Besides financial literacy, we singled out such personal characteristics as prodigality, credulity, risk preference and propensity for offence or unethical behavior. Our research is based on the data obtained by sample questionnaire survey of full-time students learning economics at Lobachevsky State University of Nizhni Novgorord, Russia. For evaluation of each personal characteristic we asked respondents to answer twelve direct and indirect questions, which enabled us to both outline distribution of the estimated features among students and calculate their average values. For the whole sample we found medium positive correlation between prodigality, risk preference and propensity for offence or unethical behavior, while other pairs demonstrated weak correlations. Further clustering of the whole sample into six approximately equal groups with use of the Ward's method allowed us to receive more pronounced dependencies between characteristics within these groups, albeit different by sign. We found out that combining various characteristics with different level of financial literacy ensured quite opposite types of expected financial behavior. This emphasizes the role of personality development as a complex task even more important for students just entering the financial market.*

Keywords: financial literacy, financial behavior, students, personal characteristics, correlation

JEL codes: A 22, G02

1 Introduction

Modern researchers actively study the problems of financial literacy, its relationship with other personal characteristics and its influence on people's behavior in the financial sphere. A detailed review of such studies is represented in (Stolper and Walter, 2016).

First of all, scholars emphasize that concepts of financial knowledge and financial literacy are not synonymous. Apart from knowledge, financial literacy includes specific skills and competencies, embracing orientation in the flow of financial information, mastering of planning and accounting for income and expenses, operating with contemporary financial tools, assessing risks, as well as abilities to predict the consequences of financial decisions and to prevent breach of the law, etc. (Khudko, 2016). Financial literacy implies an attainment of financial independence, as well as development of a certain level of financial culture and financial discipline.

Financial literacy is examined from various standpoints. Some studies focus on methodological issues of financial literacy assessment (Huston, 2010). Other researches are dedicated to evaluation of the overall level of financial literacy within and between different countries and demographical groups. Thus, in 2010-2011 the experts of the Organization for Economic Cooperation and Development (OECD) and the International Network on Financial Education (INFE) carried out a pilot project covering 14 countries. It involved evaluation of financial knowledge, behavioral preferences and population's

attitudes toward personal finance. The research revealed a serious lack of financial knowledge among a sufficiently high proportion of the population (Atkinson and Messy, 2012).

Another range of literature concerns the relation of financial literacy to certain socio-demographical, institutional or macroeconomic indicators. Thus, (Bumcrot, Lin and Lusardi, 2011) comparing financial literacy in different regions of the United States found that urban residents have higher financial literacy than rural residents. Whereas (Jappelli, 2010) found positive dependency between financial literacy with human capital development indicators and its negative dependency with generosity of social security systems.

The researchers of financial literacy of Russian population emphasized its relationship with people's socio-economic adaptation to changing market conditions. Based on the materials of the Russian Monitoring of the Economic Situation and Public Health conducted by NRU-HSE, (Kozyreva, 2012) analyzed the trends and peculiarities of financial behavior of different social groups and strata of the Russian population during recession in economy. The author concluded that older aged respondents are more prone to conscious savings behavior. Other authors (Nivorozhkina and Sinyavskaya, 2012) demonstrated the influence of the level of financial literacy, the risk preference and the ability to identify suspicious financial transactions on the likelihood that clients of financial institutions could be involved in unlawful schemes.

By means of sociological survey (Fedorova et al., 2015) analyzed the impact of financial literacy on the awareness of Russian citizens toward financial services, their ability to effectively identify the highest-quality financial market offers that meet their personal needs. The authors concluded that in general Russian citizens have a fairly low level of financial literacy. By use of econometric modeling the author revealed that people who are more literate in finance are also more active in using financial instruments, investing in pension funds and having less debt on bank loans. Using another sociological survey, (Malkina and Khramova, 2016) found that the majority of depositors of the Russian banks demonstrated inherent risk aversion, which restricted their financial practices.

Some researchers are engaged in the study of the peculiarities of young people financial behavior. For example, the OECD experts conducted in 2012 an international study of financial literacy among 15-year-old schoolchildren from 18 countries (OECD, 2014). The results of the study showed a higher level of financial literacy among schoolchildren from China and Belgium, a wide variation of estimated literacy across countries and a large gap between the financial literacy levels within the countries.

The research of financial behavior of young students of Australian universities (Beal and Delpachitra, 2003) established insufficient financial literacy, excessive use of credit and inessential use of savings. It also revealed a positive parental influence on the improvement of students' financial skills. Meanwhile, the survey of 420 USA college students" behavior (Jorgensen and Savla, 2010) showed that perceived parental influence had direct and moderate impact on their financial attitude; indirect and moderate impact on their financial behavior mediated through financial attitude, whereas it did not have any noticeable effect on their financial knowledge. Studying Russian children behavior, (Fedorova et al., 2015) indicated that parents with relatively little experience in the stock market activity often advised them to refrain from buying securities and not to accept risks associated with them. Some authors (Worthy, et al., 2010) detected the difference in risk preference among students who have been employed on their professions and those who have not.

Our current research is aimed at analyzing the influence of personal characteristics on the peculiarities of the expected financial behavior of those students who have chosen various economic programs. These students already possess some knowledge and demonstrate aspirations in the financial and economic spheres; therefore, analysis of their perceptions and types of behavior is most interesting.

The hypothesis of our research affirms that financial behavior in general, and behavior of students of economic specialties in particular, depend on interference of the level of financial literacy with other personal characteristics influencing decision-making, namely prodigality, credulity, risk preference and propensity for offence or unethical behavior.

2 Methodology and Data

To test the above hypothesis, we conducted a survey among the day-time students training on the bachelor and master degree programs in economics and finance at the Lobachevsky State University of Nizhny Novgorod. In total we interviewed 179 different respondents. The main part of the questionnaire consisted of 5 blocks, 12 questions each. The respondents expressed their opinion on a scale from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was supplemented with a personal block embracing questions related to age, gender, number of family members, employment status.

The first block of questions of the main part of the questionnaire was purposed to identify and measure the respondents' *propensity for extravagance (prodigality)* and included questions of two types. Some questions were aimed at revealing the respondents' psychological predisposition to money spending, e.g. "Spending money cheers me up", "I will buy the things I like - even if it causes financial difficulties". Other questions identified the respondents' subconscious readiness to bear financial losses: "It's better to buy a new TV than pay for repairing the old one", "I often buy things that I do not really need".

The second set of questions was intended for assessing *the level of credulity* that was interpreted differently from other personality traits. The average level of credulity was considered optimal, while the extreme gullibility was supposed to negatively interact with other personality traits. On the one hand, gullible and semi-literate individuals can be involved in illegitimate activities by someone else's initiative and become a victim. On the other hand, the recognition of own credulity along with sufficient level of literacy can result in more cautious behavior, excessive risk avoidance and loss of income. At the same time, distrustful individuals, as a rule, have the worst communicative abilities and often cannot realize their potential in the financial market. We evaluated the level of credulity in relationships with relatives, familiar and unfamiliar people, institutional structures and responsible persons. The examples of this block questions are following: "Sometimes I can lend a large sum of money to a friend", "When buying household appliances it is better to trust the opinion of a consultant", "The investor can only rely on the state which would not let its citizens down", etc.

The third block of the questionnaire, devoted to the evaluation of propensity for risk, included questions related to both the risk within day-to-day professional activity and the personal financial risk. Examples of the first type of questions are: "I am ready to postpone the execution of important work on the last day", "I'm ready to suggest a new idea to the boss without predicting his response". Examples of the second type of questions are: "I'm ready to invest in risky financial assets with volatile returns", "I am ready to start my own business in a sphere that is not completely clear to me".

The fourth block of questions, investigating the *propensity for offence or unethical behavior*, estimated the respondents' attitude to deception or concealment of the truth, to informal monetary practices, etc. It should be noted that our survey gives only an approximate estimation of a person's inclination to illegitimate or ethically wrong actions. Moreover, the framework context of the asked questions varied significantly: "Sometimes breach of the law may be justified if it benefits good people", "If the fellow does not recall the monetary debt, it is acceptable not to repay it", "Some informal hospitality may stimulate the boss to resolve the issue in my favor", "Offence is tolerable in an extreme need".

The next set of questions was related to identification of the *level of financial literacy*. For this purpose we asked standard questions from various financial disciplines. According to our starting remark, financial literacy is not confined to stock of knowledge. However, the lack of experience in the financial sphere was a feature of the majority of our young respondents. Therefore, we assumed that their financial knowledge is an important prerequisite for correct decision-making and appropriate behavior in the future.

Calculation of the total scores in the first four blocks allowed us to measure four main characteristics of our respondents. The appraisal of the level of their financial literacy was obtained in a different way - by multiplying the number of correct answers by 5. The interrelationship between the characteristics was calculated by means of the Pearson's linear correlation and the Spearman's rank correlation coefficients.

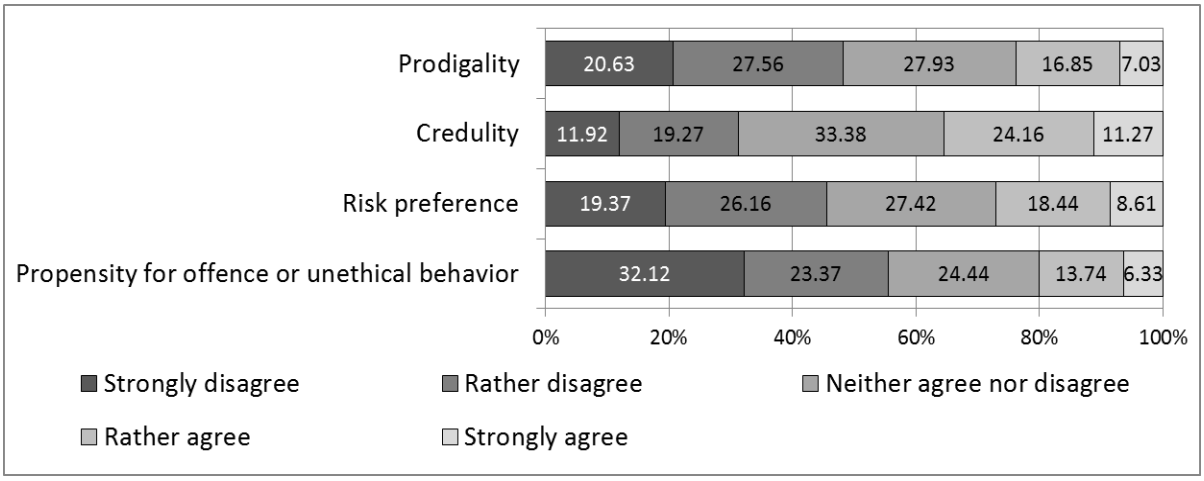
Next, we divided all students into groups with similar characteristics using the Stata-14 module for hierarchical cluster analysis. For clustering we have applied the Ward's method based on construction of the hierarchical tree (dendrogram). In this approach, the criterion for pooling observations in the same cluster is the decrease in total sum of Euclidean distances between all observations and the clusters' centers.

3 Results and Discussion

The survey covered students aged 18 to 24 (averaging 20). Boys and girls are presented in the proportion: 31% against 69%. Circa 58.1% of them live in smaller families (1-3 people), while 41.9% live in larger families (4-6 people). Additionally, 20% of the respondents are employed, 67% are economically inactive, and 13% are looking for a job.

Figure 1 shows the distribution of the respondents characteristics obtained with the questionnaire. The average assessments of characteristics are: prodigality – 2.6, credulity – 3, risk preference – 2.7, propensity for offence or unethical behavior – 2.4. Credulity appeared to be the most pronounced characteristic of our respondents, while readiness for illegitimate or unethical actions was rejected by the majority of them.

Figure 1 Distribution of the assessments of the respondents' characteristics, %



Source: authors own calculations based on the data obtained by sociological survey

The questions measuring the level of financial literacy ensured about 45% correct answers and 23% incorrect answers. Rather high proportion of respondents (32%) found it "difficult to answer". It should be noted that in our study the financial literacy is cardinal in interrelationship of personal characteristics. While literate people demonstrating risk preference take it deliberately, illiterate ones may undertake reckless actions. By assessing current situation incorrectly they could both lose money and be involved in various illegal schemes. However, more literate individuals can invent various

tricks to hide illegal nature of their activities. On the contrary, illiterate ones can refrain from making decisions in the financial sphere. Obviously, connection of financial literacy with other characteristics of individuals plays a crucial role in their financial behavior.

The calculated correlations between the levels of the characteristics examined for all respondents are represented in Table 1.

Table 1 Coefficients of correlation between personal characteristics for the entire sample (N=179)

	Prod	Offen	Risk	Cred	FinLit	Prod	Offen	Risk	Cred	FinLit
	The Pearson's coefficient					The Spearmen's coefficient				
Prod	**1**					**1**				
Offen	**0.332**	**1**				**0.341**	**1**			
Risk	**0.297**	**0.383**	**1**			**0.315**	**0.409**	**1**		
Cred	**0.156**	**-0.239**	**0.020**	**1**		**0.105**	**-0.226**	**-0.023**	**1**	
FinLit	**-0.165**	**-0.048**	**-0.107**	**-0.093**	**1**	**-0.164**	**-0.017**	**0.097**	**-0.082**	**1**

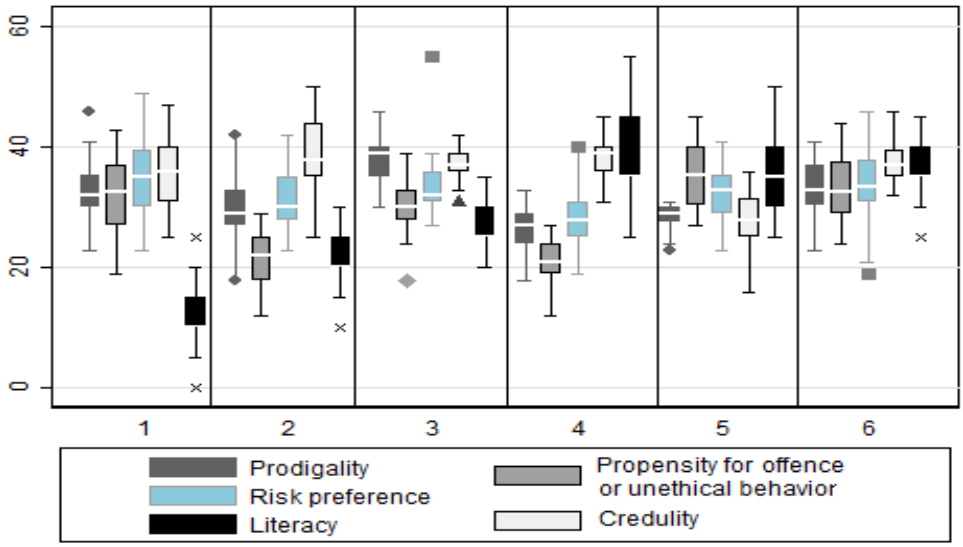
Note: Prod – prodigality, Offen – propensity for offence or unethical behavior, Risk- risk preference, Cred – credulity, FinLit – financial literacy

Source: authors own calculations

The correlation matrix constructed for the entire data indicates a tripartite positive relationship between prodigality, risk preference and propensity for offence or unethical behavior. In our opinion, positive relationship between extravagancy and propensity for misconduct may be explained by the increased interest of such people in overcoming existing budgetary constraints.

Subsequent application of the Ward's method allowed us to split the sample into 6 different clusters distinguished by combination of the respondents' features (Figure 2). Calculation of the correlation between the assessed levels of personal characteristics within isolated clusters enabled us to determine their interdependencies (Table 2).

Figure 2 Description of personal characteristics in the clusters singled out



Source: authors own calculations

Next, we describe each cluster and interrelationship of the personal characteristics in it separately.

Table 2 Matrix of the correlations of personal characteristics within the clusters

	Prod	Offen	Risk	Cred	FinLit	Prod	Offen	Risk	Cred	FinLit
	Cluster 1 (40 observations)					**Cluster 2 (37 observations)**				
Prod	**1**					**1**				
Offen	**0.446**	**1**				**0.188**	**1**			
Risk	**0.447**	**0.594**	**1**			**0.320**	**0.191**	**1**		
Cred	**0.184**	**0.080**	**0.089**	**1**		**0.502**	**0.261**	**0.563**	**1**	
FinLit	**-0.039**	**0.365**	**0.375**	**-0.201**	**1**	**0.287**	**-0.378**	**-0.139**	**-0.289**	**1**
	Cluster 3 (21 observations)					**Cluster 4 (25 observations)**				
Prod	**1**					**1**				
Offen	**0.013**	**1**				**-0.123**	**1**			
Risk	**0.224**	**-0.579**	**1**			**-0.325**	**0.038**	**1**		
Cred	**0.105**	**-0.004**	**0.085**	**1**		**0.129**	**-0.074**	**-0.066**	**1**	
FinLit	**0.150**	**-0.641**	**0.308**	**0.365**	**1**	**-0.193**	**0.063**	**0.416**	**0.236**	**1**
	Cluster 5 (20 observations)					**Cluster 6 (36 observations)**				
Prod	**1**					**1**				
Offen	**0.119**	**1**				**0.137**	**1**			
Risk	**0.147**	**-0.020**	**1**			**-0.181**	**0.301**	**1**		
Cred	**0.061**	**-0.170**	**-0.170**	**1**		**-0.370**	**-0.174**	**-0.201**	**1**	
FinLit	**-0.373**	**-0.529**	**0.317**	**0.069**	**1**	**0.281**	**-0.027**	**-0.144**	**-0.444**	**1**

Source: authors own calculations

Cluster 1 - «Low level of financial literacy + increased risk appetite»

A distinctive feature of this cluster is the lowest level of financial literacy among all respondents (the literacy mean value equals 11.75, while median value - 10.00). Another peculiarity of this cluster is a higher risk appetite (mean value at 35.28, and median value at 35.00). In this cluster the high level of risk preference demonstrates a positive correlation with both prodigality and propensity for offence or unethical behavior.

This cluster is also characterized by higher proportion of the respondents searching for the job. This group of students is at the risk zone, therefore they are not recommended to make independent decisions and should be under supervision of adults.

Cluster 2 – «Low level of financial literacy + trustfulness + adherence to law and ethics»

A feature of this cluster is the greatest proportion of girls (83.78%) demonstrating the highest level of credulity among all students (with mean value at 38.81). This group of students is also characterized by low level of financial literacy, which shows inverse dependency with propensity for illegal or unethical activities. Both risk preference and propensity for extravagance in this cluster are low.

Apparently, this cluster is represented by unconfident and cautious individuals who are not yet ready for professional activity in the financial market and aware of it.

Cluster 3 – «Medium level of financial literacy + extravagancy»

This cluster mainly consists of non-working young respondents aged 18-20 years. A remarkable feature of them is an increased propensity for extravagancy (with mean value 37.95, and median value 39.00). The literacy of these respondents is below the average established for the entire sample, but higher compared to the previous two clusters. The risk preference is slightly above the average. The level of credulity in this cluster turned out to be neutral.

For this cluster we can observe inverse dependence between the level of financial literacy and propensity for illegal activities. At the same time this cluster is characterized by a

positive relationship between literacy, on the one hand, and the level of credulity and risk preference, on the other hand. So far as the representatives of this cluster are keen to spend money, having improved their financial literacy, in future they might benefit from more lucrative market proposals and manage risks consciously, avoiding offences.

Cluster 4 – «High level of financial literacy + risk aversion + adherence to law and ethics»

This cluster incorporates the students demonstrating the highest level of literacy and an increased level of trust. They also showed low propensities for risk and extravagance as well as negative attitude towards illegal and unethical practices.

The fourth cluster is also characterized by a negative correlation between risk preference and extravagance. Apparently, the students aiming at consumption are more inclined to risk aversion. The students aiming at saving prefer relatively more risky behavioral practices and use of different methods of increasing capital. The correlation matrix for this cluster shows direct dependence between the level of financial literacy and the risk preference. Despite an advanced level of literacy among all respondents, these students are still inclined to refrain from financial activity. But further training and overcoming of excessive risk aversion might turn precisely this group of students into professionals at financial markets.

Cluster 5 – «High level of financial literacy + propensity for offence or unethical behavior»

This cluster is distinguished by a higher proportion of students aged 21-24 years. The lowest level of trust among all respondents and the highest propensity for illegal or unethical activities are unique features of the cluster. In addition, the respondents have a high degree of financial literacy (its median here is at the same level as in the 4th cluster, who demonstrated the highest level of financial literacy among the respondents).

The low level of extravagance is supported by their thrift and tendency to make rational decisions. In this cluster, growth in the level of financial literacy leads to decrease in the level of extravagance and increase in the risk preference, while the propensity to break formal or informal rules remains very high. Similar to students of the first cluster, these students require additional awareness-raising work. When the former (illiterate but risky) may be embroiled in violation of the rules, the latter (literate and risky) are capable of independent invention of grey business schemes.

Cluster 6 – «Slightly advanced level of financial literacy + ordinary/moderate behavior»

This cluster does not demonstrate pronounced features. All estimates are in the middle zone. However, it is distinguished by a higher proportion of employed persons (25%), and the majority of respondents (63.69%) live in smaller families. The correlation matrix indicates the positive relationship between the riskiness and the propensity for illegitimate or unethical actions in this cluster.

In this group, an increase in literacy level, as well as an increase in prodigality, is accompanied by a decrease in level of credulity. We assume that the respondents of this cluster are prone to work with financial instruments, but they will probably adhere to moderately risky strategies.

4 Conclusions

The paper puts forward and confirms the hypothesis stating that financial literacy along with other personal characteristics such as prodigality, credulity, risk preference and propensity for offence or unethical behavior influence expected financial behavior of young students. For testing this hypothesis we conducted a survey in Nizhny Novgorod State University of Russia and measured the characteristics explored, then clustered all

the respondents into groups with different combination of characteristics and computed their levels' correlations both for the entire sample and for the isolated clusters.

As a result of our study, we revealed direct correlation between prodigality, risk appetite and propensity for illegal or unethical activities for the entire sample. We singled out 6 clusters of students distinguished by the dominated characteristics and found pronounced but different by strength and sign interdependencies between them. Their description allowed us to suggest certain type of expected financial behavior for different clusters of students, find their vulnerabilities and outline the directions of awareness-raising work.

Nevertheless, we comprehend the limitations of the method used to obtain primary data. First of all, what people think, how they respond and how they behave in reality, do not always coincide. Secondly, the questions are not always understood by different respondents in the same way, the framework context influence their perception. Thirdly, it is necessary to make a reservation regarding the degree of sincerity of the respondents, their desire to answer the questions honestly. Stressing the similar issues, (Schmeiser and Seligman, 2011) warn researchers against haste while interpreting the data raised from the financial literacy surveys.

Further development of the research is expected by extension of the interviewed audience and inclusion to the survey of respondents with more advanced experience in the financial markets. We intend to complete the questionnaire by adding a block that directly explores financial behavior. This should allow us in the future to fulfill a comparative analysis for different population groups.

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Decomposition of spatial inequality in budget provision by income sources: case of modern Russia

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Abstract: *The research is aimed at assessment of contribution of various income sources to spatial inequality in budget revenues per capita in modern Russia. It is based on itemized data on various tax and non-tax revenues in consolidated budgets of Russian regions in 2012-2015. For assessment of interregional disparities in budget revenues per capita we employed three alternative measures: the population-weighted Gini coefficient, the coefficient of variation and the Theil index. The decomposition of spatial inequality by sources was made by means of the A. Shorrocks and R. Lerman – Sh. Yitzhaki techniques, as well as by the nested disintegration of the Theil index. As a result we obtained the structure of spatial inequality in budget provision per capita in Russian regions for four years and estimates of spatial inequality elasticity with respect to various budget revenue sources. We found that two most profitable taxes, i.e. corporate income tax and personal income tax, provided the lion share of inequality, although the elasticity of inequality with respect to corporate income tax was significantly higher than to personal tax. Non-tax revenues, such as incomes obtained from the use of public and municipal property and sale of tangible and intangible assets, provided relatively larger contribution to spatial disparities in budget provision compared to their share in total revenues, enhancing inequality even stronger. Inter-budgetary transfers, including grants, subsidies, subventions and other intergovernmental aid, proved to have the most smoothing effect on budget provision, although relative efficiency of different types of transfers in different years altered due to the changes in rules of their funding. The results obtained are applicable to management of spatial inequality in budget provision through adjusting budget revenues structure and transfer allocation.*

Keywords: budget revenues per capita, spatial inequality, indices, sources, decomposition

JEL codes: H 61, H 71, R 12

1 Introduction

The spatial inequality in economic performance is one of the main problems primarily concerning large and diverse states such as Russia. The problem has different aspects, one of which is unevenness in the regions' budgetary provision, which affects their ability to provide local population with public goods. It necessitates reallocation of financial resources throughout the budget system, resulting in change in interregional inequality and influencing the regions resources and incentives to develop their economic potential.

The current state of Russian budgetary system has certain distinctive features associated with allocation and distribution of public resources.

The first feature is establishment of specific rules for taxes distribution throughout the budget system partially allowing to reduce the level of interregional differences directly at the stage of taxes allocation. Indeed, the taxes most unevenly distributed among regions (such as value added tax - VAT and a large portion of the mineral extraction tax - MIT) are channeled to the federal budget. Simultaneously, two other profitable taxes, the personal income tax (PIT) and a substantial portion of the corporate income tax (CIT),

remain at the regional level. The PIT is characterized by noticeably lower degree of spatial inequality compared to the taxes allocated at the federal level, while the CIT tax yield rate demonstrates significant regional disparities (Malkina, 2016).

The second feature of Russian budget system is maintenance of its vertical imbalance. Thus, in 2006 the share of the regions' consolidated budgets in total revenues of the Russian budgetary system was 35.7%, then it had been growing up to 43.6% till 2009, followed by the drop to 33.4% in 2014, and in 2016 it amounted to 35.8%. The growing dependence of regional budgets on the federal center is manifested in decrease in the share of own revenues in the regional consolidated budgets, increase in the share of inter-budgetary assistance in their total revenues, and imbalance between revenue sources and spending obligations of subnational governments.

The third feature is the existence of so-called system of delegated mandates, when decisions of a higher level are descended to perform to the lower level supported by appropriate resources. This type of assistance mainly represented by subventions contradicts to the subsidiarity principle of budget federalism, according to which it is the lower level that should delegate authority and transmit resources to higher level. Moreover, economists are concerned about increase in unfunded mandates in Russian budget system (Oding et al., 2016). Their existence blurs the responsibility of the regional authorities for fulfillment of the obligations discharged from the top (Yushkov et al., 2016).

Fourthly, the inter-budgetary assistance in Russia is based on different types of transfers: grants (dotation), subsidies, subventions and so-called other transfers. Other transfers are also represented by subsidies and subventions distributed by federal off-budget funds among regional budgets. From all the types of inter-budgetary aid only grants are non-targeted. Moreover, they are distributed under the long-run rules taking into account the general condition of regional budgets. However, the share of grants in intergovernmental assistance in Russia has decreased from 69% in 2005 to 31% in 2012 (then it was stabilized and insignificantly increased), while the share of subsidies and subventions had grown over time. Increasing number of haphazard subsidies and subventions becoming more specified and less transparent, indicates the practice of manual control over regions (Zubarevich, 2014). In such a system, the regions suffer a shortage of resources to carry out their own economic policies based on internal goals and priorities. They have to cover budget deficit and finance their own investment programs through costly borrowing mainly from banks (Akindinova et al., 2016) having faced significant increase in their public debt in recent years (Zubarevich, 2014).

Fifthly, economists argue about the effectiveness of intergovernmental assistance in Russia both from the standpoint of its influence on reduction in regional disparities in budget provision and impact on incentives for regional development. They also emphasize the problem of opportunistic behavior of regions, prone to understate tax capacity and exaggerate the need for budgetary assistance (Yushkov et al., 2016).

Some researchers advocate the existing system of inter-budgetary aid in Russia. Thus, (Deryugin, 2016) calculated the compensation of outstripping economic growth in Russian regions with subsequent reduction in equalization grants distributed in line with the current regulations. He found that in all funded regions the compensation of economic growth would be less than 100%. Additionally, he revealed that the regions with pre-distribution budget provision level within 0.6-1 should benefit from economic growth considerably more compared to the regions with lower budget provision. Finally, the author concluded that the applied technique positively affected the stimuli to regional development. Another researcher (Yushkov, 2016) applying econometric modeling proved the positive influence of the share of inter-budgetary transfers on economic growth in the Russian regions.

A number of studies suggest specific measures to improve the effectiveness of intergovernmental assistance in Russia. They are: expanding of the block broad-based subsidies, reducing the number of subventions, rejection of subsidies for budget balancing, which are in a greater degree a tool for manual management, enlargement of the share of non-targeted transfers resulted in the extension of regions autonomy (Timushev, 2016), unification of subventions, shifting some underfinanced mandates to the federal level (Yushkov et al., 2016).

The purpose of our current study is to analyze the impact of different components of regional budget revenues, both own incomes and gratuitous assistance, on the ultimate interregional inequality in budget provision per capita based on last tendencies. We are particularly interested in measurement of elasticity of total spatial inequality with respect to different income sources in Russian budget system.

The main hypothesis of our research is that various taxes and non-tax revenues make a different relative contribution to interregional budget inequality, which depends on their interrelation with regional economic development and the degree of pro- or counter-cyclicality. At the same time, the impact of inter-budgetary transfers on interregional inequality depends on their built-in explicit and implicit goals.

2 Methodology and Data

Our research is based on the official data on 83 Russian regions in 2012-2015 provided by the Federal Treasury (FT) and Federal State Statistics Service (FSSS) of Russian Federation. The data embraces the regions' consolidated budget revenues detailed by sources and the average number of population in regions.

We apply three alternative techniques for evaluation of spatial budget inequality and its further decomposition by income sources. All of them allow to present total inequality in additive form, i.e. as a simple sum of the contributions made to it by different sources.

The first approach is based on *the population-weighted squared coefficient of variation* (CV) and the A. Shorrocks technique for its decomposition (Shorrocks, 1982). In this approach the relative contribution of each k-th source to total inequality ($CV(k)$) is calculated as follows:

$$CV(k) = \frac{Cov(y_k, y)}{Var(y)} = \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} - \bar{y}_k \right) \cdot \left(y_i - \bar{y} \right) \Big/ \sum_{i=1}^{m} \rho_i \cdot (y_i - \bar{y})^2 , \quad (1)$$

where $i = \overrightarrow{1,m}$ - serial number of the regions, ρ_i - the share of i-th region in total population of the country, y_{ik} - budget revenue per capita from k-th source in the i-th region, $\bar{y}_k = \sum_{i=1}^{n} \rho_i \cdot y_{ik}$ – average budget revenue per capita from k-th source in the country, y_i - budget revenue per capita from all sources in the i-th region, $\bar{y} = \sum_{i=1}^{n} \rho_i \cdot y_i$ - average budget revenue per capita in the country. Obviously, $\sum_{k=1}^{K} CV(k) = 1$.

The second technique of inequality decomposition by income sources related to *the Gini coefficient* was proposed by (Lerman and Yitzhaki, 1989). In this approach the absolute contribution of each k-th source to total inequality ($G(k)$) is assessed based on the covariance of relevant income with total distribution of population arranged in order of increase in total income per capita:

$$G(k) = \frac{2}{\bar{y}} \cdot Cov\left(y_k, F(y)\right) = \frac{2}{\bar{y}} \cdot \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} - \bar{y}_k \right) \cdot \left(\hat{F}_i - 0.5 \right), \quad (2)$$

where $i = \overrightarrow{1,m}$ - serial number of the regions ranked in order of increasing total budget revenues per capita, $F(y)$ – cumulative distribution of population among the regions ranked as stated above, $\hat{F}_i = \sum_{i=0}^{i-1} \rho_i + \rho_i / 2$ – a mid-interval of F-function for each i-ranked region, which population-weighted average equals 0.5. Eventually, the Gini coefficient for total budget revenues per capita equals: $G = \sum_{k=1}^{K} G(k)$.

The third approach to inequality evaluation and its additive decomposition is based on nested disintegration of *the Theil index*. In this technique the absolute contribution of each k-th source to total inequality ($Th(k)$) is computed as follows:

$$Th(k) = \alpha_k \cdot \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} / \bar{y}_k \right) \cdot \ln\left(y_i / \bar{y} \right) = \sum_{i=1}^{m} \rho_i \cdot \left(y_{ik} / \bar{y} \right) \cdot \ln\left(y_i / \bar{y} \right), \quad (3)$$

where $\alpha_k = \bar{y}_k / \bar{y}$ - the share of k-th source in total budget revenues. This approach is applicable only when all regional revenues are non-negative and national-wide average revenues are strongly positive. Evidently, the Theil index for total incomes inequality equals: $Th = \sum_{k=1}^{K} Th(k)$.

For the last two mentioned techniques the proportional contribution of each k-th source to total inequality is determined as its share in the total Gini and Theil indices.

According to (Yitzhaki and Schechtman, 2013) and some following research (Jurkatis and Strehl, 2014), the relative importance of each source in total inequality may be evaluated by means of *the Gini elasticity with respect to different incomes*:

$$\eta_k = G(k)/G - \alpha_k. \quad (4)$$

This elasticity shows how many percent of total inequality may be obtained due to increase in relevant income by 1%.

3 Results and Discussion

The table 1 generalizes the results of evaluation of contributions of different income sources to interregional inequality in budget provision in Russia in 2012 and in 2015 obtained by use of three alternative techniques. The sources' shares in inequality are compared with their shares in total budget revenues.

According to our estimations, the own regional budget revenues have provided 72.8% of total earnings of consolidated budgets of Russian regions in 2012 and 71.3% in 2015. At the same time these sources' contribution to spatial inequality in budget provision was noticeably higher compared to their contribution to total revenues. It varied between 90% and 110% over time measured by different coefficients of inequality. Comparison of two relevant shares indicates the growth of relative impact of own regional sources on total spatial inequality in budget provision.

In the group of own regional incomes the tax-based revenues proved to be the most influential. They provided 65.7% of total regional budget revenues and 78.9-93.5% of

total interregional inequality in 2012. By 2015 their contribution to budget revenues had dropped to 64.7%, while their contribution to inequality had grown up to 80.3-96.0%.

The personal income tax is the most profitable tax of Russian regions ensuring circa one third of total tax revenues. In 2013 its share in tax revenues was the highest over the period considered, 36.5%. This tax is fully allocated at the sub-federal level and after that it is shared between regional and municipal levels pursuant to the rule established by the law on the regional budget for the corresponding year. The personal income tax's absolute contribution to budget revenues inequality is also noticeable, although its relative contribution varies within 0.966 (CV_{2012}) – 1.466 ($Theil_{2013}$).

Table 1 The contribution of various budget sources to interregional inequality and to total revenues of consolidated budgets in Russian Federation in 2012 and 2015, %

	2012				2015			
	CV(k)	**G(k)**	**Th(k)**	**α_k**	**CV(k)**	**G(k)**	**Th(k)**	**α_k**
Corporate Income Tax	37.3	37.6	51.8	22.4	42.3	35.7	53.4	19.7
Personal Income tax	29.0	31.4	34.8	25.6	25.3	33.6	33.5	26.2
Property Taxes	10.3	8.9	9.7	8.9	9.4	10.7	10.2	10.0
Excise duties	-0.4	0.4	-4.7	5.0	-0.6	-0.2	-4.8	4.6
Special tax regimes	1.5	2.0	0.5	3.1	1.6	2.2	0.9	3.2
Other taxes	1.1	1.0	1.3	0.7	2.3	1.8	2.9	1.0
Non-tax revenues	10.8	10.3	13.7	7.0	10.8	10.4	14.1	6.6
Total tax and non-tax revenues	89.7	91.6	107.3	72.8	91.1	94.2	110.2	71.3
Grants (dotation)	3.7	1.1	-0.3	5.9	3.3	-1.1	-2.1	5.6
Subsidies	-0.1	0.9	-5.8	6.5	-0.6	-1.0	-4.8	3.6
Subventions	0.5	0.6	-1.9	3.2	0.2	0.3	-2.2	3.1
Other inter-budgetary transfers	4.1	4.9	-1.4	10.9	5.3	6.9	-1.9	15.9
Other receipts and refunds	2.1	0.9	2.1	0.6	0.7	0.7	0.8	0.5
Total gratuitous receipts	10.3	8.4	-7.3	27.2	8.9	5.8	-10.2	28.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: CV(k) – contribution of k-th source to the coefficient of variation; G(k) – it's contribution to the Gini coefficient; Th(k) – it's contribution to the Theil index; α_k – it's contribution to total revenues.

Source: author calculations based on the data provided by Russian Federal Treasury (FT) and Federal State Statistics Service (FSSS)

The second most profitable tax for Russian regions budgets is the corporate income tax, which rate was distributed among the federal and sub-federal levels in proportion 2% against 18% till 2017. For 2012-2015 the contribution of the corporate income tax to total tax revenues of consolidates regional budgets has dropped from 28.4% to 24.6%. However, the relative influence of this tax on inequality has enhanced over this period: according to the coefficient of variation - from 1.663 to 2.146, by the Gini coefficient - from 1.676 to 1.808, and by the Theil index – from 2.308 to 2.709. Apparently, recession in economy affected the relative influence of personal income tax and corporate income tax on interregional inequality in budget provision in opposite direction.

The property taxes given as a whole appeared the relatively enhancing inequality in 2012-2014, whereas in 2015 their share in interregional budget disparities occurred approximately the same as their share in budget revenue, i.e. about 10%. However, a more detailed analysis revealed significant differences within this group. The lion share of inequality was provided by the corporate property tax. Thus, its share in total inequality in 2012 amounted to 9.76% (according to CV), 7.72% (by the Gini), and 10.63% (by the

Theil), while its share in budget revenues was 6.08%. By 2015 its share in revenues has slightly increased (6.69%), while its share in inequality has changed ambiguously.

The absolute impacts of other property taxes on budget revenues and on spatial inequality were very small. Despite the flattening role in regional disparities, they could not noticeably affect them. Thus, personal property tax provided only 0.28% of total budget revenues and ensured 0.03-0.2% of total budget inequality in Russian regions in 2015. Simultaneously, transport tax ensured 1.32% of budget proceeds and 0.33-0.88% of total inequality, and land tax created 1.74% of income and -0.59-0.91% of inequality.

The special tax regimes, including the simplified taxation system for small and medium-size businesses, the unified tax on imputed income for certain types of activities, the unified agricultural tax and the patent system of taxation demonstrated relatively positive influence on reduction in spatial disparities in budget sphere. However, due to small share in total budget revenues (2-3% in various years) their contribution to total disparities and regional convergence in budget provision appeared to be very small.

Other own revenues of regional budgets include the mineral extraction tax and royalties paid under the so-called 'production sharing agreements'. A very small part of such taxes remains at the regional level, whilst a huge portion of these is allocated at the federal budget. Nevertheless, this source has relatively enhanced inequality.

The non-tax incomes generate another part of own regional budgets revenues. They brought about 6.5-7% of total revenues but made relatively higher contribution to total spatial inequality. The largest portion of them, about 3.4%, was generated by use of state and municipal property, which ensured 5.3-8.1% of total budget inequality in 2015. Compared to 2012, the share of this source in both revenues and inequality has increased. The next important source, sales of tangible and intangible assets, provided only 1.2% of total budget revenues in 2015 and has been relatively enlarging inequality.

The second group of regional budget revenues is formed by the gratuitous receipts, which provided about 27-29% of total budget incomes. Most of them are inter-budgetary transfers transmitted from the federal to regional levels of budget system. Obviously, they impose substantial smoothing effect on budget system spatial inequality.

The grants are unconditional transfers provided in two main forms. Overall they comprise less than $1/5^{th}$ of inter-budgetary aid. The grants for alignment of the budget provision per capita amounting to 64-76% of all grants have demonstrated considerable and stable leveling effect. The grants for balancing of regional budgets have ensured much less but increasing smoothing effect, which is better detected by their elasticity (table 2).

Table 2 Elasticity of spatial inequality in budget provision assessed by the Gini coefficient with respect to different income sources

	2012	2013	2014	2015
Corporate Income Tax	0.152	0.131	0.154	0.159
Personal Income tax	0.058	0.080	0.074	0.074
Property Taxes	0.000	0.005	0.004	0.007
- **personal property tax**	-0.001	-0.001	-0.001	-0.001
- **corporate property tax**	0.016	0.020	0.019	0.020
- **transport tax**	-0.003	-0.003	-0.003	-0.004
- **land tax**	-0.012	-0.012	-0.011	-0.008
Excise duties	-0.046	-0.050	-0.045	-0.048
Special tax regimes	-0.011	-0.010	-0.010	-0.011
Other taxes	0.003	0.004	0.006	0.008
- **mineral extraction tax**	0.004	0.005	0.006	0.010
Non-tax revenues	0.033	0.040	0.037	0.039
- **use of state and municipal property**	0.013	0.019	0.022	0.027
- **sales of tangible and intangible assets**	0.015	0.009	0.011	0.008
Total tax and non-tax revenues	0.189	0.201	0.219	0.229
Grants	-0.049	-0.064	-0.074	-0.067
- **for alignment of budget provision**	-0.053	-0.054	-0.051	-0.052
- **for support of budgets balancing**	0.005	-0.009	-0.023	-0.015
Subsidies	-0.056	-0.055	-0.048	-0.046
Subventions	-0.026	-0.022	-0.024	-0.028
Other inter-budgetary transfers	-0.060	-0.068	-0.081	-0.089
- **for Territorial Compulsory Medical Insurance Funds**	-0.060	-0.070	-0.079	-0.082
Other receipts and refunds	0.003	0.007	0.008	0.001
Total gratuitous receipts	-0.189	-0.201	-0.219	-0.229

Note: specification of some groups is incomplete, only main items are presented.

Source: authors calculations based on the data provided by Russian FT and FSSS

The subsidies are inter-budgetary transfers designed for co-financing of expenditure obligations of the lower budgets. They are strictly targeted and issued by decision of higher authorities for specific purposes, e.g. support to certain industries, events, activities or groups of population. The total share of subsidies in inter-budgetary aid has reduced almost twice from 2012 to 2015. Their leveling effect remains essential, albeit relatively decreasing.

The subventions comprise earmarked non-matching transfers aimed at financing expenditure obligations of regional governments following by corresponding regulations of federal level. According to our calculations, subventions demonstrate stable contribution to regional budget revenues and relatively moderate counteraction to inequality. This result is quite consistent with the findings by (Yushkov et al., 2016), showed that the proportion of subventions in inter-budgetary aid in 2014 was higher in more affluent Russian regions compared to backward ones.

The fourth part of federal aid called 'other inter-budgetary transfers and revenues from the budget system' consists of mixed type of assistance distributed for current purposes and changing from year to year. Now the main portion of this source belongs to transfers from Federal Compulsory Medical Insurance Fund to the regional medical insurance funds. The total share of other transfers in budget revenues has shown outstanding growth, by more than 45%, and their absolute contribution to inequality has been the greatest among all transfers. However, according to the elasticity calculation, these transfers precisely ensured the greatest equalizing effect.

Other receipts and refunds, including transfers from various organizations, had little effect on Russian regions budget provision whereas their impact on spatial inequality was rather inconsistent.

4 Conclusions

In this study, using the population-weighted indices of inequality, i.e. the coefficients of variation, Gini and Theil, and the methods of their additive decomposition, we obtained the contribution of various types of regional budget revenues to the overall interregional inequality in the level of budgetary provision per capita in Russia in 2012-2015. The absolute assessments of the sources' contribution to income and inequality were supplemented by calculations of relative indicators - the elasticity of the Gini coefficient of interregional inequality with respect to various types of income. The study confirmed the hypothesis of different absolute and relative contributions of various types of tax and non-tax revenues, as well as gratuitous assistance to interregional inequality in budget provision, withal sensitive to economic conditions.

In the group of own budget revenues, the greatest absolute contribution to inequality was made by tax revenues, especially by corporate income tax and personal income tax. However, the greatest relative contribution to inequality was provided by taxes from enterprises – corporate income tax and property income tax, as well as non-tax incomes, especially incomes from use of state and municipal property and from sales of tangible and intangible assets. Despite personal income tax has positively affected inequality, its relative impact was considerably less compared to corporate taxes. At the same time personal property tax, excise duties and special tax regimes demonstrated the negative relative influence on inequality.

Generally, intergovernmental transfers provided considerable reduction in regional budget provision disparities. Among the types of this aid, the grants for support of budgets balancing and subventions demonstrated the least relative smoothing effect. Grants for alignment of regional budget provision had a significant impact on reducing interregional differences, while subsidies moderately contributed to it. Meanwhile, the greatest relative impact on the reduction of interregional differences was provided by transfers from extra-budgetary funds, primarily Federal Compulsory Medical Insurance Fund, which in fact were also subsidies and subventions. This allows us to conclude about the implicit leveling function of absolutely all transfers, which in turn fits into the policy of manual management of regions. Apparently, the equalization power of transfers was restrained by manipulations undertaken by regional authorities claiming their needs and hiding potential and the federal center seeking for political and economic rent in cooperation with some regions.

We foresee further development of the issue of interregional inequality in budget provision in improving the decomposition methodology, as well as more thorough explanation of formal and informal institutions' impact on horizontal alignment in Russian budget system.

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Corporate Tax Revenues of Selected EU Countries Using Spatial Autocorrelation Approach

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Abstract: *The reason of state interventions in economic processes of countries is in the economic literature supported by the hypothesis of the failure of the market mechanism with the efficient allocation of economic resources in the context of social optimum. In terms of fiscal policy affecting the rate of growth of corporate income tax revenues, there are numbers of views expressed by experts in economic theory. During the process of increasing internationalization, it is important to monitor the economic, and spatial contexts that are influencing changes in corporate tax revenues in countries. The main goal of this study is to model spatial autocorrelation of corporate income tax revenues in the EU member countries of selected time periods. Authors analyse the spatial structure of corporate income tax revenues of selected EU member countries by using the Local Indicators of Spatial Association Method. The used method identifies the range of the relevant spatial clusters of selected indicator, while the partial aim of the contribution is to identify areas with negative spatial autocorrelation of selected EU member countries' corporate income tax revenues. The results of the analysis are compared by observing fiscal indicators in terms of the tax policies of individual countries.*

Keywords: corporate income tax revenues; spatial autocorrelation; local indicators of spatial association (LISA) method

JEL codes: H20, H61

1 Introduction

Corporate income tax includes a number of determinants of economic, political and social character that are often subject to multiple changes, and therefore it is important to monitor its development in national conditions as well as in an enlargement as part of international groupings (Tanzi, 1996; OECD, 2014; Schultzová, 2015). Corporate taxation is an important factor for business "when they decide where to invest, how much to invest, and which types of operations to locate in which countries. No longer can a country levy high taxes on business investment and activity without adversely affecting its economic performance" (Pomerleau and Cole, 2016). Investigation of the development, as well as differences in corporate taxation of individual countries, can be realized from the perspective of corporation, in relation to the effective taxation, capital costs, tax-deductible costs, FDI, provision of tax concessions and incentives, and other tax and legal institutions (Vartia, 2008; Barrios et al., 2009). The second important consideration is a survey of revenues to the state budget, from the perspective of public finances and tax policy, tax revenues and GDP, macroeconomic indicators of corporate sector, transfers of mobile bases, corporate sector expansion, and tax competitiveness (Lee and Gordon, 2005; Bayer, 2011; Macek, 2015; Zuluaga, 2016).

The aim of the paper is to model spatial autocorrelation of corporate income tax revenues in the EU member countries of selected time periods. 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.

2 Theoretical Background

Examining the development and comparison of corporate income tax in selected EU member countries is motivated by the recognition of the status of corporate income tax revenues and their mutual transfers between countries. In connection with tax theory, the existence of corporate income tax fulfills several tasks that affect macroeconomic developments (Kubátová and Říhová, 2009).

The structure of a country's tax code is an important determinant of its economic performance (Šoltés and Gavurová, 2014). In 2015, fiscal burden of corporate tax of selected European Union countries was 2.66% of GDP, from 1.47% of GDP in Slovenia to 4.53% of GDP in Norway (OECD, 2017). Different development stems from several factors shaping the tax system and fiscal policy preferences (Siničáková et al., 2017). The imbalance between corporate income tax revenues in selected member countries is considered to be the effect of tax competition resulting from the different macroeconomic situation of the countries as well as from the different tax legislation. In order to compare corporate income tax revenues between selected EU Member states, this part of the contribution is devoted to a possible ways of comparing the corporate tax reveues using the most frequently used tax indices, which are: standard tax rate, average tax rate, corporate income tax revenue ratios of the total tax revenues or tax quota II representing the share of corporate income tax revenues determinated with social and health insurance contributions to GDP.

The simplest determinant of corporate tax reveues that mainly affects the behavior of corporations and their investment activity in countries is considered to be the standard tax rate. Because the determinant does not reflect complex information about the corporate tax reveues, in particular, because of the possibility of reducing corporation profits by applying tax legislation to taxable income, there is a distortion in the interpretation of the results. The indicator is reliable in the case of limited opportunities for taxpayers to reduce their tax base. The interaction between standard tax rate and the corporate tax reveues suggests a negative relationship between the variables (Devereux, Griffith and Klemm, 2004; Kenny and Winer, 2006; Clausing, 2007). Correlation between standard tax rate and the corporate tax reveues analyse Mintz and Tulkens (1986) too. According these authors, when countries with high tax burden increase the standard tax rate, cross-border shoppers move to neighbouring countries with lower standard tax rate. 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.

Another determinant for international comparison of corporate tax reveues is average tax rate. Examining the corporate tax reveues only by taking into account the previous indicators is inadequate, because it does not reflect the tax deductions of corporations, although it takes into account many other factors that are considered to be important for investment and job opportunities, and may give misleading information about its effects on the tax system (MoFSR, 2001). Another way of international comparison of corporate tax reveues is to monitor ratio indicators, e.g. corporate tax reveues as a percentage of GDP (e.g. Castro and Camarillo, 2014). The authors recorded the positive relationship between the development of corporate tax reveues and GDP. The ratio indicator provides only limited tax information about the development of corporate tax reveues in the country. In order to capture the development, as well as changes in tax systems, tax bases and tax rates, Devereux, Griffith and Klemm (2004) are noticing a decline in the indicator in most countries for two reasons. The first reason is resulting from legislative

changes that are reducing the standard tax rate, which negatively affects corporate profits and returns on investment. The second reason is based on the criticism of the corporate tax reveues analysis method.

The development of corporate tax reveues in individual countries is often affected by volatility for reasons other than tax systems, for example, because of a relative corporate tax reveues in proportion to GDP. The factors that affect the height and the development of corporate tax reveues to GDP ratio include the extent to which economic assistance is provided through the tax expenditures, the relationship between tax base and GDP, GDP growth rate, tax evasion, time intervals between the creation and adoption of a change in a particular tax or corporate governance (Škare and Hasić, 2015; Temur et al., 2017). Another ratio indicator for international tax revenues comparison is tracking the rate of corporate tax revenue growth over the previous period. In this work it is this indicator that is used and is subsequently modified by the Local Indicators of Spatial Association Method.

3 Methodology and Data

The paper uses the Local Indicators of Spatial Association Method (LISA) to identify a group of countries that have the same or opposite pace of development of corporate tax revenues R. Spatial autocorrelation is defined as the presence of the spatial structure of mapped variables due to their geographical proximity (Gregory et al., 2009; Slavík et al., 2011). If similar values of the selected indicator are located in the area closer together, it is a positive spatial autocorrelation. If there is a grouping of significantly different values, it is a negative spatial autocorrelation. Most indicators and variables in social science disciplines have mainly slightly positive spatial autocorrelation. The spatial autocorrelation rate is most frequently quantified by Moran and Geary coefficient of spatial autocorrelation. The present analysis uses the method of Moran coefficient of spatial autocorrelation I, which is given as:

$$I = \frac{n}{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}} \times \frac{\sum_{i=1}^{n}\sum_{j=1}^{n}(x_i - \bar{x})\left(x_j - \bar{x}\right)}{\sum_{i=1}^{n}(x_i - \bar{x})^2} \tag{1}$$

where n is the number of spatial units, in this paper those are the selected European countries, x_{i_t} it is the value of the variable, in this paper it is the rate of change of R in a particular year, and $\bar{x}$ is the arithmetic mean of the variable. W_{ij} represents the spatial weight between the *i* and *j* country.

The analysis is carried out in selected 22 EU countries, namely Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, and the United Kingdom. It is important to note that the analysis does not follow data for Macedonia, Albania or Bulgaria, which are the direct European neighbors of Greece. For this reason, Greece is excluded from observation to determine spatial analysis using the spatial weight matrix. Data of R are taken from the Revenue Statistics published by the OECD each year, 2001, 2004, 2010, 2011, 2013, and 2015.

For each country, R is available in the domestic currency for the period 2000-2015. For each country, the rate of corporate tax revenue growth is determined by:

$$x_{i_t} = \frac{R_{i_t} - R_{i_{t-1}}}{R_{i_{t-1}}} \tag{2}$$

Where x_{i_t} is the growth of corporate tax revenues of the country i at time t and R_{i_t} is the amount of R in the domestic currency of the country i at time t.

The matrix of spatial weights W is intended for 22 countries using the method of the six closest neighbors. The number of 6 neighbors represents according to Gregory et al. (2009) an optimum number. The main objective of the contribution is to model spatial autocorrelation of R in the EU member countries of selected time periods. The analysis should point to the difference in dynamics of corporate tax revenue development in selected European countries at various times. The assumption is that the tax "increase" (or "decrease") of corporate tax revenues in a particular country may, in addition to other endogenous variables, also be caused by the exogenous variable "decrease" (or "increase") of CIT in the neighboring countries, similarly as in the study by Mintz and Tulkens (1986) and Kanbur and Keen (1993). For this reason, we expect a negative or no spatial autocorrelation in the Moran coefficient analysis.

The following hypothesis *H* was chosen based on the target of the post: "The decline in the growth of corporate tax revenue is affected by the change in tax and macroeconomic indicators of neighboring countries, where the growth of corporate tax revenues rises". In the analysis, we identify countries whose value of the indicator is high and their neighbors have a low value and vice versa. This information is provided by the LISA method, which, unlike the Moran coefficient, is finding the local clusters of spatial autocorrelation. The considerable heterogeneity of the analyzed European countries requires the use of a method of identifying local autocorrelated areas. Based on Anselin (1995), 5 situations are derived:

- Locations with high values and with similar neighbors (high-high): positive local spatial autocorrelation.
- Locations with low values and with similar neighbors (low-low): positive local spatial autocorrelation.
- Locations with high values and with neighbors with low values (high-low): negative local spatial autocorrelation.
- Locations with low values and with neighbors with high values (low-high): negative local spatial autocorrelation
- Locations where local spatial autocorrelation is not statistically significant.

The analytical part of this work is implemented in the environment of language R. Used are mainly libraries of econometric models for spatial panel data *splm*, linear models for panel data *plm*, bindings for the geospatial data abstraction library *rgdal* and SPArse Matrix *spam*.

4 Results and Discussion

The aim of the paper is to analyze and compare the differences in the development of selected indicator between countries EU and subsequently compare the results with selected traditional macroeconomic indicators. In this part of the contribution, we selected three groups to compare in the period between 2001 and 2004, 2010 and 2011, and 2013 and 2015 that shows significant changes. The paper focuses on the high-low and low-high categories. We identified countries with negative autocorrelation by using LISA method. In the following chapter we are listing mainly the most significant changes in the indicator's development that occurred especially under the influence of global changes, or changes in the tax systems of selected countries.

We selected the tax quota II from the traditional macroeconomic indicator. From 2000 to 2015, there is a significant fluctuating development in tax quota II recorded in selected countries. The average tax quota II in 2000-2015 was 2.99% of GDP, in the concrete between maximum 3.53% (2007) and minimum 2.55% (2014). The decline in the indicator was primarily caused by the global economic crises, changes in the economic activity of corporation, tax legislation and changes in GDP levels (Mikalauskiene et al., 2016). The highest tax quota II among selected countries was in Norway, at 12.59% of GDP (2006). According to OECD (2014), "corporate tax code complexity is quantified by

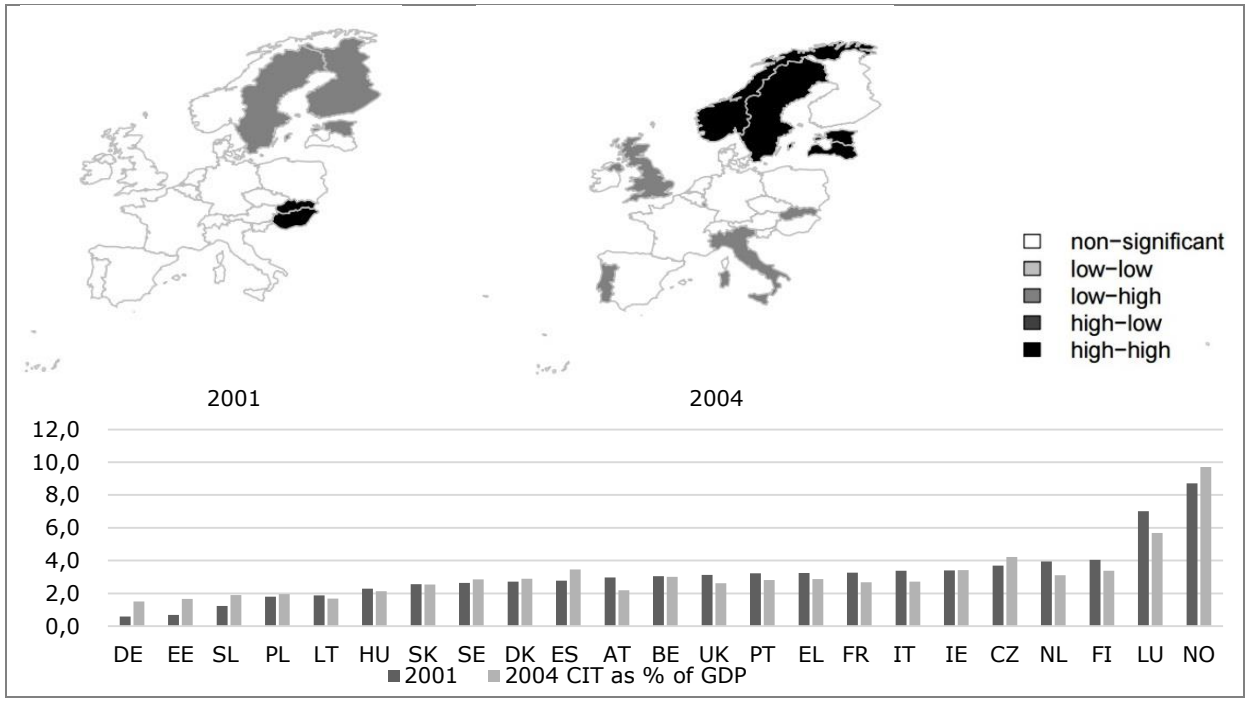
measuring the tax compliance burden placed on firms. These burdens are measured by the number of payments made for the corporate income tax, as well as the time needed to comply with the tax (measured in hours of compliance time per year)". Norway imposes the fewest number of payments with 3. The lowest tax quota II was recorded in Germany at 0.58% (2001), with a tax rate of 45% since 1999, then reduced to 25% (2001) and 15% (2008). It is necessary to add a trade tax and a solidarity tax to it. Countries with long-term above- tax quota II in the entire selected period are Cyprus, Luxemburg, Malta, Ireland, Romania and Czech Republic.

Period 2001 to 2004

At the beginning of the analysis (2003-2005), we monitor in the Nordic countries (Norway, Sweden) areas so-called high-high indicating that the corporate tax revenues of these countries and their neighbours (Finland, Denmark) have grown during this period. This result reflected the decrease in government spending, the elimination of double taxation of dividends in 2003, the growth in corporate profits and a decline in a tax rate of corporation. The share of the tax on GDP was reduced in percentage terms, but corporate tax revenues in absolute terms increased. The tax burden in Finland in monitored period was one of the highest among the other selected countries, but at the same time also the lowest among the northern only countries.

In addition, we identify areas such as Portugal, Slovakia, Italy, or the UK located in a low-high sector, which indicates that corporate tax revenues of these countries have declined over the period while this indicator have increased in their neighbours. In the case of Slovakia, in 2000, the tax rate for the legal entities decreased from 40% to 29% in the country. This change influenced the increase of tax revenues to the state budget as well as the growth of the submitted tax returns. The change took place in 2001, whereby Slovakia changed its position to high-high.

Figure 1 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2001 and 2004



Source: Authors

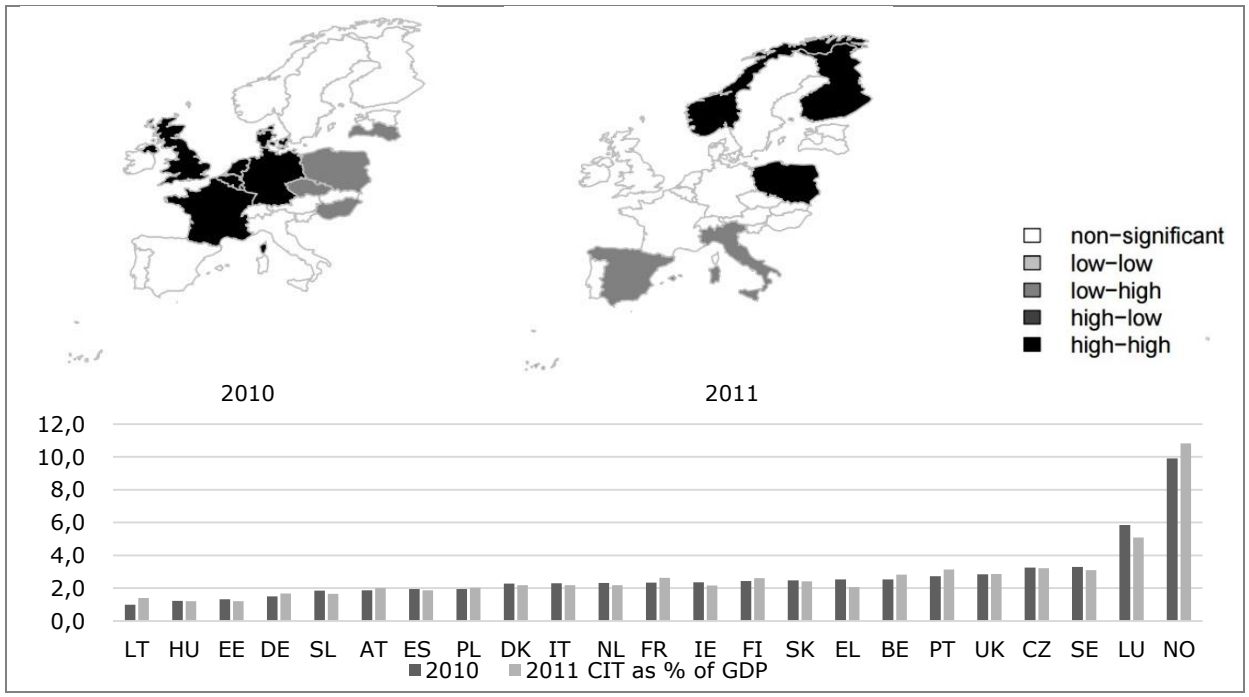
The analysis has shown that despite ongoing integration within the European countries, differences still remain between member states. These differences are both in the indicators of the countries´ maturity, but also in the economic policies of individual

governments. It is confirmed that the process of integrating and harmonizing policies is a long-term, dynamic and unique process.

Period 2010 to 2011

In 2009, corporate tax revenue, compared to 2008, declined as a result of the culminant financial crisis, with the exception of Luxembourg (a negligible increase of 3.59%). In general, Luxembourg regularly increases the revenue from income tax of legal entities despite the very small size of the territory. This is due to the existence of a large and highly developed financial sector and a highly internationalized tax base. This result was also reflected in the graphical representation. The number of decrease varied in countries (the highest in Latvia by 59.83% and the lowest in Slovenia 2.71%). These considerably heterogeneous values have resulted in statistically insignificant spatial autocorrelations in most locations. Years 2010 and 2011 represent a period of economic recovery, resulting in a growth in corporate tax revenue. As we can see, this rise was triggered in 2010 by the largest European economies (Germany, the United Kingdom, France), which have also positively influenced their neighbours. These countries have a long-term above-average tax rates (above the EU average for the year). Despite that the traditional indicator of the tax quota points to a slight change in shares of corporate tax on GDP in the years 2010 and 2011.The tax reform in 2008 in Germany brought significant changes in the taxation of legal entities, what immediately reflected in the revenues of the state budget. This change also affected the growth of corporate tax revenues, which improved the country's position on the high-high position, as well as in the neighboring countries of France, Netherland, Belgium, Luxemburg, and the Great Britain.

Figure 2 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2010 and 2011



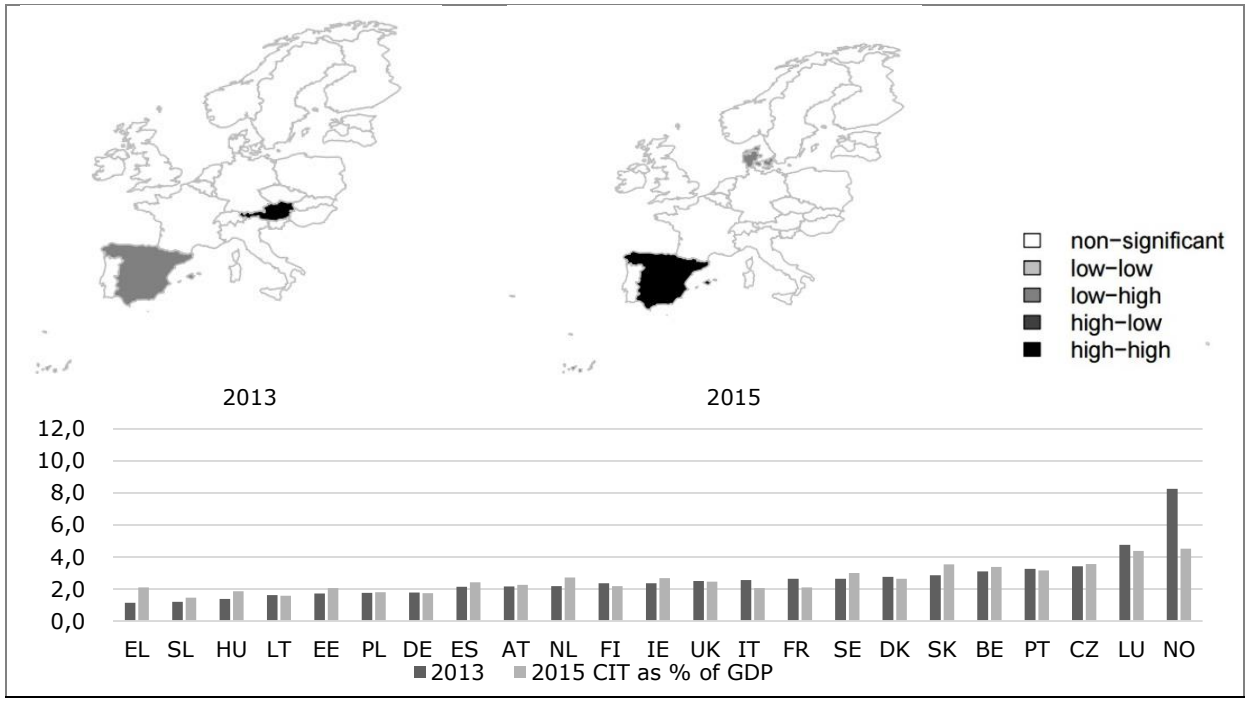
Source: Authors

In 2011, expansion has also shifted towards northeast of Europe, where it is possible to see the growth in corporate tax revenues of Norway and Finland and their neighbours, and Poland and its neighbours. Decline in corporate tax revenue has been seen in Spain and Italy as a result of the surge in this indicator of neighbouring countries.

Period 2013 to 2015

Between 2013 and 2015, a gradual harmonization of tax burden can be observed, resulting in the statistical non-significance of spatial autocorrelation in most locations. As we can see in the picture below, most of the observed countries hold the position of a non-significant impact of neighbours on changes in the growth of their corporate tax revenues. Significant changes are observed only in two countries; in 2013 in Spain, for which the low-high position is significant. Spain is one of the European states that was severely affected by the crisis and has not yet recovered. The bad state of public finances and the generally weakened health of the economy forced the Spanish government to make changes in the tax system as well. Spain, with the level of tax burden thus belongs to the group along with Greece, Ireland or Portugal. Applied changes in the tax system subsequently resulted in a change in the country's position in 2015.

Figure 3 Autocorrelation of growth of corporate tax revenue by using LISA method and tax quota as % of GDP in 2013 and 2015



Source: Authors

5 Conclusions

Examining the development of corporate tax is often complemented by a comparison of corporate tax revenues between selected countries by traditional or specific methods. Realized analysis confirm that the decline in the growth of corporate tax revenue is affected by the change in tax and macroeconomic indicators of neighbouring countries, where the growth of corporate tax revenues rises. In conclusion we interpret that within the selected EU countries, the imbalances in positions of individual countries were identified by using the LISA method. These imbalances are sequentially equalize within the integration group. The results of tax quota II show that the fall in the tax rate was not reflected in the decrease of tax revenues. This is due to the trend in the expansion of tax bases in individual countries, the granting of tax concessions and incentives to foreign investors and the improvement of the economic situation in all EU countries. Furthermore it is clear that despite ongoing integration within the EU countries and efforts to harmonize the tax system in the field of corporate taxation, there are still divergences between the member states.

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How are 1bis pension pillar funds performing? A cross-country analysis

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Abstract: *Private DC pension schemes implemented in CEE countries possess common features in the way how contributions are made, investment vehicles and investment management. As the investment risk and subsequent adequacy risk is effectively shifted onto savers, pension funds' performance net of fees and inflation is of utmost importance for the sustainability of the pension schemes and ability to deliver expected results from the view of replacement ratios. Understanding the investment returns and the impact of fees under the comparative analysis is therefore our main objective. Object of our research are the particular investment vehicles (pension funds) in three countries: Slovakia, Estonia and Latvia. Subject of our research is the risk adjusted returns of analyzed pension funds provided under the 1bis pillar pension scheme in these countries. We use conventional Sharpe and Sortino ratio to assess the performance and confirm that even if there are no major differences in investment policies, the risk adjusted performance is vastly different even when comparing similar pension funds based on their portfolio structure. We also suggest that these differences in risk adjusted performance may result in vastly different pension pots and thus replacement ratios.*

Keywords: 1bis pension pillar, pension funds, Sharpe ratio, Sortino ratio, performance

JEL codes: J26, J32, H55, O16, G11

1 Introduction

Over the past 20 years, several post-socialist countries have adopted World Bank recommendations and created a multi-pillar pension system by reforming pension systems. The traditional pay as you go (PAYG) system has been supplemented by the 1bis and third pillars, which are personal funded pension schemes, investing pension savings on the financial markets.

As the risks including the adequacy risk measured by replacement ratio are effectively shifted onto savers, ability to achieve targeted level of pension pot is of crucial importance. Two main determinants on the side of pension asset management companies influence the overall outcome: fees and performance.

In our article, we focus on three countries representing a pure DC private pension scheme (1bis pillar) – Slovakia, Estonia and Latvia. These countries have similar features of 1bis pillars and could be an object of comparative analysis. We focus on gross and net pension funds' performance in 1bis pillars in selected countries aggregated by fund category. According to the applicable law in these countries, by the term 1bis pillar we understand (Berthon et. al., 2016, Mavlutova, Titova and Fomins, 2016 or Malíček and Sokolová, 2016):

a) voluntary funded defined contribution (DC) scheme in Slovakia,
b) mandatory funded DC scheme in Estonia,

c) mandatory state funded pension scheme, which is financed partially by the social insurance contributions diverted from Pillar I in Latvia.

The aim of this paper is to analyze net and gross pension fund performance aggregated into categories based on portfolio structure. Using classic ratios as Sharpe ratio and Sortino ratio, we evaluate risk adjusted returns of pension funds and compare results of pension funds categories in selected countries.

2 Methodology and Data

In this paper, we work with monthly *m* and yearly *t* data about pension funds during the life of the 1bis pillar in selected countries. Table 1 below contains list of selected countries with data source and observed period.

Table 1 List of selected countries with source of data and observed period

	Acronym	Data Source	Observed period
Slovakia	SVK	NBS, www.manazeruspor.sk	2005 - 2016
Estonia	EST	www.pensionikeskus.ee	2003 - 2016
Latvia	LAT	www.manapensija.lv	2003 - 2016

Source: authors' elaboration

For valid evaluation of pension funds in selected countries we need to calculate yearly *t* gross returns *R* before inflation after fees for each pension funds *i* in every fund category *c* in pension system in country *j* as follows:

$$R_t^{i,c,j} = \frac{P_t^{i,c,j}}{P_{t-1}^{i,c,j}} - 1 \tag{1}$$

where $P_t^{i,c,j}$ is price of pension fund in category and country in time *t*, $P_{t-1}^{i,c,j}$ is price in previous period *t-1* and $t \in (1, \dots, T)$. Than we calculate weighted gross returns for each pension funds category $R_t^{c,j}$ as follows:

$$R_t^{c,j} = \frac{\sum R_t^{i,c,j} * AuM_t^{i,c,j}}{AuM_t^{c,j}} \tag{2}$$

where $AuM_t^{i,c,j}$ is value of asset under management of pension funds *i* in category *c* in country *j* at time *t* and $AuM_t^{c,j}$ is value of asset under management in category *c* in country *j* at time *t.* Than we calculate R_t^j as an overall gross profitability of whole pension system in country *j* in time *t* as follows:

$$R_t^j = \frac{\sum R_t^{c,j} * AuM_t^{c,j}}{AuM_t^j} \tag{3}$$

We indicate R_t^{*j} as an adjusted return after fees and inflation and calculate them as follows:

$$R_t^{*j} = R_t^j - I_t \tag{4}$$

where I_t is inflation rate valid for time *t.*

In order to evaluate pension funds' performance in selected countries, we apply two indicators which are widely used in financial practice. First is Sharpe ratio (SR) developed by Sharpe (1994, 2007). This ratio describes how much excess return investor receives for the extra volatility (risk) measure with different risk measures. SR is calculated as follow

$$SR_t^{c,j} = \frac{E[\mathrm{R}_t^{c,j} - \mathrm{R(f)}^j]}{\sigma[\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j]} \tag{5}$$

where $SR_t^{c,j}$ is value of Sharpe ratio for pension fund category *c* in country *j* at time *t* and $\mathrm{R(f)}_t^j$ is risk free rate valid for country *j* in time *t*. In this paper, we use returns of 3 month treasury bills for selected countries from OECD database valid for observed period present in Table 1 as a risk free rate. Next ratio is Sortino ratio (*SoR).* This ratio was introduced by Frank Sortino in 1968 and described by Sortino and Van Der Meer (1991) and Sortino, Van Der Meer and Plantinga (1999). As the Sharpe or Treynor ratio, this ratio measure the risk-adjusted return of portfolio. The Sortino ratio is a variation of the Sharpe ratio that differentiates harmful volatility from total overall volatility by using the asset's standard deviation of negative asset returns, called downside deviation or target downside deviation (TDD). We used Sortino ratio providing by Pedersen and Ruddholm-Alfin (2003) or Pekar, Cickova and Brezina (2016) as follows:

$$SoR_t^{c,j} = \frac{E[\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j]}{TDD_t^{c,j}} \tag{6}$$

where TDD can be calculated as follows:

$$TDD_t^{c,j} = \sqrt{\frac{1}{T}\sum_{t=1}^{T} \min(0, (\mathrm{R}_t^{c,j} - \mathrm{R(f)}_t^j))^2} \tag{7}$$

To calculate *SR* in (5) and *SoR* in (6) we use annualized returns of each pension funds category in each country for last 12 months.

In Table 2 we provide list of pension funds category with number of funds in each category used in our elaboration in this paper.

Table 2 Number of pension funds, fund category and country of origin

Fund category	Acronym	Country	Number of Funds
Stock pension funds	SPF	SVK, EST,LAT	6,5,8
Bond pension funds	BPF	SVK, EST,LAT	6,5,8
Mixed pension funds	MPF	SVK, EST,LAT	3,5,4
Index pension funds	IPF	SVK, EST	6,7,-

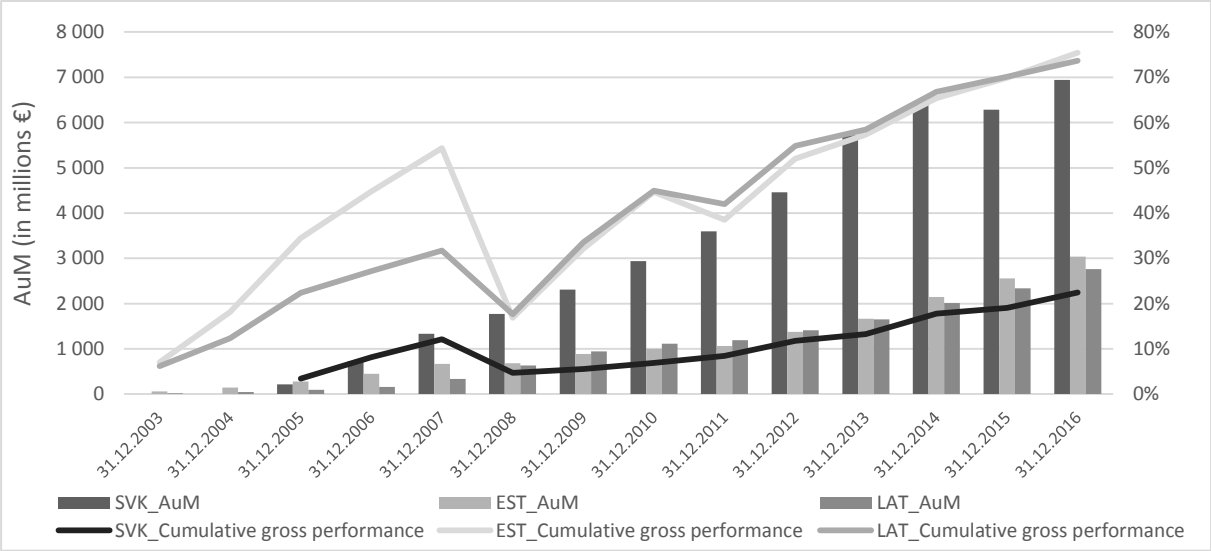
Source: authors' elaboration

All four categories of pension funds are provided by pension fund management companies only in Slovakia and Estonia. Only Latvia offers three type of pension funds (index pension fund category are missing).

3 Results and Discussion

In Figure 1 we could see very similar value of assets under management during following period in Estonia and Latvia with almost the same gross cumulative performance. Cumulative gross performance in these countries after 14 years of existence has reached 75,46 % in Estonia and 73,68 % in Latvia. In contrast, the volume of assets under management in Slovakia has grown significantly during the time and now stands at two to three times the amount of AuM in these two countries. Cumulative gross performance in Slovakia is significantly lower than in those countries, because of investment restriction in SPF´s and MPF´s from June 2009 till September 2012, large displacement of savers from risk pension funds to BPF´s in April 2013 till now (Šebo, Šebová and Virdzek, 2014) and mainly later inception of 1bis pillar than previous both Baltic countries. Different amount of AuM is due to the diversity of the national contributions and the amount of participants who contribute to this system (Berthon et. al., 2016).

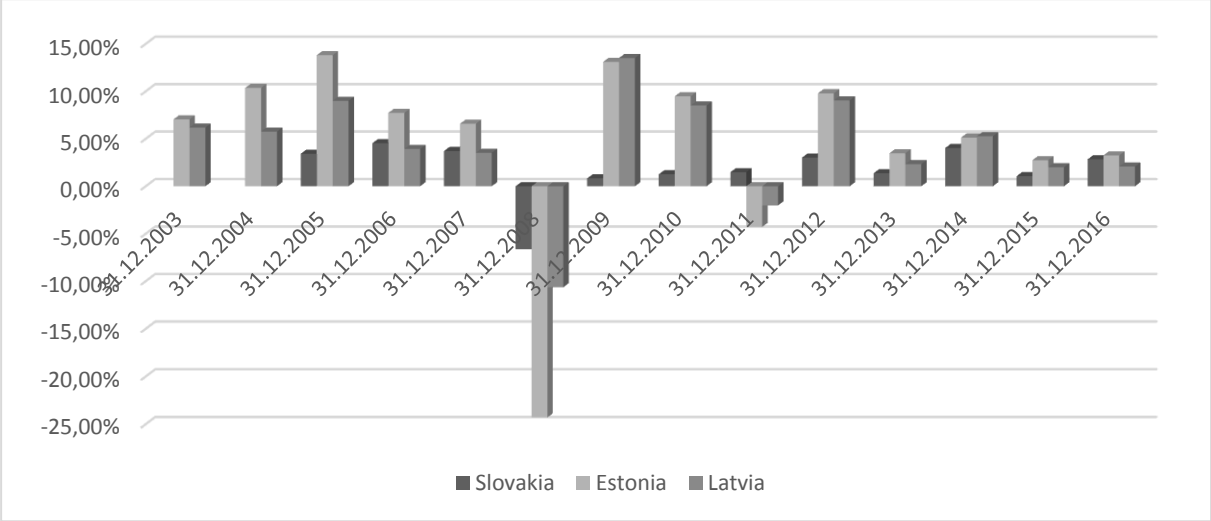
Figure 1 Assets under management gross cumulative performance in 1bis pillar in selected countries



Source: NBS, Manazeruspor.sk, Manapensija.lv, Pensionikeskus.ee, Money.net, 2017

In Figure 2, we see again very similar gross annual performance of pension system in Latvia and Estonia. This phenomenon is mainly due to almost identical investment policy in those countries (OECD, 2015). In Slovakia, gross annual performance is lower than in other countries for each year in following period due to later inception of 1bis pillar and investment restriction in the early years with huge amount of AuM in BPF´s after 2013. Further information about the share of each pension fund category in total assets in each country you can find in Berthon (2016).

Figure 2 Gross annual performance after fees before inflation in 1bis pillar in selected CEE countries



Source: NBS, Manazeruspor.sk, Manapensija.lv, Pensionikeskus.ee, 2017

According to Table 3, average annual gross return is the highest in Estonia, 4,56 % and Latvia 4,18 % p.a. In Slovakia, it is only 1,74 %. When we adjusted gross annual performance from inflation, we get net performance. Average net performance is below zero in Slovakia and Latvia, - 0,01 % and – 0,03 %. In Estonia, net performance is 1,16 % annually, which is better results than in previous countries. Another finding presented in the Table 3 is information about cumulative gross and net performance with

cumulative inflation. Estonia and Latvia has reached very interesting 75,46 % or 73,68 % cumulative performance from 2003 to 2016. This performance is significantly higher than Slovakia. In Slovakia, 1bis pillar has reached only 22,43 % cumulative performance from 2005 to 2016. This gross performance in Slovakia is significantly influenced by factors mentioned at the beginning of this chapter. When we adjust gross performance from inflation, we see real net cumulative performance which was provided by the 1bis pillar in each country. Big advantage of the 1bis pillar in Estonia and Latvia is their stable policy and minimal interference with the investment policies of pension fund management companies. Negative net cumulative performance is delivered by Slovakia (-0,87 %) and Latvia (-4,60 %) 1bis pillar. Estonia 1bis pillar delivers interesting net cumulative performance at the level of 7,37 %.

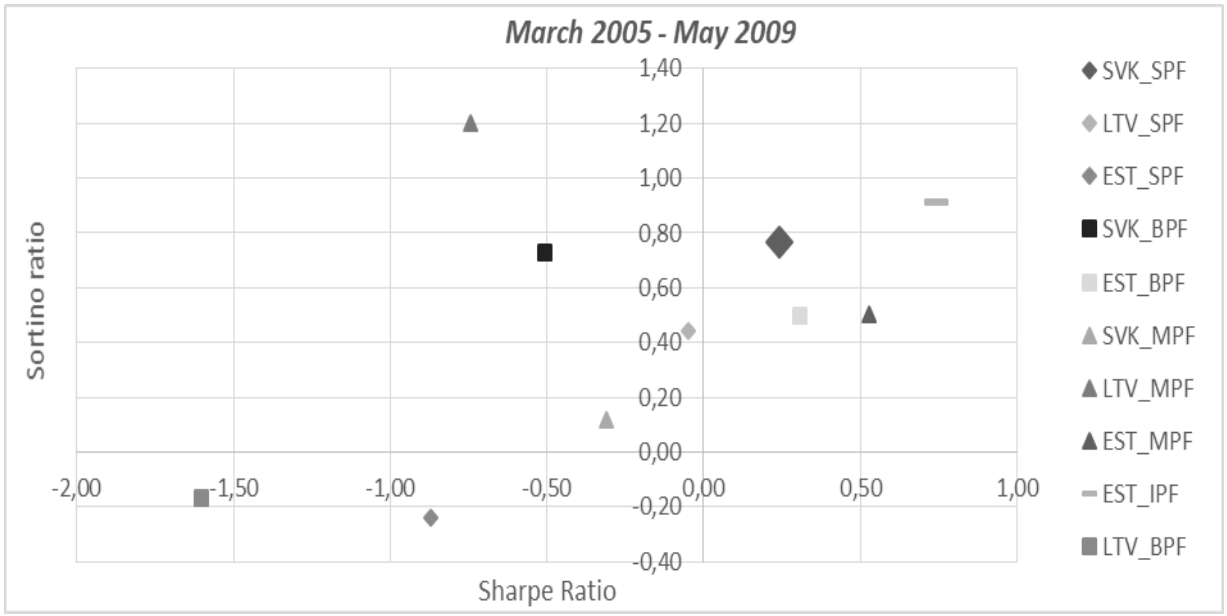
Table 3 Annual average and cumulative gross and net performance of pension system in selected countries from 2003 till 2016 (*in Slovakia from 2005)

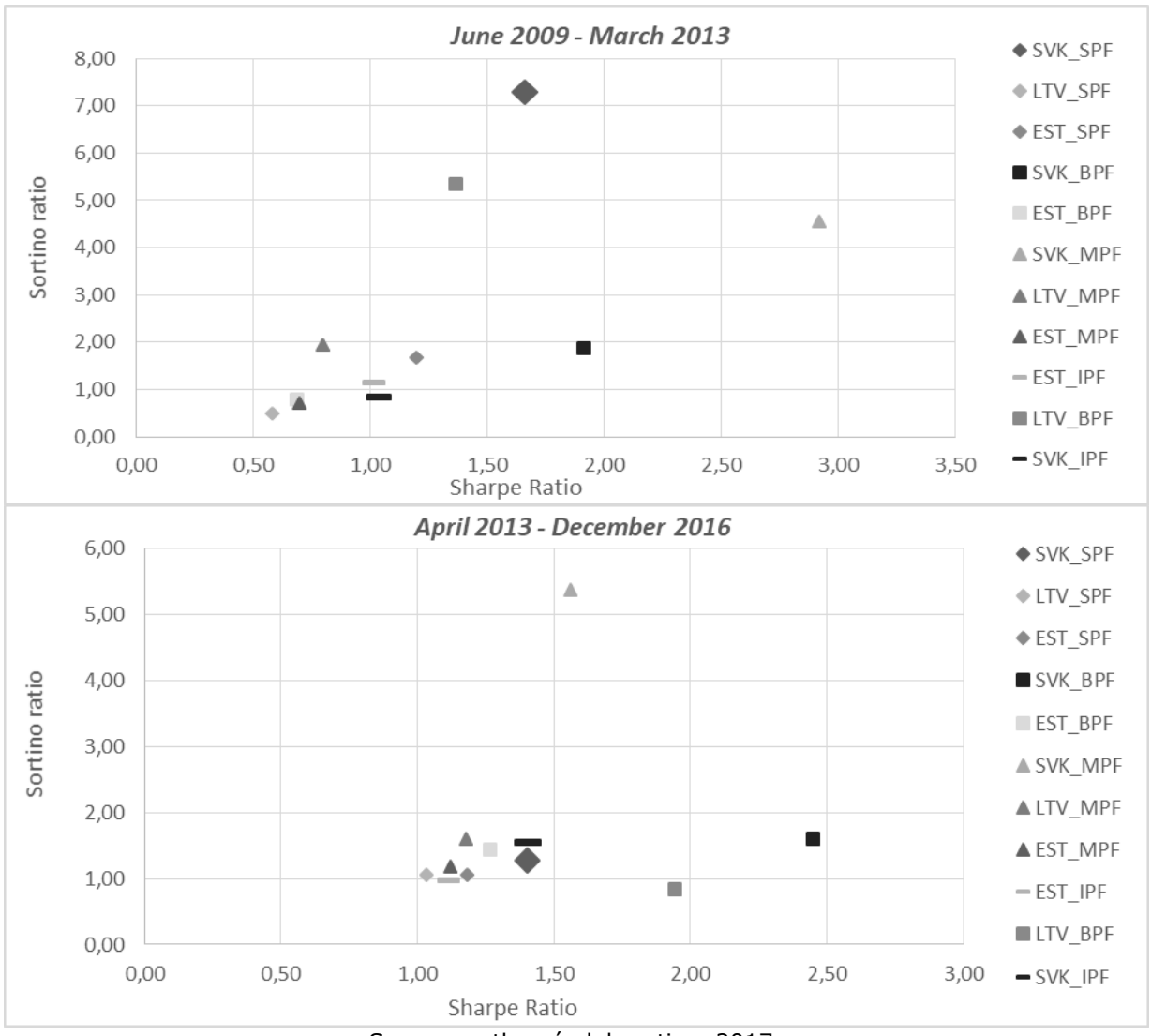
	Average performance			**Cumulative performance**		
	Gross	**Inflation**	**Net**	**Gross**	**Inflation**	**Net**
Slovakia*	1,74 %	1,75%	-0,01 %	22,43%	22,94%	-0,51 %
Estonia	4,56 %	3,40 %	1,16 %	75,46 %	58,74 %	16,71 %
Latvia	4,18 %	4,15 %	-0,03 %	73,68 %	74,64 %	-0,96 %

Source: authors' elaboration, 2017

In Figure 3, we provide comparison of average SR and SoR in three different time periods between 2005 and 2016 for each pension fund category in Slovakia, Estonia and Latvia. Selected time periods are based on essential interventions in the pension system in Slovakia (Šebo, Šebová and Virdzek, 2015) in June 2009 and 2013 which were mentioned at the beginning of this chapter(*).

Figure 3 Average monthly Sharpe and Sortino ratio in selected countries calculated for 3 periods





Source: authors´ elaboration, 2017

During the period from March 2005 till May 2009, we observed in all Estonian pension funds categories relatively low SR, but higher than SR observed in other countries. This period is characterized by big bull market from 2005 to 2007 and one of the biggest bear market in 2008 because of financial crises. In other countries, almost all pension funds categories had negative SR (below 0), except Slovakia SPF which is above 0. The lowest SR was provided by Latvia BPF and Estonia SPF. When we compare adjusted return and target downside deviation, we observed almost all pension funds categories above 0, except Latvia BPF and Estonia SPF again. In Latvia MPF fund category, we observed the highest excess returns per unit of target downside deviation. Estonia IPF and Slovakia BPF and SPF also had relatively higher SoR in the following period.

In the next period from June 2009 to March 2013, we can see significantly different results. No funds deliver negative average returns. In case of Slovakia, all non-guaranteed pension funds (SPF and MPF) were exposed to the 6 months of benchmarking to guarantee a minimum 0 % appreciation of assets in the fund. In this time PFMCs sold out a significant part of shares from the portfolio of SPF and MPF from June 2009 to September 2012 and by substituting it with less volatile bond instruments (Mešťan, Kubaška and Králik, 2016). Despite the fact, all Slovakia pension fund categories have higher SR than 1 and significantly higher SoR which indicates relatively good adjusted performance from risk free rate against risk measured by standard deviation or target

downside deviation in this funds categories. When we look at Figure 2, we can see lower pension fund performance in Slovakia than in others countries while Latvia and Estonia had SR and SoR worse than Slovakia. We can see significantly better performance in Latvia pension funds. A slight improvement can be observed even with pension funds in Estonia. When we compare their performance providing in Figure 2, we can see that their pension funds had relatively high standard deviation from excess returns. Latvia pension funds improved their results significantly compared to the previous period. Estonia and Slovakia IPF (in Slovakia was launched in April 2012) provide less excess return for one unit of risk than other pension funds category mainly due to higher risk and much more stocks in their portfolio.

Between April 2013 and December 2016, we observed very similar results of individual indicators in almost all PFs categories, with the exception of MPF in Slovakia and BPF in Slovakia and Latvia. In this period pension funds in following countries did not have any significant investment restriction in their investment policy in pension funds.

In table 4, we have differentiated the color values of the indicator in selected periods from the best (green color) to the worst (red color). In general, we cannot mark one pension fund category or country as the best perform during the time. In some period of time, according to SR or SoR, BPFs or MPFs are the best performing pension funds categories in some countries. On the other side, the worst performance is provided by SPF and IPF. Relatively low SR or SoR could indicate higher returns and volatility in SPFs and IPFs, and lower returns with lower volatility could be in MPFs and BPFs because of the portfolio structure in this category.

Table 4 Order of monthly average values of the Sharpe ratio and Sortino Ratio for each pension funds category in selected countries in reference periods.

	Sharpe ratio			Sortino ratio		
Fund type	**March 2005 - May 2009**	**June 2009 - March 2013**	**April 2013 - December 2016**	**March 2005 - May 2009**	**June 2009 - March 2013**	**April 2013 - December 2016**
SVK_SPF	0,07	0,48	0,40	0,77	7,28	1,27
LTV_SPF	-0,05	0,17	0,3	0,44	0,49	1,06
EST_SPF	-0,25	0,34	0,34	-0,24	1,67	1,06
SVK_BPF	-0,15	0,55	0,71	0,73	1,87	1,60
LTV_BPF	-0,46	0,39	0,56	-0,17	5,35	0,83
EST_BPF	0,09	0,20	0,37	0,50	0,80	1,44
SVK_MPF	-0,09	0,84	0,45	0,12	4,56	5,37
LTV_MPF	-0,22	0,23	0,34	1,20	1,95	1,61
EST_MPF	0,15	0,20	0,32	0,50	0,70	1,19
SVK_IPF	-	0,30	0,40	-	0,84	1,56
EST_IPF	0,21	0,29	0,32	0,91	1,13	0,97

Source: authors' elaboration

When we evaluate pension funds' performance, we need to look at structure of savers in this system – not risk profile of savers, but their age structure. Without these information we cannot mark pension fund with lower SR, SoR or lower returns as the worst pension funds because savers in this fund could be mainly above 50 years and they are very close to retirement age. Unfortunately, available data about pension system in selected countries do not provide this information publicly.

4 Conclusions

Pension funds' gross performance in Estonia and Latvia is much higher than in Slovakia, but net performance in Slovakia is higher than in Latvia but still less than in Estonia (due to investment restriction in SPF´s and MPF´s from June 2009 till September 2012 and large displacement of savers from risk pension funds to BPF´s in April 2013 till now). Slovak 1bis pillar has almost twice as much asset under management as Latvia and Estonia. In general, SPFs and IPFs provide higher gross and net return than BPFs and MPFs. Evaluation results of pension funds categories in selected countries based on SR and SoR, which compare returns against risk, are not so clear. In the pre-crisis period we observed higher ratios in Estonia IPF, MPF and BPF categories, but in the next period, these pension funds categories has much worse results.

Acknowledgments

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The structure of limited liability companies with low registered capital

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Abstract: *The extensive recodification of private law in the Czech Republic, which was actively taking place primarily from 2002 to 2012, was completed on January 1, 2014, when Act No. 89/2012 Coll., the Civil Code, and subsequent Act No. 90/2012 Coll., on Commercial Companies and Cooperatives (Business Corporations Act), came into effect. Since that date, besides other things, the amount of minimum registered capital necessary for setting up limited liability companies has changed. At present, the minimum member´s contribution is CZK 1. The paper aims to analyse the structure of limited liability companies with registered capital less than CZK 200,000. The first chapters will clarify the reasons that had led to the reduction of the minimum amount of registered capital, and also the advantages and disadvantages that this reduction has brought about. The next chapters will examine the distribution of companies with low registered capital by individual regions and industrial sectors in the Czech Republic. The paper will also answer the question of whether there is a relation between the amount of registered capital and the territorial, or more precisely sectoral structure of limited liability companies. A separate chapter will deal with the analysis of companies with registered capital from CZK 1 to CZK 1,000.*

Keywords: code on capital corporation, law capital, limited liability company, registered capital

JEL codes: G32, C12, K22

1 Introduction

The extensive recodification of private law in the Czech Republic, which was actively taking place primarily from 2002 to 2012, was completed on January 1, 2014, when Act No. 89/2012 Coll., the Civil Code, and subsequent Act No. 90/2012 Coll., on Commercial Companies and Cooperatives (Business Corporations Act), came into effect. The re-codification of private law returns the system of law to the continental legal conventions and a fundamental basis is therefore one basic code of private law (the Civil Code), which comprehensively regulates civil relations. Until then, the legal regulation of business corporations (formerly commercial companies) was contained almost exclusively in the Commercial Code, and the Civil Code was applied to business corporations only exceptionally. After the recodification, the Civil Code is a basic and general legal regulation. The Business Corporations Act contains only the legal regulation of some specifics of business corporations. Besides other things, it determines the minimum amount of each partner´s contribution to a symbolic CZK 1.

The paper aims to analyse the structure of limited liability companies with registered capital of less than CZK 200,000 (focusing on companies with their registered capital of CZK 1 – CZK 1,000), and in particular to assess the relationship between territorial/sectoral structure and the amount of registered capital.

2 Reasons, advantages and disadvantages of reducing the minimum amount of registered capital

The previous legal regulation stipulated CZK 100,000 to be the minimum amount of registered capital (until 31 December 2000) and later it was CZK 200,000 (until 31

December 2013). The determined minimum amount of registered capital was to ensure the fulfilment of its functions, which were attributable to the registered capital at that time. According to Dědič, Kunešová-Skálová (1999, p. 76), the functions of registered capital, besides other things, include the guarantee function and that of the partner´s share in the company. In terms of economics, the stipulation of a higher minimum value of registered capital may be considered as a certain barrier to the access of new companies on the market. The guarantee function of registered capital was indisputably crucial.

The purpose of registered capital was to replace the missing unlimited responsibility of partners for company´s liabilities and to provide creditors with a guarantee that the company had at least certain assets amounting to its registered capital. (Dědič, 2002) However, experts usually agree that registered capital did not fulfil its guarantee function well. That was the main reason for limiting the institute of registered capital. It has become a mere accounting record in the Commercial Register and did not practically secure the necessary guarantee for protecting the interests of company´s creditors. The law no longer required that companies maintained their assets in the same amount as well. (Hejda et al., 2014)

Under the Business Corporations Act, the guarantee function is secured by other ways, in particular by the so-called insolvency test (section 34 and section 40 of the Business Corporations Act) and stricter rules of administration. The liability of directors for damage caused to the company by their acts have been tightened and made more accurate. The new legal regulation has increased the protection of creditors. To put it simply, a limited liability company becomes a company with an unlimited liability in case that the Director or Directors fail to act in the interests of the company and the company will declare its bankruptcy by reason of their ill-considered decision-making.

Perhaps, the only advantage of a low registered capital is the lower cost to set up a limited liability company because the founder does not have to make a capital contribution of many thousands. There are groups of businessmen for whom this change will make their conduct of business easier. Entrepreneurs who are more likely to operate on local markets, have low start-up costs, and are able to cover their company´s operation by sales rank among them. For these small businessmen, the previously required registered capital of CZK 200,000 could have been the reason for not setting up a limited liability company, because they had to obtain funds for it by loan capital. There are also sectors where the amount of registered capital does not virtually matter. Typical examples are frequently converted doctors´ offices to limited liability companies, which usually have a registered capital of up to CZK 1,000.

However, the low value of registered capital may make the impression of non-credibility, especially in case of companies operating on the national or international market. Although the high value of registered capital does not guarantee solvency (as explained hereinbefore), it is perceived more positively in the eyes of business partners and other people than the Czech crown value.

The lack of funds, especially in the early stages of business, when it is not possible yet to finance business activities from profit, may be the disadvantage of a low registered capital. If the company uses a loan capital to cover operating costs, it may fast go into bankruptcy due to its overindebtedness, because the liabilities may quickly exceed the value of assets (see section 3 of Act No. 182/2006 Coll., the Insolvency Act).

3 Methodology and Data

The necessary data on the companies were obtained from the Bisnode Albertina database. The data file includes limited liability companies which were established between 2014 and 2016. The data were collected in the second and third months of 2017. Calculations were performed using MS Excel and SW Statistica.

To assess the relationship between the amount of registered capital and the sector in which the company operates, alternatively the amount of registered capital and the region in which the company was registered, the Chi-squared test of independence in contingency table was used. The Chi-squared test of independence is used to determine if there is a significant relationship between two nominal (categorical) variables. **Null hypothesis H_0** assumes that there is no association between the two variables. **Alternative hypothesis H_1 a**ssumes that there is an association between the two variables. Consider the null hypothesis that cell probabilities equal certain fixed values ϖ_{ij}. For a sample of size n with cell counts n_{ij}, the values $\mu_{ij} = n\varpi_{ij}$ are expected frequencies. They represent the value of the expectations when H_0 is true. To judge whether the data contradict H_0, we compare n_{ij} to μ_{ij}. If H_0 is true, n_{ij} should be close to μ_{ij} in each cell of contingency table. The larger the differences ($n_{ij} - \mu_{ij}$), the stronger evidence against H_0.

The Pearson chi-squared statistic for testing H_0 **is (Agresti, 2007):**

$$\chi^2 = \sum \frac{\left(n_{ij} - \mu_{ij}\right)^2}{\mu_{ij}} . \tag{1}$$

The χ^2 statistic has approximately a chi-squared distribution, for large n. Larger χ^2 values are more contradictory to H_0.

From the mentioned statistic 2, Cramer's coefficient V can be derived. It is a measure of association between two nominal variables and varies from 0 (corresponding to no association between the variables) to 1 (complete association). Cramer´s V is computed (Řezánková, 2011):

$$V = \sqrt{\frac{\frac{\chi^2}{n}}{\min\left(k-1, r-1\right)}} , \tag{2}$$

where n is the grand total of observation, k is the number of columns in contingency table and r is the number of rows in contingency table.

4 Results and Discussion

The structure of limited liability companies in the Czech Republic between 2014 and 2016

In 2014, when new legislation came into force, in total 24,266 new limited liability companies were established, 26,104 limited liability companies were established in 2015, and 27,946 in 2016. Of these nearly 60,000 companies were established with their registered capital lower than CZK 200,000, i.e. 76.5% of all newly registered limited liability companies. Therefore, it is evident that entrepreneurs have welcomed the possibility to set up a limited liability company with a minimum amount of registered capital.

Nearly one half of newly established companies in the period of 2014 - 2016 was registered in Prague. The Regions of South Moravia, Moravia-Silesia and Central Bohemia have an important position from the regional perspective. The fewest limited liability companies were registered in the Region of Karlovy Vary. This is a long-term trend, with the most companies being established in the vicinity of major cities where there are the most business opportunities. The situation is shown in Table 1.

Table 1 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the registration region

Region	CZK 1	CZK 2 – CZK 1,000	CZK 1,001 – CZK 100,000	CZK 100,001 – CZK 199,999	CZK 200,000 and above	Total
South Bohemia	153	471	1,392	18	471	**2,505**
South Moravia	507	1,948	5,167	86	2,072	**9,780**
Karlovy Vary	80	312	616	7	192	**1,207**
Hradec Králové	130	469	1,175	21	353	**2,148**
Liberec	99	348	901	16	281	**1,645**
Moravia-Silesia	367	1,210	3,524	60	1,307	**6,468**
Olomouc	103	389	1,762	28	487	**2,769**
Pardubice	94	356	1,127	20	377	**1,974**
Plzeň	126	384	1,441	30	540	**2,521**
Prague	2,061	7,468	15,524	513	10,114	**35,680**
Central Bohemia	330	1,151	2,698	59	1,011	**5,249**
Ústí nad Labem	155	650	1,264	27	447	**2,543**
Vysočina	65	274	814	8	341	**1,502**
Zlín	119	499	1,261	30	416	**2,325**
Total	**4,389**	**15,929**	**38,666**	**923**	**18,409**	**78,316**

Source: author´s own processing according to the Bisnode database, 2017

Table 1 shows that the largest proportion of companies has a registered capital amounting to CZK 1,001 – CZK 100,000. In individual regions, these companies accounted for 49.7% (in the Region of Ústí nad Labem) up to 63.6% (in the Region of Olomouc) of all newly established companies. On the other hand, entrepreneurs do not prefer the registered capital of CZK 100,001 – CZK 199,999 and the proportion of companies established with this registered capital ranges from 0.53% (in the Region of Vysočina) to 1.44% in Prague. Overall, the highest proportion of companies with registered capital amounting up to CZK 200,000 was recorded in the Region of Karlovy Vary (84.1%). The lowest percentage of these companies is logically in Prague (71.7%), where a great number of large, often multinational companies, which have a high amount of capital, are registered.

The dependence between the amount of registered capital and the territorial structure of companies was confirmed using the chi-square test of independence. However, the value of Cramer´s *V* coefficient was very low, $V = 0.069$. This implies a very low contingency rate. The file size determines acceptance of an alternative hypothesis and thus confirmation of dependence. With a large number of observations, dependence is often confirmed even with very small deviations between empirical and expected frequencies. Thus, it may be concluded that the dependence between the amount of registered capital and the region where the companies were established has been statistically confirmed, but the contingency is very low, which means that this dependence is not significant in practical terms. Table 2 presents the values of individual statistics.

Table 2 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the registration region - statistics

Pearson chi-squared statistic χ^2	p-level	Cramer's *V*
1,504.325	0.0000	0.069

Source: author´s own calculations, 2017

When reading the sectoral structure of newly established companies in the table, it is evident that the lowest proportion of companies with a low registered capital (up to CZK 200,000) in the observed period was recorded in the sectors of "Electricity, gas, heat and air conditioning supply" (56.3 %) and "Professional, scientific and technical activities" (68.4%). These are sectors for which a high input capital is typical.

Table 3 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the main business activity (by CZ-NACE)

	CZK 1	CZK 2 – CZK 1,000	CZK 1,001 – CZK 100,000	CZK 100,001 – CZK 199,999	CZK 200,000 and above	Total
A Agriculture, forestry and fishery	143	567	1,452	32	598	**2,792**
B Mining and quarrying	5	5	20	0	9	**39**
C Manufacturing industry	376	1,328	4,073	98	1,599	**7,474**
D Electricity, gas, heat and air conditioning supply	3	4	37	0	34	**78**
E Water supply; activities related to waste water, waste and sanitation	29	122	321	5	199	**676**
F Construction	292	1,029	2,874	56	1,272	**5,523**
G Wholesale and retail trade; repairs and maintenance of motor vehicles	1,156	3,888	10,102	198	4,273	**19,617**
H Transport and storage	113	403	1,009	19	511	**2,055**
I Accommodation, food and beverage service activities	310	1,273	2,831	35	752	**5,201**
J Information and communication technologies	145	554	1,429	42	532	**2,702**
K Finance and insurance	24	74	191	1	73	**363**
L Real estate activities	477	1,458	3,782	101	2,088	**7,906**
M Professional, scientific and technical activities	831	3,515	6,720	278	5,237	**16,581**
N Administrative and supporting activities	97	332	877	19	323	**1,648**
O Public administration and defense; social security	50	157	374	7	83	**671**
P Education	164	658	1,413	11	398	**2,644**
Q Health and social care	46	189	396	7	94	**732**
R Cultural, entertainment and leisure activities	55	188	547	7	147	**944**
S Other activities	73	185	218	7	188	**671**
Total	**4,389**	**15,929**	**38,666**	**923**	**18,409**	**78,316**

Source: author´s own processing according to the Bisnode database, 2017

When assessing the dependence between the amount of registered capital and the business sector, we come to the same conclusion as in the case of the previous analysis (the amount of registered capital vs. the territorial structure). Thus, testing has proved the dependence between the amount of registered capital and the sector of limited liability companies, but the contingency rate, i.e. the dependence rate is very low. The Cramer´s *V* coefficient was $V = 0.108$. In practical terms, this low coefficient more likely indicates the independence of observed variables. Other calculated statistics are shown in Table 4.

Table 4 Distribution of limited liability companies established between 2014 and 2016 by the amount of registered capital and the main business activity (according to CZ-NACE) – statistics

Pearson chi-squared statistic χ^2	p-level	Cramer's *V*
3,099.581	0.0000	0.108

Source: author´s own calculations, 2017

Analysis of limited liability companies with their registered capital of CZK 1 – CZK 1,000

Between 2014 and 2016, 20,318 limited liability companies with their registered capital of CZK 1,000 maximum were established in the Czech Republic. 4,389 companies had their registered capital amounting to CZK 1 and 15,929 companies with their registered capital of CZK 2 – CZK 1,000 were established.

Table 5 shows the distribution of companies within individual regions in the Czech Republic. When comparing the values in columns B and F, it is possible to identify regions where the percentage of limited liability companies with their registered capital amounting up to CZK 1,000 is relatively low (compared to other regions). This situation occurs when the value in column F is lower than the value in column B. This applies to the Regions of South Bohemia, South Moravia, Olomouc, Pardubice, Plzeň and Vysočina. Interesting values are given in column G, where the percentages of newly established limited liability companies with registered capital of CZK 1 – CZK 1,000 to the total number of newly established companies in individual regions of the Czech Republic are recorded. The Region of Karlovy Vary, where the observed percentage is 32.48%, may be included in the regions with the highest proportion of low-capital companies. That implies that more than one third of the newly established limited liability companies in the Region of Karlovy Vary have their registered capital amounting to a CZK 1,000 maximum. The proportion is also high in the Region of Ústí nad Labem, namely 31.66%. It may be assumed that the proportion of low-capital companies may also reflect the overall economic position of the regions. Both Regions of Karlovy Vary and Ústí nad Labem have taken last places in the rankings of the regions for a long time. On the contrary, the proportion is lower than 20 % in the Region of Olomouc, as in the only region in the Czech Republic.

Table 5 Distribution of limited liability companies with a registered capital amounting to CZK 1 – CZK 1,000 by the individual regions in the CR between 2014 and 2016

	Number of newly established limited liability companies (irrespective of the amount of registered capital)	Percentage distribution of newly established limited liability companies in individual regions	Number of newly established limited liability companies with a registered capital of CZK 1	Number of newly established limited liability companies with a registered capital of CZK 2-CZK 1,000	Number of newly established limited liability companies with a registered capital of CZK 1,000 maximum	Percentage distribution of newly established limited liability companies with a registered capital of CZK 1,000 maximum in individual regions	Percentage share of new limited liability companies with their registered capital of CZK 1,000 max. to the total number of new l. l. companies in individual regions
	A	B=A/ΣA·100	C	D	E = C + D	F=E/ΣE·100	G=E/A·100
South Bohemia	2,505	3.20	153	471	624	3.07	24.91
South Moravia	9,780	12.49	507	1,948	2,455	12.08	25.10

Karlovy Vary	1,207	1.54	80	312	392	1.93	32.48
Hradec Králové	2,148	2.74	130	469	599	2.95	27.89
Liberec	1,645	2.10	99	348	447	2.20	27.17
Moravia-Silesia	6,468	8.26	367	1,210	1,577	7.76	24.38
Olomouc	2,769	3.54	103	389	492	2.42	17.77
Pardubice	1,974	2.52	94	356	450	2.21	22.80
Plzeň	2,521	3.22	126	384	510	2.51	20.23
Prague	35,680	45.56	2,061	7,468	9,529	46.90	26.71
Central Bohemia	5,249	6.70	330	1,151	1,481	7.29	28.21
Ústí nad Labem	2,543	3.25	155	650	805	3.96	31.66
Vysočina	1,502	1.92	65	274	339	1.67	22.57
Zlín	2,325	2.97	119	499	618	3.04	26.58
Total	**78,316**	**100.00**	**4,389**	**15,929**	**20,318**	**100.00**	**---**

Source: author´s own processing according to the Bisnode database, 2017

Table 6 shows the distribution of limited liability companies according to the CZ-NACE classification of economic activities. In terms of the analysis performed, it is important to compare the values in column B (the distribution of limited liability companies regardless of the amount of registered capital according to CZ-NACE) and column F (the distribution of limited liability companies with a registered capital of up to CZK 1,000 according to CZ-NACE). Only 7 companies in Section D "Electricity, gas, heat and air conditioning supply" with their registered capital amounting up to CZK 1,000 maximum were established in the observed period. The proportion of low-capital companies registered in this sector in the observed period is only 8.95%. Other companies established in this sector had their registered capital higher. It has been explained hereinbefore that this sector is associated with high input costs and therefore usually a higher registered capital. However, section D also includes companies engaged in electricity trade (class 35.14 according to CZ-NACE) and these companies often conduct business with a low registered capital. The mining and quarrying industry is also associated with high input costs, but this industry has an unexpectedly relatively high proportion of low-capital companies to the total number of newly registered companies in this sector, namely 25.94%. According to CZ-NACE, companies with a low registered capital operating in this sector are classified especially as class 08.09 (Other mining and quarrying n.e.c.). These companies are also often linked to other companies that already have a high registered capital. One may therefore believe that low-capital companies are set up to secure and perform certain supporting activities and are financially connected to other companies.

Table 6 Distribution of newly established limited liability companies by the sectoral classification CZ-NACE between 2014 and 2016

	Number of newly established limited liability companies (irrespective of the amount of registered capital)	**Percentage distribution of newly established limited liability companies in individual sectors**	**Number of newly established limited liability companies with a registered capital of CZK 1**	**Number of newly established limited liability companies with a registered capital of CZK 2-CZK 1,000**	**Number of newly established limited liability companies with a registered capital of CZK 1,000 maximum**	**Percentage distribution of newly established limited liability companies with a registered capital of CZK 1,000 maximum in individual**	**Percentage share of new limited liability companies with their registered capital of CZK 1,000 max. to the total number of new l. l. companie**

					sectors	s in individual sectors
	A	B=A/ΣA·100	C	D	E = C + D	F=E/ΣE·100	G=E/A·100
A Agriculture, forestry and fishery	2,792	3.57	143	567	710	3.49	25.43
B Mining and quarrying	39	0.05	5	5	10	0.05	25.94
C Manufacturing industry	7,474	9.54	376	1,328	1,704	8.39	22.80
D Electricity, gas, heat and air conditioning supply	78	0.10	3	4	7	0.03	8.95
E Water supply; activities related to waste water, waste and sanitation	676	0.86	29	122	151	0.74	22.34
F Construction	5,523	7.05	292	1,029	1,321	6.50	23.92
G Wholesale and retail trade; repairs and maintenance of motor vehicles	19,617	25.05	1,156	3,888	5,044	24.83	25.71
H Transport and storage	2,055	2.62	113	403	516	2.54	25.11
I Accommodation, food and beverage service activities	5,201	6.64	310	1,273	1,583	7.79	30.43
J Information and communication technologies	2,702	3.45	145	554	699	3.44	25.87
K Finance and insurance	363	0.46	24	74	98	0.48	27.02
L Real estate activities	7,906	10.10	477	1,458	1,935	9.52	24.47
M Professional, scientific and technical activities	16,581	21.17	831	3,515	4,346	21.39	26.21
N Administrative and supporting activities	1,648	2.10	97	332	429	2.11	26.04
O Public administration and defense; social security	671	0.86	50	157	207	1.02	30.83
P Education	2,644	3.38	164	658	822	4.05	31.09
Q Health and social care	732	0.93	46	189	235	1.16	32.10
R Cultural, entertainment and leisure activities	944	1.21	55	188	243	1.20	25.73
S Other activities	671	0.86	73	185	258	1.27	38.45
Total	**78,316**	**100.00**	**4,389**	**15,929**	**20,318**	**100.00**	

Source: author´s own processing according to the Bisnode database, 2017

5 Conclusions

The paper has presented some possible benefits but also risks associated with the legislative change of the minimum amount of registered capital necessary for limited liability companies. Currently, the minimum amount of registered capital is CZK 1. At the same time the liability of directors for business management has increased. Nevertheless, entrepreneurs have welcomed the opportunity to choose any amount of registered capital. The performed analysis has shown that 76.5% of companies established between 2014 and 2016 had their registered capital lower than CZK 200,000. More than a quarter of the companies had their registered capital lower than CZK 1,000. Most often, entrepreneurs in the Regions of Karlovy Vary and Ústí nad Labem choose the

low registered capital. Although the statistical dependence between the amount of registered capital and the sectoral/territorial structure of companies has been proved, the intensity of this dependence is very low and practically insignificant.

The new legislative amendment is effective since 2014 and only time will show how it will influence not only the business environment.

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Assessing and Managing Absenteeism with Bradford Factor Score Analysis

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Abstract: *Proper work with quantitative data is important for each segment of a company including Human Resource Management. People analytics represents a data-driven approach to HRM and implementation of quantitative models in decision processing about company´s workforce planning. Absenteeism is becoming an issue with high importance for all production companies. High costs following increasing absenteeism connected with decreased production or increased overtime work are at stake, and companies feel the necessity to set action steps and try to deal with it. This work aims to present the analysis of sick leave absenteeism based on information from five production companies with almost four thousand employees in total during 2016 and ways of managing and dealing with sick leave absenteeism. Focus groups are determined and their approach to absenteeism is discussed as well as HRM approach to this problem. Furtherly the analysis based on Bradford factor score is proposed. Bradford factor score represents a managerial tool to evaluate individuals according to the total length of their absenteeism and frequency of their absenteeism events. Rules and ways of possible active use of Bradford factor score analysis to manage the level of absenteeism are described and active action steps of HRM policies are discussed.*

Keywords: Absenteeism, Bradford Factor Score analysis, Human Resource Management (HRM), People Analytics

JEL codes: J11, M50

1 Introduction

Growing trend in employees' sick leave absenteeism in production companies is a very current issue. Sick leave absenteeism plays important role also in the organization of work and consequently in the costs of the company. This issue is discussed daily by company management and personalists. Growing trend is shown in Figure 1 presenting that sick leave absenteeism almost doubled between years 2013 and 2016. Increasing employee sick leave is currently the subject of many researches, such as Ala-Mursula, L., Vahtera, J., Linna, A., Pentti, J., & Kivimäki, M. (2005), Bakker, A. B., Demerouti, E., De Boer, E., Schaufeli, W. B. (2003) and Delgado, M. A. and Kniesner T. J. (1997) identifying and analyzing the reasons for increasing sick leave. Common feature of increasing absenteeism in an organization is that organizations often investigate the root causes and factors while being unable to deal with the consequences and being uninformed about any ways of active policy reducing the sick leave share on nominal work fund, Georges, D. and Benoit, D. (2007).

Dealing with sick leave absenteeism also represents a difficult task due to possible technical or moral problems. It is also challenging for employers to create conditions for effective monitoring and measuring. It is important for the organization to have or establish system of effective evidence such electronic attendance system supported by collecting written and confirmed document from a doctor. This way the organization also

avoids unauthorized and unnecessary absenteeism. On the other hand, it is important to maintain work-friendly environment and support the absenteeism when needed because the cost can multiply when a sick employee spread the sickness or when the employees' health gets even worse. All analyzed companies fulfill conditions of effective monitoring and comes from a productive area from Moravian-Silesian region, which allows us to combine gathered data in order to create large population of almost four thousand employees with enough empirical evidence about the sick leave oriented behavior of their employees.

In this study we present Bradford factor score analysis, which gives higher weight to the amount of absenteeism events rather than simply measuring the total length of absenteeism. Bradford factor score analysis is calculated with the data from calendar year 2016 and ways of application are described in chapter two. Use of Bradford factor analysis was described also in Hopkins, B., Dawson C. Veliziotis M. (2015) for tracking absenteeism of agency workers. We aim to analyze and describe ways to manage sick leave absenteeism and reduce unnecessary absenteeism events while keeping work-friendly policy toward employees. We propose to visualize the Bradford factor score also with amount employee's absenteeism events to secondarily sort employees according to their absenteeism frequency. Evaluation of application of Bradford factor score analysis with proposition of possible solutions to reduce unnecessary sick leave absenteeism is summarized in the conclusion.

Redistribution of kinds of absenteeism events was mentioned in Armstrong, M. and, Taylor, S. (2014), where they observed that generally absenteeism events are following:

- 60% are chronic illness, injuries or family emergencies,
- 20% are short-therm illness (for example flu), work-related accidents or personal problems,
- 10% are minor illness (such as cold),
- 10% are of other character.

Cost of absenteeism

Absenteeism costs companies large amount of money each year in lost productivity, wages, poor quality of goods/services and excess management time. In addition, the employees who do show up to work are often burdened with extra duties and responsibilities to fill in for absent employees, which can lead to feelings of frustration and a decline in morale. Study from Allen, S. G. (1983) is oriented on costs connected with absenteeism and their calculations.

Costs of absenteeism are direct and indirect, Cascio, W. F. and Boudreau, J. W. (2008). Czech legislation states that the company pays the wage compensation to employee for the first two weeks of sick leave and injury absenteeism with exception of first three days, which represents the direct costs. The regional social security administration as representation of public authority pays a sickness benefit from the fifteenth day of absenteeism. These conditions make a short term absenteeism (up to two weeks or also defined as up to one month) the most expensive. Indirect costs vary from costs for hiring a replacement, pay overtimes to present employees doing the job of the absent one, lower production etc. Employers have a possibility to hire a temporal replacement (agency worker, part time worker) covering for long term absenteeism to avoid the need for overtime work while it is not cost-effective (and sometimes impossible) to find a replacement for the short term absenteeism. Short term absenteeism thus brings costs including wage compensation for absent employee as well as expensive overtime hours of present employees. Overtime work costs at minimum 1,25 times of regular worktime, as stated in Czech Labor Code §114, and it already assumes a company has suitable employees to handle and finish a job instead of the absent employee. Study oriented to connection of absenteeism to overtimes was presented by Ehrenberg (1970).

2 Methodology and Data

There are many ways to look at company´s absenteeism. Absenteeism generally represents all situations in which an employee is not present in the workplace during agreed worktime, Whitaker, S. (2001). Workplace, work activities, starting workday and information are part of employment contract according to §34 of Czech Labor Code while it usually contains also information about a worktime according to §78 of Czech Labor Code, otherwise agreed separately. We can distinguish three types of absenteeism (excluding illegal or unexplained absenteeism which is not allowed and which is punished by termination of contract with an employee and thus not measured):

- holiday,
- sick leave and injuries,
- other absenteeism.

Holiday represents an official, planned and paid form of absenteeism. Holidays are unavoidable and also employees should be given a possibility to properly take a vacation during the year in full length. Minimum length of holidays per year is four weeks although many employers offer extra week to attract employees. We can express a holiday share on the net nominal work fund for the whole company, selected parts or even of an individual in a given time period as following:

$$\%\ holiday = \frac{total\ amount\ of\ holiday\ workdays}{net\ nominal\ workday\ fund}. \quad (1)$$

Net nominal workday fund is generally is equal to approximately 21,5 days per each month and it reflects average amount of workdays in a month (excluding bank holidays and weekends).

Sick leave and injuries is the main area of absenteeism, to which is this study solely dedicated. Some of the absenteeism events are unnecessary although occasional absences are inevitable because people are getting sick or injured. It is habitual sick leave or high frequency of absenteeism events that are preventable and that are very well highlighted by the Bradford factor score analysis. Important value is represented by the share of sick leave absenteeism on the net nominal workday fund, which is calculated as following:

$$\%\ sick\ leave\ absenteeism = \frac{total\ amount\ of\ sick\ leave\ absenteeism\ workdays}{net\ nominal\ workday\ fund}. \quad (2)$$

Other absenteeism includes events which are usually short term oriented, sometimes even just a part of the day. Some of them are planned, such as scheduled doctor visit, blood donations, compensatory time off for the holiday and compensations defined in Czech Labor Code (wedding, funeral etc.), or unplanned, such as emergency doctor visit, unexpected obstacles etc. A share of other absenteeism on net nominal work fund is expressed as:

$$\%\ other\ absenteeism = \frac{total\ amount\ of\ other\ absenteeism\ workdays}{net\ nominal\ workday\ fund}. \quad (3)$$

A sum of shares of each form of absenteeism on the net nominal workday shows which amount of worktime which is actually spend at work and which is spend legally outside a workplace.

Bradford factor score analysis

Bradford factor is represented by a simple formula that allows firms to apply a relative weighting to employee's unplanned absence (illness, doctor visit, childcare etc.). Many companies use this factor as a trigger point to alert them if an employee's absenteeism level is reach to worse or unacceptable level. Bradford factor score is well defined in People HR Blog online (cit. 2017). Bradford factor calculation is a combination of absence frequency and duration for giving and individual Bradford factor score. Bradford factor score is calculated as following

$$B = \left(\sum_{i=1}^{n} D_i \right) \cdot E^2, \tag{4}$$

where B represents Bradford factor score, D represents amount of absent work days in i^{th} absenteeism event and E represents an amount of sick leave absenteeism events during observed period.

Table 1 Bradford factor score examples for 10 days of absenteeism

absent work days x amount of sick leave events	Bradford factor score
10 x 1	10
5 x 2	40
4 x 2 + 2 x 1	90
3 x 3 +1 x 1	160
2 x 5	250
1 x 10	1000

Source: own research

Table 1 shows examples of final Bradford factor score for different amounts of sick leave events. Having the same length of sick leave gives significantly different results, which is even amplified for real observations. Action steps which triggers when a certain limit of Bradford factor score can be set to create a clear sick leave policy.

Table 2 Bradford factor score action steps

Bradford factor score	Action step
1-99	no action required
100-249	attention needed
250-499	consider issuing a verbal warning
500-999	consider issuing a written warning
1000+	consider dismissal

Source: own research

Online source of Employment law clinic (cit. 2017) presents certain action steps based on the level of Bradford factor score which were adjusted based on empirical evidence to set easier orientation. Flat limit levels set in Table 2 are easier to monitor and grasp while they still keep the value in identification of absenteeism risky employees.

Bradford factor score below 100 is acceptable and requires no action. This includes most of the employees, see Table 4. Bradford factor score 100-249 represents a group of employees which already have a few sick leave absenteeism events or long term illness and it is necessary to keep track of them to monitor whether they move up or down. Bradford factor score 250-499 already represents a potentially risky employee with necessity to issue a verbal warning. Bradford factor score 500-999 is very high and requires to be actively solved, we recommend to issue a written warning and discuss the situation of the employee with the supervisor. Bradford factor score over 1000 can be reached only by frequent repetitive absenteeism and employees with such score are recommended to be terminated if possible.

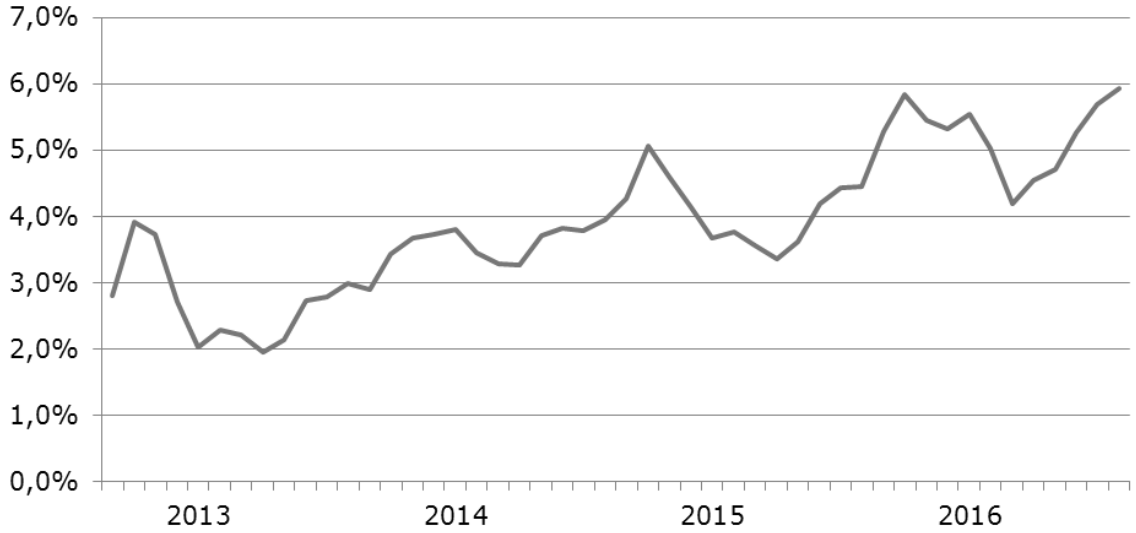
3 Results and Discussion

Following chapter is dedicated to Bradford factor score analysis and discussion. Data presented in Figure 1 represent average values of sick leave absenteeism of six

production companies considering their share on the total amount of employees of all six companies during period 2013-2016. Sick leave absenteeism rate was calculated according to (2). Growing trend of the sick leave absenteeism rate is clearly visible and cannot be explained by seasonal or temporal factors. Average rate is increasing each of the observed years, although seasonal effects are also visible: sick leave absenteeism higher during winter months and lower during summer months. This trend is dangerous and presents a great threat for organizations.

Bradford factor score analysis is calculated for twelve consecutive months from January to December 2016 only for sick leave absenteeism, which eliminates a possibility to unjustly highlight an employee with many holiday events instead of one or two longer ones or an employee with a few doctor visits during the year.

Figure 1 Sick leave absenteeism rate development 2013-2016



Source: own research

Table 3 presents us with the summary of analyzed employees. Total amount of observed employees is 3937, while 2466 representing 62,6% of the whole population had zero sick leave absenteeism events. Only around 6% of all employees were on a sick leave twice or more than twice leaving only 37 employees, which should be closely monitored. This way an organization can rapidly reduce the amount of possibly problematic employees to deal with. Interesting information is that only 1 employee out of 3937 has recorded 5 sick leave absenteeism events.

Table 3 Sick leave absenteeism frequency

Sick leave events	FTE amount	% Share	% Cumul
0	2466	62,64%	62,64%
1	1239	31,47%	94,11%
2	195	4,95%	99,06%
3	28	0,71%	99,77%
4	8	0,20%	99,97%
5	1	0,03%	100,00%

Source: own research

Table 4 shows the redistribution of employees in the Bradford factor score groups according to the amount of absenteeism events they had. Sick leave events work as a multiplication and so with the growing amount of events the Bradford factor is

exponentially growing. Primary focus should be to the 47 employees with Bradford factor score higher than 500 following the rules set in Table 2 while monitoring those with higher amount of absenteeism events.

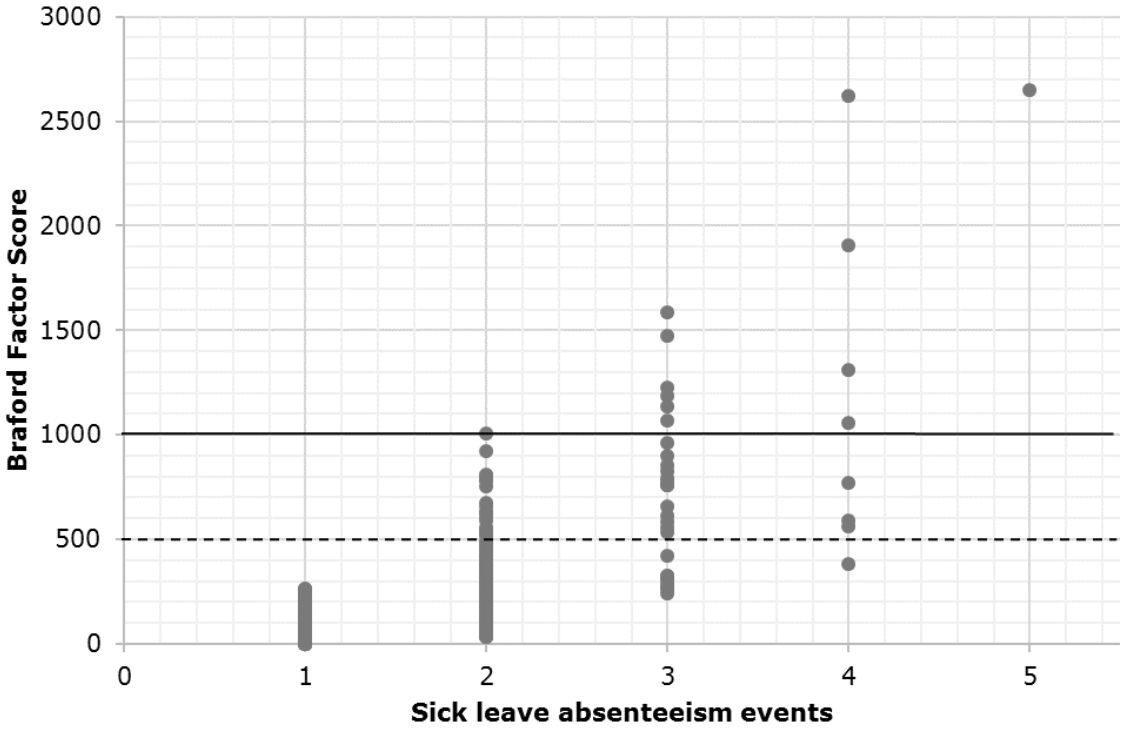
Table 4 Pivot table of Bradford factor score with amount absenteeism events

	BFS_group				
Sick leave events	**1-99**	**100-249**	**250-499**	**500-999**	**1000+**
1	1107	126	6		
2	39	87	50	18	1
3		1	8	13	6
4			1	3	4
5					1

Source: own research

We can visualize a pivot table combining the level of Bradford factor score and amount of absenteeism events using the scatter plot as shown in Figure 2 with marked limits defined in Table 2. This allows us to synoptically visualize the amount of employees in each group and above the limit. Primary focus should be given to 13 employees with Bradford factor score above 1000 and secondarily on those in the area between 500 and 1000, which is in total 34 employees. This way the company can monitor each of the absenteeism risky employees because by using Bradford factor score analysis we could reduce the amount of employees from over one thousand to a determined group.

Figure 2 Scatter plot Bradford factor score with amount of absenteeism events



Source: own research

4 Conclusions

This study investigated the topic of employees' absenteeism with focus on sick leave absenteeism. It is undeniable that the sick leave absenteeism is increasing and both

direct and indirect costs connected with this are increasing as well. This is the reason why companies are looking for any active solution which transforms them from a passive observer of the situation into active participant with a goal to reduce the absenteeism. We presented a Bradford factor score analysis which reflects not only the total length of employee's absence but also amount of absenteeism events. Bradford factor is designed to give higher weight for the amount of absenteeism events to avoid a false positive indication of absenteeism risky or problematic employees. Visualized results of Bradford factor score from Table 4 with projected amount of absenteeism events as in Figure 2 gives a selected sample to apply active solutions.s

Following the instructions described on Table 2 after an employee reaches a certain limit of Bradford factor score requires cooperation with a supervisor of an employee with high Bradford factor score to issue firstly a verbal warning and with Bradford factor score above 500 also a written warning. Three written warnings issued in less than 6 months allow an employer to terminate a contract with a given employee. Other solution is to terminate a contract by agreement or cancel the position of an employee. Last two mentioned solutions require a severance payment, which according to Czech Labor law § 67 is in maximum three times of average monthly wage. This can be a suitable solution considering the costs connected with keeping an employee with so high risk of frequent sick leave absenteeism. Described information is applicable directly not only to companies active in Czech Republic, but also internationally. The influence and perception of Human resource management policies is changing from supportive to strategic, supported by Harel, G. H., Tzafrir, S. S. (1999) and its role is becoming more important.

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The investment through bonus certificates

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Abstract: *If a potential investor makes a decision regarding the choice of an asset, he has still an option to invest in this asset direct or indirect. One of the options of an indirect investment is a bonus certificate. The aim of this paper is to examine the change in the investment characteristics, especially a change in the expected return and the risk of investment, provided that the investor will use the bonus certificate instead of a direct investment in the underlying asset. First will be selected an underlying asset. Then it will be modeled the development of the value of this asset by using Monte Carlo simulation. Next it will be discussed possible ways of construction of bonus certificates. Components from which is bonus certificate comprised will be priced and it will be modeled development of the value of bonus certificates on chosen underlying. 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.*

Keywords: bonus certificate, risk, return, investment

JEL codes: G11, G12, G17

1 Introduction

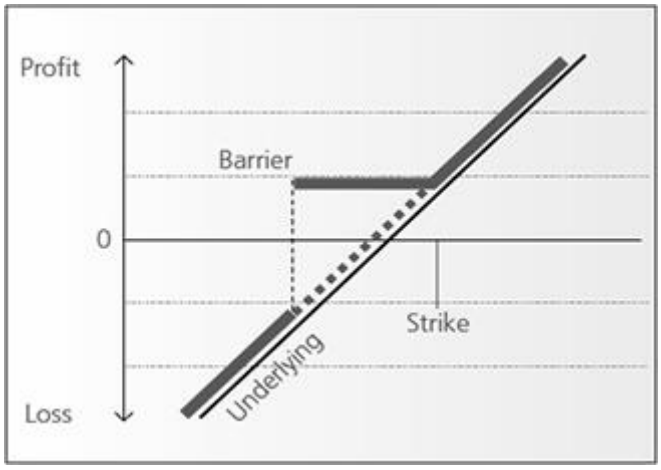
Modern structured products are presented as products that can optimize an investment of retail investor. If the investor is able to define his expectations regarding the development of the value of the underlying asset, his investment horizon and his propensity for risk, then you may find the structured 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 bonus certificates.

The aim of this paper is to examine how to change the basic characteristics of the investment, if investor utilizes bonus certificate instead of direct investments in the underlying assets.

Bonus certificate offers conditional protection against downside losses to a pre-defined level (barrier) 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 too). The return-risk profile of bonus certificate is shown in the figure no. 1.

Figure 1 Return-risk profile of bonus certificate



Source: European structured investment products association

Bonus certificates have a risk buffer for price losses in the underlying; the bonus guarantees a minimum return above the risk level.

A bonus certificate represents an alternative to a direct investment in a share, an index or another underlying. Investors primarily use them if they believe that despite rising prices setbacks are still likely to occur. A bonus certificate is furnished with a bonus amount and an upper and lower price level. If the certificate expires with the price of the underlying ranging between these two levels, owners are paid out their bonuses. If the underlying was at or below the risk level during the certificate's lifetime, its price is that of the current value of the certificate at expiry. If the underlying is above the upper level at expiry, the investor fully participates in the price gains. Some bonus certificates have a profit cap. This is where the certificate stops participating in the price gains of the underlying (Börse Frankfurt, 2017).

2 Methodology and Data

This paper 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. Bonus certificate can also be considered as a derivative financial instrument, since its basic structure consists of two components (options):

- long underlying (LEPO option, zero-strike call option)
- long down-and-out put option

First, will be designed the structure of hypothetically bonus certificate issued on 28 April 2017. 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 price index EURO STOXX 50 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 bonus certificates issued in practice. Since the development of the underlying shares will be derived also the development of the value of the bonus certificate.

By using Monte Carlo will be simulated changes in the value of the underlying assets according this formula:

$$dP / P = \mu\,\mathrm{dt} + \sigma\,\mathrm{dz} \quad (1)$$

where:

dP – change in the value of an asset

P – value of an asset (start value 3559,59)

μ - average return (8.91%)

dt – the shortest period of time for which the change occurs (1/252)

σ – volatility (19.43%)

dz – random component ($N(0,\sqrt{(1/252)})$

Optional component – barrier option will be priced according to Hull (2006). The price of down-and-out put option (P_{DO}) will calculate as difference between price of plain vanilla put option (P) and price of down-and-in put option (P_{DI}):

$$P_{DO} = P - P_{DI} \quad (2)$$

Price of down-and-in put option will calculate according following formula:

$$P_{DI} = -S_0 N(-x_1) e^{-qT} + K e^{-rT} N\left(-x_1 + \sigma\sqrt{T}\right) + S_0 e^{-qT} (H/S_0)^{2\lambda} [N(y) - N(y_1)] - K e^{-rT} (H/S_0)^{2\lambda-2} \left[N\left(y - \sigma\sqrt{T}\right) - N(y_1 - \sigma\sqrt{T})\right] \quad (3)$$

where:

$$\lambda = \frac{r - q + \frac{\sigma^2}{2}}{\sigma^2}; \quad y - \frac{ln\left(\frac{H^2}{S_0 K}\right)}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}; \quad x_1 = \frac{\ln(\frac{S_0}{H})}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}; \quad y_1 = \frac{\ln(\frac{H}{S_0})}{\sigma\sqrt{T}} + \lambda\sigma\sqrt{T}$$

and where:

S_0 – spot price of underlying

H – barrier level ($H<S_0$)

K – bonus level

q – dividend yield

r – risk-free interest rate

The results will be compared with each other and will evaluate their investment characteristics.

3 Results and Discussion

According to the structure of the bonus certificate, was created a new bonus certificate. The value of the underlying asset at the date of issuance amounted to 3559.59 points. After the pricing of relevant option component of bonus 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 second 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 return potential of the product, which was previously unbounded.

First, it was selected a variant with higher price of certificate by issue compared to price of underlying.

Thus were formed bonus certificates, which parameters are summarized in table no. 1.

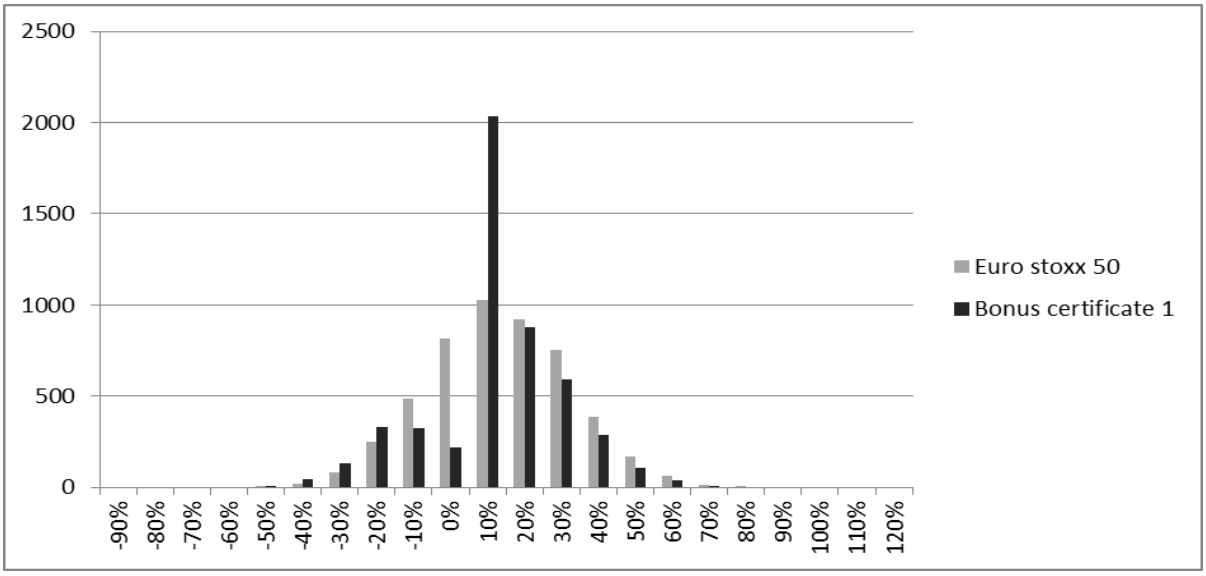
Table 1 Parameters of created bonus certificates (without dividends)

	Bonus certificate 1	**Bonus certificate 2**	**Bonus certificate 3**
Underlying	EURO STOXX 50	EURO STOXX 50	EURO STOXX 50
Date of issue	28.4.2017	28.4.2017	28.4.2017
Maturity	27.4.2018	27.4.2018	27.4.2018
Spot price of underlying asset	3559.59	3559.59	3559.59
Ratio	1:100	1:100	1:100
Issue price	37,07 EUR	37,11 EUR	37,14 EUR
Barrier level	3000.00	2800.00	3300.00
Bonus level	4000.00	3750.00	4700.00

Source: author´s construction

It was created histogram of differences of frequencies of returns of 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 certificates and their differences are shown in the figures below.

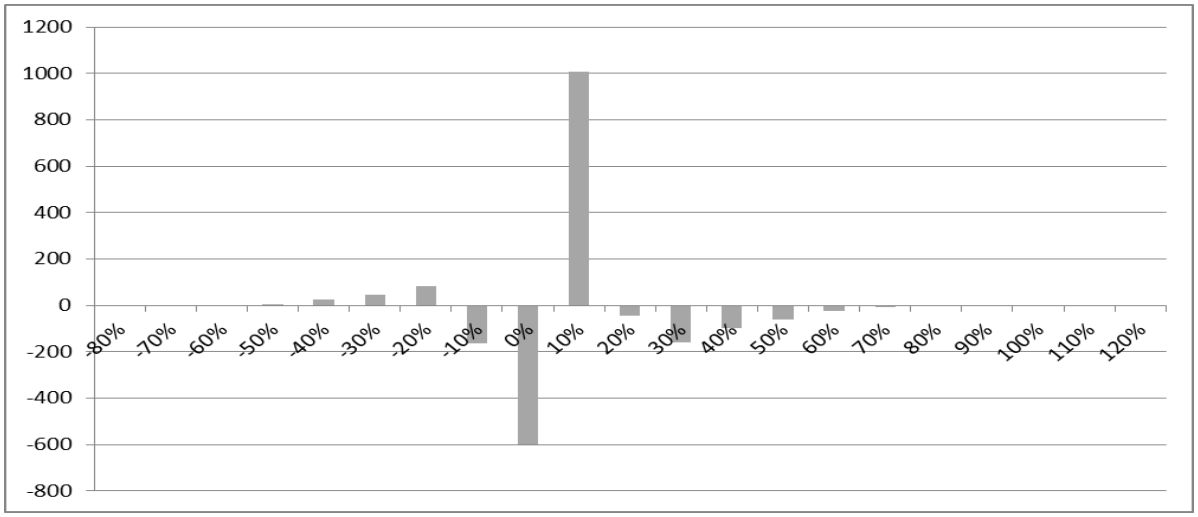
Figure 2 Frequencies of returns of bonus certificate 1 and returns of underlying asset



Source: author´s construction

By including a barrier option to structure of bonus certificate is significantly changed the probability distribution of returns compared to the distribution of returns of underlying asset. Differences in absolute frequencies of returns are by way of illustration shown in figure 3.

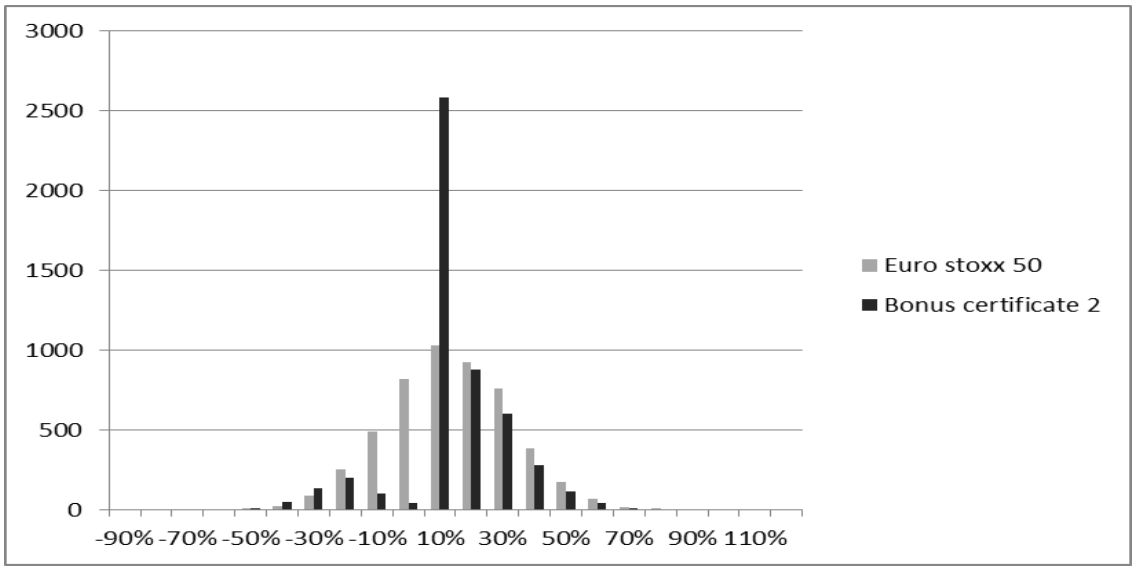
Figure 3 Differences in the frequency of returns (bonus certificate 1 and underlying)



Source: author´s construction

Bonus certificate 2 is considered as more conservative investment. It offers protection against the loss in amount of 21.34% of the initial value of the underlying asset (the value of underlying asset at the date of certificate issue). Probability distribution of return frequencies is similar to a bonus certificate 1, as shown by figure 4 below.

Figure 4 Frequencies of returns of bonus certificate 2 and returns of underlying asset



Source: author´s construction

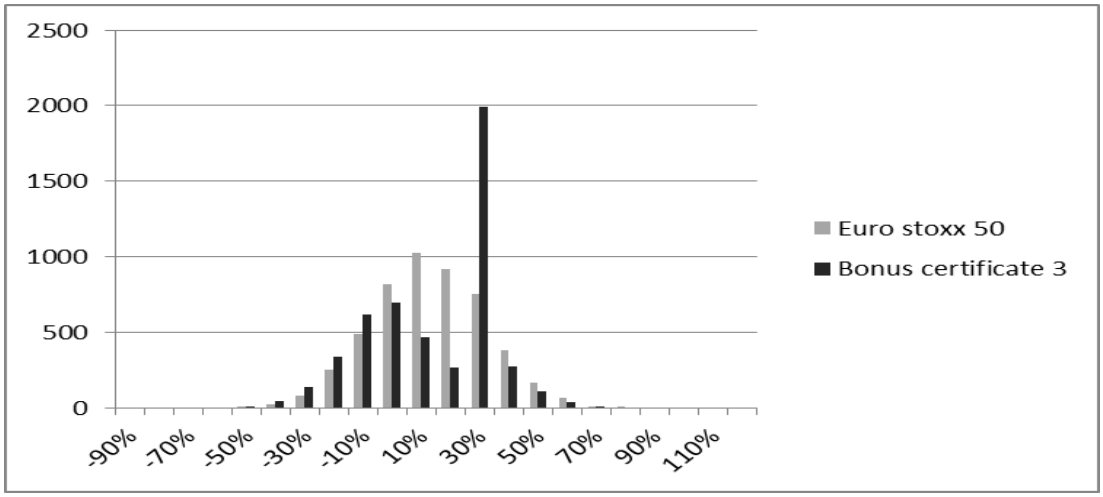
With regard to a bonus return of both examined certificates (1 and 2) fall return of most cases of 5000 cases examined to the interval 0 -10%.

Bonus certificate 2 offer lower bonus return than bonus certificate 1 (consider bonus level and issue price of certificates from table 1), but this bonus return was achieved in 2583 cases in comparison to 2034 cases by bonus certificate 1.

Bonus certificate 3 is considered as most aggressive investment. It offers conditional capital protection only in amount of 7.29% of the initial value of the underlying asset. It offers but the higher bonus return if the barrier was not breached. Probability distribution

of return frequencies is rather different from distribution of certificates n. 1 and 2, as shown by figure 5 below.

Figure 5 Frequencies of returns of bonus certificate 3 and returns of underlying asset



Source: author´s construction

The number of cases in which investor ended in a loss was increased as a result of lower capital protection, but the return in the band 20% - 30% (that also includes a bonus return) was still reached in 1995 cases of 5000 cases examined.

Table no. 2 below provides information on the characteristics of compared investments.

Table 2 The characteristics of the examined investments (without dividends)

	EURO STOXX 50	**Bonus certificate 1**	**Bonus certificate 2**	**Bonus certificate 3**
Excepted (average) return	8.33%	7.83%	7.51%	8.62%
Standard deviation	19.07%	17.94%	16.80%	20.79%
VaR (5 %)	23%	22%	20%	26%
Median of returns	8.21%	7.61%	4.03%	17.12%
Skewness	0.02	-0.49	-0.27	-0.43
Kurtosis	-0.13	0.73	1.35	-0.68

Source: author´s construction

Then it was considered second way of creating of bonus certificate. In this case the purchase of a barrier option is funded from the dividend yields (discounted) of the underlying asset. It was anticipated a dividend yield 3.58% and in table no. 3 are summarized parameters of bonus certificates after taking dividend yields into account. All parameters remained basically the same, only the price of the certificate changed. A potential investor would buy all three of the certificates cheaper at the issue, which naturally influences the characteristics of his investment because the return potential remains the same.

Table 3 Parameters of created bonus certificates (with dividends)

	Bonus certificate 1	Bonus certificate 2	Bonus certificate 3
Underlying	EURO STOXX 50	EURO STOXX 50	EURO STOXX 50
Date of issue	28.4.2017	28.4.2017	28.4.2017
Maturity	27.4.2018	27.4.2018	27.4.2018
Spot price of underlying asset	3559.59	3559.59	3559.59
Ratio	1:100	1:100	1:100
Issue price	35,81 EUR	35,84 EUR	35,88 EUR
Barrier level	3000.00	2800.00	3300.00
Bonus level	4000.00	3750.00	4700.00

Source: author´s construction

It is highly probable that the potential bonus certificate issuer will prefer this method of issuing of the bonus certificate. Issuer can easily duplicate the underlying price index and still ensure that he receives the dividend yields from the underlying asset. Table no. 4 below provides information on the characteristics of compared investments after taking dividend yields into account.

Table 4 The characteristics of the examined investments (with dividends)

	EURO STOXX 50	Bonus certificate 1	Bonus certificate 2	Bonus certificate 3
Excepted (average) return	8.33%	11.87%	11.34%	12.60%
Standard deviation	19.07%	18.09%	17.13%	21.01%
VaR (5 %)	23%	18%	17%	22%
Median of returns	8.21%	11.07%	7.95%	21.93%
Skewness	0.02	-0.44	-0.19	-0.41
Kurtosis	-0.13	1.05	1.57	-0.52

Source: author´s construction

4 Conclusions

Bonus certificates are structured products which offer a modified return-risk profile of investment to retail investors (compared to direct investment in underlying asset). Based on the research it was found that it is possible to issue a bonus certificate only on condition that his underlying asset brings dividend yields, which can be used to finance the product structure. Another option is limited return potential of the investment due to selling a call option and bring parameter cap into being. This article was working with bonus certificates that were issued to higher price than was a value of underlying asset too. Researched bonus certificates offer an alternative investment with a partial guarantee on invested capital.

By selecting a bonus certificate with various parameters, the investor can influence the basic characteristics of the investment, such as expected return and investment risk. By choosing parameters like barrier and bonus return, the investor could realize different investment strategies, more conservative or more aggressive than direct investment in the underlying asset.

Bonus certificates evince (compared to direct investment in the underlying asset) higher negative skewness; bonus certificates 1 and 2 evince higher positive kurtosis, bonus certificate 3 lower negative kurtosis.

It is more rational for issuers to finance the purchase of the barrier option contained in the certificate from dividend yields they can obtain from the underlying asset than to transfer the cost of financing to the investor. In essence, the investor renounces the dividend yields (by choosing the price variant of the index instead of the performance variant) in favor of the construction of the bonus certificate.

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Tax Rate Changes Impact on Mineral Oils Taxes Yields in the Czech Republic

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Abstract: *The study identifies the importance of mineral oils tax rates and other relevant factors for the mineral oil taxes yields amount. The study is focused on the unleaded fuel and diesel because of the yields importance. The correlation was confirmed by the Pearson coefficients, which reached the value above of 0.8. Moreover, the tax rate was surprisingly identified as highly important factor for mineral oils taxes yields using the econometric modeling, together with factors as the net income per capita and number of registered vehicles. On the other side GDP, transport performance (freight and passenger transport), consumer retail price of petrol and diesel, and price of petrol were identified as not statistically important for the unleaded petrol and diesel tax yields amount in the condition of the Czech Republic within the analyzed period.*

Key words: consumption taxes, tax burden, tax rate, tax yield, mineral oil taxes

JEL codes: H23, H26, E62, C51

1 Introduction

The fiscal policy means a group of instruments used by the state to influence the economy through changes of state expenses and state incomes (Klíma, 2006). Some economists declared that the aggregate supply can be supported by low taxes (Laffer, 2004). But Laffer (2004) said that it cannot be understood as a general principle meaning that lowering taxes leads to increasing or decreasing of tax yields comparing to the starting point of changes. Moreover, there are discussions about the shape of the curve proposed by Laffer (Samuelson, 2010). Most studies of tax incidence aim at the tax rate influence on the final price or consumer demand as the study targeted to the VAT (Široký at al., 2012) or to the cigarette taxation (Zimmermannová and Široký, 2016). The general tax incidence impact of consumption taxes in the Czech Republic was presented by Zápal (2014): The higher consumption tax rates lead to the higher price of the taxed commodities; but the prices do not follow the decreasing of the tax rates. Nevertheless, the tax incidence of mineral oils taxes cannot be described unambiguously as the amount of the mineral oils taxes shifted by distributors to consumers is highly variable in different periods (David, 2007), which influence the amount of tax yields. In some period, the tax burden can be nearly fully shifted to consumers (David, 2012). The changes in the price, caused by any reasons including mineral oils taxes, did not significantly influence the level of consumption in the period of 1999-2005 (David, 2007). Viren (2009) mentioned that in case of general taxation of consumption about half of the new tax burden is shifted to the consumers. Nevertheless, the impact of changed tax rates on tax yields remains hardly predictable based on the potentially high influence of the traders´ reaction, the related grey economy influence and potentially other factors.

The aim of this paper is to estimate the elasticities of the mineral oils taxes yields to the selected group of factors, particularly the tax rate, based on the correlation analysis using the parametric Pearson's correlation and the econometric modeling. The current article targets to the period 1993-2011. The paper is a part of the study testing the practical tax incidence in different periods, as the amount of the tax burden shifted from trades to consumer is highly volatile in time (David, 2007).

There are pending discussions about the function of consumption taxes rates and the impact of the rates on tax yields. Generally declared purpose of the consumption taxes is to discourage the taxpayers from consumption of the taxed commodities. It means that increased taxes might lead to decrease of tax yields (Klíma, 2006). But this function of consumption taxes applied to harmful commodities consumption could be retreated sometimes (Kubátová, 2010).

As the issue of consumption taxes is attractive for politicians and media many different opinions are reproduced by media but purely they are supported by some relevant study. One of the studies presented by the Ministry of Finance of the Czech Republic declared the consumption taxes, particularly taxes on mineral oils, were not sensitive to the tax rate and increased rates man increased tax yields (Jareš, 2008). Consequently, after increasing the mineral oils taxes in the year 2010 there was published a study Ševčík and Rod (2010) declaring another opinion that the demand on mineral oils is highly sensitive to the tax rates. The study was realized on data from the year 2010 published by the Ministry of Finance but later demented as based on false data (Táborský, 2013).

The unsatisfactory development of consumption taxes yields in 2010 was explained by the factors outside the Czech Republic, particularly the changes in the Slovak Republic, as mentioned in declaration of the Ministry of Finance (Minčič, 2011). Contrary approach can be find in declaration of DSV - Global Transport & Logistic experts (2012) which estimates that implementing special tax rate for mineral oils used in industry in the Czech Republic (such an option is enabled by Energy Taxation Directive 2003/96/EC) can lead to the increased tax yields about CZK 8 billion. It is a fact that such an approach was successfully implemented in France, Spain and Slovenia for example (Roškanin, 2011). The group of private car owners seems to be highly sensitive to mineral oils prices, particularly in the border regions (Michaelis, 2004; Banfi et al., 2005).

The EU tends to harmonize the principles and also rates of the consumption taxes nevertheless it was not possible to eliminate the historical and political backgrounds of different states fiscal policy, so some harmonized minimal tax rates remained at the level of zero tax rate (Kubátová, 2010) nevertheless it is not the case of the mineral oils taxes with relatively high rates. It is necessary to consider carefully the changes in consumption taxes rate as increasing of consumption taxes might be contra-productive and it might lead to shifted demand towards the black market with negative impact on tax yields (Koubová, 2014). Moreover consumption taxes frauds effects can be multiplied potentially influencing the VAT yields (Miroslav, 2013).

The purpose of its paper is to confirm the importance of tax rates for mineral oils tax yields within last decade in the Czech Republic and identify the influence of the tax rate and other relevant factors on the yields relating taxes mineral oils.

2 Methodology and Data

The study uses the analyses of the time series describing the development of rates and revenues of excise duties in the Czech Republic. The officially published data of the period 1993 – 2011 were collected and evaluated using the sources as Ministry of Finance of the Czech Republic, the Czech Statistical Office and the European Commission. The variables were tested for multicollinearity and heteroscedasticity while entering the econometric models. There are two basic analytical approach applied, the correlation analyses and the econometric modeling using the principles of the regression analyses.

This study targets to the mineral oils tax rates importance particularly. The importance of the mineral oils tax yields can be confirmed by the structure of yields in 2011, in the Table 1.

Table 1 Consumption Taxes Yields – case of the year 2011

Taxable commodities	Tax yield, mil. CZK	Share, %	Tax yield to GDP, %
Mineral oils	83,391	59.60	2.18
Alcohol	6,767	4.84	0.18
Beer	4,488	3.21	0.12
Wine	313	0.22	0.01
Tobacco products	44,958	32.13	1.18
Total	139,917	100.00	3.66

Source: Ministry of Finance of the Czech Republic (2012)

The following Table 2 includes the two most important products from mineral oils, which bring by far the highest tax revenue (more than 99% among the other mineral oil products taxed) - unleaded petrol and diesel.

Table 2 Overview of excise duties on mineral oils in the Czech Republic (1993-2011)

Year	Unleaded petrol, CZK/ 1000 l	Diesel, CZK/ 1000 l	Rate change, %	Tax yield, mil. CZK	Tax yield change, %	GDP change, %	Consump-tion tax quote, %	Infla-tion rate, %
2000	10,840	8,150	0	47,286	3.75	5.62	2.08	3.9
2001	10,840	8,150	0	54,835	15.96	7.88	2,24	4.7
2002	10,840	8,150	0	55,370	0.98	4.86	2.16	1.8
2003	10,840	8,150	0	58,411	5.49	4.70	2.17	0.1
2004	11,840	9,950	31.31	67,191	15.03	8.97	2.29	2.8
2005	11,840	9,950	0	77,676	15.60	6.38	2.49	1.9
2006	11,840	9,950	0	78,840	1.50	7.59	2.35	2.5
2007	11,840	9,950	0	82,901	5.15	9.25	2.26	2.8
2008	11,840	9,950	0	84,224	1.60	5.07	2.19	6.3
2009	11,840	9,950	0	81,600	-3.12	-2.32	2.17	1.0
2010	12,840	10,950	18.50	83,722	2.60	0.85	2.21	1.5
2011	12,840	10,950	0	83,391	-0.40	0.86	2.18	1.9

Source: European Commission, 2012a, 2012b; Ministry of Finance of the Czech Republic, 2011

For measuring of the correlation between tax rates and tax yields the Pearson coefficient was applied for the data of the period 2000 – 2011. The reason for this data set restriction was the change in determination of the tax base starting in the half of the year 1999.

In the column "Tax yield change" of the Table 2 the calculation of summary increase /decrease of the tax rate on unleaded petrol and diesel fuel is carried out and compared to the previous year, expressed as a percentage. The most general rate increase occurred in 2004, when the rates were increased for both products (petrol by 1,000 CZK, even on diesel by 1,800 CZK). The highest income tax on motor oils was recorded in 2008 in the amount of 84,224 million CZK. In the subsequent years, the tax collection was lower by 3.12%, probably also due to the economic recession. The most massive

year-on-year increases in tax revenues from mineral oils produced growth of rates in 2004, when the next two following years annually raised the collection of more than 15%. The highest level of the share of tax revenue to GDP was recorded in 2005 (2.49%) while the lowest was reached in 1998 (1.97%).

The correlation analysis and econometric modeling is based on data from the period of 2000 – 2011 as the data from the previous period before 2000 were evaluated as the inconsistent set of data.

The model estimates the tax revenues of taxes on unleaded petrol and diesel as the explained variables. Due to the nature of the economic principles expected, the linear regression model was built as the most suitable one. The models are built on the economic principles and the group of potentially important factors was included in the model and the stress was put on the tax rates. Number of variables, which should not absent in the model, according to previous general economic assumptions, progressively assessed as unfit during the models testing in the software GRETL and IBM SPPS Statistics. High Correlations between some explanatory variables were identified and some explanatory variables did not meet the statistical significance criteria. Due to this above mentioned reasons the following variables were not included in the model - GDP, transport performance (freight and passenger transport), consumer retail price (petrol and diesel), and the price of petrol. Their importance test and the correlation verification in a different period will be the object of the deeper consequent analysis as the changes in their role and mutual relationships may be expected.

The explanatory variable "tax rate" had to be an indispensable part of the final form of the model, since the aim of this research, and therefore this econometric modeling, is particularly to measure the dependence between the rates of excise duties and the resultant effect of a choice of relevant taxes. The considered tax rate was formulated as the average rate since the involvement of both rates in the model caused unwanted high correlation between these two predetermined variables.

The following factors were chosen as the entering variables into the model: an average tax rate of mineral oils, the change of net income per capita per year (as a factor indicating the purchasing power of the population), the change of number of registered motor vehicles in a given year (for verification whether the fact of more cars means automatically higher tax yields as some cars might not be used at the same time, by families for example).

Generally formulated econometric model:

$$y = F(x1, x2, x3) \quad (1)$$

Formulation of the stochastic model:

$$Y1 = \alpha + \beta 1\, x1t + \beta 2 x2t + \beta 3 x3t + u1t \quad (2)$$

Table 3 Overview of selected variables

Variable	Description	Mark	Units
explained	Mineral oils tax yields	y_{1t}	mil. CZK
explanatory	Average tax rate of unleaded fuel and diesel tax rates	x_{1t}	CZK/1000 litres
	Change in net income per capita	x_{2t}	CZK
	Change of registered motor vehicles	x_{3t}	thousand pieces
stochastic		u_{1t}	

Source: own elaboration

Due to the change in determining the tax base from 1,000 kg to 1,000 liters in 1999, the period 2000 - 2011 was chosen to build the model (Table 4). The reason was the incompatibility of rates values before 1999 and after.

Table 4 Overview of data entering the model

Year	Tax yield, mil CZK y_{1t}	Average tax rate, CZK/1000 l x_{1t}	Net income per capita, CZK x_{2t}	Registered motor vehicles, thousand pieces x_{3t}
2000	4,286	9,495	2,651	-59.1
2001	54,835	9,495	6,745	117.6
2002	55,370	9,495	2,986	171.8
2003	58,411	9,495	4,949	65.9
2004	67,191	10,895	5,889	113.1
2005	77,676	10,895	5,068	220.6
2006	78,840	10,895	8,968	227.8
2007	82,901	10,895	9,929	270.9
2008	84,224	10,895	11,777	225.4
2009	81,600	10,895	3,385	11.8
2010	83,722	11,895	1,479	75.4
2011	83,391	11,895	2,859	102.7

Source: Czech Statistical Office, 2013a, 2013b; Ministry of Finance of the Czech Republic, 2011

During modeling the GRETL and the IBM SPSS Statistics software was used.

3 Results and Discussion

Analyses covering the data from the Table 2 show, that the correlation coefficient for the relationship between the tax rate on petrol and tax yield is represented by the coefficient value of r = 0.8617. This relationship can be described as a very strong positive correlation. Relating the correlation of the tax rate on diesel fuel and the tax revenues the correlation coefficient is 0.9154, so it is a nearly perfect correlation relationship. Assuming a causal impact of the tax rate to the tax revenue (not vice versa), the correlation coefficients between these variables can be interpreted that the variability (r2) of the tax collections can be explained from 74% for petrol and from 84% for diesel by the tax rate variability based on the realized analyses.

The aim of the constructed econometric model for excise duty on mineral oils in the Czech Republic is to identify factors, which participate on the final level of tax revenue. Another key task is to define the force which the tax rate enters this algorithm; therefore, it is the prerequisite for participation of the tax rate in the model. The construction of a correlation matrix allows assessing the strength of correlations between different variables included into the model. Undesirable high multicollinearity, with coefficient value higher than 0.8, was not identified between any pair of explained variables as shown in Table 5.

Table 5 Multicollinearity test

	X1	X2	X3
X1	1.0000	0.0513	0.2346
X2		1.0000	0.2391
X3			1.0000

Source: own elaboration, Gretl, SPSS

The Method of Ordinary Least Square Regression was used for estimation of the structural parameters value of the model. The analysis outputs can be formulated the following way:

$$y1t = -75{,}830.3 + 12.915x1t + 1.153x2t + 28.819x3t + u1t \quad (3)$$

Test of the model confirmed the result reached:

$$71{,}287.25 = 75{,}830.30 + 136{,}829.13 + 6{,}409.43 + 3{,}708.09 + u1t \quad (4)$$

y1t calculated by the model = 71,116.34

The test confirmed that y1t of real value 71,287.25 (average) is approximately equal to y1t interpolated by the model to 71,116.34. Difference 170.9 (0.24%) is defined by a random component u1t.

The statistical model verification

P-values of all parameters in the model indicate statistical significance at the level of 95% as can be seen in Table 6.

Table 6 P-value

Variable	P-value
constant	0.00080
X1	0.00001
X2	0.01890
X3	0.05595

Source: own elaboration, GRETL, SPSS Statistics

For variable X3 the P-value tends to the threshold, but with regard to possible distortion of rounding and other positive results of model testing, this variable was kept in the model.

The model's coefficient of determination R2 reaches the level of 94%. So, it can be declared that the 94% of tax revenues of mineral oils can be explained by the explanatory variables included in the model.

The econometric model verification

The Durbin-Watson test shows the f value of 3.09. Such a value does not clearly identify the presence or absence of autocorrelation of residuals. Therefore, further analysis was realized. The Breusch-Godfrey test was carried out for further identification of autocorrelation of the first order. The result identified the P-value of 0.0517388, which was above the chosen level of significance α = 0.05, so we can conclude that the model is not burdened with model autocorrelation of the first order.

Testing the normality of residues was carried out by Jargue-Bera test. The aim was to test the null hypothesis that residuals are normally distributed. Evaluation of the test was obtained from the graph during the assumed normal distribution of residues compared to the actual distribution of the residue through a p-value of Chi-square. The results show the Chi-square result of 2.22368 with the p-value of 0.328953. We can conclude that residues are derived from a normal distribution.

The White's test excluded the heteroskedascity of the model (testing criteria LM = 9.54298 vs. P-value = 0.388732).

4 Conclusions

The study aimed at the factors influencing the tax yields identification; in fact it jumped the usually applied approach targeted to the relationship between the tax rates and prices or consumptions. It avoided using the GDP as the indisputable factor, the standardly expressed demand on mineral oils, tax competition among the EU states enabled by the EU legislation and expressed by different countries´ mineral oils tax rates and tax reliefs' amount. And the hardly estimated amount of mineral oils tax fraud in the Czech Republic was not also involved in the study.

The logical and economic assumptions about the positive effects of the explanatory variables can be seen and confirmed in the model results. The intensity of the parameters also corresponds to the general assumptions; therefore the entire estimated model can be described as a real simplified view of the investigated economic phenomenon.

The results of the correlation between the tax rate of mineral oils and relevant tax yields are confirming the opinion that under current condition in the concrete period the increase of tax rates could lead to higher tax revenues relating the unleaded petrol and diesel based on the data of the analyzed period in the Czech Republic. The net income level potentially influences the behavior of the mineral tax buyers which led to the increased tax yields in the analyzed period. Moreover the better net income may lead to ignoring the grey economy by the consumers. The increased number of registered cars means higher mineral oils taxes yields which is not surprising, moreover it may be derived from the fact, that most the newly registered cars were immediately used, which might has consequences not only in the field of taxation. On the other hand the above mentioned conclusion cannot be fully generalized due to the Laffer curve behavior vs. the concrete mineral oils taxes policy and automatically applied to any period. This is going to be a object of the planned future research.

The outputs of the model confirm the dependency of mineral oils taxes yields on their tax rates in the analyzed period. As the rates have been continuously increasing for decades we can say that the model describes the situation when tax rates increase at the concrete state of our economy. Moreover the model describes only the taxation of mineral oils so the conclusion cannot be without further verification transferred and applied to other period or generally to the consumption and environmental taxes without any additional analysis and comparison.

The data set consists of twelve years. The standardly required tests were realized, particularly the normality test, nevertheless the conclusion should be applied only to the period analyzed. We can express the conclusion, valid for the period of 2000 – 2011 based on the correlation and regression analysis, the increase of the average tax rate of unleaded petrol and diesel of 1 CZK/ 1.000 l could lead to the tax revenues increase of 12.9 mil. CZK. Any increase of household net incomes per capita compared to the previous year by 1 CZK tends to increase the mineral oil taxes yields of 1.15 mil. CZK. An additional thousand newly registered motor vehicles, in relation to the previous year, could cause the tax revenues increase of 28.8 mil. CZK.

The strong correlation between the mineral oils tax rates and tax yields was confirmed by the Pearson coefficient as it reached the value of 0.8617 for unleaded fuel and 0.9154 for diesel. Moreover the tax rate was identified as the statistically important factor for mineral oils taxes yields using the econometric modeling for the unleaded fuel and diesel in the Czech Republic in the concrete period.

The factors as the net income per capita and the number of registered vehicles were identified as statistically important factors in the analyzed period in the Czech Republic too. The coefficient of determination of the whole model reaches the high level of 94%.

Contrary to the statistically important variables the transport performance (the freight and passenger transport), the consumer retail price of petrol and diesel, and the price of petrol, were identified as factors being not statistically significant at the chosen level of statistical significance ($\alpha = 0.05$) in the analyzed period.

The next consecutive analysis should follow the results of this paper and evaluate the relationship between the tax rates and the tax yields of different consumption taxes targeted to variable importance of the tax rates in different stages of the economy development using the data of the period 2004 – 2016.

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Evaluating the Implementation Level of Management and Control Principles of the Public Finances

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Abstract: *The article deals with evaluating the level of application of management and control principles of public finances in selected public administration entities. Standards for this evaluation, valid principles of management and control of public finances and the rules for their application have been established between 2000 and 2001. They are applicable in activities during the acquisition and operation of property. The article focuses on the current status and monitoring 3E concept – effectiveness, economy and efficiency and the use of the term accuracy. These should be part of common public administration management during their decision-making procedures. The management of public administration entities uses internal regulations for their internal activities, which determine the procedures and methods for ensuring the management and controlling public finances. The article's results of principles application in the management and control of public finances in selected public administration entities can subsequently be the basis for changing the internal standards in order to improve these activities of management not only for the analysed public administration entities.*

Keywords: Efficiency, Effectiveness, Economy, Internal Regulations, Public Administration Entity

JEL code: H83

1 Introduction

The basic standards for the evaluation the level of application of management and control principles of public finances are the statutory standards and regulations issued by the Ministry of Finance of the Czech Republic (CR), as well as regulations and norms in order to conduct the management and activities of public administration entities (PAE). For each activity of the economic entity are crucial principles relating to the management and control of the financial system in the appropriate organization.

Preparation for the entry and subsequent involvement of the CR into the structures of the European Union (EU, in 2004) meant to learn in PAE to respect and apply the principles of the management and control of public finances (the principles).

Existing principles: accuracy, efficiency, economy and effectiveness applied in relation to public finance has become, along with other related activities as control and audit, basis for all activities in public administration. The principles are related to the various activities which public administration carries out. These activities include for example financial management, employee compensation or property management: during acquisition and purchase of products and services, usage and operation of property, its maintenance etc.

The principles are contained in laws, which focus on the activity of public administration. The basic legal standard in terms of these principles is Act No. 320/2001 Coll., on

Financial control in the public administration (2001) (the Financial Control Act). In connection with this was adopted Decree No. 416/2004 Coll. (2004), which implements the Financial Control Act (the Financial Control Decree). Some of the principles are also contained in other acts of law (in the current legal text), as for example: Act No. 219/2000 Coll., on Property of the Czech Republic (2000) (the Property Act); Act No. 128/2000 Coll., on Municipalities (2000) (the Municipal establishment Act); Act No. 129/2000 Coll., on Regions (2000) (the Regional Settlement Act); Act No. 218/2000 Coll., on Budgetary Rules and on Amendments to Certain Related Acts (2000) (Budgetary Rules Act); Act No. 250/2000 Coll., on Budgetary Rules of Territorial Budgets (2000) (the Territorial Budgetary Rules Act) and others.

In relation to these principles, PAE is required to adopt procedures for establishing and maintaining an internal control system. That creates the conditions for the economical, efficient and effective performance of the relevant PAE. The system should be able to identify, evaluate and minimize operational, financial, legal and other risks arising in connection with meeting the agreed intention and targets. It should also include procedures for timely information reporting to relevant levels of management and about the occurrence of serious deficiencies and the actions, which are taken and implemented to fix them.

The Financial Control Act, come into force in 2001. How important are the principles included in here for the activity of PAE, is the question in here. This fact can be assessing from the audit findings and the annual reports of the Supreme Audit Office (SAO) for the period since year 2001. The annual SAO reports for individual years point out to the persistent problems of keeping the principles and their application to the activities of individual evaluated PAE (Supreme Audit Office, 2016).

In its annual 2016 report, the SAO identified the key factors which reduce the impact of individual principles on state expenditure policies. These include, for example: poor strategic and conceptual management, leak control of the costs substation and the effectiveness of the incurred funds. The annual report notes (according to identified weaknesses), that institutional management has wide scope for improving its own performance by implementation of the principles (Supreme Audit Office, 2016).

Currently, the Ministry of Finance of the CR, the Government of the CR and the Chamber of Deputies are preparing the amendment to the Financial Control Act. The guideline for change is Regulation (EU, EURATOM) No. 966/2012 Coll., on the financial rules applicable to the general budget of the Union (the Regulation), applicable to the general budget of the EU. The Regulation sets out a series of principles regarding the control and management of public finances. Specifically, Article 30 deals with the principles of proper financial management. These rules will introduce (through amendment) a new concept of these principles into the Czech environment.

The existence of the amendment will also mean a reassessment of existing procedures of PAE. It will be necessary to take measures that will put these principles into practice. There is the premise that new setting of powers and responsibilities of employees - including top management will occur.

The internal standards, rules and procedures are the source for the level of assessment of the principles application.

The underlying problem is to determine what the current level of implementation of existing principles is within selected PAE. The aim of the contribution is to get the answer from the selected PAE to the question: At what level are currently being respected principles and related economic tools within internal regulations (IR)? Based on the results and evaluation of achieved levels will be then suggest recommendations. These could be implemented in relation with the introduction of the amendment to the Financial Control Act into practice at various PAE.

2 Methodology and Data

Different methods of scientific work were used during processing the above-mentioned problems; the Grounded Theory method was the basic one. This qualitative method has allowed us to narrow the research problem through research questions and deal with individual data areas and then addressing them with supplementary questions. Further methods used for the examination and evaluation the research was: analysis and synthesis, comparison and induction.

The data collection and analysis process was based on the examination of the acquired IR of selected PAE. The cost-utility analysis (CUA) has become a tool for evaluatiing the surveyed data. The rating scale was used for the CUA implementation. The evaluation in chosen individual areas (via the rating scale) was based on the measurement of the utility on the base of the subjective expression of the evaluator's satisfaction (Ochrana, 2001). Research questions were: At what level is fulfilled the diction of legislative norms in the examined areas in their specific use within IR? How are in IR applied principles for the management and control of public finances and related activities?

A rating scale from 1 to 5 was used for the assessment of individual areas. The value 1 indicates the most preferred state and value 5 indicates the least preferred state. Table 1 shows the qualitative assessment of the individual points in relation to the selected areas. The wording for the assessment of individual areas created possibility to specify the state in which the evaluated phenomenon is currently set. The follow-up description of the results allowed accepting the formulation of the proposals for the measures, which are related to the evaluated area.

Table 1 Description of rating scale for assessing the evaluated areas

Value	The area is meeting in terms of requirements:
1	Without defects. The area is clearly expressed in the internal documents. The procedures of the process implementing are described in relation to the persons responsible. The realisation of the principles allows measurability of the area and direct application in decision-making and control processes.
2	Minor defects. The area is expressed in internal documents. The procedures of the process implementing are described in relation to the persons responsible. The principles are used in decision-making and control processes.
3	Major defects. The area is expressed in internal documents. The procedures of the process implementing are not described. There are missing bindings, rights and responsibilities for applying the principles in decision-making and control processes.
4	Serious defects. The area is expressed in internal documents, but only referring to the higher legal standard. It has no informative value in relation to the responsible persons. The procedure for applying the principles in decision-making and control processes is not clearly described.
5	Crucial defects. The evaluated area is not included in internal regulations

Source: author's own research

IR of selected PAE were used as the basis for the option of evaluation.

PAE were selected by a stratified selection, so different groups of public administration organizations were represented:

- organizational component of the state (ministry) – obtained IR is from 1 subject out of 14, p_1 = 0,0714, (Government of Czech Republic, 2017);
- higher local authority units (regions) – obtained IR are from 3 subjects out of 14, p_2 = 0.2143, (Czech Statistical Office, 2017);
- local authority units (districts of municipalities with extended competence) – obtained IR are from 12 entities out of 206, p_3 = 0.0582 (Czech Statistical Office, 2017).

At the level of confidence (α = 0.03), it can be stated that the levels of reliability of individual groups of public administration organizations (p_1, p_2, p_3)> α. The number of IR received from each group of entities is relevant for evaluation.

The management of the above-mentioned PAE mostly uses, during their operations, management by objectives. In this management, it is implemented a process where top management sets goals and other employees meet the objectives with their daily basis activities. The management uses for implementation of management by objectives IR for its internal activities.

The purpose of IR is to apply legal norms into specific conditions of PAE. The IR includes the rules, procedures and methods for securing the management and control processes of public finances in its own conditions of each PAE. For this reason, we were acceding to the solution of solving this area by classifying the level of observance and respect of selected areas resulted from the IR.

The IR were obtained via the websites of the individual entities and further through the application of the relevant legislative standard – obtained on request.

Table 2 Examined areas of internal regulations

	Areas of IR in relation to the principles for management and control of public finances
1	Determining the responsibilities of departments and persons in the organizational structure.
2	Definition of terms efficiency, economy, effectiveness and accuracy.
3	Usage of procedures under the Financial Control Decree.
4	Usage of planning under the Financial Control Act
5	Acquisition of property, public contract and acquisitions processes under the Financial Control Act.
6	Usage of processes of risk management.

Source: author's own research

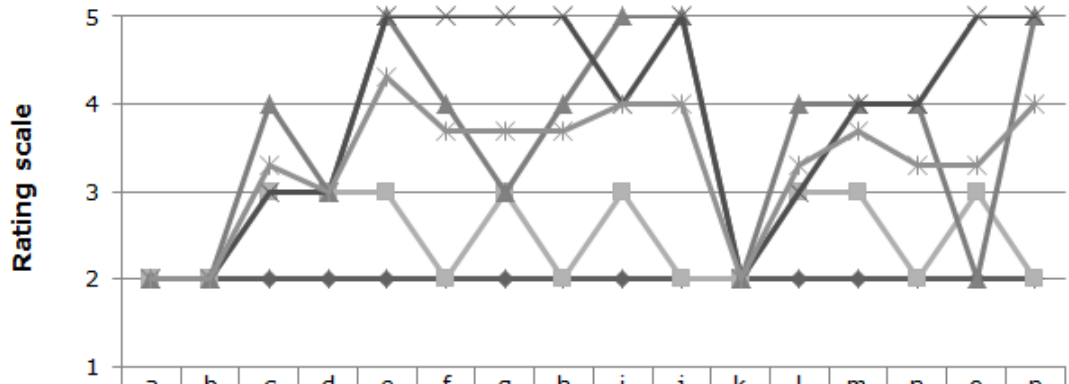
3 Results and Discussion

The results of the examinations within the individual areas 1–6 are shown in the following Figures:

Figure 1 "The results for selected subjects in the range of areas 1 to 3" indicate the individual PAE on the X axis, the Y axis specifies evaluated rating scale (1 to 5). The figure also shows a table with achieved value for individual entities of public administration and examined areas (according to table 2 "Examined areas of internal regulations") and the arithmetic average for three mentioned areas.

Figure 2 "The results for selected subjects in the range of areas 4 to 6" indicate the individual PAE on the X axis, the Y axis specifies evaluated rating scale (1 to 5). The figure also shows a table with achieved value for individual entities of public administration and examined areas (according to table 2 "Examined areas of internal regulations") and the arithmetic average for three mentioned areas.

Figure 1 The results for selected subjects in the range of areas 1 to 3



	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
optimum level	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
1 area	2	2	3	3	3	2	3	2	3	2	2	3	3	2	3	2
2 area	2	2	4	3	5	4	3	4	5	5	2	4	4	4	2	5
3 area	2	2	3	3	5	5	5	5	4	5	2	3	4	4	5	5
average 1-3	2,0	2,0	3,3	3,0	4,3	3,7	3,7	3,7	4,0	4,0	2,0	3,3	3,7	3,3	3,3	4,0

Source: Author's own research

Legend: PAE are identified in alphabetical order; the investigation fields are identified numerically and graphically; PAE: a – government department (ministry); b–d higher local authority units (regions); e–p local authority units (districts of municipalities with extended competence).

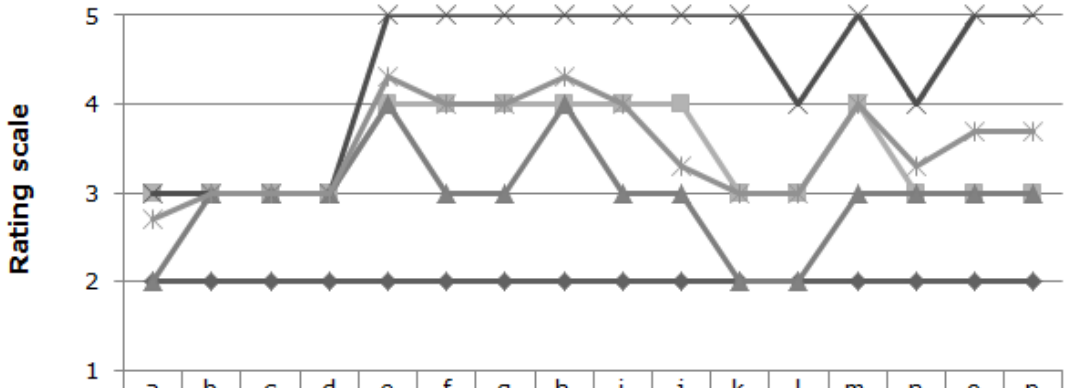
The obtained results on Figure 1 "The results for selected subjects in the range of areas 1 to 3" show that the possible expected optimum (as average for all evaluated areas) at recommended point 2 (minor defects) was achieved only by 3 entities.

In the evaluated area 1 (Determining the responsibilities of departments and persons in the organizational structure) only minor defects (8 entities) and major defects (8 entities) were identified. No other values were observed.

In the evaluated area 2 (Definition of terms efficiency, economy, effectiveness and accuracy), defects with a value 5 (crucial defects) were identified. This fact was found in 4 out of the 16 entities. Finding (25 % of PAE was rated in this area by value 5) shows that the approach of management identified by IR does not allow measurability of the area and the direct application of principles in decision-making and control processes of these entities. Responsible employees do not decide on the basis of measurable results. Principles are not identified in usable form for the management. This means that the use of budgeted PAE funds cannot be substantiated in an evaluable way. The required option necessary for the management: "If we want to manage, we need to know, and if we should know and not only to assume, we must be able to measure" (Bazala, 2006), is not fulfilled.

In the evaluated area 3 (Usage of procedures under the Financial Control Decree), none of the evaluated PAE achieved value 1 (without defects) and only 3 subjects could be rated by value 2 (minor defects). In most cases (7 out of 16 respondents), the score reached value 5 (crucial defects). This result point out that PAE with rating 5 did not introduce or describe procedures for the implementation of the Financial Control Decree in addiction to responsible persons.

Figure 2 The results for selected subjects in the range of areas 4 to 6



	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p
optimum level	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
4 area	3	3	3	3	4	4	4	4	4	4	3	3	4	3	3	3
5 area	2	3	3	3	4	3	3	4	3	3	2	2	3	3	3	3
6 area	3	3	3	3	5	5	5	5	5	5	5	4	5	4	5	5
average 4-6	2,7	3,0	3,0	3,0	4,3	4,0	4,0	4,3	4,0	3,3	3,0	3,0	4,0	3,3	3,7	3,7

Source: Author's own research

Legend: PAE are identified in alphabetical order; the investigation fields are identified numerically and graphically; PAE: a – government department (ministry); b–d higher local authority units (regions); e–p local authority units (districts of municipalities with extended competence).

The results demonstrated on Figure 2 "The results for selected subjects in the range of areas 4 to 6" show that the possible expected optimum (as average for all evaluated areas) at recommended point 2 (minor defects) was achieved only at 2 entities.

In the evaluated area 4 (usage of planning under the Financial Control Act), is insufficiently treated area in IR of PAE. This fact is confirmed by the results, because none of the analysed PAE reached the optimal levels. Out of 16 analysed PAE – 9 reached level 3 (major defects), the remaining 8 PAE reached level 4 (serious defects).

In the evaluated area 5 (acquisition of property, public contract and acquisitions processes under the Financial Control Act.), there is possible to find better results for individual entities. Eleven Subjects – that means most of the analysed PAE reached a score of 3 (major defects). This means that most entities have description of the process of acquiring property in their own IR (the Directive). These IR are characterized by a high degree of inaccuracy in relation to the specific procedures of PAE in the realization of a public contract. Therefore, it leads to inefficiencies of this area.

It is possible to evaluate that the area 6 (usage of processes of risk management), is characterized by the worst results among all the analysed areas. The status of the evaluation was at 10 subjects with value 5. The area of risks is by PAE over time underestimated discipline. PAE employees in the decision-making process do not take risks associated with management and leading. This fact negatively affects the economic performance and results of PAE.

What position and opinion to take to the introductory question: At what level are currently being respected principles and related economic tools within internal regulations?

From the Figure 1 " The results for selected subjects in the range of areas 1 to 3" and from the Figure 2 " The results for selected subjects in the range of areas 4 to 6" it is obvious that, in average, each of the areas only rarely achieved predicted value 2 (corresponding with minor defects).

IR report, in the evaluated areas, a number of different types of defects. The median of the point values for each area (1 to 6) of evaluated PAE is 3.5. It means the median reached value between 3 (major defects) and 4 (serious defects).

What are the characteristic defects in the implementation of principles and of other related tools to the management and control of public finances?

In the case that identification of principles and other instruments (control, risk assessment) exists, the content of IR is not specific in these evaluated areas. It is stated that they "should" take place, but there are no specific instructions for how to proceed it. Procedures for process implementation, performed by individual process participants, are not described. In context with this, bindings, rights and responsibilities for individual employees are not identified.

Existing simplified elaboration of the principles in IR automatically assumes execution capabilities of all employees (including management). According to the results of control findings – implementing capabilities of employees (even management) cannot meet the needs and obligations of PAE.

This fact indicates the PAE management necessity to pursue IR more consistently. PAE management should understand that their IR helps in management on various levels of the organization structure. The proper IR range and formulation can contribute to fulfilling of the required principles and, in particular, to improve management itself.

Based on the assessment in individual areas, PAE management should take a number of measures to remedy that would help to solve the evaluated current state. For each PAE management functions and for PAE individual activities, which they deal with, it is necessary to set up process procedures through IR.

The proposed measures should be aimed at adjustment changing and amending the IR.

According to the seriousness, these changes should focus on the processing and completion of the IR at least in the range of:

1 Methodology for the principles implementation.
2 Methodologies for identifying, eliminating, mitigating or preventing risks.

In both the above-mentioned cases, it is a more consistent elaboration of the obligations set by the Financial Control Act on its individual provisions. In preparing amendments of the IR, is however necessary to focus on issues arising from the forthcoming amendment of the Financial Control Act. Fulfilment of obligations under other Acts of law mentioned in the introduction of this paper could be even ensured in connection with this.

With the adjustment and amendment of IR (according to points 1 and 2), it is necessary to ensure even adjustment of a competency framework for the performance of all participating employees. PAE top management should plan and develop, in the interest of PAE, a competency profile for both sides: its own and its employees as well. The aim would be to increase their eligibility to use and implement the principles related to the management and control of public finances. Regular training and courses should become a part of the concretization of individual IR areas.

4 Conclusions

The article dealt with the issue, which has constant problems in the Czech Republic and its PAE. As previously stated under the preceding chapters – The cause of the current state lies in the deficiencies and defects resulted from the erroneous, defective, insufficient elaboration of the legislative standards into the conditions of the competent PAE through their IR.

The rights and obligations are in legal norms referenced to the PAE top management. Only on them depends the ability of individual PAE to deal with the obligations related to the management and control of public finances.

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Outsourcing in the public sector in the Czech Republic: case studies

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Abstract: *The relevant literature suggests that if, and only if, outsourcing is properly implemented, then it may, but might not, improve cost effectiveness and deliver the necessary quality. In this paper, we present two cases describing the processes and results of outsourcing by public sector bodies in the Czech Republic. Data are based on an in-depth audit delivered by students preparing their master's degree theses under the supervision of one of authors of this paper. Compared to our previous in-depth audits in Slovakia, we did not find very visible cases of inefficiency connected with in-house versus outsourcing decisions. However, our data confirm that the core problematic service in our public administration conditions is transportation. The 'habit' of public bodies having company cars or even in-house drivers is usually a very expensive practice. If such cars and the time capacity of the drivers are underutilised, the costs of taxi services can actually be much cheaper. The data also show that even with only a few competing bidders, public organisations can receive very low-cost offers for cleaning and security services, much below the minimum costs of internal production. Suppliers can achieve this by 'manipulating' the labour costs or the costs of the quality of the delivered service.*

Keywords: outsourcing, Czech Republic, process, results

JEL codes: D29, H11, H80

1 Introduction

Outsourcing the production of internal services to private suppliers is a very common type of alternative service-delivery arrangement. The decision to outsource should be based on the answer to the question: 'Produce in house or buy?' (Prager, 1994).

The growth of the number of externally produced internal services (such as cleaning) is very much connected with the New Public Management (NPM) ideology. Reform steps at the end of the 20th century focused on increased efficiency via de-monopolisation, decentralisation, deregulation, externalisation, and privatisation (Lacasse, 1992; Péteri and Horváth, 1997; Sclar, 2000; Smith, 1996; Walsh, 1995). The result was a massive increase in the use of Alternative Service Delivery Arrangements (ASDA) in the public sector (Digler, Moffet and Struyk, 1997; Donahue, 1989; Green, 2002; Hefetz and Warner, 2004; Hirsch, 1991; Miranda and Andersen, 1994; Alford and O'Flynn, 2012; Nemec, Vries and Potier, 2017).

The expected benefits from outsourcing are especially connected with potential cost savings and increased transparency in public expenditures (Savas, 1987; Siegel, 1999; Green, 2002; Digler, Moffett and Struyk, 1997; Osborne, Radnor and Nasi, 2013; Sarapuu and Lember, 2015). However, these benefits can be offset by increased transaction costs (inevitable extra costs to manage the contract) and decreased quality (if the contract is imperfect and/or contract monitoring fails); see, for example, Pratt and Zeckhauser (1986) and Arrow (1985).

In this situation, the relevant literature suggests that if, and only if, the outsourcing is properly implemented, then it may, but might not, improve cost effectiveness and deliver the necessary quality. Because of this, it is of utmost importance to know what the core factors and barriers of successful outsourcing are.

The goal of this text is to present two cases describing the processes and results of outsourcing in public sector bodies in the Czech Republic. The importance of this study is mainly in that similar in-depth studies are almost entirely absent from the existing economic literature about outsourcing.

2 Methodology

The study uses a rather simple methodology. Detailed data about all aspects of the outsourcing processes and outsourcing results in two selected public organisations were collected via in-depth audits conducted by students preparing their master's degree theses (Kufova, 2016 and Mrazkova, 2016) under the supervision of an author of this paper. Additional information was collected in interviews with the economic directors of the investigated organisations. Two bodies were selected – the municipal office in a medium-size city and a theatre of national importance. The organisations are unnamed, at their request.

3 Case Study 1: Municipal Office

In the selected municipal office, two outsourced services (cleaning and part of IT services) and two in-house produced services (maintenance and transport) are analysed.

Cleaning

This service was produced in house before 2010, but the office decided to outsource it. The service costs in 2014 were 5607.6 CZK per employee and 138.1 CZK per sqm (1 EUR ≈ 27 CZK). The first tender for an external supplier was conducted in 2010/2011; three firms submitted proposals:

- Vidocq s.r.o., Pardubice,
- Technické služby Moravská Třebová s.r.o., Moravská Třebová,
- ALFA – BETA servis s.r.o., Zábřeh.

The selection criterion was the lowest price bid (may be not so wise decision for this service). The winner of the tender was ALFA-BETA servis, offering a price of 34 788 CZK (Vidocq offered 37 747 CZK and Technické služby Moravská Třebová offered 46 800 CZK). However, a few days after the contract was signed, the contract price was amended and increased by 1 800 CZK (without VAT), with a new total monthly price of 36 948 CZK. This is still below the second-lowest bid, but not exactly in line with existing legal regulations. In 2013, the contract price was increased to 37 255.9 CZK. The firm proposed a further increase to 40 018.4 CZK, but this proposal was not accepted by the municipality.

The cleaning costs invoiced by the winner were, for most months of service delivery, higher than the contract price (the municipality explains that it ordered extra services), which may, but might not, be legally correct (lowest 36 948.00; highest 60 595.10).

In 2015, the municipality repeated the tender, as the municipality was not willing to accept the price increases proposed by the supplier. Again, the municipality received three bids, and the criterion was the lowest price. The results were as follows:

1. JASPA Servis s. r. o., Opava: 38 528.21 CZK
2. Kamil Effenberger, Zábřeh: 35 077.90 CZK
3. SECCON s. r. o., Litomyšl: 36 295.16 CZK

The winner, JASPA s. r. o., Opava, did not offer the lowest price, but it received a special 'discount' because more than 50% of its employees are disabled; for this reason, its price was formally the lowest. Taking into account that such results would increase cleaning

costs, the municipality cancelled the tender and started a new one – with the same group of suppliers (legally problematic solution). The results from the new tender were as follows:

1. JASPA Servis s. r. o., Opava: 29 982.19 CZK
2. SECCON s. r. o., Litomyšl: 32 668.55 CZK
3. Kamil Effenberger, Zábřeh: 34 109.90 CZK

The tender results show that the proposed service prices are significantly decreasing. We tried to determine if such a low price had an impact on quality by surveying the municipal staff. The results were not conclusive: some staff were happy, and some were not. It seems that this significant decrease in cost was not noticeably offset by a decrease in quality (in a short-term perspective).

We also tried to test the 'efficiency' of the new price to determine if outsourcing is a good decision. The first benchmark is data from the benchmarking system of Czech municipalities (Table 1). Because full cost accrual accounting is not used, the data are imperfect. Normally only direct costs are included, and thereby in-house production costs are underestimated. Because this municipality has 83 employees and monthly costs of approximately 30 000 CZK, its relative costs for externalised production are comparatively very low.

Table 1 Cleaning costs in Czech municipalities per employee (benchmarking initiative members with internal cleaning), CZK

	2010	2011	2012	2013	2014
5	10 855.85	11 334.48	11 770.90	11 536.58	12 174.54
10	8 666.66	9 703.70	10 657.71	10 935.64	10 734.21
18	9 152.04	8 845.23	8 458.82	7 080.92	7 977.40
23	7 769.69	6 540.69	7 552.79	7 697.53	7 615.85
26	9 834.58	9 967.30	11 280.70	11 008.77	10 872.88
28	10 444.68	10 994.38	10 407.40	11 876.47	11 605.71
34	13 905.45	11 796.06	10 410.62	12 393.93	11 411.76
39	5 410.83	6 126.31	6 111.11	6 059.52	6 234.73
41	18 938.97	8 855.26	9 093.33	9 066.66	8 824.05
42	8 817.82	8 010.89	9 121.05	8 572.02	9 060.08

Source: municipal office (data are not public)

Another benchmark is the 'virtual' offer of existing companies offering cleaning services. We received two virtual bids for the conditions of the municipal office. The first bid, by HESTIA úklidová s.r.o., was an unrealistic 238 550 CZK without VAT for one month. The second bid, by BRUCO, was 42 315 CZK without VAT per month. Despite the fact that a real competition could decrease the offered prices, our 'virtual tender' indicates that the winning bid by JASPA servis was really inexpensive.

Information technologies

The municipality decided to outsource part of its IT needs, connected with the obtainment of an EU grant (Technologické centrum pro ORP Moravská Třebová). In this case, the selection criterion was the most economically advantageous bid (price for part I, price for part 2, and technical parameters of the offer (problematic choice). The winner was OR-CZ s.r.o with 99.64 points and monthly service costs on the level of 18 162 CZK (this sum was invoiced monthly for the whole investigated period).

It is difficult to assess the efficiency of this solution, because only one part of the IT services is covered. If the municipal office needed to employ one more specialist in order to obtain this service, the costs for outsourcing seem to be comparatively low (the monthly labour costs for one IT specialist in the Czech Republic are at least 50 000 CZK;

the yearly direct salary costs of two IT specialists employed by the municipality are almost one million CZK).

The negative aspect of this service is the fact that the contract was signed for an unlimited period and the contract provided the supplier with the right to increase the price (based on inflation) without consulting with the municipality.

Maintenance of buildings

The regular and irregular minor building maintenance is delivered by one internal full-time employee. The direct costs of this service were approximately 200 000 CZK yearly. Because the sum is very small, we decided not to check the efficiency of this service.

Transportation

The municipality does not have in-house drivers, but it does have six passenger cars, and employees who have passed a prescribed examination are allowed to drive the office cars. The list of cars, with their purchase prices, is as follows:

- ŠKODA SUPERB: 689 300 CZK (2014 mileage 19 513 km)
- ŠKODA OCTAVIA: 436 590 CZK (2014 mileage 18 645 km)
- ŠKODA OCTAVIA COMBI: 476 599.99 CZK (2014 mileage 1 899 km)
- ŠKODA FABIA: 332 996.10 CZK (2014 mileage 20 166 km)
- ŠKODA FABIA: 318 857,50 CZK (2014 mileage 9 520 km)
- ŠKODA FABIA: 314 733.50 CZK (2014 mileage 5 599 km)

In 2015, the municipality purchased (by the direct award method – rather problematic solution) a new SKODA OCTAVIA for 479 300 CZK. This price included a discount for an old SKODA FABIA that was sold to the supplier. The sum paid seems to be 20% higher than standard market price.

The data above show that the existing system (six previously owned cars plus one new one) is inefficient. The very visible indicator is that the mileage for some cars is too low – the effectiveness principle is not respected. Concerning economy, we compared the existing situation with two alternative scenarios.

The first possible option for replacing/reducing an owned fleet of vehicles is to rent cars as needed. A local rental company has the following 'set' price - Skoda Octavia: daily lump sum 290 CZK plus 2.90 CZK per km. The second option is to use a taxi service. A local taxi service price is 10 CZK/km for long-term customers. Comparisons are shown in Tables 2 and 3.

Table 2 Transport characteristics municipal office in 2015

Car	km	Fuel costs CZK	Repair costs CZK
ŠKODA SUPERB	19 176	38 561	18 825
ŠKODA OCTAVIA	18 020	24 290	107 366
ŠKODA FABIA	19 989	46 928	25 999
ŠKODA FABIA	5 411	14 483	341
ŠKODA FABIA	9 517	22 140	31 312
Total	72 113	146 402	183 843

Source: own research

Table 3 Comparative data (CZK)

	In-house direct costs	Rental cars (including fuel costs)	TAXI
Costs	330 245	341 458	723 350

Source: own research

The calculations in Table 3 clearly suggest that owning a large fleet of cars is an ineffective solution (the costs for petrol and repairs alone are fully comparable with the cost of using rental cars).

4 Case Study 2: Theatre

The theatre uses outsourcing for the following internal services – security, maintenance of the theatre property greens, and cleaning in some of its buildings. Most cleaning is delivered in house, as the theatre was not successful with its last tender aimed at switching to fully externalised production of this service.

Security

This service has been outsourced for more than ten years, but with frequent changes in suppliers. The firm LEMESSIANA s.r.o. delivered the service until the end of 2014, when the firm itself cancelled the contract by its own initiative. The firm Forcorp Group then delivered the service until 31 March 2016 (selected only for one year by a simplified procurement method, because of insufficient time to conduct an open tender for service delivery). Since 1 April 2016, the service has been delivered by the firm BARTOŇ A PARTNER, s.r.o. In 2015, the yearly service costs were 1 574 385 CZK.

The most recent tender for the service was organised in 2016, with the tender process outsourced to a specialised firm. The selection criterion was 'best bid' with the following elements:

1. Price: 80%
2. Complexity and quality of offer: 20 %

The tender included two slots. Eight bids were submitted for both slots, four of them were excluded. The proposed prices for the first slot were (without VAT):

- BARTOŇ A PARTNER, s.r.o.: 54 168.00 CZK
- OP Security, s.r.o.: 66 900.00 CZK
- PPH s.r.o.: 51 100.00 CZK
- IPO – Star, s.r.o.: 73 689.85 CZK

The proposed prices for the second slot were:

- BARTOŇ A PARTNER, s.r.o.: 296.00 CZK
- OP Security, s.r.o.: 370.00 CZK
- PPH s.r.o.: 310.00 CZK
- IPO – Star, s.r.o.: 379.60 CZK

The final winner for both slots was the firm BARTOŇ A PARTNER, s.r.o. The contract was signed for an unlimited period (should not be done so) on 22 February 2016. The price for this service is really low, as the invoiced labour costs are below the minimum wage in the Czech Republic. The perceived quality of the service is partly problematic – the theatre is evaluating the option to switch to a mixed model, with an in-house night security staff. The supplier hires pensioners for this position, which enables the supplier to invoice such low sums, but raises the risk of such staff being unable to act in case of a real emergency.

One specific issue is connected with the contract for security services. The yearly total costs calculated on the basis of the contract should be 1 697 708 CZK, but the 2016 reality was 2 347 724 CZK (the management provided no explanation for this difference). This price is still an economically effective solution, as the minimum direct labour costs for delivering the service in house (for the same workload) would be approximately 2 358 650 CZK. The issue is the limited quality of the night security service, as mentioned above.

Maintenance of greens

This service has been outsourced for more than ten years. The most recent tender was organised (small scale procurement procedure) in 2014, and the municipal company Veřejná zeleň města Brna was selected. The 2015 costs for the service were 388 760 CZK.

The 2014 tender selection criterion was lowest price (with a voluntary option of accepting bartered payment for parts of the invoices with tickets for theatre performances or other services – rather problematic aspect). The following bids were received (without VAT):

- Veřejná zeleň města Brna, p.o.: 394 305 CZK
- Bartoň a Partner, s.r.o.: 419 956 CZK
- DVOŘÁK comte, a.s.: 657 196 CZK

The theatre management is satisfied with the quality of service provided by the winner. The minimum level of direct labour costs for in-house production of this service (at the same volume) would be about 500 000 CZK. This means that in-house production would be a more expensive solution.

Outsourced cleaning

For most of the theatre buildings, the cleaning is provided in house (only the directorate building, a small administrative building, and two flats are cleaned by the firm selected by a direct award (should not be so) in 2004 (formally, the yearly costs at the time of selection were on a level allowing for direct purchase). In 2015, the cost for cleaning the above-mentioned buildings were 667 282.79 CZK without VAT (above the maximum limit for a direct purchase today), but the old contract is valid and was signed for an unlimited period (should not be so). The minimum direct costs for in-house production of this service would be slightly higher – we calculated them at 685 820 CZK.

We tried to benchmark the contract prices to virtual bids from selected potential suppliers. From the ten firms contacted, only one submitted a virtual offer – on a level of 648 480 CZK, marginally less than the current contract.

The perceived quality of contracted cleaning services is positive, with some but not very crucial negative comments. The willingness of the firm to communicate about problems was appreciated.

In-house cleaning

The theatre announced a tender for outsourcing cleaning for all its other buildings in January 2014. It used an external body to manage the tender. This tender was eventually cancelled due to different complaints from the bidders. In this situation, cleaning of the main theatre buildings is produced in house by theatre employees – a twenty-member cleaning staff. The direct (labour) costs for internal cleaning in 2015 were 2 348 368 CZK.

To benchmark the costs of in-house production, we again contacted ten firms with a request for virtual bids. Only one complex virtual bid was received, with a contract price of 2 532 000 CZK. Because the in-house 'price' for cleaning does not include any indirect costs (not even social contributions), outsourcing, supposing that virtual bid is realistic, could be a better option for the future.

The management is fully satisfied with the work of the in-house cleaning staff.

Transport

Most of the transport is carried out by company cars. The theatre has four full-time employed drivers (!). The theatre was not willing to provide any more detailed information about transportation costs, only the fleet structure: Škoda Superb – 2 cars, Ford Transit, Škoda Superb Combi, Škoda Octavia Combi, Renault Mascott, Fiat Scudo and Mann tractor trailers. The fleet is a combination of older and almost new cars.

From accounting, we were able to determine that the total transportation costs in 2015 were 1 464 850.91 CZK. Fuel represents 699 733.33 CZK and ticket costs are 400 082 CZK. The rest is probably service costs – full costs (including depreciations) are not calculated. In any case, owning a fleet (except for specific cars) and especially having in-house drivers, whose time capacity is not used sufficiently, is proven to be an ineffective solution.

5 Discussion and conclusions

In this paper, we provide detailed information about the in-house versus outsourcing decisions of two public bodies in the Czech Republic. The data presented are fully reliable, because the data were collected through direct research in the selected organisations and were verified with representatives of the selected organisations. This guarantees that our analysis is an accurate reflection of the situation – but only of the situation in these two selected bodies, not necessarily of the general situation in the Czech public sector.

The data reveal examples of effective outsourcing, thereby indicating the potential value of externalisation, if it is properly implemented, but also examples of ineffective decisions. We can compare our results with only a few similar studies – this kind of in-depth audit is rather rare. Moreover, the results of case studies are not representative and cannot be used for generalisation. If we compare our findings with similar in-depth audits in Slovakia (Merickova et al, 2010), our cases studies indicate a much better quality of decisions. We did not find very clear cases of inefficiencies connected with in-house versus outsourcing decisions (in Slovakia, ten out of ten decisions were 'wrong'). On the other hand, as in the Slovak case studies, major deficiencies are connected with procurement processes.

Our data confirm that the core problematic service in our public administration conditions is transportation. The 'habit' of public employees having their own cars or even in-house drivers is usually a very expensive solution. If such cars and time capacity of drivers are underutilised, the costs of taxi services can actually be much cheaper. The source of this problem is the non-existence of full costs accrual accounting – depreciations and other indirect costs are not followed and the ownership of cars may therefore appear to be a low-cost choice.

The data also show that even with only a few competing bidders, public organisations can receive very low-cost offers for cleaning and security services, much below the minimum costs of in-house internal production. Suppliers can achieve these low-cost offers by 'manipulating' labour costs or the costs of the quality of delivered services. Effective and systematic contract management is a 'must' in these areas.

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Stabilization Programs of the International Monetary Fund in the Course of Time

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Abstract: *Since starting its business in 1947, the IMF also began to support member countries with balance of payments problems by giving them credits. This process was accompanying by design of the respective stabilization (financial) program. In the early 50th, a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability was developed as the base of the IMF´s approach. Afterwards, the methodology of the program design has been changing in accordance with changing conditions. The aim of the paper is by method of historic analysis to find out how the IMF has been changing the way of construction of its stabilization programs from the side of theory and methodology and how it complies with stabilization mandate of the IMF. There are some criticisms that claim the IMF fails to fulfill its aims also for unsound methodological framework of stabilization programs. Our analysis shows that thanks to the flexibility of the IMF´s approach that allows to prepare country tailored programs, this institution have succeeded in the course of time in creating of the reliable framework for preparing of the stabilization programs.*

Keywords: financial crises, financial stability, International monetary fund, stabilization programs

JEL classification: E32, E63, F33, F34

1 Introduction

After the end of World War II, it was the Bretton Woods´ agreement in 1944 that governed the international monetary relations. Under this agreement, each member country undertook to maintain the par value of its currency in terms of gold or the U.S. dollar. In other words this established fixed exchange rates system. Since its starting business in 1947, the IMF also began to support member countries with balance of payments problems by giving them credits. In the early 50th, a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability was developed mainly by Polak (1957, 1997) and Robichek (1967). Also findings of Fleming (1962) and Mundell (1963) were incorporated into the the stabilization (financial, adjustment) programs that accompanied the loans. Process of developing these programs was called financial programming.

After the collapse of Bretton-Woods in the early 1970s, the methodology changed. The main challenge was the change of the fixed exchange rates of the world major currencies into flexible ones, while the original approach addressed the situation with fixed rates. Central banks started to use monetary policy regime based on inflation targeting, which brought about the change to evaluation of monetary targets (e.g. Bléjer et al., 2001). To the methodological and technical aspects of the financial programs are devoted e.g. the papers Barth and Hemphill (2000), Martin et al. (1996.) which had summarized the knowledge originated from ongoing programs and Mikkelsen (1998) examining the posibilities of utilization of computer model for preparation of program design.

With the outbreak of global and financial crises in 2007, it turned out that the previously preferred framework of inflation targeting in the form of pre crises configuration is not

suitable to stabilization needs and had to be modified. It had also consequences for stabilization programs, when minimally it turned out that there is a need to incorporate in stabilization programs not only monetary (and inflation) targets but also target concerning financial stability (Blanchard et al., 2010 and 2013).

Generally, there are extensive literature sources which deals with various sides of the IMF´s financial programming activities, the policy issues in particular e.g. Agenor and Montiel (2008), Laurens and de la Piedra (1998), Bleaney (1999), Borghijs and Kuijs (2004), Clark and MacDonald (1998), Lipschitz et al. (2002) and IMF (1987, 2001, 2016) and many others.

Some sources (especially that sprung from IMF) present positive explanation of IMF´s theoretical and methodological approach to the stabilization program design, others bring criticism (e.g. Nowzad, 1982, Easterly, 2005, Guice, 2015 and others).

Having analyzed these sources (and much more to make it possible to mention them in contribution of limited extent), the aim of this contribution is with method of historic analysis to evaluate if the IMF has established and has been changing the way of construction of its stabilization programs from the side of theory and methodology in that way which would comply with stabilization mandate of the IMF.

The remainder of the contribution is organized as follows: Part 2 is description of the IMF´s monetary model within the Bretton-Woods system, part 3 deals with IMF´s operational approaches under free exchange rates and part 4 with IMF´s activities in the period of financial crises. Each of these parts is followed by discussion. Part 5 Conclusions follows.

2 IMF´s monetary model within the Bretton-Woods system

The analytical basis of the programs negotiated between the IMF and individual member countries in the beginning of the IMF activities in the area of providing the financial help was formalized in a number of papers by the Fund staff. It was Polak (1957, 1998) and in some respects Robichek (1967) who mainly contributed to the building of IMF monetary model which remained as basic approach for all Fund supported financial programs. There were used also deductions of other economists among others of Fleming (1962) and Mundell (1963).

IMF monetary model elaborated mostly by Polak extends the classical quantity theory of money to the open economy. The model consists of the following four equations (Polak, 1998):

$$\Delta M = (1/v)\,\Delta Y \tag{1}$$

$$IM = mY \tag{2}$$

$$\Delta M = \Delta D + \Delta R \tag{3}$$

$$\Delta R = X - IM + \Delta FI \tag{4}$$

M - money stock
v - velocity of circulation of money
IM - imports
m - propensity to import
R - change of net foreign assets (foreign reserves)
D - stock of net domestic assets (domestic credit) of the banking system
X - exports,
FI - net capital inflow
Δ - first difference operator

Model contains two behavioral (1,2) and two definitional (3,4) equations. Equation (1) represents demand for money function, equation (2) import function, equation (3) is an

identity relating money supply to two sources of monetary expansion - domestic and external (coming out from the consolidated balance of the banking sector) and (4) is an equation of the balance of payments. It is pressuposed that net capital inflows and exports are exogenously determined, so as the parameters v and m.

Characteristic sign of the model is its simplicity. There were good reasons for that (IMF, 1987) because of absence of statistical data in some areas for many of the Fund´s member countries and also due to the almost total absence of econometric models describing their economies. Generally, two sets of data were available – banking and trade data. There was further factor of great importance – the focus of the model on the key variable that the authorities could control – domestic credit creation. This variable was seen as crucial for correction of the balance of payments problems for which the Fund assistance was assigned. This was characteristic of the Fund´s use of the monetary approach to the balance of payments.

The model was designed to illustrate the effects of two most important exogenous variables - autonomous changes in exports and the creation of bank credit, on both income formation and the balance of payments.

The model is dynamic in character – it contains both Y (in equation 2) and ΔY (in equation 1) (Polak, 1998).

A stable demand for money function was assumed, with the economy in equilibrium when money supply growth equals the rate of growth in the demand for money. This means there is supposed to be the mandate of the central bank which takes care about money supply so that it should be exactly the same as predicted demand of money. There are two sources of monetary creation - domestic bank credit and the monetization of foreign exchange inflows.

Equations (1) – (4) constitute the base for elaboration of financial programs ("financial programming") countries applying for the Fund´s financial assistance. At the same time it is also the base for conditionality, when IMF is requesting countries to fulfill agreed indicators as the condition for the access to credit from the Fund. Projected numerical values for individual variables are not a result of solving a set of equations (although there were later attempts to do so – see Mikkelsen, 1998) but rather result of iterative calculations. Polak stated that valuable byproduct of this approach is that it forces the analysts to construct a set of consistent data across the individual sectors of the economy (Polak, 1998).

The original financial programming methodology was designed for use in countries with fixed exchange rate. After 1971, more and more countries started to implement monetary policy within a flexible exchange rate regime, which meant either implicit or explicit orientation of monetary policy to inflation target. This development meant also the need of some analytical as well as practical changes in operational procedures related to financial relations with the IMF and member countries. The problem was conditionality which ties the provision of financial resources with the fulfillment of certain criteria, which are usually built in respective financial program. In the area of monetary policy, these were usually targets for the change of net foreign assets (foreign reserves - ΔR) and limits on the development of net domestic assets (domestic credit - ΔD).

The mechanism of setting criteria for ΔR and ΔD worked in practice as follows: First the target for the level of foreign exchange reserves (ΔR) was determined. While setting a limit for the ΔD, which was compatible with the development of NFA, there was a need of taking into account the expected development in velocity of money. Once the real values of ΔR began to approach the limited level, the growth of ΔD limits inhibited the expansion of the monetary base, which prevents monetary policy to exert additional pressure on the balance of payments or inflation. This mechanism has proved to be functional until the break- down of the Bretton-Woods system and many programs were executed with it.

The IMF is often criticized for its theoretical approach to programs design which is said to have been neo-liberal or monetaristic. These critics question the validity and universality of the economic theory which provides the rationale for the Fund's policy instruments and program implementation. Allegedly these free market policies were not always suitable for the situation of the country. In fact, the IMF´s approach is eclectic as is indicated already in IMF (1987), i.e. not based on on a particular view of the economy or on the convictions of a single school of economic thought. In the program, there could be incorporated any theory that seems reasonable in specific situation. It is evident for example from the Figure 1 which incorporates absorption (CA = Y – A) and monetary (ΔR = ΔM – ΔD) approaches to the balance of payments. There is to say that IMF does not use a uniform, rigid framework for assessing macroeconomic policies of its members. The emphasis in Fund programs varies considerably depending on the circumstances of the country in question.

3 IMF´s operational approaches under free exchange rates

After the break-down of Bretton-Woods in the early 1970s, the conception and the structure of adjustment programs changed. The main challenge was the change of the fixed exchange rates of the world major currencies into flexible ones. Furthermore, several events in the 1970s such as large fluctuations in world prices of commodities, sharp increases in real interest rates in international credit markets, and an extended period of slow growth in major economics, aggravated the adjustment problems of developing countries and seriously complicated the task of economic management IMF member countries. There were also modifications in thinking about these programs which had arisen from institutional and structural developments in the economies that the Fund had been called on to assist. Finally, the design of Fund supported adjustment programs has gradually absorbed many of the developments that have taken place in the macroeconomics and international economics (IMF, 1987). Last but not least, there were important changes in technical progress of elaboration financial programs related with introduction of computers as well as econometric techniques.

As a result system of identities has been developed as illustrated in Figure 1. Within the figure there are number of additional equations that cover structure of the economy. Starting from savings – investment balance which results in external current account, current account as a result of subtraction of absorption from product, through balance of payments equation (CA + ∆FI = ∆R) and finally to the consolidated balance of the banking sector. This figure has the advantage that shows interrelations of the individual sectors of the economy. The only exeption is the general government sector which is included in the figure implicitly through domestic credit and net capital inflow.

Figure 1 Basic macroeconomic framework for financial program design

	[(S – I)g	**+**	**(S – I)p]**	
	=		=	
	CA	**=**	**Y – A**	
	+		+	
		∆FI		
	=		=	
	∆R	**=**	**∆M – ∆D**	

Source: IMF (2001)

(S - I) – savings-investment balance, g/p – government/private, CA – current account balance, A – domestic absorption

Traditional approach to the setting limits on ΔR and ΔD was challenged in these new conditions (monetary policy was oriented towards the inflation target) and became more complicated. Therefore it was desirable to modify traditional monetary conditionality (Blejer et al. 2002).

Development of the ΔD might not be directly linked with the development of inflation, so that any targets for the ΔD might be wrong markers. It could happen that actual ΔD exceeds targeted and at the same time might not be a threat to the inflation target. This means that while in terms of financial objectives of the program monetary policy should be tightened, in terms of the inflation targeting it was not necessary.

Coming out from the abovementioned it can be inferred that in countries where monetary policy is conducted under an explicit inflation target, it is necessary to modify traditional practices of the financial programming exclusively based on monetary indicators. This allows improvements to the whole course of realization of the program, in particular the formation of a clearer link between the program objectives and the objectives of the central bank but also facilitates the use of appropriate tools to achieve the objectives. At the same time there is better communication with the central bank's economic entities and markets.

From the practical point of view, there is important for the financial programs in an inflation targeting context, to specify an inflation path more comprehensively with e.g. quaterly intermediate inflation targets as opposite to usual annual one. These are subject to regular IMF program reviews and on the base of that respective tranches of the IMF´s credit is paid. There is also important that inflation targets are forward-looking oriented (Bléjer et al., 2001). We can conclude that the IMF has also succeeded in solution of inflation vs. monetary target dilemma.

Operational framework (Figure 1) is composed of definitional equations which include real, external, monetary and fiscal (implicitly) sectors of the entire economy and allows great variability of eventual use of various mathematical models for identification of each variable in the form of behavioural equations.

However, the key restrictions of financial programming are assumptions about exogeneity of some components of identities with respect to others, and the assumption of stable and "reasonable" parameters for some very simple behavioral relationships (Easterly, 2005). This is the real problem. For example, the use of the monetary identity (bottom line of the Figure 1) is based on the condition that money demand (ΔM) is independent on domestic credit (ΔD) which is generally problem in modern economies (concerning some developing countries it could be still the case). In ideal circumstances real program exercise could looks like: there is an exogenous estimation of ΔM, there is a target for foreign reserves and endogeneous variable ΔD is a residual of the equation. This is the case if the condition about independency is fulfilled, if not, the exercise must continue under simplified procedure. There is also a problem with estimation of demand for money function. In recent decades which are characterized by financial inovations, the estimation of money demand function is usually not possible at all. And there are similar situations with attempts to estimate any other behavioural equation from the operational framework (e.g. demand for exports function, consumption function etc.).

Taken into account all abovementioned troubles, the operational framework is still leading guidline to set up the design of stabilization programs. It contains identities which have to hold by definition. The limiting side of using identities are the data. Either the data miss at all or there are some degree of their faultiness. This is typical for developing countries but in some sorts of data also in countries with advanced statistical system. An example can be mentioned in the area of monetary statistics („other items net") but also in the balance of payments („errors and omissions"). However serious the related problems may be it can be stated that this is not specific problem of financial programming but problem of any areas of economic analyses.

4 IMF in the period of financial crises

The global financial crisis that´s consequencies the world economy is still facing, is a big challenge for the IMF. This most influential international financial institution developed activities designed to help member countries to overcome the consequences of the crises. This was also reflected in the amount of aid. General scope and seriousness of the current crisis provoked the need for some way to modify the standard activities of the IMF.

IMF by virtue of his position appeared to be a useful element to coordinate the reconstruction of the international financial system. Practically it is done in the form of the Fund´s assistance to G20 groop, which took possession as coordinator in the agenda of the financial crisis. Within the framework of the G20 summit, which took place in April 2009 in London, it was agreed a substantial increase in resources to support members of the IMF (IMF, 2016).

At the same time it came to sharpening IMF analysis and policy advice. The IMF provided risk analysis and policy advice to help member countries to overcome the challenges and spillovers from the global economic crisis. It also implemented several major initiatives to strengthen and adapt surveillance in conditions of more globalized and interconnected world.

In order to reflect the increasing importance of emerging market countries there were done in 2008 and 2010 respective reforms which ensured that smaller developing countries would retain their influence in the IMF**.** IMF also reformed its lending framework to be more suitable to various circumstances which countries had to face.

There was also increased emphasis on social protection. The IMF helped governments protect and even increase social spending*.* In particular, the IMF promoted measures to increase spending on, and improve the targeting of social safety net programs that can mitigate the impact of the crisis on the most vulnerable members of society. Social aspect was emphasized also by improving conditions of helping the world's poorest countries when it was agreed that concessional loans to the poorest countries will be quadrupled. As a result, IMF programs are now more flexible and tailored to the individual needs of low-income countries.

From the point of view of the methodology it is important that it came to reforms of terms for the IMF lending (conditionality), reworking of conditions for lending. Traditional framework of financial support, based on the gradual provision of individual tranches of loans under strict terms of the objectives of the financial program has been modified by introducing new flexible forms of lending. These are intended for countries with normally functioning economies, with the ability to adhere to the agreed policy measures. In this case, the credit is granted immediately if necessary financial resources - unlike traditional support programs linked to the performance of the financial program agreed objectives. This approach allows more flexibility to respond to the specific needs of each country and the nature and extent of their problems. Performance criteria were loosed, in fact they were discontinued for all IMF loans, including for programs with low-income countries. Structural reforms continue to be part of IMF-supported programs, but they have become more focused on areas critical to a country's recovery. It is in a way the reflection of the IMF on criticism of governments and civil society organizations that "a significant number of structural conditions are very detailed, and often felt to be intrusive and to undermine domestic ownership of programs." (IMF, 2016).

All that means the shift of the emphasis from the narrowly understood monetary and inflation targets to more widely comprehension of the development targets. As for the demand policies (monetary and fiscal) which were traditionally the key part of the stabilisation programs, the crisis has caused the Fund to acknowledge the limits of monetary policy and bring fiscal policy more to the center stage as an important countercyclical tool (Guice, 2015). This was very important change in views of the IMF on

macroeconomic policy consistent with general advance in this area of economic thinking (Blanchard et al., 2010, 2013).

Under current circumstances there is of key importance that analytical framework of the financial programs described in parts 2 and 3 of this contribution has basically remained unaffected. Their flexible framework make it possible to absorb all these new tendencies in theory and praxis.

5 Conclusions and policy implications

The IMF has based its policies on a theoretical and methodological framework developed over about sixty years. Their models were based on a set of assumptions that do not reflect inevitably the economic realities of the whole scale from developing to advanced countries. However, the framework is flexible and has been reflecting developments in the world economy, advances in the theory and policy and also improvement in econometric analysis.

The system started in the early 50th when a specific approach in the form of a simple model as well as accompanying set of conditions for ensuring financial stability in economies with fixed exchange rate were developed. Later - after breaking down of Bretton-Woods system - there was a need to adjust the IMF approach to the new circumstances. They were represented namely by prevailing use of flexible exchange rates but also by stressing medium-term economic growth and concerns about inflation. Crucial challenge for the IMF activities has however arisen by outbreak of global and financial crises in 2007. It has become apparent that the previously preferred framework of monetary (and inflation) targeting in the form of pre-crises configuration is not suitable to stabilization needs and has to be modified. It had also consequences for stabilization programs, when minimally it turned out that there is need to incorporate in stabilization programs not only monetary (and inflation) targets but also targets concerning financial stability in a broader sense and the same concerning general development targets. The original IMF primary mandate - to ensure the stability of the international monetary system - was updated to include all macroeconomic and financial sector issues that bear on global stability.

Despite of the whole range of limits related to the IMF´s approach, our analysis has come to conclusion that current system of financial programming is prepared to absorb all needs which stem from fulfilling the stabilization mandate of the IMF. There is enough space for use of any sophisticated tool(s) which possibly emerge in further advances in theory and praxis.

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Financial Literacy: Study of the Financial Literacy Level

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Abstract: *Financial literacy is usually interpreted as a set of knowledge which is necessary to have for being able to make proper and correct decisions concerning personal investments, debts and other ones related to personal finance. Such type of education has become an important part of every educational system, since its importance has increased within previous years. As a consequence of this, financial literacy needs to be measured and regularly tested. The goal of the study is to measure if there is a difference between objective level of financial literacy and between subjective self-assessment. The study focuses on differences among various age groups. The results of the study help to target further proposal for formal and informal education system amendments. The study is based on data collected through an electronic questionnaire. As for methods, the study is based on comparison of average values across various groups of respondents, therefore, t-test is employed. Consequently, the study also includes various descriptive statistics.*

Keywords: financial literacy, financial education, subjective assessment, comparison

JEL codes: I22, I31

1 Introduction

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.

Financial literacy according to National strategy for Financial Education in the Czech Republic consists of:

- Money literacy
- Price literacy
- Budget literacy

Each of the groups is characterized by different set of knowledge which belongs to the particular group. Generally speaking, price literacy factors knowledge related to price mechanisms, inflation and other macroeconomic and microeconomic indicators. Money literacy includes knowledge related to banking products, loans, banking investments and similar ones. The last group, budget literacy, factors ability to administer own budget and issues related to personal finance in general.

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.

The goal of the article is to verify whether there is a link between objective level of financial literacy and subjective assessment of the financial literacy. In other words, the respondents in the study were asked questions and tasks related to the financial literacy (all its parts, meaning price, budget and money literacy). Such answers provided an assessment of objective financial literacy level. On the top of that, respondents were asked questions revealing their confidence in the area of financial literacy. Those answers provide the author with a tool for objective and subjective assessment comparison.

Further to the set goal, there are following research questions set:

- Research question no. 1: Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- Research question no. 2: In relation to the previous research question (research question no. 1), for which age groups is there the highest discrepancy between the objective level of financial literacy and between the subjective assessment of the financial literacy level?

The main contribution of the study is to revel whether the population can objectively assess their strengths and weaknesses when it comes to the financial literacy. Such findings can help the author of the study when preparing other studies and recommendations related to the financial literacy and financial education.

2 Methodology and Data

The study is based on data file collected via an electronic questionnaire. The questionnaire consists of three parts:

- The first part is devoted to questions which enable to measure the objective level of financial literacy. In other words, respondents are asked questions concerning decision on different situations related to personal finance, financial debt, financial terminology, products, etc. The gained score is afterwards transferred to the standardized scale ranging from zero points (for total ignorance) to ten points.
- In the second part of the questionnaire, respondents are asked to measure their own level of financial literacy using the scale from zero points (total ignorance according to the subjective assessment) to ten points (standing for complete understanding of financial literacy; again, based on subjective assessment)
- The third part has been devoted to demographic factors of the involved respondents

The whole data set consists of 294 valid observations. With regard to the set research questions, descriptive statistics have been employed particularly average and standard deviation. Consequently, in order to verify possible gaps between objective and subjective evaluation of financial literacy, t-tests have been used. As both of the variables are dependent each other (subjective and objective assessment of financial literacy), dependent t-test for paired samples have been used.

3 Results and Discussion

The following section is devoted to results and consequent discussion. When it comes to the tests, the following two research questions (specified above) have been taken into consideration:

- Research question no. 1: Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- Research question no. 2: In relation to the previous research question (research question no. 1), for which age groups is there the highest discrepancy between the objective level of financial literacy and between the subjective assessment of the financial literacy level?

Research question no. 1

For the purposes of the first research question, dependent t-test for paired samples has been applied as both of the variables are dependent each other. The difference between them is derived from normal statistical distribution. Before proceeding to the test, the

following table (Table 1) summarizes average values and standard deviation of both of the groups.

Table 1 Descriptive statistics

	Objective assessment	Subjective assessment
Average	6.77	7.06
Standard deviation	2.00	1.84
Number of valid observations	294	294

Source: author's own computation, processed in STATISTICA

Looking at the Table 1, it is obvious that there is a difference between the objective and subjective assessment of both of the groups. However, the difference amounts to only approximately 0.3 points (out of ten). Taking into account the scale (ten points) and the number of observations (294), it is difficult to state if such a difference proves to be significant.

To verify such significance (or insignificance), dependent t-test for paired samples has been run to verify whether there is a gap between the objective and subjective assessment of financial literacy level. The results of the test are stated in the following table, Table 2.

Table 2 Results of t-test

Test statistics	p-value
2.639	**0.008772**

Source: author's own computation; processed in STATISTICA

The result of the test confirms that there is a proven difference between subjective and objective assessment of financial literacy among adults in the Czech Republic. The low p-value rejects the null hypothesis of the test, which indicates a discrepancy between both of the variables (subjective and objective assessment of financial literacy). However, this result does not provide any particular information about age groups that might possibly cause the difference.

Research question no. 2

To elaborate on such evidence, it has been necessary to divide the whole dataset into several ones. Particularly, this study divides the respondents into the following groups, based on their age:

- Group no. 1 – respondents who reached 18 years but have not exceeded 26 years
- Group no. 2 – respondents who are between 27 a 40 years old
- Group no. 3 – respondents older than 40 years

The following table, Table 3, summarizes average values for all of the mentioned groups. Looking at the table, it seems to be likely that there is a gap between subjective and objective assessment of financial literacy when it comes to the first age group (respondents between 18 and 26 years). Their subjective assessment is 7.23 points out of ten on average, while the objective knowledge is represented by approximately 6.74 points out of ten. In other words, the subjective assessment is approximately 0.5 points higher than the objective assessment.

For the second and third age group there are also differences. However, they are less significant comparing to the first age group. For the second group the difference amounts

to less than 0.1 points (in favor of subjective assessment as well), and for the last age group, it has been measured that people who are older than 40 years are less confident than their real knowledge is. They evaluated themselves 5.67 on average, while their real knowledge corresponds to 6.07 points out of ten. Moreover, it is worth mentioning that they assess themselves with lower score comparing to both of the previous age groups.

Table 3 Descriptive statistics with focus on particular age groups

	18 - 26	**27 - 40**	**41+**
Subjective assessment of financial literacy	7.23	7.21	5.67
Objective assessment of financial literacy	6.74	7.12	6.07

Source: author's own computation, processed in STATISTICA

In order to verify if this difference is statistically significant, the same test has been run (dependent t-test for paired samples). Nevertheless, three independent tests have been conducted this time, as there are three age groups.

With regard to the results, it has been confirmed that only for the first age group (respondents between 18 and 26 years), there is a statically significant difference between the subjective and objective assessment of financial literacy level. When it comes to the second and third age groups, no significant gap has been confirmed according to the data.

Table 4 Results of t-tests (according to the set age groups)

	18 - 26	**27 - 40**	**41+**
Test statistics	3.168	0.579	-1.137
P-value	**0.001795**	0.564243	0.188518

Source: author's own computation, processed in STATISTICA

Discussion

The conducted study brings an important finding in area of the financial literacy in the Czech Republic. Such finding is crucial to be taken into consideration when dealing with disparities among young people related to the financial literacy, especially the finding that young people tend to overvalue their skills.

On the top of the contribution of the study, it is also important to be aware of obstacles and constraints of it. One of them is the fact that the study consists of only approximately 300 observations, which is far away from the ideal state.

Consequently, this study lacks a comparison with other countries. Such output is planned for the following study conducted by the same author. Last but not least, whenever dealing with financial literacy testing, it can never be ensured that such study depicts the real level of financial literacy or, at least, of all participants/respondents. It might have happened that for some respondents the questions were more demanding or the other way round. Needless to say that failing to succeed in this particular test of financial literacy does not have to mean that such respondent is not financially literate.

4 Conclusions

This paper focuses on financial literacy among various age groups and with focus on subjective and objective assessment of financial literacy. The main goal of the article has been to verify whether there is a link between objective level of financial literacy and

subjective assessment of the financial literacy. To verify such goal, the following research questions have been dealt with:

- Is the objective level of financial literacy equal to the subjective assessment of the financial literacy among adults in the Czech Republic?
- In relation to the previous research question, for which age groups is there the highest discrepancy between the objective level of financial literacy and the subjective assessment of the financial literacy level?

It has been revealed that there exists a gap between subjective and objective level of financial literacy among adult population in the Czech Republic. To elaborate on this finding, the dataset has been divided into three groups according to the age of involved respondents. Furthermore, it has been unveiled that the most significant gap between subjective and objective level of financial literacy exists in case of young adults, in the age between 18 and 26. This age group tends to overestimate their skills related to financial literacy. Particularly, using 10 point scale, respondents assess themselves with 7.23 points out of ten on average, while their real skills equals to approximately 6.74 points out of ten on average.

When it comes to the second and third age group, it has not been verified that there is a difference between subjective and objective level of financial literacy is statistically significant despite the fact that the values are not completely equal either.

Acknowledgments

Support of Masaryk University within the project MUNI/A/0823/2016 "*Behavioral and knowledge aspects of trading and evaluation of financial assets*" is gratefully acknowledged.

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Internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers

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Abstract: *The internet shopping has been developing not only all over the world but in the Czech Republic too in the last years and it is possible to expect a future expansion. The aim of this paper is to describe the development of the internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers and introduce and interpret results of own quantitative research focused on knowledge, skills and behaviour in the internet shopping of consumers. On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." is verifying with using statistical methods. The aim of this hypothesis is to verify whether and how the internet shopping frequency of a consumer and the literacy in the internet shopping field of a consumer shopping on the internet are related together.*

Keywords: e-commerce, e-shops, internet, internet shopping, internet shopping frequency

JEL codes: D100, L810

1 Introduction

The internet shopping has been developing not only all over the world but in the Czech Republic too in the last years and it is possible to expect a future expansion. In 2016 sales of internet shops in the Czech Republic were 98 billion CZK, it is 17 billion CZK more than in 2015. According to APEK – Association of E-commerce the turnover of internet shops will break out the level of 100 billion CZK this year. (Czech News Agency – CTK, 2017) According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping 96 % respondents – internet users have already done shopping on the internet. 5 % respondents (who mentioned they do shopping on the internet) do shopping on the internet at least once a week and 46 % respondentst at least once a quarter (Mediaresearch, 2011).

The aim of this paper is to describe the development of the internet shopping in the Czech Republic with the focus on the internet shopping frequency of consumers and introduce and interpret results of own quantitative research focused on knowledge, skills and behaviour in the internet shopping of consumers. On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." is verifying with using statistical methods. The aim of this hypothesis is to verify whether and how the internet shopping frequency of a consumer and the literacy in the internet shopping field of a consumer shopping on the internet are related together.

2 Methodology and Data

Data for own quantitative research (focused on the internet shopping) 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 the 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 the internet shopping frequency. Respondents should answer the question "Have you already ordered goods and/or a service on the internet?" and if the answer was positive they should mark their internet shopping frequency. Collected data are evaluated by methods of descriptive statistics, especially by the statistic:

- number of respondents who have already ordered goods and/or a service on the internet/number of respondents,
- number of respondents who have not ordered goods and/or a service on the internet yet/number of respondents and than
- number of respondents who do shopping on the internet at least once a week/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a month/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a quarter/number of respondents who mentioned they do shopping on the internet,
- number of respondents who do shopping on the internet at least once a half a year/number of respondents who mentioned they do shopping on the internet and
- number of respondents who do shopping on the internet less often than once a half a year/number of respondents who mentioned they do shopping on the internet.

The formulated hypothesis "The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet." is verified using the rank correlation test.

To data processing and their evaluation (including verifying the formulated hypothesis) the software Microsoft Office Excel and STATISTICA were used.

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 paper's aim is reached by using of general science methods, primarily description, analysis, comparison, synthesis and deduction, and by using statistics methods (methods of descriptive statistics and the rank correlation test).

3 Results and Discussion

In 2016 sales of internet shops in the Czech Republic were 98 billion CZK, it is 17 billion CZK more than in 2015, which is the year-on-year increase of 20,99 %. The e-commerce share in the total retail sales increased to 9,5 %. (Czech News Agency – CTK, 2017) According to APEK – Association of E-commerce (Czech News Agency – CTK, 2017) the turnover of internet shops will break out the level of 100 billion CZK this year. In the following Table 1 and Figure 1 we can see the development of the turnover of internet shops in the Czech Republic in years 2001 - 2016. These data confirm, that the turnover of internet shops in the Czech Republic has been increasing for a long time.

According to Czech Statistical Office (Czech Statistical Office, 2017) and its published data about use of ICT (information and communication technologies) in households and by individuals in year 2016 in the Czech Republic more than 41 % individuals have not done shopping on the internet yet. 58,6 % individuals have already done shopping on the internet, in the last 12 months it was 57 % respondents. As we can see in Figure 2 the population of the Czech Republic with an experience in internet shopping is relatively stable in last years.

According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping which we can see in Figure 3 96 % respondents – internet users have already done shopping on the internet and only 4 %

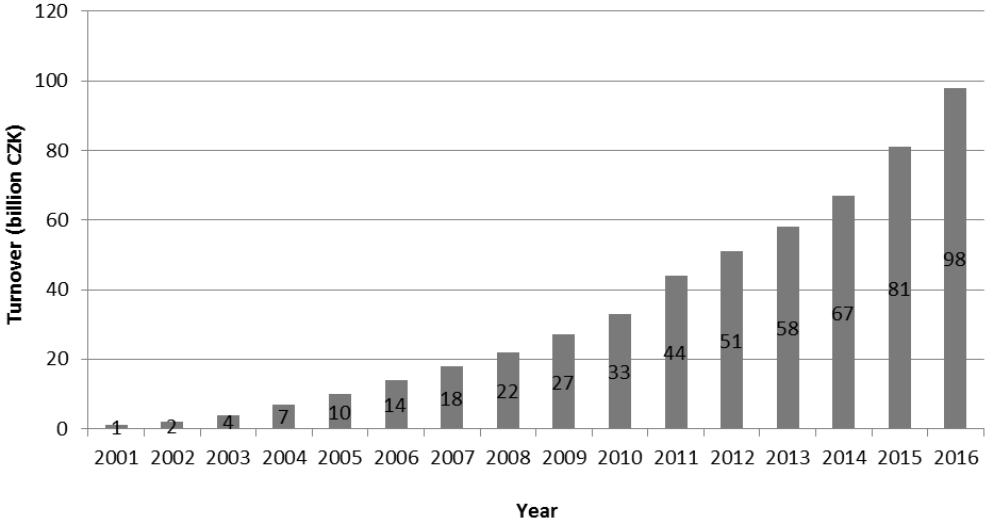
respondents – internet users have not done shopping on the internet yet. As we can see below too, the most mentioned internet shopping frequency is at least once a quarter (46 % respondents who mentioned they do shopping on the internet). The second often mentioned answer is frequency less often than once a half a year (26 % respondents who mentioned they do shopping on the internet) and the third often mentioned answer is frequency at least once a half a year (23 % respondents who mentioned they do shopping on the internet). Fewest respondents of the researched sample answered, that they do shopping on the internet at least once a week (only 5 % respondents who mentioned they do shopping on the internet). (Mediaresearch, 2011)

Table 1 Turnover of internet shops in the Czech Republic (2001 – 2016)

Year	Turnover (billion CZK)	Change per year (billion CZK)	Change per year (%)
2001	1	-	-
2002	2	1	100,00
2003	4	2	100,00
2004	7	3	75,00
2005	10	3	42,86
2006	14	4	40,00
2007	18	4	28,57
2008	22	4	22,22
2009	27	5	22,73
2010	33	6	22,22
2011	44	4	12,12
2012	51	7	15,91
2013	58	7	13,73
2014	67	9	15,52
2015	81	14	20,90
2016	98	17	20,99

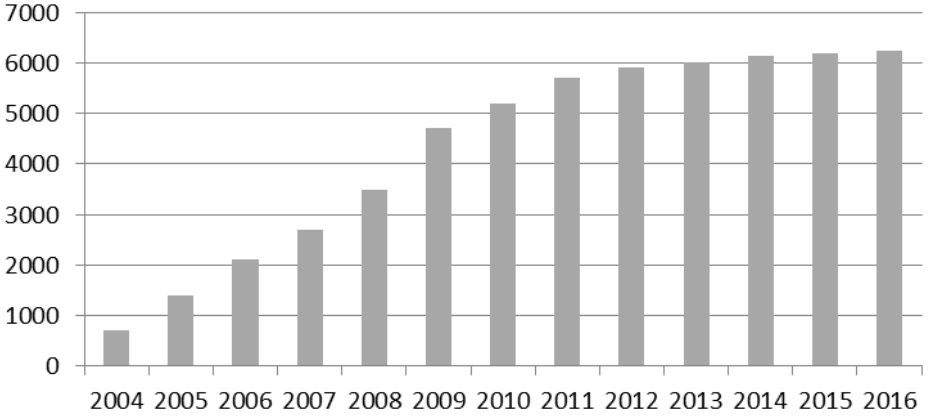
Source: author's processing according to Financninoviny.cz (2011). APEK: Last year internet shops earned record 33 billion CZK (in Czech). *Finance.cz*. Retrieved from: http://www.finance.cz/zpravy/finance/293445-apek-internetove-obchody-loni-utrzily-rekordnich-33-mld-kc/; Czech News Agency – CTK (2017). This year e-shops sales will break the level of 100 billion. But carriers are missing drivers (in Czech). *Aktuálně.cz*. Retrieved from: https://zpravy.aktualne.cz/ekonomika/trzby-e-shopu-letos-prolomi-hranici-100-miliard-dopravcum-al/r~8a7570aed1b811e6a78c002590604f2e/?redirected=1495194613.

Figure 1 Turnover of internet shops in the Czech Republic (2001 – 2016)



Source: Author's processing according to Financninoviny.cz (2011). APEK: Last year internet shops earned record 33 billion CZK (in Czech). Finance.cz. Retrieved from: http://www.finance.cz/zpravy/finance/293445-apek-internetove-obchody-loni-utrzily-rekordnich-33-mld-kc/; Czech News Agency – CTK (2017). This year e-shops sales will break the level of 100 billion. But carriers are missing drivers (in Czech). Aktuálně.cz. Retrieved from: https://zpravy.aktualne.cz/ekonomika/trzby-e-shopu-letos-prolomi-hranici-100-miliard-dopravcum-al/r~8a7570aed1b811e6a78c002590604f2e/?redirected=1495194613.

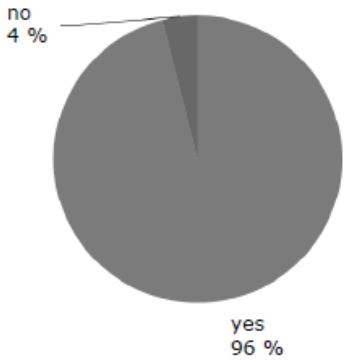
Figure 2 Population of the Czech Republic with an experience in internet shopping (in thousands)



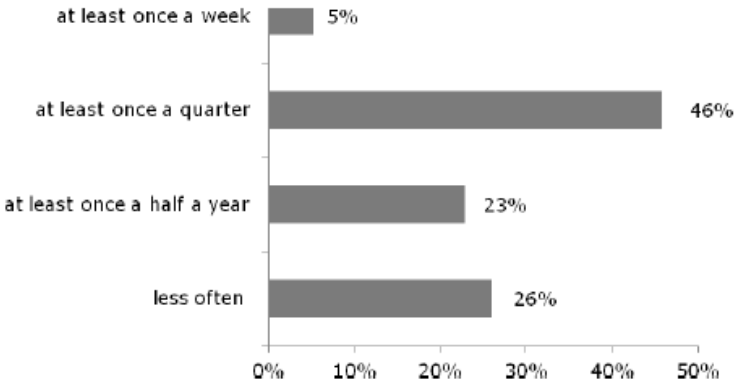
Source: Association of E-commerce (2017). Population of the Czech Republic with an experience in internet shopping (in Czech). Association of E-commerce. Retrieved from: https://www.apek.cz/download/file2/374f624e36422f6b52615961334d73616e68764d6659742f627645364a75696c7a35492f6b3346617173453d.

Figure 3 Internet shopping frequency in the Czech Republic

Have you already ordered goods and/or a service on the internet?



How often do you do shopping on the internet?
Basis: Respondents who mentioned they do shopping on the internet

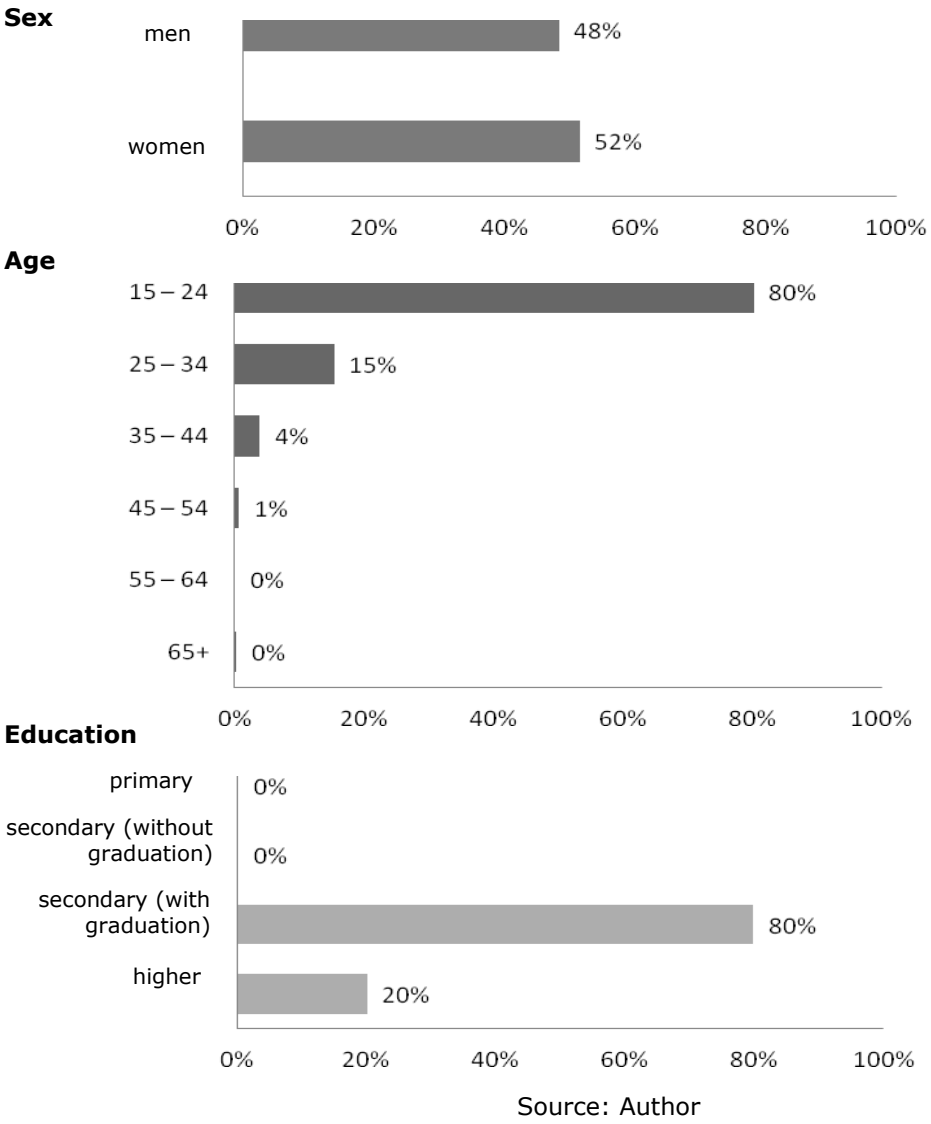


Source: Author's processing according to Mediaresearch (2011). Every second user does shopping already on the internet (in Czech). Mediaresearch. Retrieved from: http://www.mediaresearch.cz/aktualita/tz-na-internetu-jiz-nakupuje-kazdy-druhy-uzivatel.

In the following section the results of own quantitative research are presented, focused on the internet shopping frequency of consumers and their knowledge, skills and behaviour in the internet shopping field. 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 Figure 4 (by sex, age and education). It is important to note on the definition of the 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 4 Structure of the sample

Basis: All respondents, n = 910



Source: Author

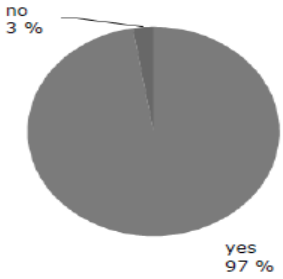
Internet shopping frequency of consumers - descriptive statistics

A part of the research was focused on internet shopping and its frequency. Respondents should answer the question "Have you already ordered goods and/or a service on the internet?" and if the answer was positive they should answer the question "How often do you do shopping on the internet?" too. As we can see in Figure 5, 97 % respondents have already ordered goods and/or a service on the internet and only 3 % respondents have not ordered goods and/or a service on the internet yet. As we can see below, the most mentioned internet shopping frequency is at least once a quarter (35 % respondents who mentioned they do shopping on the internet). The second often mentioned answer is frequency at least once a month (27 % respondents who mentioned they do shopping on the internet) and the third often mentioned answer is frequency at least once a half a year (20 % respondents who mentioned they do shopping on the internet). 14 % respondents (who mentioned they do shopping on the internet) do shopping on the internet less often than once a half a year. Fewest respondents of the

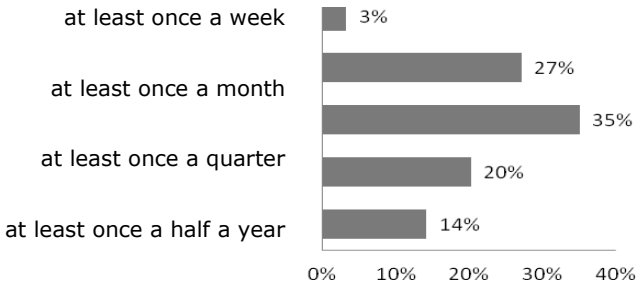
researched sample answered, that they do shopping on the internet at least once a week (only 3 % respondents who mentioned they do shopping on the internet).

Figure 5 Internet shopping frequency of consumers – descriptive statistics

Have you already ordered goods and/or a service on the internet?
Basis: All respondents, n = 910



How often do you do shopping on the internet?
Basis: Respondents who mentioned they do shopping on the internet, n = 886



Source*:* Author

When compared to the results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping which we could see in Figure 3 the number of respondents who have already ordered goods and/or a service on the internet is in both researches similar (96 % and 97 %). As to the internet shopping frequency of respondents we can observe that respondents of own research do shopping on the internet in general more often (the exception is the frequency at least once a week 3 % versus 5 %, but 27 % respondents who mentioned they do shopping on the internet mentioned they do shopping on the internet at least once a month and 35 % respondents do shopping at least once a quarter versus 46 % of respondents of the research of the agency Mediaresearch who do shopping on the internet at least once a quarter (the monthly internet shopping frequency was not used in the Mediaresearch's research)).

Internet shopping frequency of consumers and the literacy in the internet shopping field of consumers shopping on the internet – verifying of the formulated hypothesis

The hypothesis "The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet." has been formulated. The aim of this hypothesis is to verify whether and how the *internet shopping frequency* of a consumer (link to the question number 4 of the questionnaire) and the *literacy in the internet shopping field* of a consumer shopping on the internet are related together. The *literacy in the internet shopping field* is defined to the goal of this paper as a quantitative variable its values are derived from knowledge, skills and behaviour of consumers shopping on the internet. The values of this variable were calculated using respondents' answers to 14 questions of the questionnaire – 8 questions

focused on knowledge, skills and behaviour of respondents – consumers shopping on the internet in the internet shopping field and 6 questions focused on knowledge and behaviour of respondents – consumers shopping on the internet in the internet and computers field (detailed information to this variable is in Oškrdalová (2013, p. 203 – 204)).

To verify the hypothesis the rank correlation test has been used:

Null hypothesis H_0:

The *internet shopping frequency* of a consumer is not connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.

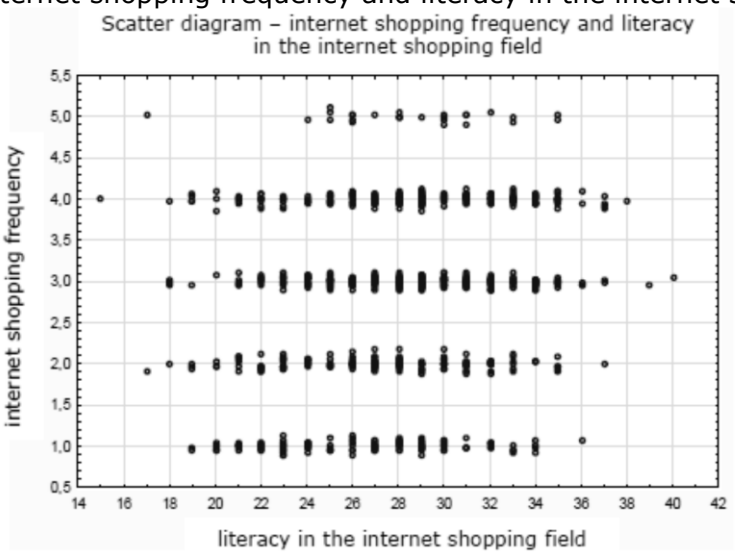
Alternative hypothesis H_1:

The *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.

Assumptions: The number of measurements for the asymptotic variant is sufficient; the equivalences correction has been made.

In the following scatter diagram (Figure 6) we can see the *internet shopping frequency* and the *literacy in the internet shopping field* of a consumer shopping on the internet.

Figure 6 Internet shopping frequency and literacy in the internet shopping field



Source: Author

As we can see in Table 2 , p-value is 0 and rejects the null hypothesis H_0 "The *internet shopping frequency* of a consumer is not connected with the *literacy in the internet shopping field* of a consumer shopping on the internet.". In favour of alternative hypothesis H_1. This means, that it is possible to state the *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet (for significance level 5 %). The sample Spearman's correlation coefficient is 0,20 (rounded to two decimal places) and it means the positive dependence of researched variables in the sample. So we can state the *internet shopping frequency* of a consumer grows with the growing *literacy in the internet shopping field* of a consumer too.

Table 2 Internet shopping frequency and literacy in the internet shopping field – correlation

	Spearman's correlations			
	Missing data are left out in pairs			
	Correlations are significant for significance level <,05000			
Pair of variables	Count	Spearman R	t(N-2)	p-value
Internet shopping frequency & literacy in the internet shopping field	870	0,200132	6,018009	0,000000

Source: author

4 Conclusions

In 2015 sales of internet shops in the Czech Republic were 81 billion CZK, in 2016 98 billion CZK and according to APEK – Association of E-commerce the turnover of internet shops will break out the level of 100 billion CZK this year (Czech News Agency – CTK, 2017). According to results of the research of the agency Mediaresearch for the Association of E-commerce (APEK) in the field of internet shopping 96 % respondents – internet users have already done shopping on the internet. 5 % respondents (who mentioned they do shopping on the internet) do shopping on the internet at least once a week and 46 % respondentst at least once a quarter (Mediaresearch, 2011).

On the basis of data gained by the questionnaire research the hypothesis "The internet shopping frequency of a consumer is connected with the literacy in the internet shopping field of a consumer shopping on the internet." was verifying and it is possible to state the *internet shopping frequency* of a consumer is connected with the *literacy in the internet shopping field* of a consumer shopping on the internet (for significance level 5 %). According to the value of the Spearman's correlation coefficient there is the positive dependence of the researched variables in the sample. So we can state the *internet shopping frequency* of a consumer grows with the growing *literacy in the internet shopping field* of a consumer. These 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.

Acknowledgments

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Czech News Agency – CTK (2017). This year e-shops sales will break the level of 100 billion. But carriers are missing drivers (in Czech). *Aktuálně.cz*. Retrieved from: https://zpravy.aktualne.cz/ekonomika/trzby-e-shopu-letos-prolomi-hranici-100-miliard-dopravcum-al/r~8a7570aed1b811e6a78c002590604f2e/?redirected=1495194613.

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The impact of foreign exchange intervention in the balance sheet of the Czech National Bank

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Abstract: *The aim of the text is an analysis of the manifestations of the foreign exchange intervention of the Czech National Bank in the central bank's balance sheets and their connections in the banking sector. The motivation of the text is the manifestation of the interventions in the central bank's balance sheets and the resulting possible manifestations after their termination. The analysis of the manifestations of foreign exchange intervention in the central bank's balance sheets was conducted from the data for the years 2010 – 2016. The data include the period before the use of this instrument and in the course of its application. The text characterizes the effects of the active and passive sides of the balance sheet of the central bank and assesses the achievement of the objectives set. Analysis of selected items of the balance of the central bank was carried out on the basis of the theoretical background of the used resources and the practical knowledge of the author. In conclusion, the author presents his views on the use of this instrument of monetary policy and pronounced his prediction. In the text were used methods description of the theoretical and practical parts, methods of comparison, analysis and prediction in the part of monitoring the evolution of balance sheet items and their context*

Keywords: Central bank, non-standard monetary policy instrument, exchange rate intervention, the balance of the central bank, the banking sector, the reserve banks, foreign exchange reserves

JEL code: G 28

1 Introduction

The main objective of the monetary policy of the Czech national bank is to maintain price stability. The inflation target is set at 2 %. The basic standard instruments of monetary policy of the national bank are interest rates, open market operations, automatic facilities and reserve requirements. The main standard tools of monetary policy are open market operations. The aim of operations is to influence the development of interest rates in the economy.

Non-standard monetary policy instruments used was by the Czech national bank in the two cases. In the year 2008 used the central bank for the delivery repo operations with a maturity of two weeks and later three months for precautionary liquidity support for the banking sector.

The second non-standard measures were foreign exchange intervention announced in November 2013. The bank board of the central bank decided to use the exchange rate of the domestic currency as the main tool for monetary easing. The reason was the depreciation of the exchange rate of the domestic currency with the aim of curbing deflationary pressures in the economy. These tendencies it was not possible to suppress the lowering of interest rates.

The aim of the text is an analysis of the manifestations of the non-standard monetary-policy measures in the central bank's balance sheets in the period 2010 to 2016. To achieve the objectives of the text are used the methods of description, comparison,

development of selected items of the balance of payments, analysis of the relationships between the selected items and the prediction of the on-balance sheet items after the termination of the intervention in April of this year.

2 The balance sheet of the central bank

The balance of the central bank differs from the balance of commercial banks. *Assets of the balance sheet of the central bank represent the ways of the money-issuing central bank and the liabilities represent certain kinds of money in the economy (Revenda, 2012).* A specific feature of the balance of the central bank is the high proportion of foreign exchange reserves in the assets and reserves of commercial banks and money in circulation on the liabilities.

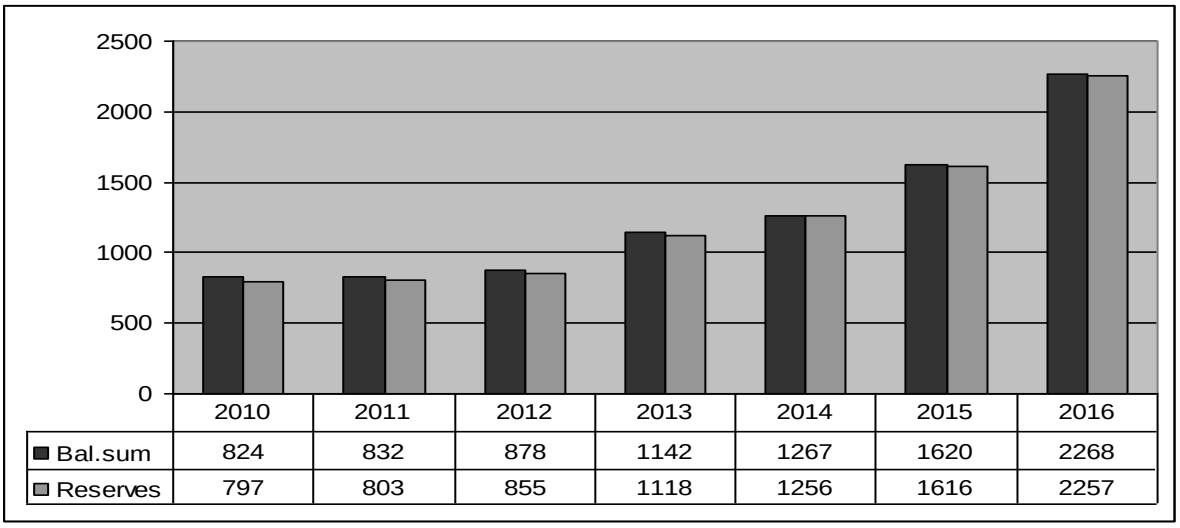
The use of the exchange rate of the domestic currency as a tool of monetary policy easing illustrated the Czech national bank as averting the threat of deflation and the related adverse accompanying phenomena in the economy. The central bank announced the commitment of the depreciation of the exchange rate of the domestic currency 27 CZK/EUR.

For the analysis of the influence of non-standard monetary policy instruments on the balance sheet of the central bank is an important development level and structure of the monetary base on the liabilities, foreign exchange reserves and lending to commercial banks on the assets and income of the central bank. The policy of monetary easing, the launch of foreign exchange interventions over the period in question, changed the form of the balance of the Czech national bank.

In the years 2010-2016 there was a gradual increase of the balance sheet of the central bank. Changing the main monetary policy instruments on exchange rate intervention there was an increase in the balance sheet from the year 2013 occurred twice.

Assets of balance sheet of the central bank
On the active side of the balance sheet of the central bank we pay attention to the movement of the value of foreign exchange reserves and their context with currency interventions of the central bank. The assets of the Czech national bank primarily consist of foreign exchange reserves (over 90%). The structure of the reserve consists of deposits in foreign banks, securities, gold and reserves with the IMF. Foreign exchange reserves make up a substantial part of the assets of the balance sheet of the central bank, their value in the long term corresponds to the recommended amount in proportion to the import of goods and services from the IMF. The movements of the exchange rate of the domestic currency significantly affect the economic result of the central bank

Figure 1 The sum of the balance sheet and foreign reserves 2010-2016 (bn. CZK)



	2010	2011	2012	2013	2014	2015	2016
Bal.sum	824	832	878	1142	1267	1620	2268
Reserves	797	803	855	1118	1256	1616	2257

Source: compiled by the author according to the Annual reports of the Czech National Bank

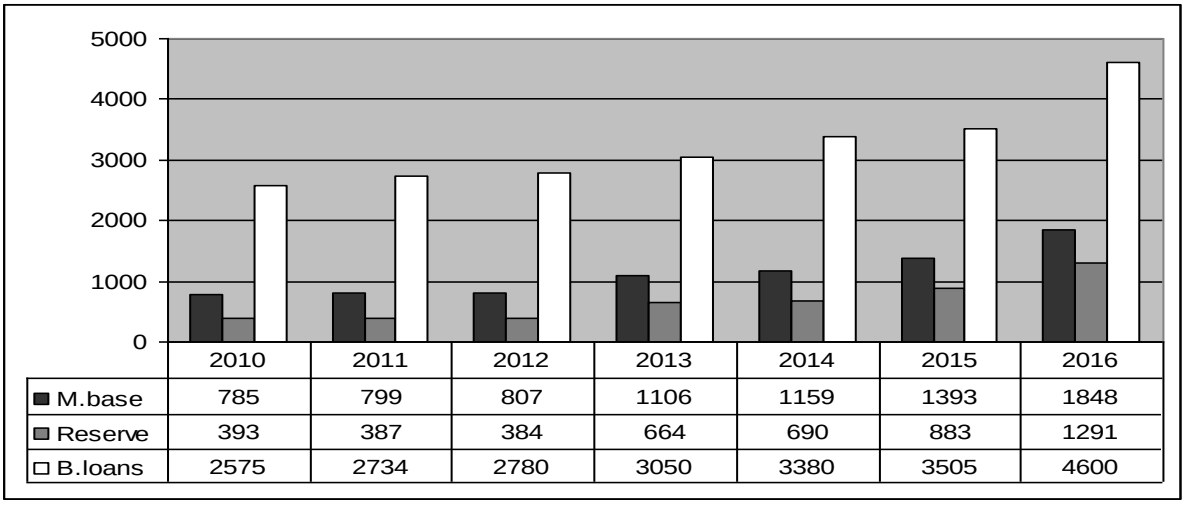
The decline in the exchange rate of the domestic currency increases the volume of foreign exchange reserves and reported profit, also increases the value of foreign claims. Returns from invested reserves to further enhance their value. The movements of the value of the foreign exchange reserves are caused mainly by foreign exchange interventions of the central bank.

In the active item claims to banks is reflected long-term systemic excess liquidity of commercial banks. It takes a low demand for loans from the commercial banks item in the balance sheet of the central bank has a zero value.

Liabilities of balance sheet of the central bank

On the passive side of the balance sheet of the central bank we follow the evolution of the monetary base involving the item banknotes and coins in circulation, required and free reserves of commercial banks at the central bank. These items form a significant part (90%) of the liabilities of the central bank.

Figure 2 The monetary base, reserve of banks and bank loans 2010-2016 (bn. CZK)



	2010	2011	2012	2013	2014	2015	2016
M.base	785	799	807	1106	1159	1393	1848
Reserve	393	387	384	664	690	883	1291
B.loans	2575	2734	2780	3050	3380	3505	4600

Source: compiled by the author according to the Annual reports of the Czech National Bank

Liabilities of the central bank to the domestic banks most grew after 2013, as the effect of the inflow of the domestic currency into the banking sector the influence of foreign

exchange intervention. There was an increase in the crown of the reserves of domestic commercial banks. Structurally there has been an increase in particular voluntary reserve banks influence monetary easing. The remuneration of the voluntary reserves of banks is lower than the interest provided by bank loans the banks so in the area of interest limit the potential returns.

Related to the influence of increasing the monetary base is the growth of banknotes and coins in circulation, the value of the currency has reached 557 billion CZK in 2016.

The sharp increase in the liquidity of commercial banks after the launch of foreign exchange interventions had the goal of increasing credit activity of banks. This goal was only partially achieved. The volume of bank loans has been curbed partially delay the growth of lending for the growth of bank reserves and also the lack of creditworthy clients and effective business plans. The consequence of this is the restriction of financial flows to households and businesses, and in effect limits the performance of the economy and a failure to fulfill the inflation target. Currently there is a growth of credit activity of banks the influence of an increase in the financial resources of banks and the improvement of the condition of the economy of the EU countries (GDP of 1.5% in 2016).

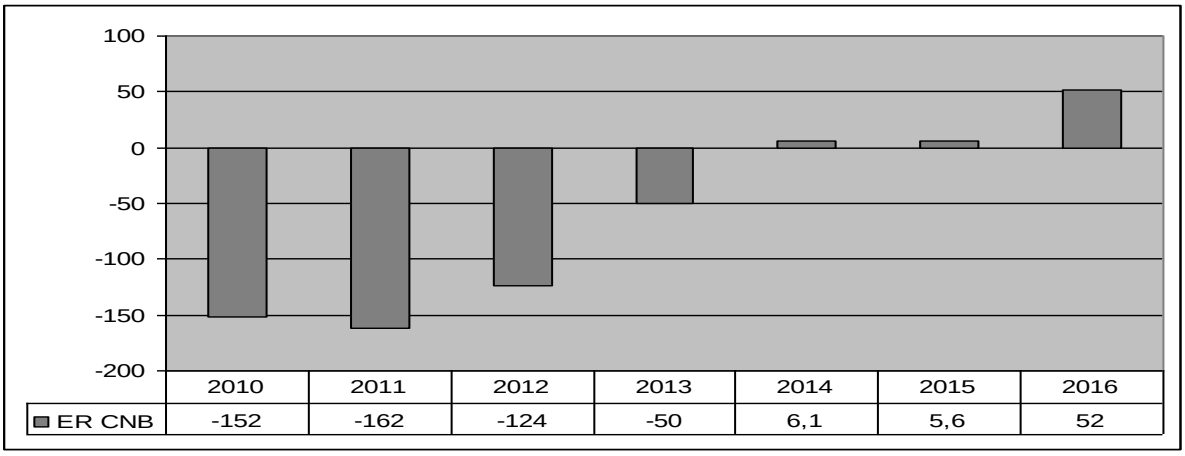
3 The result of the management of the central bank

Making a profit is not the priority activities of the Czech national bank. According to economic theory the central banks show a profit. The negative result created by the central bank is a normal situation and does not have any substantial influence on activities of the central bank.

Long-term increased demand for domestic currency due to capital inflows into the Czech Republic caused an appreciation of the domestic currency, reducing value of foreign exchange reserves and creating a loss in economic result of the central bank.

During the years 2010 to 2016 recorded the results of operations of the central bank to considerable fluctuations. The highest cumulative loss in the reference period has reached the central bank in the year 2011 in the amount of 162 billion CZK. The results of the management of the Czech national bank fundamentally affect the foreign exchange differences of the domestic currency and the related change in value of foreign exchange reserves.

Figure 3 The cumulative economic result of the CNB 2010-2016 (bn. CZK)



Source: compiled by the author according to the Annual reports of the Czech National Bank

Exchange rate intervention to weaken the domestic currency commenced in 2013 had a significant impact on the financial result of the central bank. The Czech national bank reported in 2013, the influence of the depreciation of the domestic currency, high profit in the amount of 73 billion CZK, in the year 2014 made a profit of 56 billion CZK. Created

financial resources were used to cover the losses of the previous period. The effect of exchange rate differences on the financial result of the central bank will strongly manifest itself in the non-participation of the Czech Republic in the euro area.

The economic result of the central bank even after termination of the foreign exchange interventions further influenced by the exchange rate of the domestic currency, the related value of foreign exchange reserves and interest reserves of the banks deposited with the central bank.

4 Conclusions

In the balance of the central banks are the dominant item on the asset side foreign exchange reserves, on the liabilities side, bank reserves and money in circulation. In the period of years 2010 – 2016 balance sheet of the central bank rose sharply. The important influence of the increase in the balance of payments was the release of the monetary policy of the central bank with the aim of kick-starting the domestic economy and the achievement of the inflation target.

Use the exchange rate of the domestic currency as an instrument of monetary policy and the takeover of the exchange rate commitment caused a rise in foreign exchange reserves on the assets and the increase in bank reserves and money in circulation on the liabilities. There was an increase in the share of bank reserves on the monetary base. The Czech banking sector in the long term shows a surplus of liquidity. These facts are indicative of the impact of the interventions in large part only to the banking sector.

Foreign exchange interventions have affected substantially the results of operations of the central bank. Their launch in 2013 achieved coverage of the entire accumulated losses of the central bank of the past years the influence of the increase in the value of foreign exchange reserves.

In the period after the termination of the foreign exchange interventions of the Czech national bank (April 2017) will further lead to the movement of items in the balance sheet of the central bank. The main impact on the financial result will have the exchange rate of the domestic currency, the related value of foreign exchange reserves, the returns from foreign exchange reserves and interest on bank deposits at the central bank.

Assuming a gradual appreciation of the domestic currency will be the premise of losses, the central bank partially offset by the proceeds from the foreign exchange reserves. The growth of interest rates of the domestic currency will cause higher remuneration on the reserves of commercial banks with an adverse influence on the management of the central bank. The increase in the disbursement of loans of banks from the central bank cannot be expected, while the abundance of their financial resources.

Return to the managed floating exchange rate of the domestic currency can mean higher volatility of the exchange rate of the domestic currency, supportable estimates of the development cannot be accurately determined. By assumption, the central bank will not be the termination of the foreign exchange interventions indicate a strengthening of the exchange rate of the domestic currency above the level before the interventions. The result of the management of the central bank may be negatively affected, its value, however, is not a significant macroeconomic variable.

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Blockchain-Applications in Banking & Payment Transactions: Results of a Survey

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Abstract: *We examine different opportunities to implement the blockchain technology into online payment and sales transaction systems with a focus on the financial sector of the German speaking area in Europe. To this end, we conduct a literature review and conduct a questionnaire survey among payment transaction experts. In addition the advantages and disadvantages are pointed out as well as other applications. Results from the survey suggest that many experts are investigating the new technology, but the efforts made at Austrian, German and Swiss banks are low since there are still many open issues pending. Especially setting up a legal framework for the international treatment of payment transactions based on the blockchain would be an important step.*

Keywords: blockchain, payment transaction service, cybercrime, electronic banking

JEL codes: E42, E50, F23, F55, G21, J33, K23, L22

1 Introduction

When payment systems were first computerized, the underlying processes were not significantly changed. While records and ledgers have been converted from paper to electronic form, the basic structure of centralized payment systems remained. At the core of these conventional payment systems lies a central "clearing bank" serving as ledger, with settlement taking place across the books of this central authority. The so-called "blockchain" or "distributed ledger" technology (DLT) introduces a fundamentally different, decentralized structure into payment systems, with cryptography rather than a central clearing institution as its very basis, and without intermediaries such as banks. Blockchain technology is an innovative way of ensuring that money cannot be "double spent", thus providing for a highly secure payment structure and possibly preventing fraud (Böhme et al, 2014; Bohannon, 2016; Martins et al, 2013). This is a key issue in systems that rely on digital records where it is simple to copy and edit entries.

Various efforts by banks and other market participants are under way to investigate the possibilities of the DLT technology for financial transactions such as instant payments. If adopted, DLT will influence banking and commerce at large. Opportunities and effects of its implementation are an important issue for financial sector participants and beyond.

We will investigate several areas: For one, how could DLT make payment transactions and banking services safer, what are possible advantages and disadvantages according to current literature? For two, what current efforts are under way among German and Austrian banks? To answer this question, we collected responses from 22 experts in information technology (IT)- and payment transaction from banks, financial institutions such as credit card providers and other parties, which are involved in the payment transaction process (e.g. FinTechs, auditors, stock exchanges…) in the German speaking area of Europe. We find that many financial institutions are currently examining DLT, while only few tried to implement it yet. Banks are investigating, but don´t want to invest too much money in a potentially hyped technology. Most conventional institutions don´t know much about it yet. Developments to date suggest that the blockchain technology bears promise but that there is still a long way to go for implementation.

Since digital banking is continuously gaining importance, the safety is of core concern. Cases like of the Bangladesh National Banks theft could be prevented if security

standards would be improved (FAZ, 2016). However, not only security would be improved by implementing the blockchain technology but also costs and the duration of processes would be reduced (Schreiber, 2015).

This study is of interest to those who want to get an overview of the ongoing efforts and intentions of financial institutions to adopt the blockchain technology, including market participants, regulators and auditors. It similarly is interesting for people who care about new technologies and future trends like IT-experts who are interested in the current movement by market participants.

The remainder of the paper is structured as follows. Chapter two explains the concept of the distributed ledger technology. Chapter three discusses DLT usage among financial institutions and reports the findings from our empirical investigation among German-speaking financial institutions. The final section concludes.

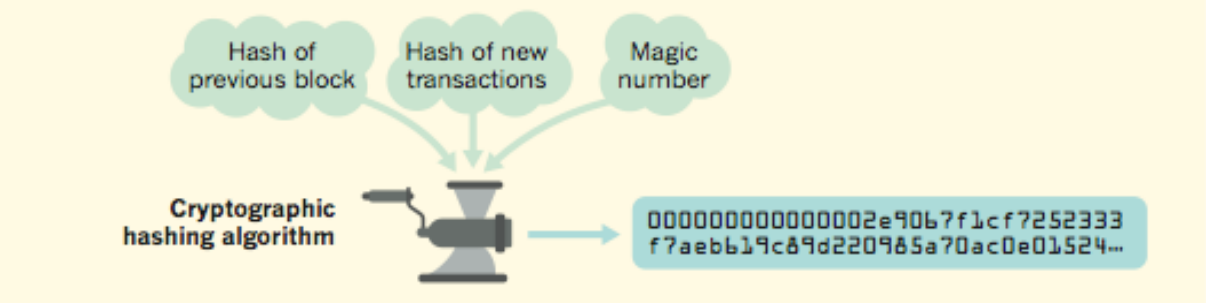
2 The Blockchain Technology

According to Mei (2015), the blockchain technology is a mix of "*cryptography, game theory and peer-to-peer networking without central co-ordination*". The following section will discuss the technical rationale in more detail.

Technical Background

The main idea behind the blockchain technology is already in its name. It is basically a chain of blocks. These blocks consist of transactions realized during a particular time and are created at cost (Nakamoto, 2008). For example, when Bernd pays 2 coins to Albert, the transaction is sent to the so-called "peer-to-peer network". All transactions received during that particular period are collected in those blocks. Each collection of transactions then creates a new "hash". Such a transaction hash is dependent from the users involved in the transaction, since every participant of this system has a public and a private key. The public one can be compared to an address while the private one is similar to something like a signature (Bohannon, 2016). To avoid double spending of a coin, a hash of the private key from the sender (Bernd) and the public key from the receiver (Albert) are added to the coin's end in the case of bitcoins (Extance, 2015).

Figure 1 Creation of a new Hash



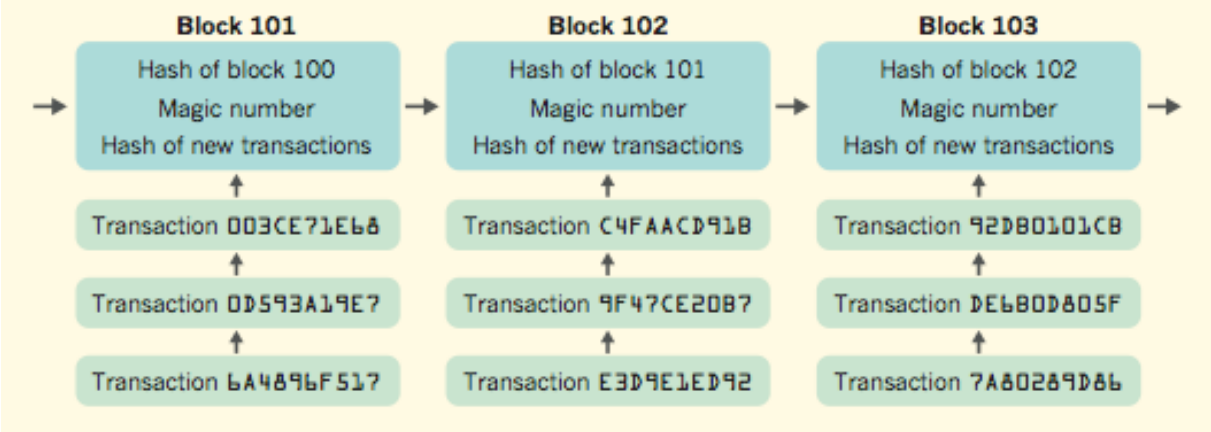
Source: Extance (2015)

These keys are necessary for a user to make his own encrypted transaction activity valid. The new added hash to the coin's end is the same thing as a new block. From a more general point of view, the hash for the new block is selected as a combination of the hash of the previous block and a so-called "magic number". That magic number can be seen as a puzzle based on the transactions (see figure 1). To verify the correctness of them, so-called "miners" calculate the magic number. This system is also called "proof-of-work" (Extance, 2015).

Once a solution is found, the other miners can quickly confirm the solution and the winner gets rewarded with bitcoins (in our example). In the end a precisely determinable new block was created. It is also important that the activities are sorted chronologically

using a timestamp and the first one received is valid. In addition, all transactions made were added to the blockchain and are therefore visible to every user (see figure 2). Of course the participants do not use their real names, but pseudonyms. So the system is pretty anonymous. According to Bloomberg (2016) the blockchain technology can be categorized into private and public blockchains. While the former ones are rather used by companies to process equities and stakes in private companies, the latter ones are under investigation by independent startups among others (Bloomberg, 2016). According to Gerber (2015), experts fear private blockchains, since they are under control of a single company and as a result do not correspond to the independence principle of the blockchain.

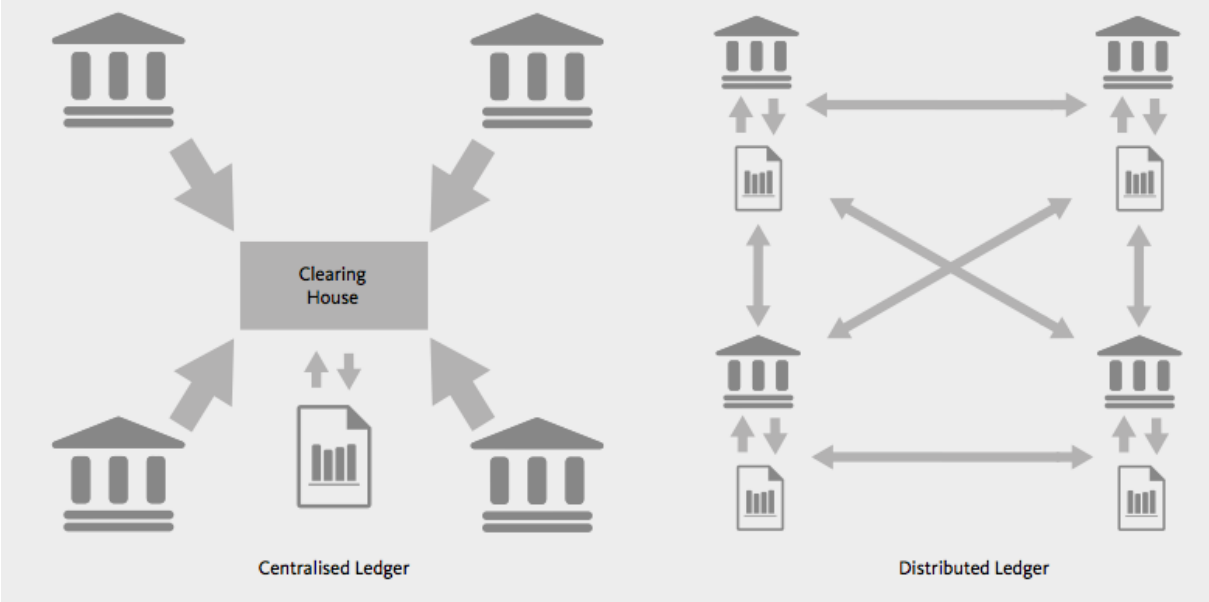
Figure 2 Illustration of a Blockchain



Source: Extance (2015)

The blockchain uses also elements from cryptography and game theory. The former can be described as highly secure encoding that may be also used for safe communication (Mei, 2015). In this fully decentralized payment system, copies of the ledger are shared between all participants and a process is created by which participants agree on changes to the ledger (i.e. which transactions are valid. The need for a controlling central authority is removed as everybody can check proposed transactions against the ledger at a certain conditions, providing confidence in the integrity of other participating entities (Barrdear, Clews and Southgate, 2014; Knibbs, 2015).

Figure 3 Centralized and decentralized ledgers



Source: Santander (2015)

The blockchain technology enables to save crypted personal information in a decentralized network that makes it nearly impossible to hack the system and steal such information. The users are highly anonymous and the chance that an error occurs is close to zero. Intermediaries are not necessary in such a network, which eliminates a weak point of current systems. The main disadvantages at this time are the slowness, irreversibility, the need for high calculation power and weaknesses in the proof-of-work technology.

3 Usage and Empirical Findings on Implementation

DLT is already used by digital currencies, with bitcoin as most famous example. In the following we eview selected literature on its application and then report our own findings.

Literature Review

According to the EU Commission (2017), potential applications of DLT might include international (non SEPA) payments, syndicated lending, post-trade clearing, settlement & custody, primary issuance of securities, to track and manage asset re-hypothecation, automated reporting both to investors and regulators (EU Commission, 2017). Dapp (2016) reports DLT is investigated by so-called innovation labs run by several banks. According to Dapp and Karollus (2015) clearing houses, insurance companies, stock exchanges and credit card firms are examining it, though there are no implementations yet. New challenges are also arising for governments, since a new legal framework to treat systems without a central ledger or to avoid tax fraud and other illegal activities is needed.

According to Schreiber (2015), 50 international bank institutions are currently concentrating on an US-based FinTech called R3. Members are for example: Goldman Sachs, Credit Suisse, JP Morgan, Deutsche Bank, and Commerzbank (Allison, 2016; Schreiber, 2015). This group is engaged in setting standards for decentralized network applications and classifying assets (Börsen-Zeitung, 2015a). Schreiber counted more than 700 Start-ups specializing in the blockchain technology. The Spanish bank Santander already estimated an imaginable reduction in cost of USD 15 to 20 billion annually until 2023 that could derive from an implementation of the blockchain

technology (Schreiber, 2015). According to Weiguny (2016) people have already invested USD 450 million in start-ups that investigate the blockchain technology. The European Securities and Market Authority (ESMA) started to investigate the purposes of European banks, which make efforts to implement Blockchain. Relating to FAZ (2015), they are concerned about the increasing anonymity of customers due to the already known misuse of the Bitcoin for criminal activities. According to Börsen-Zeitung (2016a), the ECB has made some efforts to analyze the potential of DLT (technology used for bitcoin) for applications too.

Business Wire (2016) reports that the State Street Corporation ran a survey among 50 investment funds. Interestingly, not even every second asset manager believes that the blockchain technology will reach the scale necessary. Only 13% of asset owners are convinced that this technology is going to be used by the broad public. 90% of respondents were worried if the blockchain is going to fulfil future safety standards (Business Wire, 2016). In addition, Börsen-Zeitung (2016b) mentioned that institutional investors believe that this new technology is just hyped. According to McLannahan (2016), 7 banks announced that they have successfully transferred money across boundaries using the blockchain. They did so with support from Ripple, a FinTech specialised in digital settlement. Approximately around 80 banks are doing research with that platform. The U.S. Financial Stability Oversight Council (FSOC) emphasized the potential reduction in cost which comes with the usage of systems like provided by Ripple, though they also find that banks have only little experience with that topic.

Not only banks could improve the duration of their transaction processes. According to an article of Börsen-Zeitung (2016c) an insurance company in the German speaking area of Europe is currently evaluating the usage of blockchains for compensation payments, similar to smart contracts. According to FAZ (2015), the New-York based stock exchange NASDAQ is already experimenting with the adoption of the blockchain for certain trading sectors. Deutsche Bank is experimenting with the blockchain technology to use it for smart contracts in bond issuance (Börsen-Zeitung, 2015a).

Survey

Since the literature provided only general information of the situation, we asked transaction experts of financial institutions directly. We sent questionnaires to 110 contacts from banks, 10 from stock exchanges, 7 to credit card providers, 23 to FinTechs and 17 to related consulting firms. As a final step we tried to get in touch with 15 experts from federal governmental and EU institutions. The questions were as follows:

- Is your institution currently thinking about implementing the blockchain technology for payment transaction systems?
- What are the its advantages over other prior technologies in your specific case?
- Are there still issues that have to be solved prior to implementation?
- Where do you see the future of digital payment transactions?
- Have you heard about other financial institutions plans to introduce DLT?
- Are you aware of other interesting applications based on that technology?

In the end, we received 22 answers of which 12 fully completed the questionnaire. The rest stated their intentions relating to the blockchain or sent us extra material to imply the answers, e.g. press releases. All of these institutions are based in Austria, Germany or Switzerland. Thus, we answered the survey based on the information obtained.

The answers of banks were widely spread. They had only one thing in common: none has currently the intention to implement the blockchain technology. Only one mentioned that they have already used a system based on the blockchain, namely Ripple. But they did not continue the tests. At the same time, they mentioned to start some tests again in the future. Three of them not even have started to evaluate the new technology. One stated that he does not believe that any bank or one of the TOP 100 FinTechs in his particular country has made big efforts to investigate that topic. Furthermore he explained that

banks are too conservative concerning new technologies. This may seem legit if we look at the opinion from another payment transaction expert: he emphasized the already good working payment transaction system. It would make sense to use the blockchain for classical foreign trade transactions, however demand seems to be too low. In addition two of the experts mentioned that a joint implementation from all banks is needed. If one would remain the old system, there would be no reduction in cost. Possible advantages for nearly all of the experts interviewed would be a reduction in cost and time, an improvement in privacy and security and slimmer procedures. Other experts stated that customers are not willing to trust an unknown technology. Also it still has to be decided if private or public blockchains should be used. Again only one claimed that the new technology will lead to a decrease of importance of banks and that this could promote illegal activities like money laundering and financing of terrorism. Besides trust issues that were also enforced because of the criminal activities operated with the bitcoin, one mentioned that system is too complex at the moment. Two of them criticized the lacking legal framework.

Concerning the future, the opinions were widely spread once again. It is clear for all that it is going to change. While one predicts the end of payments by cards, another one sees higher demand for online payments and three even stated that the blockchain and p2p-systems will determine the future. Two of them also amended that instant payment are going to be a big thing soon, however by using another technology supported by a clearer. Relating to that topic, one explained that there is going to be a new legal framework in the EU regulating instant payments. Furthermore transaction service providers like Paypal, Google and Sofort will be covered by new regulations in 2018. Another expert mentioned that the blockchain is only one possibility to change the payment transaction system among others. One expert also argued that intermediaries would not be required anymore in the future. Only one expert admitted that he has heard of another bank of his country that is currently evaluating the blockchain technology. Other experts only mentioned banks outside the German speaking area of Europe. The other named institutions like the ECB, the European Commission, the FMA, the ASI, a taskforce of the European Banking Federation and the ESMA that are currently doing research on the new technology. Also the R3 banks, IT-companies, FinTechs, an insurance group, several international banks and two credit card providers were mentioned.

Some respondents expected the use for documentary business in foreign trade finance, credit card processing and other digital payments and trade, for stock trading, settlement, payment transactions and the treatment of financial information, though legal concerns remain high. Another bank is even investigating the implementation for their core banking system. The main advantages of DLT foreseen are lower levels of risk when talking about information reachability and errors when making transactions. In addition, the instant processing and the lacking central authority was mentioned.

Many referred to the early stage of the development. Current barriers are lacking legal frameworks and the difficult implementation into current systems among others. Only several responding FinTechs are already using the blockchain technology or adoptions of it. They also declared the main advantages as follows: the elimination of central authorities, an increase in speed, reduction in cost, distribution of risk, global application, tampering protection and public access. Besides too high calculation effort and costs, the slowness and scalability issues were mentioned. Compliance and regulations are going to play an important role too. The perceived slowness of the blockchain was emphasized by providing a comparison between the bitcoin that can operate five transactions in a second to a credit card provider that can operate 2.000 transactions in a second.

Table 1 Overview of findings

Questions	Banks	FinTechs	Credit Card providers & Stock exchanges	Other experts
Implementation of blockchain technology	• 7 made no efforts for an implementation • 1 tested a DLT based system • 3 had not evaluated DLT	• 2 out of 5 already implemented the blockchain	• No efforts for an implementation made yet	-
Advantages of DLT	• Reduction in cost/time • Security/ privacy improvements • Slimmer procedures • Easier data management	• Elimination of central authorities • Increase in speed • Lower costs, distribution of risk, global application	• No advantages for credit card provider	• Lower risk, instant processing, no central authority • Disclaim legal system by using a decentralized network
Issues to be solved before an implementation	• Lacking legal framework • All banks would need to adopt the new system • Difficult to trust new technologies	• Uncertainty about scalability • Slowness • High calculation costs	• Too slow for credit card payments	• Early stage of development, treatment of depreciating assets, high costs • Lacking legal framework
Future of digital payments	• DLT will drive the future • Importance of instant payments • No intermediary services needed	• Very competitive only a few providers survive • Coexistence of several digital currencies	• Growth of digital payments	• Medium term: new products • Long term: low chances for blockchain for payment transactions
Other institutions investigating DLT	• ECB, FMA, ASI, ESMA, R3, FinTechs, ECB, BIS	• Several banks • IT-companies • R3 consortium • Energy companies	• No information available	• 1 heard only from banks • R3 consortium
Other possible applications	• Documental transfer • Storage of digital media • Smart contracts • Core banking system	• Smart contracts: registration systems, asset treatment, voting • Combination of asset storage and transactions	• Stock trading, settlement, financial information • Combination with existing technologies	• Smart contracts • Treatment of ownership rights

4 Conclusion

Many institutions are currently examining the distributed ledger (blockchain) technology (DLT), however only few tried to implement it or even use it. The literature review and the survey we conducted in German-speaking financial markets pointed out the great possibilities of this technology. The answers from the survey varied widely and overlapped with issues covered by previous research and media. Traditional financial institutions´ efforts to implement the blockchain technology seem limited currently. The uncertainty about this new technology is obvious. While they do not want to stay behind, neither bank wants to invest too much money in a potentially hyped technology. This may have led to rather speculative answers than a clear trend. Perceived advantages of DLT are a reduction in cost and duration and slimmer procedures. Disadvantages are especially relating to slowness and the lacking legal framework. According to the EU Commission (2017), most DLT applications would require first solving various technological, operational and regulatory challenges in terms of scalability, interoperability, standards and governance, personal data protection and digital identity management to ensure fair and secure access to data stored on a distributed ledger.

Our survey revealed that DLT is not yet common industry knowledge, only the large global players that can afford costly basic research have a good understanding of the concept and opportunities at hand. On the diffusion curve, DLT has yet only reached the resourceful innovators, not even the early adopters. In that respect an information campaign e.g. by supervisory or regulatory bodies to disseminate proper innovation technology into regional banks might greatly help

A trend could be that the blockchain is going to be used in combination with other technologies. Smart contracts using the blockchain make contracts possible where the parties involved do not have to trust each other. This may change the process of taking out a loan massively. They could make loan payments safer and faster, because they take action when conditions are met and therefore reduce the risk of errors. Prerequisite for efficient and financial stability-supporting DLT solutions is, however, the establishment of platform solutions and solving pending legal prerequisites.

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Forecasting of Crisis Phenomena in Emerging Financial Market: Real-Time Monitoring of Demand and Supply Anomalies in the Stock Exchange

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Abstract: *The aim of the paper is to examine "anomalies" of instantaneous demand and supply in the stock exchange that was detected as alarm signals of a financial crisis in authors' investigations. The authors proposed to record and to analyze online information on bid-ask quotations in the stock exchange to monitor how the large investors' sentiment varies in real time. The original theoretical model of share pricing developed in the previous authors' papers plays a key role for such analysis. The model is based on the concept of time-varying Walrasian equilibrium under exchange processes in the stock exchange. Many observations for emerging stock market in Russia between 2008 and 2017 show that if capital holdings of traders on the side of demand is systematically higher than the ones on the side of supply, in most cases the uptrend will take place for share price later on; similar statement is also valid for downtrend forecasting. However, this regularity is violated in rare conditions that may be specified as "anomalies" of demand and supply. The result of the analysis carried out is that the anomalies are the specific features of drastic and protracted crises, such as stock market crash in Russia in 2008-2009. The hypothesis that investigating the anomalies of demand and supply one can foresee the beginning of protracted crisis as well as its finish was successfully verified: an investment strategy based on the idea has shown a statistically significant "abnormal" return over the period of the crisis.*

Keywords: financial crisis forecasting, asset pricing theory, demand and supply in the stock exchange, emerging markets, bid-ask quotations in the stock exchange

JEL codes: C-12, C-61, G-01, G-12, G-17

1 Introduction

In recent decades a lot of researchers looked into the possibilities of financial crises forecasting. As a result a number of successful techniques known as Early Warning Systems were developed. Examinations of several financial cycles (Mendoza and Quadrini, 2010; Reinhartand and Rogoff, 2014) lead to a conclusion that crises usually follow the periods of credit expansion and sustainable growth in asset prices (Kindleberger and Aliber, 2005; Misina and Tkacz, 2009; Mili et al., 2012; Arouri et al., 2013).

The first forecasting technique designated as "signaling approach" was proposed by Kaminsky et al. (1998). It claims that the triggering of financial crisis occurs when some indicators (developed in the model) exceed the certain threshold values. Many authors (Borio and Lowe, 2002; Sorge, 2004; Virolainen, 2004) developed and improved either general principles of Early Warning Systems or their implementation in the context of financial crises in different countries. Further examinations have shown (see, for example, Bussiere and Fratzscher, 2006) that an accommodation of an Early Warning System requires choosing between its sensitivity and false alarm rate.

Simultaneously, the phenomena of boom and ensuing crash of the stock market were analyzed in a number of papers on speculative asset pricing (Shiller, 2003), which found that asset prices producing a speculative bubble (either "positive" or "negative", see

Shiller, 2003) substantially enhance the financial stress in the national economy. In this context the progress of the asset pricing theory in modeling share price movements (including the models for market volatility forecasting, see (Engle, 2001; Poon and Granger, 2003; Jawadi and Ureche-Rangau, 2013)) is of great importance for predicting the financial crises.

The present paper extends an alternative approach to treat the share price variations (Petrov et al., 2013). The approach describes share pricing phenomena in stock exchange trading using Walrasian concept of market equilibrium. The model permits to link online dependences of demand and supply with aggregated combinations of instantaneous "micro-parameters" of market exchange; these combinations were termed in (Petrov et al., 2013) "the effective holding of free capital" and "the effective holding of shares" owned by participants of stock trading. Empirical investigations, fulfilled by authors, have shown that the new model is capable of forecasting the reversals of share price trend based on the monitoring of dynamics of the "effective free capital" for demand compared to that for supply in emerging market of Russia.

The present paper purposes to study "anomalies" in investors' behavior detected few months shy of the crisis of the Russian stock exchange in 2008-2009 and during it (Petrov et al., 2016). There are good grounds for believing that keeping track of similar anomalies gives a chance to forecast financial crises and to expand a repertoire of Early Warning Systems.

2 Methodology and Data

Suppose an economy including shares of N issuers that are traded in a stock market (Petrov et al., 2013). Evidently orders to buy appear when investors aim to exchange "cash" (we regard cash, most notably, as risk-free asset maintaining its value; the other motives for investor's interest in cash are possible also) for stock; in contrast, orders to sell reflect investors' seeking to exchange stock for cash. Consider an investor (let's "*k*" is his or her number) who trades the i^{th} share ($i = 1,..,N$) at some instant; in general investor's portfolio includes both a variety of shares and cash. Let $q_i^{(k)}$ is investor's current holding of the i^{th} share (it has meaning of a number of shares); $M^{(k)}$ is his or her current holding of cash, p_i is current price for the share "*i*".

Investor's efforts to trade stock signify that he or she is not satisfied with his or her portfolio structure. Let us assume that the investor aims the relative amount of the i^{th} share in his or her portfolio at the moment would be equal to $x_i^{(k)}$ (certainly, within the limits of budget constraint). In this case one can express an appropriate holding of the share $\tilde{q}_i^{(k)}$ (that is interpreted as investor's "demand to hold") from the relation

$$p_i \tilde{q}_i^{(k)} = x_i^{(k)} \left(M^{(k)} + \sum_{j=1}^{N} p_j q_j^{(k)} \right), \qquad (1)$$

where all share prices p_j are considered as exogenous variables. Investor's behavior in market trading is determined by his or her instantaneous "net demand"

$$\delta q_i^{(k)} = \tilde{q}_i^{(k)} - q_i^{(k)} \qquad (2)$$

– the amount of the i^{th} share the investor wish to buy at this price; obviously, negative values of $\delta q_i^{(k)}$ means the investor inclines to sell. We can express investor's net demand ("individual net demand") using relations (1), (2); in such a manner we obtain

$$\delta q_i^{(k)} = \frac{\delta F_i^{(k)}}{p_i} - \delta C_i^{(k)}, \tag{3}$$

where the following notations were introduced:

$$\delta F_i^{(k)} = x_i^{(k)} \cdot \left(M^{(k)} + \sum_{\substack{j=1 \\ j \neq i}}^{N} p_j q_i^{(k)} \right), \tag{4}$$

$$\delta C_i^{(k)} = q_i^{(k)} (1 - x_i^{(k)}). \tag{5}$$

The summing in the expression (4) includes all securities *j* except for the selected one *i*. In general, the parameter $x_i^{(k)}$, characterizing investor's expectations and appearing in the relations (4) and (5), depends on a share price p_i. However, we consider market exchange phenomena in the short run; so we can ignore this dependence in the sequel. In such a manner combinations $\delta F_i^{(k)}$ and $\delta C_i^{(k)}$ become independent of a share price p_i also. Aggregating expressions (3) over the groups of "buyers" and "sellers" one can obtain analytic representations of instantaneous net demand functions Δq_i^+ and Δq_i^- for the both parties of market exchange (superscripts (+) and (-) relate to demand and supply respectively):

$$\Delta q_i^+ = \sum_{k}^{over\ buyers} \delta q_i^{(k)} = \frac{F_i^+}{p_i} - C_i^+ \tag{6}$$

$$\Delta q_i^- = \sum_{k}^{over\ sellers} \delta q_i^{(k)} = \frac{F_i^-}{p_i} - C_i^- \quad . \tag{7}$$

Coefficients F_i^+, F_i^- and C_i^+, C_i^- of the functions (6), (7) (the "effective free capital" and the "effective capacity" respectively, see Petrov et al., 2013) can be found by aggregating the combinations (4) and (5) of the "micro-parameters" $M^{(k)}$, $q_i^{(k)}$, $x_i^{(k)}$:

$$F_i^{+/-} = \sum_{k}^{over\ buyers/\ sellers} \delta F_i^{(k)} \tag{8}$$

$$C_i^{+/-} = \sum_{k}^{over\ buyers/\ sellers} \delta C_i^{(k)}, \tag{9}$$

Note that net demand functions (6), (7) are suitable for relating to the measurements. First, at $\Delta q_i^+ > 0$ the relation (6) describes a snapshot of the modeled price dependence for market demand. Similarly, at $\Delta q_i^- < 0$ the relation (7) (being multiplied by -1) characterizes a snapshot of the modeled price dependence for market supply. Second, using the relations (4)-(9), one can analyze some important market phenomena (e.g. an activity and sentiment of shareholders and owners of free capital) on the basis of the observed demand and supply patterns. Third, Walrasian equilibrium share price can be naturally expressed based on the functions (6), (7). Forming the *total* net demand function $\Delta q_i(p_i) \equiv \Delta q_i^+ + \Delta q_i^-$, we obtain

$$\Delta q_i(p_i) = \frac{\left(F_i^+ + F_i^-\right)}{p_i} - \left(C_i^+ + C_i^-\right). \quad (10)$$

The function (10) has clear economic meaning; its positive (negative) values reflect an excess (deficiency) of demand over supply at a given price p_i. The price P_i fulfilling a condition $\Delta q_i(p_i) = 0$ is of special interest: it characterizes the Walrasian equilibrium by equalizing the opposite flows of orders to buy versus orders to sell. It is worth noting that the Walrasian concept of equilibrium corresponds to the actual mechanism of the stock market pricing. This observation makes it possible to measure the "effective free capital" and "effective capacity" appearing on the demand and supply side. At the same time, their micro-representations (4), (8) and (5), (9) provide insight into the aggregated portfolio structure on the both sides of exchange. We have developed and realized an experimental procedure of the determination of the instantaneous values of the coefficients F_i^+, C_i^+ and F_i^-, C_i^- appearing in the course of trade of particular securities. This procedure is based on the online-registration of the information on the limit orders and instantaneous share prices translated by the trading system of the Moscow Exchange. The picture of limit orders, represented by the trade blotter, is subject to significant fluctuations. In such a case it is necessary to smooth out the noise of the corresponding instantaneous values of the coefficients F_i^+, C_i^+ and F_i^-, C_i^-. In most of our studies the averaging time was taken as a half of a daily trading session.

In order to monitor the changes in the traders' sentiment, it was proposed to analyze time series of indicators α_+ and α_-, which are equal to the time-averaged values of the effective free capital F_i^+ and F_i^-, appearing on the demand and supply side, correspondingly:

$$\alpha_+ = \overline{F_i^+}, \quad (11)$$

$$\alpha_- = \overline{F_i^-}. \quad (12)$$

Petrov and Kashina (2013) were interested in the perspectives of the methods of portfolio management, based on the quantitative analysis of the interrelation of the "free capitals", appearing on the demand and supply sides. To characterize this interrelation the authors used the following parameter

$$q = \ln \alpha_+ / \alpha_-. \quad (13)$$

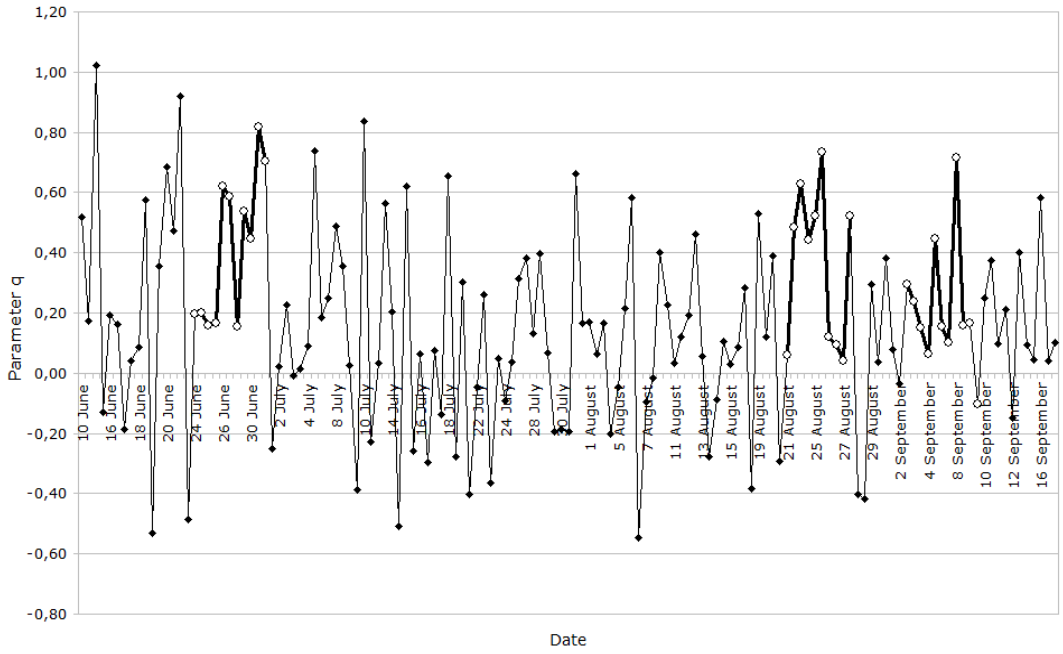
The procedure of building time series of the half-day values of the parameter *q* for shares of the Sberbank of Russia Corporation, Gazprom Corporation and LUCOIL Corporation is described in (Petrov and Kashina, 2013). It covers the period of 14.03.2008 – 19.05.2009 that is especially interesting for studying by reason of financial crisis 2008.

Accurate comparing of the time series of the parameter *q* and prices of the corresponding shares made it possible to reveal general regularities, valid for all securities, which was laid in the basis of the strategy, aiming to forecast the break-points of the price trend (Petrov and Kashina, 2013). If *q* persistently (at the minimum of one and a half trading days in a row) obtains positive values (i.e. demonstrates systematic excess of the effective free capital on the side of asset buyers), then there is a high possibility of an immediate (instantaneous or several halves of the day lagged) increase in the share price. This serves as a signal for opening a position on assets (provided it has not been opened before). Contrarily, the stable overbalance of the free capital on the supply side, which is validated by the systematically repeated negative values of the parameter *q*, as

a rule, precedes the downtrend and serves as a signal for closing position on assets (provided they has been already present in the investment portfolio).

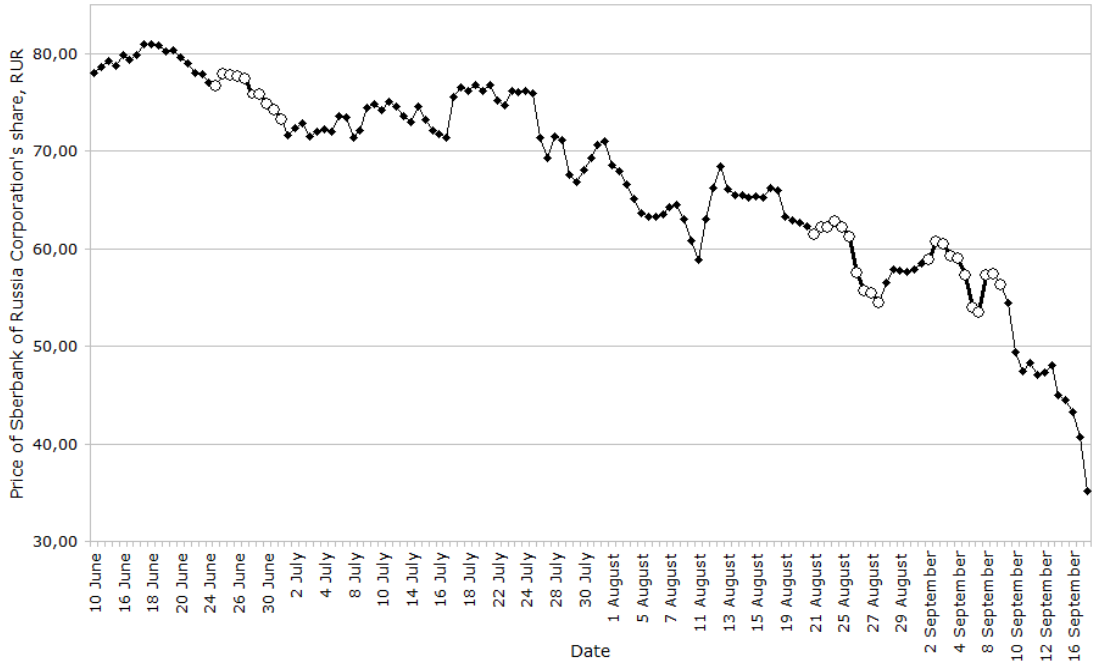
The authors of the present paper carried out similar effects for Russian stock between 2008 and 2017. The careful investigation enabled us to reveal the phenomenon valid for most of the analyzed securities, which was never observed neither before the crash in 2008 nor after the revitalization of the market in 2009 (Petrov et al., 2016). These were the "long half-waves" of the positive values of the *q* parameter (i.e. the long-term sustainable prevalence of capital on the demand side), which were not correlated with the price trend. The examples of these half-waves observed in the period of the oncoming 2008 stock market crisis, are shown in Figure 1 and Figure 2 for the shares of Sberbank of Russia.

Figure 1 Dynamics of the *q* parameter for the shares of Sberbank of Russia Corporation within the period from 10 June to 17 September, 2008



Source: author's calculations based on the data from website: http://moex.com/

Figure 2 Dynamics of share price for Sberbank of Russia Corporation within the period from 10 June to 17 September, 2008



Source: author's calculations based on the data from website: http://moex.com/

In the Figure 1, demonstrating dynamics of the *q* parameter, we observe three distinct "half-waves" within the period from 10 June until 17 September, 2008:

1. From 24 June (the first half of the trade session) till 1 July (the first half of the trade session); duration of this half-wave is 11 "macroscopic intervals" (every interval is equal to a half of the trading day).
2. From 21 August (the first half of the trade session) till 27 August (the second half of the trade session); duration of this "half-wave" is 11 macroscopic intervals.
3. From 2 September (the second half of the trade session) till 9 September (the first half of the trade session); duration of this "half-wave" is 10 macroscopic intervals.

Contrary to the experimental observations described above, the general price trend in all three discussed cases remains downward (see. Figure 2); so we identify such special cases as "anomalies". Five anomalies were revealed for Sberbank of Russia shares in 2008; the last one (which duration was equal to 17 macroscopic intervals) was observed starting from 26 November (first half of the trading session) till 8 December (first half of the trading session). In the very beginning of 2009 there were additionally observed two half-waves of this kind:

1. From 11 January (the second half of the trade session) till 23 January (the second half of the trade session); the half-wave lasted 20 macroscopic intervals.

2. From 29 January (the first half of the trading session) till 6 February (the first half of the trading session); the half-wave lasted 13 macroscopic intervals.

The periods of "abnormally sustainable" investors' interest in buying "falling" shares against the background of an impending crisis also took place for all stock under study.

3 Results and Discussion

The anomalies of shareholders' behavior were observed for all shares under consideration in approximately the same periods of time. For example, the first harbinger of the upcoming financial crisis (unusually prolonged predominance of capital on the demand

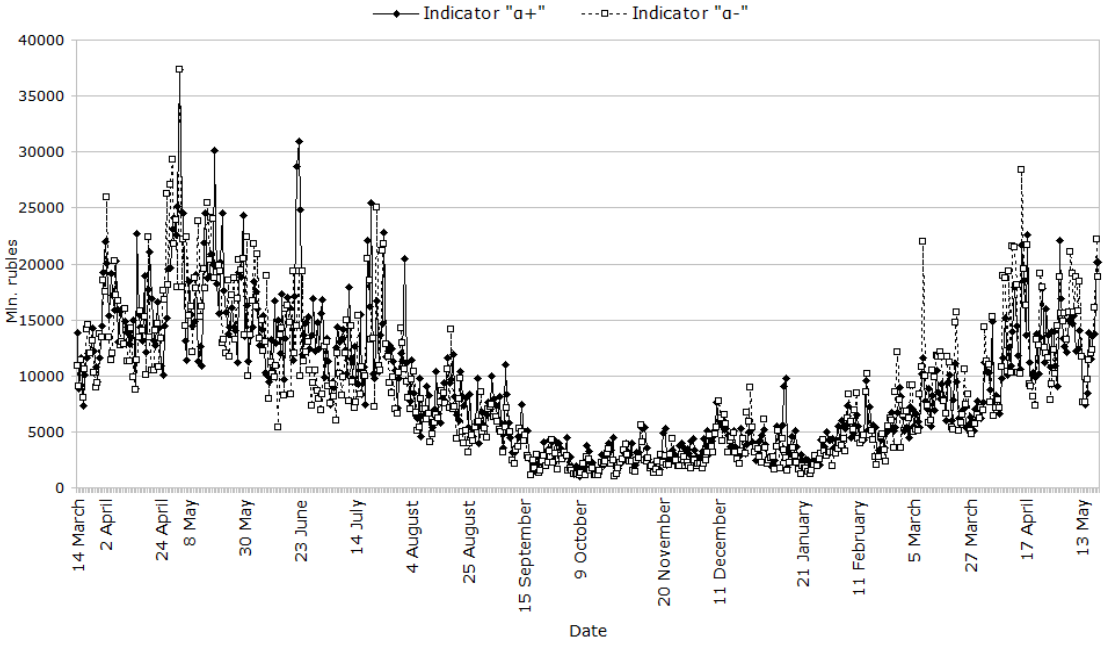
side) for each analyzed securities was observed approximately by July 2008; the second harbinger was registered at the beginning of September 2008, etc. Note also, that the first signs of a crash for each of the shares under consideration were detected a few months before the majority of traders realized that financial crisis had begun.

These observations suggest the idea of a "deliberate game" of large stockholders against downward price trend in "special" periods of time. The detailed analysis of the dynamics of effective free capital on the sides of supply and demand shows that the main cause of the anomalies is associated with the fact that large stockholders are refraining from selling of shares. It is likely that the large traders, being aware of the insider information, know in advance the inevitability of financial crisis and try to prevent prices of certain shares from sharp decrease. The very fact that almost always large stockholders "support" stock prices both at the beginning and at the end of the period of "long-term positive half-waves" (see Figure 2) testifies in favor of such interpretation of causes of the anomalies.

The investigation also shows that the anomalies usually occur against the background of downtrends of indicators α_+ and α_- or against the background of their minimum values. Accounting for the economic meaning of these indicators (see the relations (4), (8), (11) and (12)) one can conclude that the anomalies are inherent for the periods of the lower market activity of large traders. This is illustrated by Figure 3, which shows the dynamics of indicators α_+ and α_- for shares of "Sberbank of Russia" Corporation. Evidently, starting from the middle of May 2008 trends of both indicators were declining; however, share prices were still growing for a while.

On the contrary, from the end of February 2009 the indicators α_+ and α_- started to increase and the anomalies ceased to be observed: large investors were returning to trading; obviously, they knew that the "bottom" of the crisis had been passed away. Similar phenomena were observed for the shares of other issuers during the period of financial crisis.

Figure 3 Dynamics of indicators α_+ and α_- (mln. rubles) for shares of "Sberbank of Russia" within the period from 14.03.2008 to 19.05.2009



Source: author's calculations based on the data from website: http://moex.com/

Thus, it seems quite plausible that anomalies of large stockholders' behavior described above can be considered as the "harbingers" of the financial crisis (share price shocks) in the stock exchange.

4 Conclusions

The examination of empirical data on the demand and supply in the stock exchange showed that the anomalies in the behavior of large investors during the financial crisis of 2008-2009 are the essential feature of Russian stock market. The "bands" of persistent tendency of large investors to buy stock against falling price trend can be presumably considered as the regularity that characterizes periods of "dramatic events" in the stock exchange. This pattern may be due to the insider dealing and can be dictated by insiders' specific interests; the fact that insider trading activities significantly increase during the years of financial crises was described and investigated in a number of papers (Geyt et al., 2011; Abumustafa and Nusair, 2011). This is particularly true for emerging markets with weak corporate governance and investor protection (IMF, 2016).

Our investigations have shown that the hypothesis on the perspectives of forecasting financial crises by using information on early "harbingers" ("bands" of the anomalous behavior of large investors) received confirmation. The monitoring of anomalies of demand and supply in the stock exchange can be applied for the active portfolio management during financial crisis and can sufficiently enhance the effectiveness of portfolio investment. Besides, it is very likely that the results of the current research can be used for the analysis of insiders' activity in the stock market.

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Duration analysis in forecasting internal capital adequacy in banks

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Abstract: *The duration analysis as a dynamic method can constitute an effective tool in the internal system of measurement and control of interest rate risk in bank book. In this article, the author outlines the practical application of the duration analysis in the management of the bank balance when it comes to the interest rate risk. The key objective of this article is to show the use of duration method in estimating internal capital budget to cover the interest rate risk by the bank. Duration analysis is a sophisticated method of measuring interest rate risk used by Polish banks, with traditional banking practice, for single financial instruments. The originality of the article stems from its author's proposition to use the duration method to manage the entire portfolio of fixed income instruments in the banks' balance. The study of interest rate risk was conducted based on financial reports from a selected cooperative bank.*

Keywords: debt financial instruments, interest rate risk, duration analysis

JEL codes:G110, G120, G170

1 Introduction

The topic of risk is particularly important for business entities, which invest in various financial instruments and markets. The fluctuation of prices, exchange rates and indices in the market creates necessity to effectively manage risk.

A high level of investment in debt instruments with fixed interest made it necessary for investors to limit the risk of interest rate, which accompanies not only investments with variable interest. On one hand, changing interest rates alter investment conditions of received financial benefits, and on the other they change market value of these benefits.

The banking sector, banks and other financial institutions have an important influence on the debt market development. Particularly important for these economic entities is the problem of adequate measurement of interest rate risk. In case of a bank interest rate risk constitutes - next to credit risk, liquidity risk or currency risk – the key element of banking risk. The measurement of this type of risk is usually conducted through a classic analysis method of mismatch of terms of maturity of assets and liabilities (gap analysis). This thesis particularly refers to Polish banks, leading a traditional banking activity such as cooperative banks that do not use a sophisticated and advanced methods of analysis and evaluation of this type of risk. Other methods - if applied by these entities are usually used in limited ways - such as to assess single financial instruments or their portfolios. They are not used to evaluate the entire balance of the bank.

In this article, practical applications of the duration analysis in the management of the bank's balance were shown when considering the interest rate risk in debt instruments with fixed income. The duration analysis was used to forecast the internal capital[1] of the bank budgeted to cover the risk of the interest rate in the book of this bank. The author takes into consideration the imperfections of the tool analysed in this article but nevertheless argues that the usage of the duration method in the examination of interest rate risk could significantly support the management of this risk. More importantly it

[1] The internal capital constitutes an estimated by this bank amount, necessary to cover all identified, significant types of risk featuring in the banking activity and changes in the economic environment in a set timeframe.

could also create basis for a more precise assessment of the vulnerability of the financial result and capital of the entity with a large portfolio of fixed income financial instruments to the change of the interest rate.

The risk of investment in a financial instrument is discussed when there is a possibility that the difference between the estimated rate of the financial instrument's return and actual return rate will be positive. In terms of factors, which could lead to this kind of situation, there are usually the following types of risk associated with investing in fixed income instruments:[2]

- risk of interest rate change,
- risk of change in purchasing power (inflation risk),
- risk of early redemption of the instrument,
- currency risk,
- risk of insolvency.

Amongst market risk types, certainly of importance is the risk of interest rate. This risk is rooted in the change of interest rates in the market and is closely related to the financial instruments, which value is dependent on the shaping of interest rates over time.

The interest rate risk leading to achieving a financial result different to the intended one should be considered a threat. The deciding factor, in singling out the interest rate risk as an individual risk is the possibility of different shaping of level and visibility of real structures of future interest rates relative to investor's expectations. And where there are no expectations – in relation to current level and state of the structures of interest rates (Jackowicz, 1999, p. 38).

According to Canadian Deposit Insurance Corporation (Gup and Brooks, 1997, p. 3) the risk of interest rate is understood as the possible influence of interest rates on the revenues and net value of the unit. According to this institution- the risk of interest rate risk appears when the basic capital and interest rates cash flows – balance and off-balance ones, have different terms of measurement. Therefore, the size of the risk constitutes the function of the level and direction of the interest rate change and the size and terms of maturity of the mismatched positions. This definition particularly points out the interest rate risk for the entire balance of the institution rather than individual instruments or their portfolios. This definition underlines the importance of the adequate shaping of the portfolio of assets and liabilities in order, to protect against interest rate risk. A similar definition is offered by the Basel Committee on Banking Supervision, which points out the negative impact from change of interest rates and how it could influence the financial condition of the bank.

Through the risk of interest rate, both the negative and positive effect of interest rate change on the financial situation is understood, particularly when a bank is considered. In result, an adverse shaping of interest rates could decrease the financial result and equity capital of the entity.

The basis of the duration analysis is the indicator expressing time dimension, which is worked out using the following formula:[3]

[2] The names used to call the types of risk of investing in debt instruments vary in literature (see Francis, 2000, p. 3-10; Fabozzi, 2000, p. 6-10; Fabozzi, Fong, 2000, p. 30-34).

[3] More broadly on the topic of deriving the formula for *D* in both single debt instruments and their portfolios could be found in (Pielichaty, 2012, p. 69-83).

$$D = \frac{cA\sum_{t=1}^{m} t(1+r_0)^{-t} + Am(1+r_0)^{-m}}{cA\sum_{t=1}^{m} (1+r_0)^{-t} + A(1+r_0)^{-m}} \quad (1)$$

where:

A - nominal value of the debt instrument,

c - fixed nominal interest of the financial instrument (for all $t = 1, ..., m$),

m - the duration of the financial instrument,

r_0 - market interest rate.

From a formal point of view the indicator constitutes weighted average of terms of receiving payments from the ownership of debt investment, which weights are the current values of benefits. Based on this formula, key determinants of duration for debt instruments include:

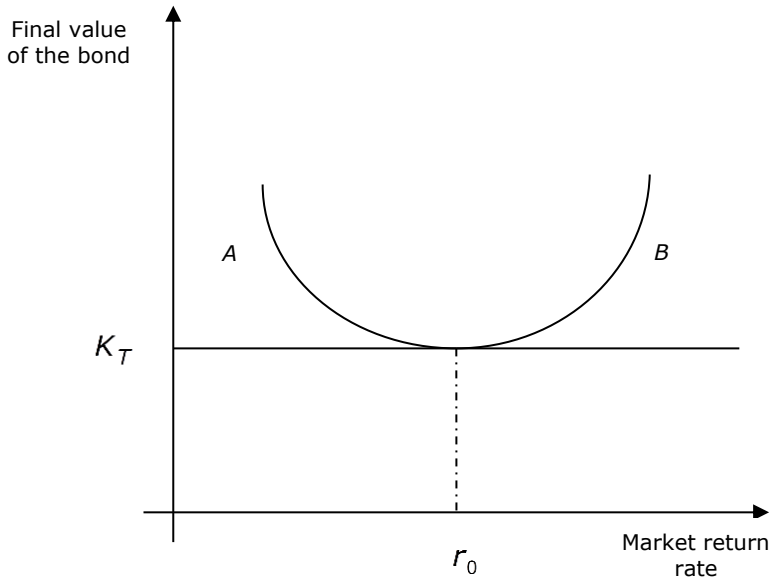
- payment schedule- interest and resulting from the buy-out of financial instrument,
- the duration of the financial instrument until maturity,
- the coupon rate,
- the market interest rate.

So that an investor could limit the interest rate risk, he needs to according to the duration strategy, precisely assess the individual factors shaping the average length of the investment in such way so that the duration of investment matched the term of its conclusion (*T*) as planned by this investor. The investment strategy based on the indicator *D* says therefore that an investor, in order, to reduce the interest rate risk, should select such a debt investment, where *D* will be aligned with the assumed investment horizon. In such a situation, when interest rates change, he will receive a payment (*K*) of at least what he calculated when making such investment: $K_T(r_0) = K_D(r_0)$.

An illustration of the convex nature of function of the final investment value in a debt instrument is seen in picture 1. Curve *AB* in the picture shows the shaping of the value of investment when *T=D*, with different level of interest rates. As seen in the picture, the function reaches minimum only when the market interest rate does not change.

The measure *D* determined by the above formula was for the first time set out as duration in American literature by R.F. Macaulay (Macaulay, 1938, p. 44) and this term is contemporarily used.

Figure 1 The shaping of final value of the bond dependent on the changes in market return rate



Source: (Jackowicz, 1996, p. 79-88)

2 Methodology and Data

The research was conducted on the example of a selected cooperative bank X[4]. In the research, data deriving from the balance and the account of profits and losses was used for a selected balance day as well as other parameters calculated for the bank, on the basis, of analytical record.

The data used in the calculations concerned the following balance positons with fixed interest:

- on the side of assets:

1) current accounts in the central bank amounting to PLN 1,707,569.58,
2) interbank deposits in the amount of 37, which balance on the balance day was PLN 55,850,000. Calculated, for the purpose, of this research weighted average amount of deposits with fixed interest was PLN 1,711,324.98;
3) Bank credits loaned to 5 262 clients, which combined balance on the balance day was PLN 129,717,501.32, including the portfolio of normal (non-endangered) credits with fixed interest in the amount of PLN 35,177,448.35, consisting of credits repaid in a single instalment (PLN 5,663,591.18) and repaid in multiple instalments (PLN 29,513,857.13);
4) 5-year Polish Treasury bonds with a nominal value of PLN 5,000,000.

- on the side of liabilities:

1) client budget account in the number of 19,794, which balance on the balance day was PLN 77,742,340.87;
2) term deposits accepted from 8,862 clients, which balance on the balance day was PLN 7,509,044.94.

[4] Due to a lack of suitable authorization, the author is unable to quote the real, full name of the bank.

Calculating duration gap was conducted in the following way: after working out the weighted averages of the maturity terms and nominal interest rates in the given group of loans and deposits with defined cash flows, an internal rate of return was calculated for the group. Next a weighted average return rate for the entire portfolio of assets and liabilities was calculated using fixed interest rate. For a purpose of calculating gap of duration, it was assumed that changes in revenues and costs are closely connected with market changes of interest rates, understood as weighted averages of the return rate to maturity of assets and liabilities offered by the bank.

When a duration gap was calculated in order, to assess the influence of interest rates change on the value of the bank's capital, then a Hicks' formula was used (Hicks,1939, p. 185-186). The entry point was the identity equation that the initial market value of the bank equity (*KW*) is equal:

$$KW = PV_A - PV_P \tag{2}$$

where:

PV_A – market value (current) of assets,

PV_P – market value (current) of liabilities.

After assuming, that a common interest rate (discount rate) for assets r_a and liabilities r_p exists, the following equation, which illustrates the change of initial value of the banks' equity is derived:

$$\frac{dKW}{dr_a} = -\frac{PV_A(r_a)}{1+r_a} L_D \ , \tag{3}$$

where L_D means: duration gap calculated with the formula:

$$L_D = D_a - D_p \frac{PV_P}{PV_A} \ . \tag{4}$$

Macaulay's duration was used in order, to calculate the impact of changing interest rates on the equity capital of the cooperative bank. The author argues that the results presented in literature show the effectiveness of this measure in the analysis of interest rate risk. Moreover, it is an easier and cheaper method to apply.

3 Results and Discussion

In accordance with The New Basel Capital Accord (Basel II), banks should maintain certain level of capital in relation to risk they take. Among the key types of risk, which are not taken into consideration when calculating the regulatory capital reserves, is the interest rate risk for the entire book of the bank. In the area, of the forecasting process of internal capital, bank should assess the amount of capital needed to cover the impact of interest rate risk on its book, when it has deemed it to be important.

If the banks' commitment to instruments influenced by interest rate risk was too risky, the supervisory authorities should oblige it to reduce the risk or to maintain a special additional amount of capital, as a certain buffer for increased appetite for interest rate risk (or both requirements where appropriate).

Regulatory guidelines do not impose methods which banks ought to use to estimate the internal capital. The duration analysis as a dynamic method could be an effective tool in

an internal system of measurement and control of interest rate risk in the bank's book and estimating internal capital to cover the risk.

The research conducted to date in this area shows the possibilities to practically control interest rate risk in the bank book in accordance with the postulates of Basel II and the Basel Committee on Banking Supervision. The author assessed the impact of parallel increases/decreases of interest rates by 200 basis points on internal capitals of banks. Simultaneously, when conducting a stress test in an area of interest rate change, additional factors were taken into consideration including:

- lack of possibility to transact by closing a position – reduced the share of temporary deposits with a fixed interest in total deposits from 9.6% to 2% on the side of liabilities,
- change of credit portfolio quality - changed the frequency of capital repayment and interest for credits with fixed interest rate and instalment repayment from 26 days to 90 days.

From the calculations presented in table 1, it is clear, that a shock interest rate change, with the structure of assets and liabilities with a fixed interest in the analyzed bank, would lead to a significant change of its capital. Interest rate increase, would lead to a decrease of PLN 2,866,932 or an increase of PLN 3,984,322 in case of a fall in interest rates. This will in turn result in a drop of economic value of capital by 17% if interest rates rose by 200 basis points. Despite the indicator does not yet reach the level of 20%, the shaping of the indicator above 15% is in practice considered to be of high risk. The bank should therefore gradually restructure its assets and liabilities of fixed interest in relation to the structure of balance positions with variable interest. Simultaneously such bank should maintain the internal capital to cover the interest rate risk in the bank's portfolio.

Table 1 The analysis of duration gap of assets and liabilities with fixed interest where shock interest rates and other changes were applied - stress test

Interest rate change	Duration of assets	Duration of liabilities	k[5]	Duration gap	The impact of interest rate change and other parameters on the value of capital in the bank (PLN)
2 percentage points	2.85 year	0.01 year	1.44	2.84 year	–2,866,932
–2 percentage points	3.5 year	0.01 year	1.27	3.49 year	3,984,322

Source: own work, on the basis, of data from bank X

An adequate change in the structure of assets and liabilities with fixed interest rate virtually allow to reduce the risk of interest rates to a zero level. In result, irrespective of the level and direction of interest rates change, the value of internal capital will not be significantly altered - as table 2 shows.

[5] Coefficient *k* means the ratio of the current value of liabilities with fixed interest to current level of assets with fixed interest.

Table 2 The gap duration analysis of assets and liabilities with fixed interest fully hedged against the risk of interest rates

Interest rate change	Duration of assets	Duration of liabilities	*k*	Duration gap	The impact of interest rate change and other parameters on the value of capital in the bank (PLN)
1 percentage points	0.92 year	0.45 year	2.02	0.01 year	-5,445
–1 percentage points	0.95 year	0.45 year	1.99	0.05 year	30,728
2 percentage points	0.91 year	0.45 year	2.04	-0.01 year	8,281
–2 percentage points	0.97 year	0.45 year	1.97	0.08 year	93,094

Source: own work on the basis, of data from bank X

The simulation encompassed, in addition to the change of interest rates, adequate:

- the reduction of repayments of capital and interest (from 76 to 38 instalments) and the frequency of repayments and interest (from 26 to 21 days) in case of credits with fixed interest rate and multiple repayment of the capital,
- the reduction of frequency of capital-interest repayments from term deposits with fixed interest (from 120 days to 480 days),
- an increase in share of deposits with fixed interest in term deposits, as a whole, (from 9.6% to 51.5%).

4 Conclusions

It is important to point out that a complete elimination of interest rate risk with the use of the duration strategy does not always constitute the best policy. This is because a bank could achieve certain benefits through appropriate management of the duration gap in the event of expected changes to interest rates. In the bank analyzed in this paper, a significant decrease in interest rates in the upcoming reporting periods would cause, assuming current balance structure for positions with fixed interest was maintained, the bank to enjoy additional financial benefits.

It is therefore imperative to adequately match expected market related change in interest to the nature of maintained gap, which could be either negative or positive. It appears that a complete reduction of risk of interest rate isn't possible in practice mainly due to varying sensitivity of financial instruments to changing interest rates as well as practical difficulties related to transacting in terms of both deposits and credits with fixed interest. Therefore, the shaping of the portfolios of assets and liabilities in time so that a balance was achieved in terms of duration of both assets and liabilities is hard to achieve and constitutes a long - term process. Thanks to the duration analysis it is however currently possible to manage the duration gap of positions with fixed interest and effectively manage the interest rate risk. It is important to remember that closing positions at fixed interest rate could mean that interest rate risk is fully eliminated. The elimination of risk could only feature in situations when the values of assets and liabilities positions based on variable interest rate are balanced.

The objective of managing interest rate risk should therefore be the reduction of the size of risk to maximum allowed, a not an attempt to eliminate it completely. Such an attempt to limit the risk could lead to reducing of chances to earn additional income

resulting from market change of interest rate. A natural element of banking activity is the lack of asset-liability matching until the mismatch isn't a threat to the bank.

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Gender differences in saving for retirement

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Abstract: *As the level of pension security offered by the state has been decreasing, it is necessary to save additionally for retirement. These savings determine financial condition of households, particularly in the period of limited income after finishing one's professional activity. The results of numerous research indicate that financial behaviours, motives and willingness to save among men and women differ significantly. Also, the willingness to save for retirement is determined by many factors, including gender.*
The objective of the article is to evaluate to what degree gender determines saving, including saving for retirement by households, as compared with other individual socio-demographic personality traits. The article presents the data of representative research "Social Diagnosis 2015". This research comprised of individual interviews conducted in 11,740 households with 35,279 members. The main conclusion which may be drawn from the research is that the chances of a household to save, including saving for retirement, decrease when a woman plays the role of household head.

Key words: gender differences, saving, retirement, Social Diagnosis

JEL codes: D14, D31, H31, H55, J32

1 Introduction

Saving behaviours of individuals and households as well as their preferences regarding the choice of form of saving, including saving for retirement, are determined by numerous factors. These have economic as well as non-economic character (Kolasa and Liberda, 2014; van Erp et al., 2013; Sass, 2016; Pieńkowska-Kamieniecka and Walczak, 2016). Numerous research indicate that economic well-being and behaviours on financial market are determined by gender (Fisher, 2010). In spite of the fact that women historically have been dependent on men for financial security (Schmidt and Sevak, 2006), it needs to observed that in recent years their role in this respect along with their position in the labour market and participation in creating household budget have changed significantly. It particularly impacts the role women play in households' financial decision-making, including saving and retirement saving decision-making (Hui et al., 2011). The gender of a household head greatly determines the amount of financial resources they accumulate. This results mainly from the fact that men and women differ in terms of their risk attitude. Low risk tolerance impacts negatively on the willingness to save and invest. It occurs that female-headed households have less wealth than others (Conley and Ryvicker, 2005; Chang, 2010). As women are usually characterised by a greater aversion to risk and are more conservative in their investment decisions (Fisher, 2010; Stendardi et al., 2006; Rietjens, 2011), they rarely opt for long-term investments related to retirement (Sung, Hanna, 1996). Although men are generally more prone to risks than women, other research allow to draw another important conclusion. Likitapiwad et al. (2013) conclude that females have a more positive attitude towards saving than males, nonetheless, they more often spend money excessively (on, for instance, clothes or cosmetic) with respect to their needs so that their savings accumulate more slowly.

It needs to be stressed that apart from gender and different attitude towards risk among men and women, also other socio-demographic traits of household head may have impact on the amount of savings accumulated by a particular household. These traits may interact with gender to a various degree, i.e. they might determine the willingness

to save for retirement among men and women (Fisher, 2010). As a matter of fact, saving might be affected by age, level of education and income (Fisher, 2010; Sabri, 2014), social-professional status, total number of children (Fisher and Anong, 2012), marital status or place of residence (Lusardi, 2003).

Elderly people save and think of retirement more frequently (Czapiński and Góra, 2016) than young people who are also characterised by a lower retirement awareness. The degree of retirement awareness is, in turn, positively correlated with the level of education (van Raaij, 2011).

Results of numerous research indicate that the willingness to save is shaped by financial knowledge which also depends on one's level of education (Lusardi, Mitchell, 2011; Bucher-Koenen and Lusardi, 2011; Kowalczyk-Rólczyńska and Rólczyński, 2016). Individuals with low level of education are likely to have lower income and wealth. Simultaneously, well-educated individuals are more likely to report income from retirement savings (Cole and Shastry, 2007). Also, the level of financial competence is determined by gender. It turns out that women are characterised by lower knowledge and financial literacy (Xu and Zia, 2012; Volpe et al., 2002; Lusardi and Mitchell, 2011b; Fornero and Monticone, 2011; Klapper et al., 2015). Men generally deal better with such financial issues as taxes, investments or savings (Clarke et al., 2005). Since there is a significant relation between the level of financial competence and participation in the financial market (Lusardi and Mitchell, 2011b), it well justifies women's low willingness to additional saving for retirement. Moreover, it is still men who are mainly responsible for making financial investment and planning decisions on behalf of the family (Hui et al., 2011).

Also, the income impacts on the possibilities and willingness to save. Lower income has a negative impact on owning savings (Munnell et al., 2011), especially among women who have smaller savings, lower income and are less wealthy as compared to men (Fisher, 2010; Gottschalck, 2008).

Of importance is also the marital status of a household head. Research conducted by Topoleski (2013) shows that the amount of household wealth is higher for married households than for single or divorced households. Additionally, Schmidt and Svak (2006) found no difference in wealth and owned savings between single female- and male-headed households. This concerns also savings for retirement. Therefore, it may be concluded that people who are married demonstrate better saving behaviours (Marital Status…, 2011).

Another variable which affects the level of savings is the number of household members, particularly the number of children, though this impact does not seem unequivocal. Scholz and Seshadri (2007) point out that households with children hold less average wealth than childless households. On the other hand, research of Mahdzan and Tabiani (2013) show that having children correlates positively with owning savings aimed at children's future education. This happens at the expense of retirement savings as households with children by rule undersave for retirement compared to similar childless households (Scholz and Seshadr, 2007). This concerns mainly households headed by females who are more likely to contain children (Fisher, 2010).

The aim of the study is to evaluate to what degree gender determines saving, including saving for retirement by households, as compared with other individual socio-demographic personality traits of household head.

2 Methodology

The article presents the data of representative research "Social Diagnosis" conducted in Poland in 2015. This research comprised of individual interviews conducted in 11,740

households with 35,279 members[6]. For the needs of this article, a head of each household was identified (with division into women and men) in order to evaluate how the gender of household head, including interactions with other variables, impacts a broadly understood household saving, particularly saving for retirement.

To realize the research task, the method of logistic regression was used. All calculations were performed with the use of IBM SPSS Statistics 24.0 program. While constructing particular logit models the following dependent variables were used: Y_1 – Do you own any savings? (M1 and M3); Y_2 – Do you own any savings for retirement? (M2 and M4).

The above variables took the following form:

$$Y = \begin{cases} 1, \text{if the event occured} \\ 0, \text{if the event did not occur} \end{cases}$$

Models M1 and M2 do not include the effects of interaction between independent variables whereas interaction effects occur in models M3 and M4.

Control variables, constituting socio-demographic traits of respondents (household heads) assumed in each model are presented in Table 1.

Table 1 Descriptive statistics for the independent variables

Variable	Variant of variable
Gender	0 – Women, 1 – Men
Age	Aged 24 and under, aged 25-34, aged 35-44, aged 54-59, aged 60-64, aged 65 and more (reference group)
Level of education	Primary and lower, lower secondary and basic vocational, secondary, Higher and post secondary (reference group)
Social and professional status	Public sector employees, private sector employees, entrepreneurs, farmers, pensioners and retirees, pupils and students, unemployed (reference group)
Place of residence	0 - Rural areas, 1 - Urban areas
Marital status	Single, married, widowed, divorced/separated (reference group)
Wealth (as the condition of well-being)	0 - Yes, 1 – No
Income (monthly net income from 3 previous months, in 1 thousand PLN)	Continuous variable
People (number of	Continuous variable

[6] The research is of a panel character. Its concept and logistics were designed by the Council for Social Monitoring. For more see http://www.diagnoza.com/index.html.

household members)	
Reading press (number of hours weekly spent on reading press)	Continuous variable
Material status (the level of satisfaction from financial situation)	Continuous variable presented in the following scale: very satisfied - 1, satisfied - 2, quite satisfied- 3, quite unsatisfied - 4, unsatisfied – 5, and very unsatisfied - 6

Source: own study based on Social Diagnosis 2015.

3 Results and Discussion

The results of the research indicate that gender has a statistically significant impact on saving, including saving for retirement. Not analysing interaction effects, the chances of male-headed households for owning savings are by 23% (M1) higher, and in the case of savings for retirement by 29% (M2) when compared to female-headed. It needs to be stressed that saving can be also affected by other individual traits of household heads, some of them interact with the variable, i.e. gender.

Chances for saving grow with age, though until 60 years of age households, irrespectively of their head's gender, do not consider financial security for old age to a great extent. Households headed by people aged 25-34 have 2-times (M1) and 4-times (M2) lower chances for savings than those headed by people aged 65 and more. This may indicate that irrespectively of gender (models M3 and M4 did not display interaction with the age of household head) young households, when able to save, usually save for other goals than additional retirement security.

In the case of saving in general as well as saving for retirement, chances for savings increase with the level of education. However, the impact of education is more visible in reference to saving in general. People with lowest level of education have 70% lower chances for savings than those with higher education (in the model without interaction - M1, as well as in the one with interactions - M3), whereas in the case of saving for retirement, these chances are smaller only by 33% (M2). Above all, the results have shown that the willingness to save for retirement among men and women is determined by their level of education (M4). Particularly in the case of primary and lower education, the chances of households for additional retirement savings, if headed by male, are by 42% lower as compared to female-headed households. Therefore, it may be claimed that with all education levels below higher, women are more likely to have old age savings than men.

Considering social and professional status, one may observe that the biggest chances for saving (M1) have farmers (by 71% higher than the unemployed). Analysing gender impact (M4) in majority of socio-professional groups, if male-headed, households are more likely to accumulate additional savings for retirement. This effect is noticeable particularly among farmers, where the chances of saving for retirement among men are 2.12 times higher than among women, and among private entrepreneurs.

Moreover, it was concluded that gender impact may be observed in the category of place of residence (what confirm also for example Krupa and Walczak (2016)). Rural households have 99.3% greater chances for saving if male-headed as compared to women, whereas in urban areas this difference is even greater and amounts to 150.7%

(M3). The situation is similar in the case of saving for retirement. Urban households have greater chances for owning such savings when male-headed (by 151.3%)(M4).

No difference has been observed between men and women with respect to saving, including saving for retirement, when taking into account the number of household members or hours spent on reading press. Yet it may be stated that these are statistically significant variables. It turns out that increasing the number of household members by one person reduced the chances of saving for retirement by approximately 9% (M2), whereas every additional hour spent on reading press improved the chances of saving in general as well as for retirement equally by 0.02%. This confirms already observed impact of education (and knowledge) on owning household savings.

The results of the research also indicate that in both male and female-headed households the chances for savings increase with income growth by 1 thousand PLN, i.e. savings in general by 17.0% (M1) and savings for retirement by 13.6% (M4). As a result, one obvious conclusion can be drawn: higher income has impact on a greater willingness to save.

Nevertheless, if one considers attitude to wealth as the condition of well-being and level of satisfaction from household material status, different observations can be made. Apparently, men and women differ in this respect. If one assumes wealth does not guarantee happiness (M3), chances of owning savings by male-headed households are greater than among women (by 51%). When female-headed households do not condition well-being on wealth, they tend to more seldom as compared to men.

Moreover, a decrease in the level of satisfaction from household material status lowers the chances for savings by approximately 32% (M1). No gender differences were noticed in the case of saving decisions oriented towards retirement. A decrease in the level of satisfaction from material status by one degree reduces the chances of saving for retirement among men and women by approximately 20% (M4).

Table 2 Estimates of logistic regression model – the analysed dependence: savings savings and savings for retirement

Variable	Variant of variable	Savings Exp(B)	Savings for retireme-nt Exp(B)	Savings Exp(B)	Savings for retireme-nt Exp(B)
		M1	M2	M3	M4
Gender		1.226**	1.286***	1.993***	-
Age	**Aged 65 and more (reference group)**	***	***	***	***
	Aged 24 and under	.784	.112**	.791	.103**
	Aged 25-34	.518***	.272***	.519***	.241***
	Aged 35-44	.678***	.427***	.681***	.386***
	Aged 45-59	.737**	.653***	.738**	.596***

	Aged 60-64	.762**	.803*	.767**	.776*
Level of education	**Higher and post secondary (reference group)**	***	***	***	-
	Primary and lower	.298***	.663***	.297***	-
	Lower secondary, basic vocational	.370***	.639***	.368***	-
	Secondary	.540***	.725***	.540***	-
Social and professional status	**Unemployed (reference group)**	***	***	***	-
	Employees of public sector	1.421*	.846	1.423*	-
	Employees of private sector	1.404*	.920	1.410*	-
	Entrepreneurs	1.219***	1.401	2.222***	-
	Farmers	1.707**	1.540	1.718**	-
	Pensioners and retirees	1.480*	1.342	1.490*	-
	Pupils and students	1.034	.552	1.016	-
Place of residence		1.258***	1.170*	-	-
Marital status	**Divorced/separated (reference group)**	***	-	***	-
	Single	-	-	1.625***	-
	Married	-	-	1.870***	-
	Widowed	-	-	1.310*	-
Wealth		1.178**	-	1.428***	-
Income		1.170***	-	1.169***	1.136***
People		-	.911***	-	.909***
Reading press		1.016*	1.016*	1.015*	1.018*
Material status		.681***	.802***	.718***	.796***

Gender * Primary and lower	-	-	-	.576***
Gender * Lower secondary and basic vocational	-	-	-	.619***
Gender * Secondary	-	-	-	.631***
Gender * Place of residence	-	-	1.258***	1.261*
Gender * Employees of public sector	-	-	-	.945
Gender * Employees of private sector	-	-	-	1.288
Gender * Entrepreneurs	-	-	-	1.785***
Gender * Farmers	-	-	-	2.121***
Gender * Pensioners and retirees	-	-	-	1.699***
Gender * Pupils and students	-	-	-	.000
Gender * Wealth	-	-	.760*	-
Gender * Material status	-	-	.918*	-
Const.	1.308	1.033	.942	1.127
Cox–Snell's R-squared	.167	.091	.168	.092
Nagelkerke's R-squared	.225	.128	.226	.128
Hosmer-Lemeshow (p-value)	.711	.404	.654	.251
Log likelihood	9,664.563	5,976.579	9,656.229	5,975.293
N	8,170	5,165	8,170	5,165

Note: *** p<0.001; ** p<0.01; * p<0.05
Source: own study based on *Social Diagnosis 2015*.

4 Conclusions

Saving behaviours of men and women differ. Gender has a significant impact on owned savings, including savings for retirement. Households headed by men are wealthier. Nonetheless, it needs to be stressed that men and women have different attitude towards risk and differ in their knowledge and awareness of financial matters.

Chances for owning savings increase with age and level of education. People who are young and not well-educated are the less likely to save. This fact justifies the need to undertake actions with respect to financial and retirement education of society, particularly women. As pointed out previously, on the one hand they are less active on the financial market and save less for retirement (OECD, 2013), but on the other hand they have greater longevity and spend more years than men in retirement (Brown and

Finkelstein, 2009). Consequently, women are not prepared financially for retirement as well as men. Moreover, women usually have lower income and this, as research shows, constitutes another key factor which determines their willingness to save, also for retirement.

Chances for savings of households headed by women as compared with men also decrease when they are conducted in rural areas and when women do not condition well-being with material status. Apparently women who associate wealth with happiness have greater chances for saving.

Concluding, one needs to state that the gender of a household head is a significant factor affecting saving. Moreover, it occurs to be correlated with other socio-demographic variables. As women are becoming more interested in financial matters and are more active on the labour market, we should aim at levelling financial knowledge, lowering risk aversion among women and increasing their financial awareness. The need to save for retirement is increasingly recognized with greater knowledge and retirement awareness among both men and women.

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Comparison of relative efficiency of Czech and Slovak cultural heritage institutions

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Abstract: *This paper deals with a comparative analysis of the relative efficiency of museums founded by the central authorities in the Czech and Slovak Republics. Through the DEA method, we evaluate data for all 22 Czech and 42 Slovak institutions for 2015. For these purposes, we chose a group of indicators that are available in both countries and where museums have a duty to report. For inputs, there are the founder's contributions and the number of employees. For outputs, there are the number of visitors, the number of exhibitions and expositions. The results revealed the differences between the Czech and Slovak institutions, which relied especially on the use of inputs and potential to achieve returns of scale.*

Keywords: Museums, public sector, efficiency

JEL codes: H73, H76, H79

1 Introduction

With regards to the fact that the contribution focuses on the economy of cultural heritage – which is a very specific value – the authors decided to define the idea of effectivity in a broader sense using the public value concept. The public value concept as a boundary for strategic control in the public sector was introduced to the scientific literature by (Moore and Khargam, 2004). It is their understanding that it is a strategic triangle which contains value (in sense of being aimed at creating something substantively valuable), legitimacy, and support (attract sufficient ongoing support—and concomitant resources—from the authorizing environment), and is operationally and administratively feasible (doable with the available organizational and external capabilities needed to be produced) (Alford and O´Flynn, 2009). This concept is connected with a profound discussion between normative understanding which says what the managers should do and empiricism which describes what, in fact, managers in the public sector do (Alford and O´Flynn, 2009). According to (Alford and O´Flynn, 2009), public value focuses on a wider range of value than public goods and outputs; and what has meaning for people, rather than what a public-sector decision-maker might presume is best for them. Commentators on this topic offer lists of values: equity, efficiency, fairness, justice, prudence, transparency, social cohesion, user orientation, political accountability, regime stability (Thomson and Rizova, 2015). According to (Thomson and Rizova 2015), many practitioners and some scholars appear to believe that government enterprises create public value in the same way business does – by increasing productivity, efficiency, and effectiveness. This view is nowadays associated with the New Public Management (NPM) (Thomson and Rizova, 2015). (Mazouz et al., 2016) confirm that effectiveness is a significant part of public value. An important function of public value concept is also the fact that it creates a boundary for measurement of effectiveness. Authors (Thomson and Rizova, 2015) claim that the public service value methodology measures how well an organization, or series of organizations, achieve outcomes and cost-effectiveness year after year. The methodology gives public managers a way to evaluate performance of an organization in relationship to the organization's average performance over a series of years.

Efficiency in the area of cultural heritage

As with other public sections within the public sector, the cultural heritage sector does exhibit resistance to performance measurement. The most frequent argument is the specificity of the sector (Herrero-Prieto, 2013), the lack of relevant data, and the difficulty of quantifying the social impact. On the other hand, there is a strong argument regarding scarce resources (Herrero-Prieto, 2013). Barrio and Herrero (2014), in their literature search, confirm the lack of empirical evidence regarding the evaluation of efficiency of cultural heritage institutions and claim that the first studies focused on the efficiency of cultural institutions normally arise within a few years of studies in other fields. Herrero-Prieto (2013) argues that museums are the most frequently analyzed subjects in the area of culture and this is precisely due to their characteristics.

Based on the research about the current state of research in this area provided by (Herrero-Prieto, 2013) and (Barrio and Herrero, 2014), the technical approach to assessing the efficiency of cultural heritage institutions is evolving. For the first phase, benchmarking models were composed of quantitative and qualitative indicators often linked to the Balanced Scorecard. These approaches were followed by an efficiency score using a specific production function, which merges a range of inputs in order to obtain goods and services (Herrero-Prieto, 2013). „Based on this approach, the goal is to estimate an optimal frontier in this transformation process, and to gauge the level of efficiency of the various study units as a distance from said optimal efficiency frontier. The problem lies in determining where this frontier lies, a hurdle which may be overcome by applying parametric or non-parametric models." (Herrero – Prieto, 2013, pp.5). Of these models, the non-parametric DEA (data envelopment analysis) is currently the most frequently used. It was first applied to cultural heritage in the Jackson study (1988) on North American museums. Applications were followed on institutions such as in Great Britain, Italy, Belgium, France. Herrero-Prieto (2013) states that most of the studies were focused on Western Europe because of its utility for public policy in terms of the efficient allocation of resources in the area of culture.

Most current applications are struggling with the absence of relevant data, so data are mostly obtained through questionnaire surveys among museums, and studies are limited to specific geographic areas. From the technical point of view, input-oriented DEA models are mainly used. It is much more appropriate to use an input-oriented model, as in (Barrio et al., 2009) and (Herrero - Prieto, 2013), and interpret the results as indicators of efficiency, i.e. given an output, the scores show how far a museum is from the most similar unit using the least resources to reach that output. Another important factor is the identification of suitable indicators on the input and output side, (Mairesse and Vanden Eeckaut 2002) e.g. a set of inputs employment, various budget items and infrastructure. In a study (Tahery and Ansari, 2012, pp. 435) inputs include all the resources required by the organization for its activities, such as, for example, the number of 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. Barrio and Herrero (2013) use three inputs (employment, size, and museum facilities), and four outputs (visitors, temporary exhibitions, the museum's social impact, and the impact of the art collection). Other studies synthesize inputs describing the size of the institution by the number of employees, infrastructure, and the number of m2 compared with the population (Herrero - Prieto, 2013). Determining the appropriate inputs and outputs has a major impact on the results achieved.

The latest trend in this area is the attempt to describe the issue of technical change and the evolution of efficiency ratios over time (Barrio and Herrero, 2013) as well as the use of a so-called two stage DEA, i.e. DEA analysis combined with regression analysis. With

the help of this, we endeavor to describe other factors that have an impact on the efficiency achieved. As for external control variables, they utilize: an institutional approach to management, distinguish between museums governed by regional authorities and other founders, and another variable which distinguishes among museums located in the capitals of provinces and among museums located in rural areas. In their conclusion, the greater relative efficiency is achieved by museums located in urban areas and those managed by regional governments.

In the Czech Republic, analyzes focusing on the efficiency of cultural heritage are still outside the focus of the mainstream of research, which focuses on DEA's application in the banking sector, healthcare, and higher education. In the field of museums, we have identified only two studies in our research. The first study (Půček et al., 2015) deals with benchmarking in the field of culture, specifically in museums, where the authors describe current practices in benchmarking in this sector. This benchmarking was designed for museums established by municipalities or regions. The data collection covers 21 performance indicators, which are divided into three groups: conditions and prerequisites for museum activity; performance; and public services, financing, spending, and efficiency. The results are primarily for the museums themselves and have yet to be published. Another study (Plaček at al., 2016) deals with the application of the DEA method for evaluating the effectiveness of museums set up by central government bodies. In their analysis, the authors used data from 2011-2013. They used inputs such as the number of branches, the area in m2 for permanent exhibitions, and the budget of the organization. The 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). According to the author's conclusions, the system delivers very good results on the whole, 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. However, this study also encountered some problems such as the difficulty in obtaining data and the problem of finding an optimal set of indicators.

This article builds on the above-mentioned study (Plaček et al., 2016) and introduces a more precise methodology and a new element of foreign comparisons. The purpose of this article is to apply the DEA method to evaluate the relative efficiency of museums established by the central authorities of the Czech and Slovak Republics in 2015 and compare the respective results.

2 Methodology and Data

The main method used is data envelopment analysis (DEA*). "This method is suitable for evaluating the efficiency, performance, or productivity of homogeneous production units - i.e., units that produce identical or equivalent effects, which we will label as the outputs of this unit. Outputs are by their nature maximizing, meaning the higher their values, the higher the performance of the monitored unit. To produce effects, the production unit consumes inputs that are, by their very nature, minimizing, and whose value leads to higher performance of the monitored unit"* (Borůvková and Kuncová, 2012, pp. 75). *"The DEA method estimates the so-called production units whose input / output combination lies on the efficiency boundary. These are efficient units as one could not actually conceive of a unit that achieves the same outputs with lower inputs or higher outputs with lower inputs"* (Borůvková and Kuncová, 2012, pp. 75).

Although the units surveyed belong among the homogeneous types especially when dealing with the region of large museums which have a wide range of functions, one can find internal heterogeneity among them, in which lies the possibility of achieving returns of scale. For this reason, we will use two model variants.

The first model calculates constant yields from a range: the Charnes Cooper and Rhodes Model called CCR. This model was first introduced in 1978 and assumes constant returns of scale. Regarding the CCR input-oriented model, we assume a constant yield from the range. Using this model, it is possible to determine the number of inputs needed to make the inefficient unit efficient. The technical efficiency coefficient is defined as the ratio of weighted sum of outputs and weighted sums of inputs. The scales must be set so that the technical efficiency factor is from 1: 0. The unit with a technical efficiency coefficient equal to 1 is effective, a coefficient less than 1 points to an inefficient unit, and determines the amount of input reduction needed to ensure unit efficiency. For simple cases, the CCR can be represented graphically. The CCR model determines the input and output weights for each unit so that the unit maximizes its technical efficiency coefficient and meets the conditions: the balance must not be negative. When using this set of weights, no technical efficiency coefficient can be greater than one.

The second model calculates variable yields from a range. The Banker, Charnes, and Cooper Model called BCC. This model was first introduced in 1984 to introduce variable returns to scale (the CCR model only assumed constant returns of scale). The only difference with the CCR model is the convexity constraint e*Lambdas = 1 corresponding to the weight in the multiplier form.

In our model, we use the following set of variables. We take the input to be the number of employees as well as the contributions of the founder, which we express as the difference between the total costs and the museum's own revenues. Outputs include the number of visitors to the museum, the number of exhibitions, and the number of expositions.

One of the important factors for the selection of input and output indicators was, besides the ability to describe the complexity of the museum's work, the availability of data for international comparisons. For our analysis, data for 2015 was used. For the Czech Republic, data was provided by NIPOS (National Information and Counseling Center for Culture), which is a contributory organization of the Ministry of Culture, which deals with the collection of statistical information on culture. Unfortunately, the organization refused to provide information on the financial performance of individual institutions, so we had to obtain this information using datamining techniques from the official portal of the Ministry of Finance http://monitor.statnipokladna.cz. For the Czech Republic, total of 22 institutions were included.

The data for Slovakia was obtained from the National Education Center, which is a contributory organization of the Slovak Ministry of Culture and also has competence in the field of culture. For Slovakia, a total of 42 institutions was included.

The model is calculated for each country separately, and we consider the number of efficient units in each country to be the criterion of efficiency.

3 Results and Discussion

In this section, we present the results of the DEA analysis of the Czech and Slovak museums which were established by the state. The first table presents the results of the CCR model, a model that works with constant yields from a range.

Table 1 Results of the DEA CCR application with constant yields from the range

	Czech Republic	**Slovak Republic**
Number of institutions	22	42
Avg. efficiency	0.589229	0.532429
Median	0.553553	0.489449
Standard deviation	0.292201	0.323082
Number of efficient units	5	8

Proportion of efficient institutions	22.72%	19.04%

Source: authors

It is clear from the results that if we consider constant yields on the scale, there is no significant differences between the two countries. The average and median efficiency is, however, higher in the Czech Republic than in Slovakia. The Czech Republic also has a relatively higher proportion of fully efficient units, i.e. units that have achieved an efficiency value of 1. Institutions in both countries only manage to achieve average efficiency values. Thus, we can say that there is room for improving the use of inputs, i.e. in the area of human resources, but also other costs such as building maintenance.

A very important view of the problem is provided by the second model, which works with the opportunity to achieve returns of scale. The following table shows the results of the second model.

Table 2 Results of DEA BCC application with constant yields from the range

	Czech Republic	**Slovak Republic**
Number of institutions	22	42
Avg. efficiency	0.789065	0.653059
Median	0.983209	0.796781
Standard deviation	0.295638	0.346185
Number of efficient units	11	15
Proportion of efficient institutions	50%	35.71%

Source: authors

If we take into account the ability to achieve variable yields from a range, institutions of both countries achieve better results, with those of the Czech Republic being significantly higher. This interpretation is entirely logical. In the Czech Republic, there is a significantly lower number of museums than in Slovakia. The Czech institutions are larger, so they have a higher potential for achieving returns of scale, which also affects their resulting relative efficiency. The institutions of the Czech Republic achieve very good results.

It is clear from the results that large museums are highly dependent on choosing a model that expresses the potential to reach returns of scale. The results of the models are partly confirmed by the results of the study (Plaček, et al., 2016), which states that most state museums achieve high relative efficiency values. On the other hand, there is still room for improvement. An ideal approach could be linked to mandatory benchmarking or centralizing and outsourcing some of the activities suggested by (Shoup et al., 2014), which demonstrate the effects of outsourcing souvenir sales and tickets based on the example of Turkish museums.

4 Conclusions

The article deals with the comparison of efficiency of Czech and Slovak museums established by the state. The DEA method is used for the analysis with models with constant returns of scale and variable yields from the range. The constant yield scale model showed very small differences between the two countries. In contrast, the variable yield model describes a markedly higher performance by the Czech institutions, which is explained by a significantly lower number of Czech museums than the Slovak ones, which increases their potential to achieve returns of scale.

Despite relatively **s**atisfactory relative effectiveness, there is room for both institutions to improve the efficiency of inputs which can be achieved by outsourcing selected activities and implementing benchmarking.

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Bankruptcy Prediction Models in Relation to SME Segment in the Czech Republic

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Abstract: *Financial analysis is an essential tool for those interested in assessing the economic situation of enterprises and subsequent decision making to predict the bankruptcy. Relating credit risk of a bank is a permanent subject of many scientific researches. We focus on small and medium sized enterprises (SMEs) because they are significantly different from large corporates from credit risk point of view. Our motivation is to show the importance of modeling credit risk for SMEs separately moreover we delimit medium sized, small sized and micro sized enterprises. The aim of this article is the comparison of the real predicting abilities of several bankruptcy models to each segment. There exist several popular bankruptcy models, that are often applied, namely the Altman Z-score, the Ohlson O-score, the Zmijewski's model, the Taffler's model, and the IN05 model. The basic form of the models is used as proposed by their authors. The results are compared using the contingency table and ROC curve.*

Keywords: Credit risk, bankruptcy prediction, SME, bankruptcy model, insolvency, probability of default

JEL codes: C52, C53, G31, G33

1 Introduction

The importance of credit risk management cannot be overemphasized, and it is well recognized by the banking industry. The introduction of the Third Basel Capital Accord (Basel III), financial crisis triggered in 2008 and other changes in the global financial market have accelerated the need to validate and improve current credit risk management systems. Financial institution are facing the problem of bad debts (outstanding loans), so they must therefore make effort to improve their credit risk management system and find new, more effective ways to face credit risk.

The issue of modeling and quantification of credit risk is the subject of interest of many studies, scientific articles and publications. Academics and practitioners have focused their research to improve the performance of existing bankruptcy models by the reason of the former financial crisis when bankruptcy risk models and rating systems failed to adequately estimate the risk in the corporate sector (Diakomihalis 2012).

The aim of this contribution is the comparison of the real predicting abilities of several bankruptcy models in relation to small and medium sized enterprises in the Czech Republic. We compare results within each sub-segment of SMEs, medium sized, small sized and micro sized enterprises. We have chosen the bankruptcy models which are used very often in many scientific papers. We compare models of the Altman Z-score, the Ohlson O-score, the Zmijewski's model, the Taffler's model, and the IN05 model.

We focus on SMEs because they are reasonably considered as the backbone of the economy many countries. Over the past decade, we have witnessed intensity in the studies of their financial health, particularly after the introduction of Basel III. Recent studies show that, SMEs demonstrate capacity to drive economic development at domestic and international levels (Gupta et al., 2014). Thanks to their simple structure, they can respond quickly to changing economic conditions and meet local customers´

needs, growing sometimes into large and powerful corporations or failing within a short time of the firm´s inception. For OECD members, the percentage of SMEs out of the total number of firms is higher than 97%. SMEs employ approximately two third of employees and create more than half of added value in EU-28 (Eurostat, 2017). From a credit risk point of view, SMEs are different form large corporates for many reasons. For example, Dietch and Petey (2004) analyse a set of German and French SMEs and conclude that they are riskier but have a lower asset correlation with each other than large businesses (Altman and Sabato, 2007). Another motivation is to show the significant importance of modeling credit risk for SMEs separately from large corporates.

2 Literature review

There is extensive empirical literature on default prediction methodologies. Many authors during the last fifty years have examined several possibilities to predict default or business failure. The seminal works in this field were Beaver (1967) and Altman (1968). The researcher William Beaver was the first to apply a number of ratios, which could discriminate between failed and non-failed companies up to five years prior to bankruptcy. Altman improved Beaver´s method, applying a discriminant analysis using financial ratios concerning to liquidity, profitability, financial leverage, activity and solvency. Being the first person to successfully develop multiple discriminate analysis (MDA) prediction model with a degree of 95.0% rate of accuracy, he is considered the pioneer of insolvency predictors. Altman´s model has been applied successfully in many studies worldwide concerning the subjects of capital structure and strategic management, investment decisions, asset and credit risk estimation and financial failure of publicly traded companies (Lifschutz and Jacobi, 2010).

Other model based on the MDA principle and very often cited in research literature is Taffler model developed in Great Britain in 1977 (Taffler, Tishaw, 1977).

Another MDA model has been developed by Inka and Ivan Neumaier in 1995 known as IN95. This model was constructed especially for the Czech market and was updated in next years. We use the last version - IN05 model which was developed in 2005 (Inka and Ivan Neumaier, 2005).

For many years thereafter, MDA was the prevalent statistical technique applied to the default prediction models. However, in most of these studies authors pointed out that two basic assumptions of MDA are often violated when applied to the default prediction models. Considering these MDAs´ problems, Ohlson (1980), for the first time, applied the conditional logit model to the default prediction´s study. The practical benefits of logit methodology are that they do not require the restrictive assumptions of MDA and allow working with disproportional samples. Next, very often cited model, which uses conditional probability, is model by Mark E. Zmijewski (1984). He was the pioneer in applying probit analysis to predict default. A probit approach is the same as in logit approach different is only distribution of random variables.

We witness a substantial increase in the number and complexity of default prediction studies due to the rapid advancement in technology and methodology. Above all, we can mention artificial neuron networks used by Angelini et al. (2007), decision trees method used by Gulnur and Fikret (2011) and hazard models used by Shumway (2001). Recent empirical literature also shows momentum in understanding the credit risk behavior of small firms. Altman and Sabato (2007) studied a panel of over 2000 SMEs and developed a distress prediction model using logistic regression technique. However they acknowledge the need to employ qualitative information to improve the predictive performance of their model. Empirical literature also highlights the significance of qualitative information such as business type, industrial sector, location, age, etc. in understanding of firms´ credit risk behavior. (Grunert et al., 2005) Altman et al. (2010) took account this issue and studied about 5.8 million SMEs and reported that the

prediction performance of Altman and Sabato (2007) model improved by about 13% when qualitative information is added.

3 Methodology and Data

We have chosen the bankruptcy models, which are used very often in many scientific papers. We compare models of the Altman´s Z-score, the Ohlson´s O-score, the Zmijewski's model, the Taffler's model, and the IN05 model. Many different versions of these models exist; we use the following form of the models.

Altman´s Z-score:

$$Z_{1983} = (0{,}717\,x\,X_1) + (0{,}847\,x\,X_2) + (3{,}107\,x\,X_3) + (0{,}42\,x\,X_4) + (0{,}998\,x\,X_5) \quad (1)$$

$$x_1 = \frac{working\ capital}{total\ assets}$$

$$x_2 = \frac{retained\ earnings}{total\ assets}$$

$$x_3 = \frac{EBIT}{total\ assets}$$

$$x_4 = \frac{equity}{liabilities}$$

$$x_5 = \frac{sales}{total\ assets}$$

Distress zone ... Z<1.23

Taffler´s model:

$$Taffler = (0{,}53\,x\,X_1) + (0{,}13\,x\,X_2) + (0{,}18\,x\,X_3) + (0{,}16\,x\,X_4) \quad (2)$$

$$x_1 = \frac{EBT}{short - term\ payables}$$

$$x_2 = \frac{current\ assets}{liabilities}$$

$$x_3 = \frac{short - term\ payables}{total\ assets}$$

$$x_4 = \frac{sales}{total\ assets}$$

Distress zone ... Taffler<0.2

Model of Inka and Ivan Neumaier:

$$IN05 = (0{,}13\,x\,X_1) + (0{,}04\,x\,X_2) + (3{,}97\,x\,X_3) + (0{,}21\,x\,X_4) + (0{,}09\,x\,X_5) \quad (3)$$

$$x_1 = \frac{total\ assets}{liabilities}$$

$$x_2 = \frac{EBIT}{interest\ cost}$$

$$x_3 = \frac{EBIT}{total\ assets}$$

$$x_4 = \frac{total\ revenues}{total\ assets}$$

$$x_5 = \frac{current\ assets}{short-term\ liabilities + short-term\ bank\ loans}$$

Distress zone ... IN05<0.9

Ohlson´s O-score:

O-score = -1,32 - (0,407 x X_1) + (6,03 x X_2) - (1,43 x X_3) + (0,0757 x X_4) - (1,72 x X_5) + (2,37 x X_6) - (1,83 x X_7) + (0,285 x X_8) - (0,521 x X_9) (4)

$$x_1 = \log\left(\frac{total\ assets}{GNP\ index\ of\ price\ level}\right)$$

$$x_2 = \frac{liabilities}{total\ assets}$$

$$x_3 = \frac{working\ capital}{total\ assets}$$

$$x_4 = \frac{short-term\ liabilities}{current\ assets}$$

$$x_5 = 1\ in\ case, that\ total\ liabilities\ are\ higher\ than\ assets, otherwise\ 0$$

$$x_6 = \frac{net\ income}{total\ assets}$$

$$x_7 = \frac{operating\ cash\ flow}{total\ liabilities}$$

$$x_8 = 1\ if\ net\ income\ was\ negative\ last\ two\ years, otherwise\ 0$$

$$x_9 = \frac{netincome_t - netincome_{t-1}}{|(netincome_t)| + |(netincome_{t-1})|}$$

Distress zone ... O-score>0.5

Zmijewski´s model:

$$Zmijewski = -4{,}336 - (4{,}513\,x\,X_1) + (5{,}679\,x\,X_2) + (0{,}004\,x\,X_3) \quad (5)$$

$$x_1 = \frac{net\ income}{total\ assets}$$

$$x_2 = \frac{liabilities}{total\ assets}$$

$$x_3 = \frac{current\ assets}{short-term\ liabilities}$$

Distress zone ... Zmijewski>0.5

We used data for the Czech SME companies from Bisnode database for the years from 2008 to 2014. The models are used for predicting bankruptcy within two years.

For the quality assessment of the models, we applied one of the most commonly used methods for evaluating models based on binary output, namely the ROC curve and the classification table. In tested models we used the original estimated coefficients by their authors. We did not use our data for estimating coefficients in the models; therefore we are able to use the whole dataset as a validation sample for the verification of these models.

Quality evaluation of bankruptcy models is also dependent on the determination of the so-called 'cut-off' points. This is the value above (or below) which the firm will be regarded as bankrupt. The optimal cut-off point is the value that minimizes errors of type I and II. However, although everything depends on the purpose for which the model will be used. Therefore, for example, we may choose higher cut-off limit if the request is to better characterize the companies that are going to bankrupt at the expense that there will be higher number of healthy ones wrongly ranked.

ROC (Receiver Operating Characteristic) curve is a graphical method, which is based on a square showing the relationship between true positive rate (TPR – also called sensitivity) and false positive rate (FPR – also called fall-out). TPR measures the proportion of positives that are correctly identified as such. FPR is also known as probability of false alarm, and it is calculated as the ratio between the numbers of negatives that are wrongly identified as positives. TPR is applied to the y-axis and FPR on the x-axis. ROC curve combines the values of TPR and FPR.

There are two possible extreme cases. The first case occurs when the predicted values are absolutely similar as real values. In this case the curve copies the border of the graph beginning in down left corner through upper left corner and ends in upper right corner. The second case is the exact opposite and describes the model with no predictive power. The curve in this case is a diagonal from down left corner to upper right corner of the graph. Thus, the closer the curve is to the upper left corner, the better predictive power of the model.

ROC curve is closely related to AUC (Area Under Curve) indicator that numerically represents the graph and helps with comparison of two or more models. This indicator quantifies the area under the curve and is useful for comparing two or more curves, because they are transformed into one measure and easily comparable. AUC ranges from 0.5 to 1, where a higher value indicates a better prediction model.

Other method is to use classification table. Classification table is very simple and intuitive method of assessing binary prediction models. As the name suggests, its principle is to assess the correct and incorrect classification of the individual observations and consequently the whole model. Prediction model is assessed by the proportion of correctly classified observations to the total number of observations. As it was discussed above the total percentage is dependent on the determination of the cut-off value. From the classification table we are also able to identify type I and II errors for a given cut-off boundaries.

4 Results

The first step was to calculate some important descriptive statistics that characterize our data in each sector. The following tables 1, 2, and 3 contain this information for medium, small, and micro enterprises respectively. There are significantly less observations for Ohlson model. This model requires longer time periods, which decreases number of usable observations.

From our whole dataset roughly 10 % consists of medium-sized enterprises, 27 % are small enterprises, and the last 63 % remains for micro enterprises. Bankruptcy rate in

each segment steadily decreases as we moved to smaller companies. The most important part of these tables is the last columns which comprise AUC values. AUC stands for "area under curve". It represents area under ROC (receiver operating characteristic) and higher AUC means better performing model.

Table 1 Basic characteristics and AUC for medium enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	10 364	10 232	132	1.27	0.61
Taffler	10 364	10 232	132	1.27	0.57
IN05	10 364	10 232	132	1.27	0.61
Zmijewski	10 364	10 232	132	1.27	0.66
Ohlson	3 423	3 382	41	1.20	0.66

Source: author's calculations

Table 2 Basic characteristics and AUC for small enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	30 573	30 311	262	0.86	0.65
Taffler	30 573	30 311	262	0.86	0.60
IN05	30 573	30 311	262	0.86	0.64
Zmijewski	30 573	30 311	262	0.86	0.69
Ohlson	8 624	8 587	37	0.43	0.63

Source: author's calculations

Table 3 Basic characteristics and AUC for micro enterprises

	Observations	Non-Bankrupt	Bankrupt	Bankrupt (%)	AUC
Altman	72 780	72 445	335	0.46	0.58
Taffler	72 780	72 445	335	0.46	0.55
IN05	72 780	72 445	335	0.46	0.61
Zmijewski	72 780	72 445	335	0.46	0.62
Ohlson	18 868	18 837	31	0.16	0.66

Source: author's calculations

As we can see from previous tables, the best models according to AUC are usually Ohlson and Zmijewski. These models use probit and logit methodologies and according to our analysis, they are the preferable choice for medium and micro enterprises. In case of small enterprises other models based on discriminant analysis beat Ohlson models, but they are still not as good as Zmijewski's model.

Each model has different cut-off boundaries which determine if the company is considered as bankrupt or healthy. The classification table is usually used for comparison in this situation. Following tables 4, 5, and 6 contain standard statistics used in classification table.

Table 4 Classification table for medium enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	84.26	15.74	97.77	1.10	85.01	26.52	0.85	0.73
Taffler	90.04	9.96	98.49	1.25	91.07	10.61	0.91	0.89
IN05	41.08	58.92	98.38	0.76	40.64	75.76	0.41	0.24
Zmijewski	25.07	74.93	99.06	2.28	24.68	55.30	0.25	0.45
Ohlson	6.08	93.92	98.86	2.29	5.06	90.24	0.05	0.10

Source: author's calculations

Table 5 Classification table for small enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	83.11	16.89	98.59	0.75	83.59	27.10	0.84	0.73
Taffler	90.88	9.12	99.11	0.85	91.59	8.78	0.92	0.91
IN05	34.59	65.41	98.91	0.40	34.16	83.97	0.34	0.16
Zmijewski	32.54	67.46	99.50	1.60	32.49	38.93	0.32	0.61
Ohlson	9.80	90.20	99.60	0.73	9.48	83.78	0.09	0.16

Source: author's calculations

Table 6 Classification table for micro enterprises

	Correct	Incorrect	Type I error	Type II error	Non-Bankrupt correct	Bankrupt correct	TPR	FPR
Altman	67.96	32.04	99.43	0.41	68.09	39.40	0.68	0.61
Taffler	86.04	13.96	99.52	0.46	86.37	14.33	0.86	0.86
IN05	27.11	72.89	99.45	0.21	26.83	87.76	0.27	0.12
Zmijewski	46.33	53.67	99.73	0.68	46.40	31.64	0.46	0.68
Ohlson	28.54	71.46	99.83	0.15	28.47	74.19	0.28	0.26

Source: author's calculations

We can observe similar trend in all segments. Cut-off boundaries in Altman and Taffler models seem to be very low, especially for medium and small enterprises. These models have high accuracy in predicting healthy companies, but their success rate is very low in case of identifying bankrupt companies. The exactly opposite situation occurs for Ohlson model. The rest of the models lie in between these two cases.

These results in classification tables do not tell us which model is better, as AUC did. But they evaluate sensitivity of their cut-off boundaries. Setting the right cut-off boundary depends on our goals and needs. In general, it is more preferred to mark a healthy company as bankrupt than vice versa.

5 Discussion and Conclusions

This study analyzed the most popular bankruptcy models and their performance for Czech SMEs. The whole dataset were divided into three segments, namely medium, small, and micro sized enterprises. The analyses were done separately for each segment to capture different characteristics of companies with various sizes.

The aim was to evaluate the original forms of the models and recommend preferable approach for Czech SMEs. Our results suggest using probit and logit methodologies

rather than discriminant analysis. Beacuse according to AUC measure, the best performing models were Ohlson or Zmijewski model.

From the second part of our analysis, we got the idea about the cut-off boundaries in each model. The results in classification tables show that results are similar for each segment. Models like Taffler and Altman used too low boundary, Ohlson did the opposite, and the rest is somewhere in between these two extremes.

In this study we did not found any significant differences between individual segments of Czech SMEs. For anyone interested in this topic, we recommend to use Ohlson or Zmijewski model and set cut-off boundaries according to the aim of the study. For even better results we suggest to re-estimate coefficients for analyzed companies. This process should provide the best possible results.

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Evaluation of Bancassurance Functioning in Selected Countries of the Financial Group KBC Group

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Abstract**:** *This paper will evaluate the level of internal integration among bancassurance products and financial institutions belonging to the financial group KBC Group in selected countries of Europe. There shall be selected four countries which are located in Central and Eastern Europe: the Czech Republic, Slovak Republic, Hungary and Bulgaria. The research was conducted as of December, 2016. This paper aims at determining whether similarities in how the financial group KBC Group is organized correspond to 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 bancassurance product will also be 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 is to contain a detailed analysis, sorting and a comparison of the set characteristics. Finally, it shall 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

„Bancassurance, bank insurance, bancassurance product, assurfinance" have all become very common in the world of financial practice. Complex packages of services are frequently offered in the financial market and bancassurance products are no exceptions. It would be incorrect to reduce the definition of bancassurance to a mere combination of a banking and insurance product. Bancassurance is primarily about internal integration of a banking and insurance product. This means that an insurance product becomes a part of a banking product. The bancassurance product is specific for its extent; it is aimed at satisfying the bank's client primarily, for instance a client who is applying for a mortgage loan with his bank.

The most prevalent reasons for creation of bancassurance structures are yield growth, diversification of income streams and costs saving, which is linked not only to a higher efficiency of branches and employees, but also to the opportunity to use distributional canals of a partner institution. Some bancassurance structures have also begun to consistently use co-marketing which means that both companies present themselves as one subject using one trade name. (ČNB, 2004)

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 the 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 the 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 KBC Group 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 KBC Group (hereinafter referred to as KBCG). 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), Slovak Republic (SK), Hungary (HU) and Bulgaria (BG).

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 and 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. On the other hand, they also mention that bancassurance 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. 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)

According to Ricci (2012) *"It is not possible to identify an ideal form of bancassurance, because the success of cooperation between banks and insurance companies depends upon many factors, both market-based and strategic or operational. Bancassurance can experience alternate fortunes across time and countries, but remains a central current phenomenon of the modern financial service industry."*

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)

Illetško (2003) 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.

The conclusion (Stracia, 2012) about the actual areas of the bancassurance products is: "The actual areas concern the life insurance, the payment protection insurance and the home insurance whereas the new areas are represented by the car insurance, the travel insurance, the pet insurance and the health insurance."

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 KBC Group is organized correspond to 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 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 Illetško (2003). The internal integration (Illetško, 2003) 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 KBCG 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, branches, number of clients, market share of bank products, market share of life insurance and market share of non-life insurance. Data available on KBCG's website and also in annual reports of KBCG as of 2015 will be used (annual report of KBC Group).

In the second part, an analysis and comparison according to property structure of insurance companies cooperating with KBCG will be performed. Also, there will be assessed what type the financial group's integration is and whether there exists a

strategic cooperation between an insurance company and a bank. Information was found on insurers' and banks' websites and annual reports as of 2015.

The third part of the research will analyze bancassurance products offered by KBCG. 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

Characteristic of KBC Bank belonging to the financial group KBCG

KBCG was formed in 1998 after the merger of two Belgian banks (Kredietbank and CERA Bank) and a Belgian insurance company (ABB Insurance). In 1999 the group embarks upon its policy of expansion in CEE with the acquisition of CSOB (in the Czech Republic and Slovakia). The group continues to expand its position in the banking and insurance markets of CEE by acquiring banks and insurance companies in Poland, Hungary, the Czech Republic and Slovakia, becoming one of the top three players in the region's financial sector (2000 - 2005). The bancassurance model is gradually introduced to the home markets in CEE. The KBC Bank and Insurance Holding Company merges with its parent company (Almanij) to create KBC Group NV (2005). KBCG sold the activity in Poland in 2013. KBCG is essentially structured around three business units, which focus on the local business and are expected to contribute to sustainable earnings and growth. The business units are Belgium, the Czech Republic and International Markets. KBC Group controls two underlying companies: KBC Bank and KBC Insurance. KBC GROUP NV and its daughter companies form an integrated bank and insurance group providing services mainly to clients of retail and private banking, as well as to medium-sized enterprises and to mid-cap companies.

KBCG is an integrated banking and insurance group that focuses particularly on clients in the following areas: individuals, private banking, SMEs and mid-sized corporations. Geographically the group operates in its home markets in Belgium, the Czech Republic, Slovakia, Bulgaria and Hungary, while also being active in Ireland and to a certain degree in other countries around the world (in support of corporate clients of primary markets). As of the end of 2015, the KBC group served approximately 10 million clients in its five home markets and Ireland and employed approximately 38,000 employees, roughly half of which in Central and Eastern Europe.

Table 1 Main characteristics of KBC bank in 2015

Coun-try	Name of bank	Share-holder	Bran-ches	Number of clients	Share of market Bank products	Share of market Life insur.	Share of market Non-life insur.
CZ	Československá obchodní banka, a.s. (CSOB CZ)	KBC Bank (100 %)	316	4 000 000	19 %	7 %	7 %
SK	Československá obchodní banka, a.s. (CSOB SK)	KBC Bank (100 %)	125	600 000	11 %	4 %	3 %
HU	K&H Bank, Zrt. (K&H HU)	KBC Bank (100 %)	209	1 600 000	10 %	4 %	5 %
BG	CITIBANK JSC (CITIBANK BG)	KBC Bank (100 %)	100	600 000	3 %	12 %	10 %

Source: summarized by authors based on website and annual report of financial institutions

Table 1 presents banks operating within the KBCG in selected countries. Table 1 shows information about shareholder, numbers of branches, numbers of clients, share of market

bank products, share of market life insurance and share of market non-life insurance. The table lets us conclude that KBC has a highest market share in banking products and also highest number of branches and clients in the Czech Republic. On the contrary, KBC has the lowest market share in banking products and also the least branches in Bulgaria. KBC operates as a bancassurance institution; its annual record allows us to find also life and non-life insurance shares of cooperating insurance companies. The highest share in the insurance market was achieved in Bulgaria, followed by the Czech Republic, Hungary and the Slovak Republic.

Integration of the financial group KBC Group

The Table 2 shows banks and cooperating insurance companies in individual countries from the viewpoint of ownership. In every country, there is only one cooperating insurance company which is a daughter company of KBCG (KBC Insurance is completely owned by KBCG). The financial group KBCG operates as an integrated bank and insurance company.

Table 2 Insurance companies cooperating with KBCG and their shareholders structure

Country	Bank	Insurance Company and Sharaholders	
CZ	CSOB CZ	ČSOB pojišťovna, a.s. (CSOBP CZ)	CSOB CZ (0,245 %) KBC Insurance NV (99,755 %) Since 2007
SK	CSOB SK	ČSOB poisťovňa, a.s. (CSOBP SK)	KBC Insurance NV (100 %) Since 2008
HU	K&H HU	**K&H Biztosító Zrt. (K&HB HU)**	KBC Insurance NV Since 2006
BG	CITIBANK BG	DZI insurance plc (DZI BG)	KBC Insurance NV Since 2007

Source: summarized by authors based on website and annual report of financial institutions

Integration of bancassurance products

Table 3 offers an overview of insurance products offered by banks within KBCG. These products are offered as bancassurance products and are intended for bank clients. The following table no. 4 presents the level of integration of bancassurance products.

Table 3 Bancassurance products offered by financial group KBCG

Coun-try	Life Insur.	Travel Insur.	Income Shortfall Insur. / Mortgage Indemnity Guarantee	Card Abuse Insur.	Real Estate Insur. / Household Insur.	Motor Vehicle Insur.	Third Party Liability Insur.	Legal Expenses Insur.
CZ	YES	YES	YES	YES	YES	YES	YES	YES
SK	YES	YES				YES	YES	
HU	YES	YES	YES		YES	YES		
BG	YES	YES	YES		YES			

Source: summarized by authors based on website of financial institutions

In Table 4, there are presented bancassurance products within KBCG and selected countries. Bancassurance products are evaluated based on their range (number), availability of insurance products for bank's clients, availability of general contracts as well as availability of discounts and other benefits for clients of the bank.

Table 4 Integration of bancassurance products offered by the financial group KBCG

Country	Number of insur. product	Insur. product for client of bank	General contract	Discounts and other advantages
CZ	8	YES		YES
SK	4	YES	YES	
HU	5	YES		YES
BG	4			

Source: summarized by authors based on website of financial institutions

Insurance products offered by banks within KBCG can be described as integrated bancassurance products. The countries Hungary (HU) and Bulgaria (BG) offer insurance products only with relation to bank products. The Czech Republic (CZ) and Slovakia (SK) offer not only exclusive integrated products but also other insurance products not related to bank products. In Slovakia (SK), all financial products are offered within the brand CSOB, though benefits for clients are not specified on the official website. In the Czech Republic (CZ), integration of a banking and insurance product is not completely clear. Some insurance products are linked to bank products but there is a range of products without apparent benefits.

4 Conclusions

This paper aimed at determining whether similarities in how the financial group KBC Group is organized also mean similarities in how bancassurance in the selected countries functions. Four countries which are located in the Central and Eastern European region were selected: Czech Republic, Slovak Republic, Hungary and Bulgaria.

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?

The conducted qualitative research has discovered that all selected countries show similarity. In every country, there is only one cooperating insurance company which is a daughter company of KBCG (KBC Insurance is completely owned by KBCG). The financial group KBCG operates as an integrated bank and insurance company. Integrated bancassurance products are offered in all countries.

What kind of integration can we observe in individual countries? KBCG is an integrated bank and insurance group. KBC Group owns two daughter companies (100% share): KBC Bank and KBC Insurance. Banks in all countries are owned by the company KBC Bank (100% share). Insurance companies in all countries are owned by KBC Insurance (100% share). KBCG is a financial group with the following type of integration: "partial integration with a parent universal bank."

What kind of internal integration have the banking and insurance products achieved in examined countries? Based on the conducted research, we found that in the monitored countries, the bank product is connected with an insurance product. Clients are offered discounts on insurance or interest rates. These products are offered exclusively to banks' clients. The countries Hungary and Bulgaria offer insurance products only with relation to bank products. The Czech Republic and Slovakia offer not only exclusive integrated products but also other insurance products not related to bank products.

In case that the insurance company offers life insurance, various types of investment life insurance products are offered. Variations of travel insurance are also offered. Having compared numbers of products offered, we can state that the highest number of products can be found in the Czech Republic, followed by Hungary, Slovakia and Bulgaria. General contracts are offered in the Slovakia.

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The Specifics of Forced IFRS Adoption by Czech Private Companies: A pilot field study

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Abstract: *The adoption of International Financial Reporting Standards (IFRS) around the globe is one of the most challenging events in accounting area of the last decade. The accounting research focuses mainly on the outcomes of mandatory IFRS adoption by listed companies and partially on the determinants of voluntary IFRS adoption by other firms. However, some countries put restrictions on voluntary adoption by unlisted companies and require them to retain the reporting under local GAAP regime. This restriction challenges especially such subsidiaries, for which their parent company prepares IFRS consolidated financial statements. The subsidiaries shall then assure the preparation of two sets of accounting information – public financial statements in compliance with local GAAP for statutory purposes and internal financial statements in compliance with IFRS for consolidation purposes of the parent company. The relation between cost and benefit of such forced IFRS adoption is unclear, which may endanger the quality of information submitted by subsidiaries to parents. This paper investigates specifics of forced IFRS adoption in transition country, applying a qualitative pilot field study by three Czech companies.*

Keywords: IFRS adoption, forced adopters, private companies, parent-subsidiary links

JEL codes: M41

1 Introduction

The adoption of International Financial Reporting Standards (IFRS) around the globe is one of the most challenging events in accounting area of the last decade. The accounting research focuses mainly on the intended outcomes of mandatory IFRS adoption by listed companies (Brüggemann, Hitz, & Sellhorn, 2013), i.e. on the changes in investors' decision making and capital market characteristics (such as cost of capital, liquidity, analysts' coverage) of listed companies. The IFRS adoption brings about also unintended outcomes, e.g. in the sphere of contracting, companies' regulation or corporate taxation. Voluntary IFRS adoption by unlisted companies can also be conceded as an unintended outcome of accounting harmonization. (Nobes, 2010), (Andre, Walton, & Yang, 2012), (Yang, 2014) indicate that decision of voluntary IFRS adopters to abandon local GAAP is motivated by their reporting incentives to produce financial statements of better quality for their users. There are two main subgroups of voluntary adopters. Either in individual financial statements of subsidiaries under the control of a parent, which reports in compliance of IFRS, or in consolidated statements of unlisted groups with major international operations. However, an important condition shall be met for the voluntary adoption – local accounting law has to contain an option to choose IFRS instead of local GAAP. An attitude of various countries differs, even for countries with similar accounting tradition, e.g. German corporate law permits under certain condition to opt for IFRS regime, but Austria restricts the IFRS usage just to listed companies (Procházka & Pelák, 2015). The legal restrictions put on the voluntary IFRS adoption as a statutory system challenge especially those subsidiaries belonging to the groups, for which the parent company prepares IFRS consolidated financial statements. These subsidiaries shall then assure the preparation of two sets of accounting information – public financial statements in compliance with local GAAP for statutory purposes and internal financial statements in compliance with IFRS for consolidation purposes of the parent company. In this context,

such internal preparation of IFRS statements based on the parent's command can be labelled as a forced IFRS adoption.

This paper is the fraction of a broader project focusing on the evaluation of benefits and costs connected with the IFRS adoption by Czech private (unlisted) companies under foreign control, following the command of the parent to adopt IFRS for the group's purposes. The project progresses in several steps. Firstly, recent literature is reviewed to identify the main benefits and costs of IFRS adoption on the preparers' side. Unfortunately, evidence is available only for the parent listed companies (Jermakowicz & Gornik-Tomaszewski, 2006), (Fox, Hannah, Helliar, & Veneziani, 2013), (Morris, Gray, Pickering, & Aisbitt, 2014). Despite the experience with IFRS implementation differs across stakeholders and countries, the respondents share a widespread agreement that the costs exceed the benefits under IFRS reporting on the company level. However, the methodology applied is not utterly suitable for this project, because the focus of these studies on parent listed companies result in: (a) examination of capital market benefits of IFRS adoption by listed companies, which are, although, not available for unlisted companies; (b) addressing of a motivation behind the decision of parent companies to stay at capital markets even if benefits of switch to IFRS do not compensate the costs – subsidiaries do not have such discretion, as they have to comply with the parent's instructions about the group's reporting regime. Therefore, the second phase of the project employs a pilot field study among three Czech companies – unlisted subsidiaries under foreign control – to detect the specifics of forced IFRS adoption, which are not addressed by recent accounting research. The findings of in-depth interviews with the companies' managers are consequently utilized to refine the research hypotheses about the benefits and costs of IFRS adoption by the entire population of the companies under the project's scope. Furthermore, the outputs of the pilot study serve as the starting point for the construction of semi-structured survey to test the hypotheses empirically on a sample containing more Czech subsidiaries under foreign control adopting IFRS as the groups' main reporting regime alongside their statutory local GAAP system. The main goal of this paper is to present the results of the pilot study.

2 Methodology and Data

A pilot field study was run by three Czech private companies under foreign control. The research interest is put on the main challenges and outcomes surrounding the implementation of IFRS into the accounting system, following the command of parent company to adopt IFRS as the group's primary accounting regime. The data collection rests on the in-depth interviews with the chief financial officers of those subsidiaries. The unstructured discussion of selected issues with respondents enables to express their personal perspective of the particular situation, including changes over the time based on own experience and involvement in the case (Smith, 2015).

The Company A launched the operations in the late 1990s, originally as a private family firm. The main business was a subject to major changes over several years. Finally, the company started to engage in the energy industry as a trader. Following the liberalisation of Czech electricity and gas market in 2006 and onwards, the owners sold the company to a German competitor. Before the sale, the company's turnover reached over CZK 2,000m, total assets were around CZK 300m and had less than 10 employees. The group's securities are listed on the Frankfurt Börse.

The Company B was established in early 1990s within the process of so-called small privatization, as a successor of the former public entity transformed into a company under private ownership. The centrally-planned company was privatized and operated as a family business. The company had been steadily growing and was acquired by a German competitor, partially in 2002 (40%) and fully in 2006. At the time of the ultimate sale, the company's turnover was around CZK 700m, total assets of CZK 500m, and had

200 employees. The parent was and still is one of the world-leading producers in automotive industry, and it is listed on the Frankfurt Börse.

The Company C was established in 2002 with a view to capitalize on the advantages of free movement of services after the planned accession of the Czech Republic to the European Union. The company operates as a software developer; the parent company was listed on the Paris Bourse at the time of subsidiary's incorporation, and it is still listed (nowadays on Euronext). The investment by the parent – expressed as the amount of subscribed capital – was CZK 3m.

Regarding the IFRS adoption as required by the parent for the reporting purposes within and outside the group, the pilot companies experienced a different schedule:

- Company A: the IFRS implementation immediately after the acquisition (i.e. from 2006 onwards),
- Company B: firstly, the requirement of the parent for additional reports based on German GAAP (since 2002); then a switch to IFRS following the parent's listed status (partial IFRS reporting in 2005 and full reporting since 2006),
- Company C: firstly, internal reports based on French GAAP in the period 2002-2004; IFRS adoption from 2005 onwards.

3 Results and Discussion

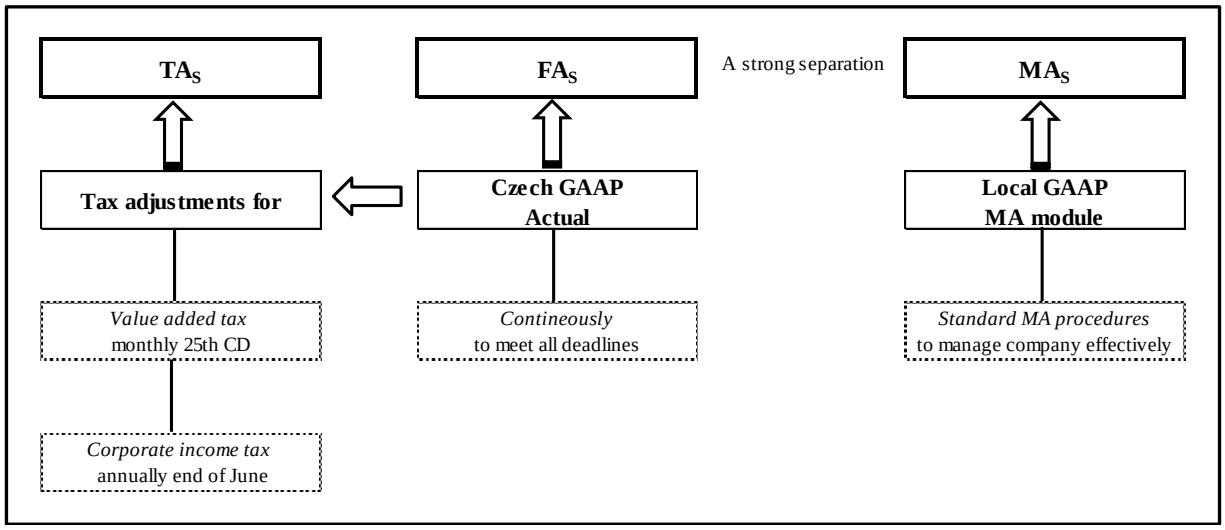
The first part of the interviews concerned on the changes in the architecture of accounting system of the company, once the parent required the subsidiary to adopt IFRS. Figures 1 and 2 sketch a simplified look at the reporting scheme within the Company A before and after the acquisition. The chart depicts not only the specific case of the Company A, but it is a picture of common situation for all Czech private companies. Regarding the external reporting pressures, the companies must prepare individual statutory financial statements once a year, which are made available to the public via an online application of the Business Register. Secondly, entities are obliged to meet their tax duties. On a regular monthly basis, companies are mandated to report their status relating to value added tax. The preparation of VAT tax filling, including supportive control reports is usually the major activity in corporate interim reporting. It shapes the bookkeeping and reporting schedules of private companies decisively, especially if firms engage in complex business transactions (involving international trade, reverse charge transactions, etc.). The next tax duty relates to corporate income tax. The tax filling shall be prepared on an annual basis. The calculation of tax profits is based on the profit determined in compliance with the Czech GAAP, adjusted for non-taxable items. Because of historical and institutional factors, Czech GAAP are tightly aligned with the tax rules. The subordination of financial reporting to fiscal needs is constituted in a considerably significant manner (Mejzlík, Arltová, Procházka, & Vítek, 2015), which impairs the quality of statutory financial statements and their serviceability for making sound economic decisions. This is the main factor, why management accounting for internal purposes of Czech companies is strongly decoupled from financial accounting and why Czech practice strongly supports the tendency to operate financial accounting system (FAS) and management accounting system (MAS) separately in a dual manner. The extent of autonomy of MAS on FAS goes far beyond the practices common in developed countries (Procházka, 2014).

The acquisition by the foreign parent adds new dimensions to the reporting processes – the change is captured at Figure 2. In particular, the Company A has to process data to comply with following informational demands.

- External:
  - separate financial statements for statutory purposes in compliance with Czech GAAP;
  - tax accounting based on adjusted Czech GAAP;
- Internal:

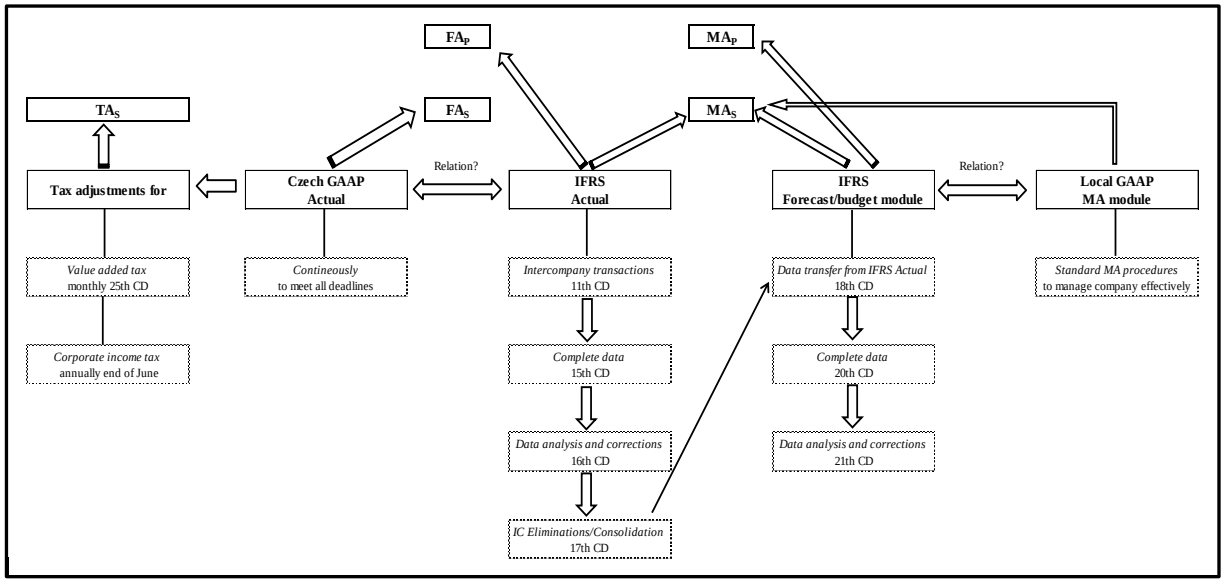
- required by parent company:
  - financial statements for consolidation purposes in compliance with the IFRS;
  - management accounting reports based on IFRS principles;
- own decision tasks (budgeting, cost allocation, price calculations, etc.) based on local practices.

Figure 1 Reporting schedules of a real Czech private company before acquisition



Source: own construction based on the interviews
(TA: tax accounting; FA: financial accounting; MA: management accounting; P: parent, S: subsidiary; CD: calendar day)

Figure 2 Reporting schedules of a real Czech private company after acquisition



Source: own construction based on the interviews

The additional information requirements raised by the parent relate to the supply of accounting information based on IFRS. In addition to three areas previously described, the Company A is commanded to prepare financial statements presenting actual results according to IFRS monthly (by the 15th calendar day at the latest). Furthermore, forecasted figures and other management reports shall be prepared by the 20th day. The parent designs the group's management accounting system as a superstructure over the

group's financial accounting system (both based on IFRS), which confirms the evidence collected by (Angelkort, Sandt, & Weißenberger, 2008) in case of EU listed companies. Although the accounting system is expanded "only" by two processes, additional information requirements of the parent have greatly increased the complexity of the subsidiary's accounting system. The additions do not enlarge the architecture of accounting system linearly, but in a multiplicative way, as it is easily visible in Figure B. The similar experience was expressed by the Company B and C, apart from the alternative set of accounting standards used as the primary information source within the group.

The Figures 1 and 2 indicate that the reporting workload of a subsidiary increases dramatically, after being acquired by an MNE using IFRS as the group's main reporting standard. Secondly, if the parent is located in a country with materially different economic, political, social background, then local institutions clash against global standards. When reconstructing the accounting system to meet requirements and commands of the parent, the subsidiary's management needs to select an appropriate strategic approach to counterbalance all institutional pressures subject to a cost-benefit constraint, the subsidiary is exposed to. Basically, the management can follow several strategies based on the assessment of relevant internal and external factors corresponding to the (Oliver, 1991)'s model:

- To reject the MNE's objectives defined by the Parent and to continue giving priority to their own goals. Consequently, the IFRS are adopted only in a ceremonial way (Kostova & Roth, 2002).
- To incorporate the parent's goals into own strategy by:
    - addressing all internal and external pressures individually and designing separate information modules specifically to each purpose; i.e. operate local FAS and MAS based on Czech GAAP and group's part of the FAS and MAS based on IFRS;
    - aligning own statutory FAS with the internal reporting of the Parent, by the voluntary adoption of IFRS, as evidenced e.g. by (Guerreiro, Rodrigues, & Craig, 2012) in the case of Portugal;
    - aligning own MAS with the internal reporting of the parent, i.e. by incorporating IFRS principles into local management accounting practices (Procházka, 2014).

The second part of the interviews therefore focused on the reaction of companies on the parents' commands to adopt IFRS as well as on the influence of IFRS adoption on internal decision-making processes within the companies. Unlisted companies were neither required nor allowed to select IFRS in their statutory accounts until 2011; therefore Scenario based on the model of (Guerreiro et al., 2012) could not have been opted for by subsidiaries around the group's switch to IFRS. To obey the command by the parents, IFRS had to be implemented alongside with local GAAP. The procedure resulted in a substantial extension of accounting systems, with an impact on the cost of operating such a complex system. Operating two separate and quite different modules of financial accounting increases compliance costs and administrative burden in general; this aspect was stressed by the Company A. The CFO admitted that in the first phase (2006-2007), the management had opted to adopt IFRS only symbolically. They had not complied with reporting deadlines and the overall quality of submitted information had been low. The parent had criticized the subsidiary repeatedly for the non-compliance. The subsidiary management paid a low attention to IFRS reporting and to the critique, because the old bonus scheme designed by the previous owners was still applied for their compensation. The old remuneration system referred to Czech GAAP results; therefore, management did not have sufficient incentives to handle the IFRS reporting in timely and quality manner. Except for the CFO, no member of top management even knew what IFRS are and how much they differ from Czech GAAP. In the post-adoption phase, local

practices survived the parent's effort to import the standards globally applied by the group.

The situation changed rapidly in 2008, when the parent company introduced a new compensation plan based on IFRS results (combining three key performance indicators "revenue, gross profit, and ROCE"). Initially, the management board of Company A pleaded the CFO to present regularly both actual and forecasted IFRS figures, which were sent to the parent. In next step, the management decided that major business decisions would be approved only if backed-up by calculations assessing the impact on IFRS results. The increase in perceived importance of IFRS by management boosted the workload of the financial department. However, the usage of outputs from the local MAS module started to fall steadily. At the end, the traditional management accounting tools (investment planning, budgeting, cost allocation, price calculation, etc.) survived, but the figures based on Czech GAAP were replaced by the procedures referring to IFRS numbers. The previous ignorance of IFRS reporting turned to its perceived usefulness in internal decision-making. However, the company's expression of moderate favor is preconditioned by (a) relatively low number of differences between statutory accounting and IFRS module regarding measurement of financial statements' elements, and (b) discretion in choosing the appropriate conversion method. As far as the first point, the principle variation between both systems relates to the presentation of the items within the income statement (nature vs function classification of expenses, different structure of operating vs finance costs, etc.) and minor differences in the recognition. As far as the latter condition, the company developed an Excel-based semi-automatic solution, which is sufficient for frequent monthly reporting and yet it is relatively cheap.

The adherence of Company B to the IFRS principles applied in the group reporting was also supported by the existence of IFRS-based compensation plan for top managers. However, the initial perception of IFRS usefulness was very low, as the company struggled with a lot of differences between Czech GAAP and IFRS without having a suitable IT solution for the complex conversion. The company was required to implement the group's common accounting and reporting software, which was, although, insufficient to account for all transactions of the subsidiary. The inadequacy was a result of different business model of the subsidiary compared to the rest of the group. The problem was removed after the implementation of new group's accounting software, which took place as a response to Company B's pressure on the parent to help it with optimizing the reporting process. The conversion process speeded up, the quality of prepared data increased and subsidiary started to utilize the new database in internal decision-making more extensively. On the other hand, the costs of implementing new software were so high, that – in the view of the company's management – they outweighed the incremental benefits. To at least balance plusses and cons, the Company B substantially rearranged the structure of management accounting by implementing tools and practices developed by the parent. The balanced relation between benefits and costs of IFRS adoption is therefore a result of (a) relatively high number of differences between statutory accounting and IFRS module regarding measurement and recognition; (b) quick conversion of financial statements using two-book system, which is, although, costly; (c) heavy reliance of the parent on uniformity of management accounting techniques within the group to promote higher cooperation among the group's units.

Company C exhibits a different pattern of IFRS adoption. The information flows within the group had been based on French GAAP and the preference of national standards survived even after the mandatory adoption of IFRS. The statutory consolidated financial statements in compliance with IFRS were perceived only as a necessary condition required by the regulators to remain on capital markets, but without any material benefits for the parent and group. This might correspond to evidence of (Daske, Hail, Leuz, & Verdi, 2013) that some companies adopt the IFRS as a label without any vital reporting incentives to provide high-quality data for the users. The reporting structure within the group was replenished by new package for IFRS consolidation (replacing the

original package based on French GAAP). The change of underlying standards brought more complexity to the conversion of financial statements of Company C, as the number of differences between Czech GAAP and IFRS was substantially higher than the distance between Czech and French GAAP. However, other reporting tools (especially in the group's management accounting) remained to grow up on French GAAP-based figures (including management compensation). The management of Company C considers the IFRS adoption as a "lost game" bringing costs without any measurable benefits.

4 Conclusions

Based on the literature review and the outcomes of the pilot study presented in this paper, the project's goal to assess the specifics of forced IFRS adoption by Czech subsidiaries under foreign control will be concretized into four hypotheses:

- H1: The costs of forced IFRS adoption exceed corresponding the benefits by Czech private companies under foreign control
- H2: The benefits, if any, will be realized within the internal structure of subsidiaries and not in relations with external parties
- H3: The positive attitude of the subsidiaries' management towards the outcomes of IFRS adoption is conditioned by the implementation of executives' bonus plan based on IFRS results
- H4: Different combinations of factors influencing the form, processes, and outputs of IFRS reporting can result in similar outcomes regarding the cost-benefit analysis

As the in-depth interviews are less structured and they incline to be subjective and less comparable across different respondents, the findings from interviews will be complemented with archival data in the next stage of the research project, as recommended by (Smith, 2015). The outcomes of empirical evidence will be confronted against preliminary findings of the pilot study presented by this paper. Missing robust empirical evidence precluding generalization is thus the main limitation of this paper, but the paper still complies with methodological approach applied for the whole project.

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How do remittances react to business cycle in receiving countries? Evidence from transition countries

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Abstract: *There are two main views on remittances. The first one implies that remittances increase dependency of receiving countries and distort economic development, serving as a transfer mechanism for business cycles. The second view claims that remittances serve as an important mechanism for internal development through various channels and that on the contrary remittances reduce volatility of economic growth in receiving countries due to their stability and size. The paper assesses the association of remittances with the aggregate output in receiving countries. The analysis consists of 11 transition countries over the period 1993-2015. The findings reveal that remittances towards transition countries seem to be rather procyclical as in 4 countries there is a downturn in remittances when GDP decreases and vice-versa. Only in one country remittances are found to be countercyclical. For the remaining 6 countries, no pattern of cyclicality is found, the character of remittances being assessed as acyclical. The paper discusses possible explanations for these findings.*

Keywords: Remittances, Economic cycle, Migration, Transition countries

JEL codes: F24, F22, E32, F32, F35

1 Introduction

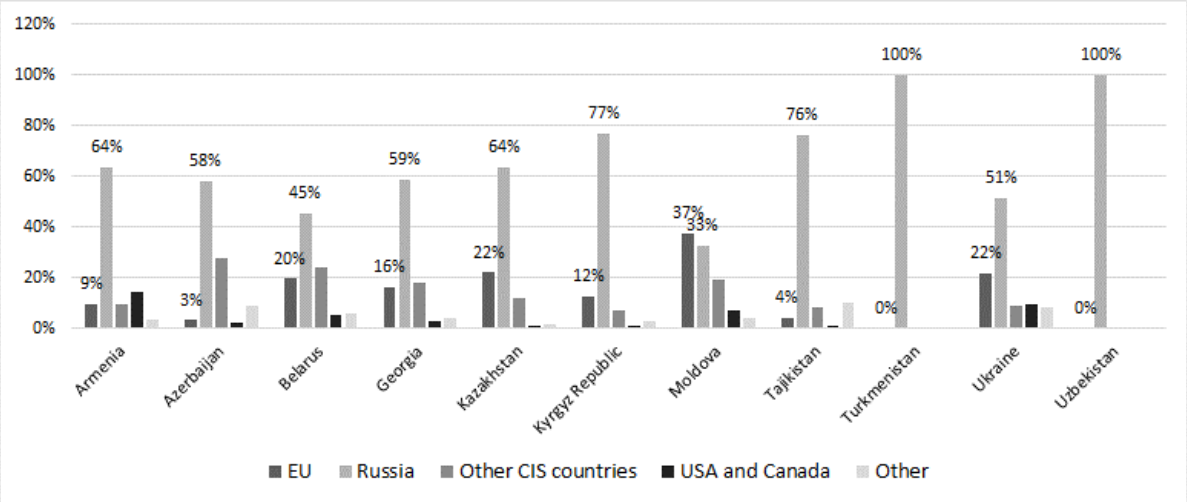
Remittances, private transfers from migrants to family members in the home country, add up to significant amounts annually. The number of international migrants has reached 244 million in 2015, which was the highest absolute number ever recorded (from 232 million in 2013). Migration as a share of the world population has been oscillating around 3 % for the past decades (IOM, 2017). After the fall of the Soviet Union, the successional states have been passing through a period of intense emigration. The yearly net emigration rate for 11 countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan) has been 3 % in 1992 and people were still continuing to emigrate from these countries at a rate of 0,2 % in 2012. As a comparison, low-income countries have a net emigration rate oscillating between 0,2 %-0,5% (World bank 2017a, own calculations).

People that emigrate because of work reasons usually remit certain amounts of money to their families in the home country. These financial flows, called remittances, represent a considerable source of national income, in some countries even exceeding not only official development assistance, but also incoming foreign direct investments. Recorded remittance flows towards the 11 transition countries were estimated to be 19,6 billion USD in 2015 (falling from 28,3 billion in 2014), an amount represents over 4,5 % of their GDP in the year 2015, 5,3 % in 2015 (World Bank 2017a, own calculations).

Transition countries form a specific geographical, cultural and economic area. They are also facing numerous problems related to political and economic instability (WEF, 2016). Immigrants coming from this area are relatively high skilled; they have good premises to integrate in the host country both due to their language skills and cultural proximity to

both Asian and European cultures. However transition countries are not a homogenous group. The share of remittances on GDP is not even through the analyzed group of countries. While in some countries remittances represent over 20 % of their GDP (Kyrgyz Republic, Moldova, Tajikistan), in other the share is close to 0 % (Turkmenistan, Kazakhstan) (World Bank 2017a, own calculations). The source of remitted money is similar for all countries in the dataset. As figure 1 shows, in all cases the main source is Russia. The only exception is Moldova with 37 % of all remittances coming from EU and only 33 % from Russia.

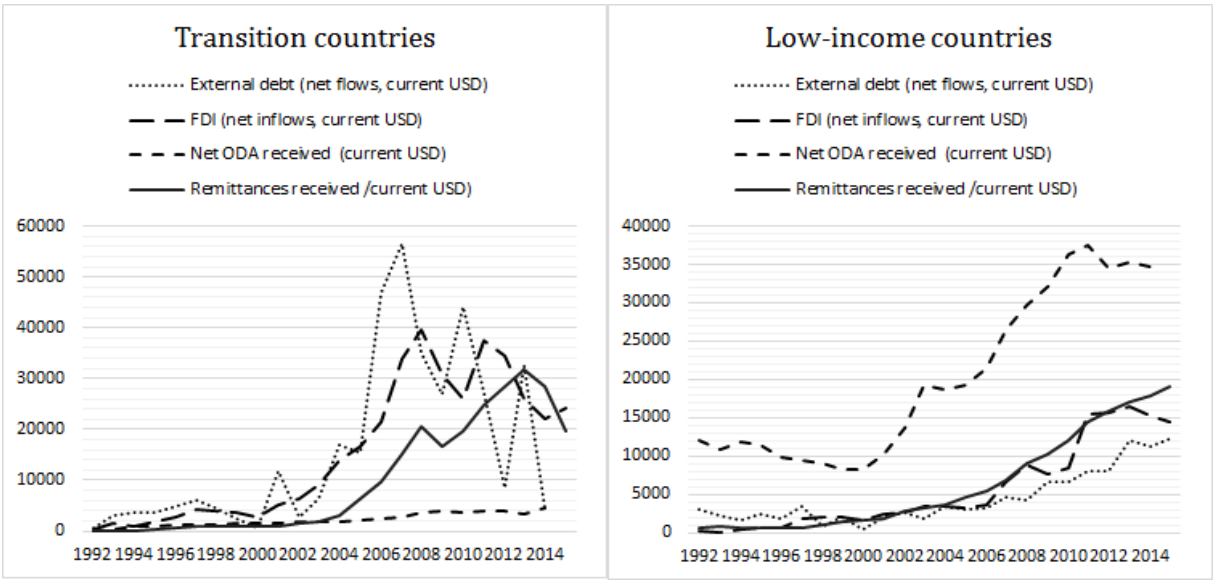
Figure 1 Source of remittance receipts by country in 2015 (as a share of total remittances)



Source: World Bank, 2017a, own calculations

Figure 2 shows how remittances and other capital flows have developed over time in the selected transition countries. As a comparison, the right side of the figure indicates the data for low-income countries. In both cases remittances proved to be resilient over the time. Unlike other capital flows, remittances represent numerous small transfers between private individuals, often family members. This might be one of the factors explaining why they have proven to be relatively less volatile than other financial flows as foreign direct investments, official aid flows, etc.

Figure 2 Remittances receipts by transition countries and low-income countries compared to other external financial flows (billions USD, current prices)



Source: World Bank, 2017a, own calculations

As showed in Figure 2, remittances represent a significant source of external financing for developing countries. It is therefore not surprising that there are various studies on how these financial flows affect the receiving regions. Early studies on remittances were elaborated by Stark and Bloom (1985), Russell (1986). Later, the study of remittances divided into various directions. Most studies are focused on the impact of remittances on development in migrant sending countries (economic growth, poverty, education, entrepreneurship, etc.). There are also studies that deal with the techniques of collecting remittance data (Reinke, 2007, Kapur, 2004). Much work concerning remittances and migration is being done by the World Bank, which has made attempts to examine both official and unofficial remittance flows (Maimbo and Ratha, 2005).

The idea of remittances as a transmitter of business cycle is not new to economic thinking. Recent studies search for the effect of the current economic crisis on remittances (O'Hara et al., 2009, Dietz, 2009, Ratha and Sirkeci, 2010; Barajas et all., 2012). Some studies find evidence of remittances being countercyclical to receiving countries' output, tending to even increase during periods when GDP drops (Spatafora, 2005, Kapur, 2005, Yang, 2007, Bugamelli and Paterno, 2011). This finding seems logical, as the main reason of remitting is to help families at home. On the other hand, some studies find that the relative size of remitted amounts is not as high as one could expect, Leontiyeva and Tollarová (2011) for example estimated that migrants send home about 22-27 % of their income. Hard times in the host country are likely to affect migrants' income. Remittances therefore can also have a procyclical character, responding accordingly to changes in output in the host country.

The goal of this paper is to assess the association of remittances with the aggregate output in receiving countries. The analysis consists of 11 transition countries from former Soviet Union over the period 1993-2015. The paper is organized as follows. Section 1 introduces the topic, including literature review. Section 2 outlines the methodological approach applied, including data sources. Next section presents and discusses the main findings. Section 4 concludes.

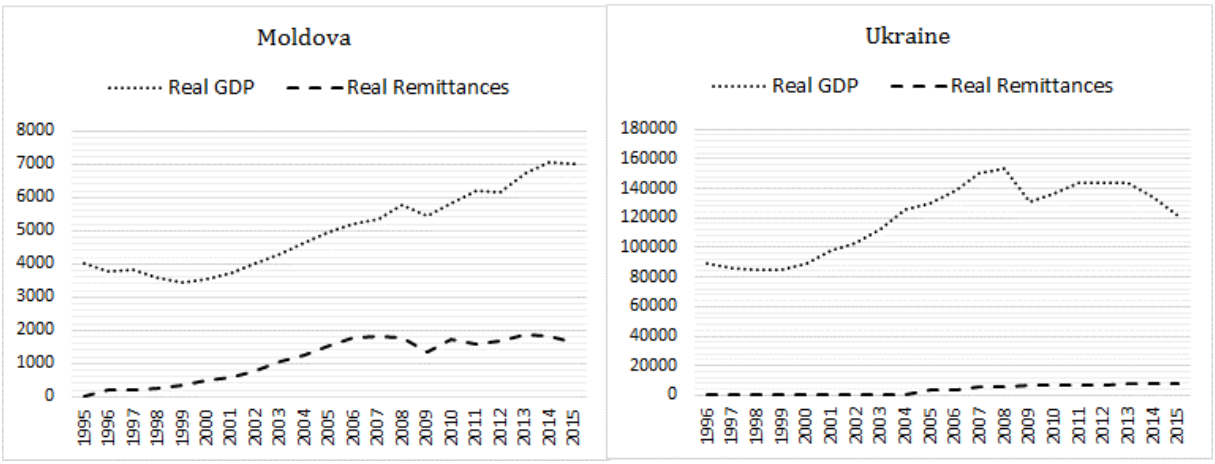
2 Methodology and Data

In this section, the paper analyzes how remittances react to changes in the receiving countries' output for each of the selected countries individually. I chose not to make the calculations for all the countries as a group as I do not consider it relevant. The calculations will be made for 11 countries (Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan), using annual data between 1993 and 2015. In fact, only for two countries data covering the whole period was available (Belarus and Kyrgyz Republic), for some countries the data covered a much shorter period (only 10 years for Turkmenistan and Uzbekistan).

The calculations will be made based on real GDP and real remittances. GDP was extracted from World Bank Databank, while real remittances were obtained by multiplying the share of remittances on GDP by the real GDP (for details on the Databank see World Bank, 2017a).

Figure 3 shows how real remittances and real GDP have variated over time. Moldova and Ukraine were chosen as an example. Data from Figure 3 indicate in both cases a growing time trend with observable fluctuations around this (supposed) trend. The first step of the analysis is therefore to detrend the time series. Detrending by eliminating the estimated time trend makes possible to calculate deviations (cyclical components) of real GDP and real remittances from the trend. These cyclical components would be stationary to zero making possible to statistically assess procyclicality (in case remittances will be on the same side of the trend as output) or countercyclicality of remittances (in case remittances will be on the opposite side of the trend than the corresponding output value). The absence of any procyclical or countercyclical character will be interpreted as acyclicality of remittances (see also Kydland and Prescott, 1990; Sayan, 2006 for details on detrending time series).

Figure 3 Evolution of real remittances and real GDP in selected transition countries (current 2010 USD)



Source: World Bank, 2017a, own calculations

Detrending will be done by using a polynomial of degree k for output (see Equation 1) and remittances (see Equation 2):

$$y_t^T = \alpha_0 + \alpha_1 t + \alpha_2 t^2 + \alpha_3 t^3 + \ldots + \alpha_k t^k \quad (1)$$

$$r_t^T = \beta_0 + \beta_1 t + \beta_2 t^2 + \beta_3 t^3 + \ldots + \beta_k t^k \quad (2)$$

Tables 1 and 2 present the results for the polynomial trends estimated for each of the time series:

Table 1 Estimated trends for real GDP (y_t^T)

y_t^T	α_0	t	t_2	t_3	t_4		R^2adj	F-statistic	Press-statistic
ARM	27.791*** (0.019)	2.163*** (0.107)	-0.233* (0.112)	-0.326*** (0.106)			0.969	211.588***	0.0879
AZE	22.805*** (0.021)	3.656*** (0.142)	-0.279* (0.155)	-0.394** (0.147)	-0.332** (0.125)	0.372*** (0.098)	0.993	581.757***	0.0855
BLR	30.134*** (0.009)	1.810*** (0.041)	0.046 (0.041)	-0.396*** (0.041)			0.989	677.485***	0.0513
GEO	22.610*** (0.023)	1.210*** (0.165)	0.535*** (0.162)	-0.535*** (0.124)	0.218** (0.076)		0.990	452.125***	0.0396
KAZ	29.575*** (0.007)	1.877*** (0.047)	0.254*** (0.050)	-0.471*** (0.047)	0.211*** (0.041)		0.996	1,232.024***	0.0372
KGZ	23.955*** (0.009)	1.253*** (0.042)	0.131*** (0.042)	-0.137*** (0.042)	0.141*** (0.042)	-0.110** (0.042)	0.977	188.656***	0.0736
MDA	23.838*** (0.014)	0.727*** (0.100)	0.619*** (0.102)	-0.536*** (0.087)	0.260*** (0.064)		0.981	248.830***	0.0508
TDJ	21.301*** (0.094)	4.686*** (0.620)	-1.919*** (0.495)	0.893*** (0.264)	-0.210** (0.082)		0.999	3,824.357***	0.0102
TKM	23.519*** (0.016)	3.205*** (0.070)					0.996	2,075.240***	0.0231
UKR	27.479*** (0.021)	1.225*** (0.121)	-0.515*** (0.120)				0.842	51.777***	0.1005
UZB	27.732*** (0.041)	3.602*** (0.238)	-0.587*** (0.143)	0.134** (0.042)			1.000	38,509.620***	0.0043

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on data of World Bank, 2017a

Table 2 Estimated trends for real remittances (r_t^T)

r_t^T	β_0	t	t_2	t_3	t_4	R^2adj	F-statistic	Press-statistic
ARM	25.643*** (0.058)	4.158*** (0.358)	-0.800* (0.382)	-1.119*** (0.361)	0.728** (0.314)	0.951	97.659***	0.2674
AZE	18.208*** (0.086)	9.864*** (0.462)	-4.414*** (0.475)			0.958	229.895***	0.4136
BLR	25.052*** (0.150)	6.266*** (0.721)	-3.499*** (0.721)	3.906*** (0.721)	-3.478*** (0.721)	0.870	37.923***	0.9508
GEO	20.278*** (0.066)	0.971** (0.440)	1.675*** (0.417)	-0.951*** (0.315)		0.891	49.956***	0.2147
KAZ	23.343*** (0.070)	-0.902** (0.377)	0.601 (0.387)			0.178	3.160*	0.3212
KGZ	20.423*** (0.149)	11.534*** (0.713)	-2.131*** (0.713)	-1.704** (0.713)		0.925	91.990***	0.7715
MDA	21.984*** (0.043)	3.939*** (0.296)	-1.193*** (0.304)	-0.749** (0.258)	0.793*** (0.190)	0.984	290.126***	0.1428
TDJ	18.102*** (2.241)	16.375 (14.819)	-6.887 (11.842)	0.370 (6.316)	0.444 (1.968)	0.949	61.163***	0.3292
TKM	-40.915** (11.662)	361.929*** (72.734)	-252.439*** (51.332)	105.880*** (22.236)	-22.422*** (4.862)	0.901	21.564***	0.2124
UKR	22.250*** (0.108)	11.550*** (0.750)	-2.398*** (0.771)	-2.420*** (0.655)	1.659*** (0.481)	0.988	389.340***	0.2718
UZB	-32.765 (18.051)	366.226** (112.585)	-258.357** (79.457)	113.500** (34.419)	-26.412** (7.526)	0.873	16.398***	0.2570

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on data of World Bank, 2017a

The best fitting trend was selected for each country based on the p-values, R^2-adjusted and Press-statistic. The Press-statistic summarizes the fit of a particular model in a sample of observations that were not used to estimate the model parameters (Statistica, 2017). For example, the trend for real output in Kazakhstan is best represented by a polynomial of 4th degree, which explains 96,6 % of the real GDP evolution and a Press-

statistic of 0,0372 (the absolute value is not relevant, it is important to compare the Press-statistics for various polynomials for the same country knowing that the lower value the better).

After removing the trend three types of correlations between cyclical components of real output and real remittances were run:

- contemporaneous correlation (between real output for year t and real remittances for year t)
- asynchronious correlations (remittances shifted backward or forward by one year compared to GDP)
- asynchronious correlations (remittances shifted backward or forward by two years compared to GDP)

The scope was to identify possible delays in the way remittances responded to output shifts (in case remittances prove to react to changes in GDP with some delay). In case remittances react to changes in GDP in advance, that could indicate that remittances work as a business cycle transmitter.

3 Results and Discussion

The results of contemporaneous and asynchronous correlations are showed in Table 2 (Pearson correlation was run). The values highlighted in bold represent the values with the lowest p-value.

Table 3 Results of correlation analysis

Pearson correlation coefficients	Remit(t-2)	Remit(t-1)	Remit(t)	Remit(t+1)	Remit(t+2)
ARM	0,404	**0,459****	0,193	-0,004	-0,217
AZE	-0,154	0,212	0,370*	0,247	-0,176
BLR	**0,481****	**0,521****	-0,080	**-0,756*****	**-0,455****
GEO	-0,226	0,186	**0,485****	0,193	-0,198
KAZ	0,134	-0,020	-0,351	-0,350	-0,145
KGZ	0,154	0,144	0,188	0,137	-0,142
MDA	-0,149	0,364	**0,651*****	-0,229	-0,040
TDJ	0,158	**0,554****	0,496*	-0,285	-0,529*
TKM	-0,539	0,539	0,250	-0,508	0,040
UKR	-0,001	0,051	0,027	0,098	-0,181
UZB	-0,045	-0,093	0,558	-0,007	**-0,822**

Note: Significance levels: *** p-value < 0.01 ; ** p-value < 0.05; * p-value < 0.10
Source: own calculations based on World Bank, 2017a

Table 4 summarizes the results. Remittances seem to be countercyclical only in Uzbekistan, while in 4 other countries (Armenia, Georgia, Moldova and Tajikistan) they are procyclical. No specific pattern of cyclicality was detected in the remaining 6 countries (Azerbaijan, Belarus, Kazakhstan, Kyrgyz republic, Turkmenistan and Ukraine).

Table 4 Character of correlation between real HDP and real remittances

	Character of correlation (coefficient)	Share of remittances on GDP (2015)	Main sources of remittances	Length of time series (number of years)
ARM	**procyclical (0,459)**	**14,2%**	Russia (64%)	21
AZE	acyclical	2,4%	Russia (58%)	21
BLR	acyclical	1,4%	Russia (45%)	24
GEO	**procyclical (0,485)**	**10,4%**	Russia (59%)	19
KAZ	acyclical	0,1%	Russia (64%)	21
KGZ	acyclical	**25,7%**	Russia (77%)	24
MDA	**procyclical (0,651)**	**23,4%**	EU (37%), Russia (33%)	20
TDJ	**procyclical (0,554)**	**28,8%**	Russia (76%)	14
TKM	acyclical	0,04%	Russia (100%)	10
UKR	acyclical	3,4%	Russia (51%)	20
UZB	**countercyclical (-0,822)**	8,8%	Russia (100%)	10

Source: own calculations based on data of World Bank, 2017a and 2017b

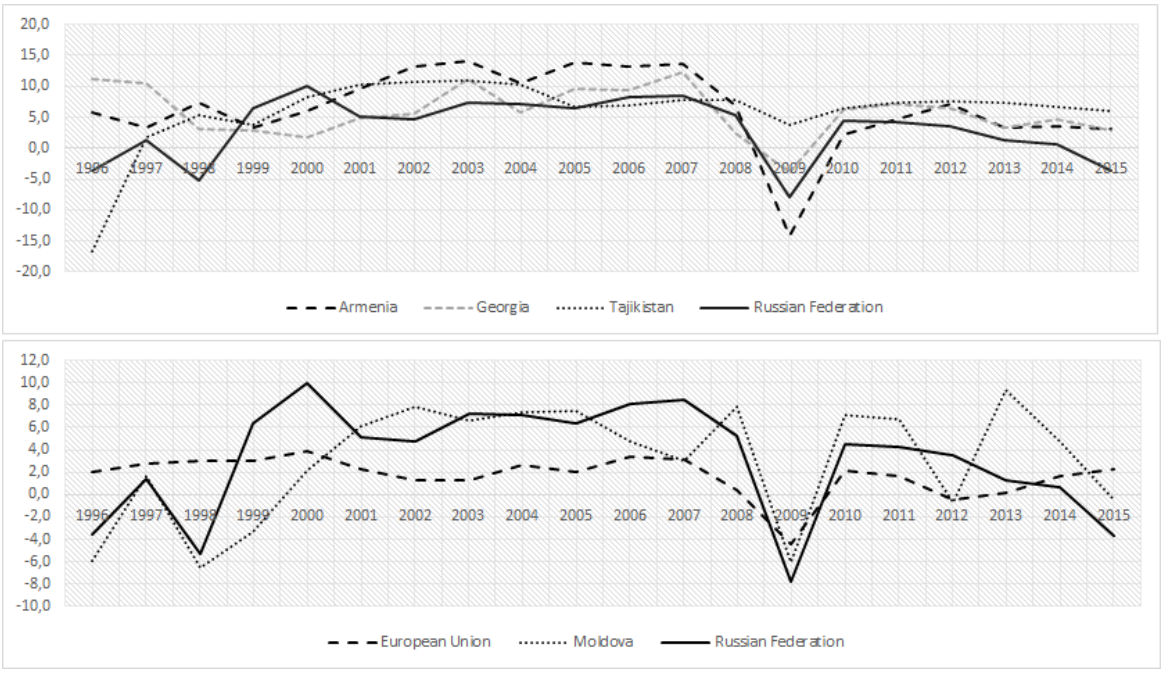
The results for Uzbekistan indicate that Uzbek remitters increase money transfers towards their home country when GDP at home decreases and vice-versa. Furthermore,

remittance react to changes in GDP with an anticipation 2 years. These results might seem surprising, as it seems quite improbable for migrants to anticipate changes in the home country GDP and act accordingly years in advance. In the case of Uzbekistan, it is important to take account of the limited number of observations for this country (only 10 years) and consider the possibility that this limitation could have biased the results.

In the case of Armenia, Georgia, Moldova and Tajikistan, the correlation coefficient is around 50 % and is positive. This reflects a procyclical behavior of remittances respective to output. Remittances are synchronous in Moldova and Georgia (no time shift) and asynchronous in Tajikistan and Armenia (remittances react with a one year delay to changes in output). In different words, remitters from these countries lower their money transfers during economic downturn at home, which could indicate that their main motive to remit is mainly to support investment and at a lesser extent to smooth consumption at home. Remitters could be risk aversive, not trusting the home country in times of economic hardship and preferring to spend (or save) their gains otherwise than sending it home. Another, more plausible reason, could be that that remittances are simply affected by the business cycle in the remittance-sending country. Economic hardship in the countries where migrants are employed implies loss of jobs, reduction of wages, which would cause a drop in the amounts remitted. As Figure 4 suggests, business cycles in Armenia, Georgia Tajikistan and even Moldova have very similar paths as the business cycle in Russia (which is the main source for remittance flows for all countries except Moldova). When there is less (or more) to remit because of economic downturn (or upturn), remittances would in fact act as a transmitter of business cycle.

It is interesting to remark that for the remaining 6 countries (Azerbaijan, Belarus, Kazakhstan, Kyrgyz republic, Turkmenistan and Ukraine) remittances and business cycles at home are uncorrelated. Except Kazakhstan, all these countries have a low share of remittances on GDP, which could explain these results. Studies dealing with various form of transition capitalism indeed classify these countries (except Kyrgyz republic) differently, as "commodity exporters", while countries like Armenia, Georgia, Moldova, Tajikistan and Uzbekistan are viewed as "remittance and foreign aid receivers" (Vlčková, 2017).

Figure 4 Comparison of GDP growth in remittance-receiving and main remittance-sending countries (in %)



Source: World Bank, 2017a

4 Conclusions

The results of the discussion in this paper indicate that remittance receipts in transition countries respond rather procyclically to the economic activity in the home country in some countries, while in some countries no pattern of cyclicality was found. It is not surprising that countries with acyclical character of remittances also have a low share of remittances on GDP.

While countercyclical behavior of remittances would indicate the prevalence of consumption smoothing motive of remitters, procyclical movements of remittances and output point out remitter's risk aversion and predominance of investment reasons over consumption reasons of remitting. Another, more credible reason of procyclicality, is synchronicity of business cycles in remittance sending and receiving countries. This seems to be the case of the transition countries with procyclical character of remittances.

It should be noted that transition countries form a specific group of countries in terms of data availability. The results reported in this paper could be improved by increasing the number of observations. As adding more years is not possible, what come into consideration is to use more detailed data, for example quarterly data instead of annual. The latest is however difficult to achieve due to limitations of data availability. A third possibility is to separate the time series into shorter period of times and observe whether cyclical character of remittances does not change over time. Due to relatively short data series the applicability of this method is limited.

Another final note is on the reliability of remittance data itself. It is well-known that besides official channels, migrants also make use of unofficial money transfer channels, geographical proximity of transition countries and the main remittance source country being a strong reason for that. In time, as technologies and information are increasingly accessible, migrants tend to switch to official channels. The uneven capturing of genuine remittance flows in time can also bias the results.

Acknowledgments

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Analysis of Prize Money Gap in Wimbledon 2007 - 2016

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Abstract: *Currently, it is rare in professional sports to offer equal prize money to male and female players. Tennis Grand Slam tournaments represent the leading part of those sports that committed to prize money parity. In 2007, Wimbledon, the oldest Grand Slam tournament, became the last Grand Slam to pay the same prize money to male and female players. Although men and women are paid equally they still play a different number of best-of sets: men play best-of-three sets while women play best-of-two sets in Wimbledon. These two competing circumstances have given rise to a financial gap in prize money obtained for a game played by men compared to women on average. The present paper estimates this financial gap by analyzing the unique data set on Wimbledon prize money and game scores in years 2007-2016.*

Keywords: tennis, gender inequality, gender bias, prize money

JEL codes: G02, Z21, Z23

1 Introduction

Wimbledon and all three other Grand Slam tournaments - Australian Open, French Open, and US Open, are the most prestigious individual tennis competitions in the world, which are open to all internationally ranked players. Among all tennis professional championships, Grand Slams constitute the highest media attention, prize money and the highest amount of ranking points entering ranking systems. Moreover, Grand Slams are the only championships which are organized for both, men and women. This fact yields an opportunity to compare how men and women are treated in professional tennis competitions and what is the most important, it allows us to conduct an analysis in which we will compare the actual prize money obtained by male and female athletes.

The goal of this paper is to extent the study conducted by Svoboda and Rakovska (2017) which examined single-player payment structures of four Grand Slam tournaments: US Open, Australian Open, Wimbledon and French Open in year 2016. In the present study, we will use enlarged data set containing data from 2007 to 2016. We decided to study data only for one Grand Slam, concretely for Wimbledon, in order to develop research design which would be beneficial for our further research of prize money gap in tennis tournaments within a wide history of periods. Wimbledon (The Championships)[7] is the oldest Grand Slam tournament, and paradoxically, it was the last tournament which announced prize money parity. It happened in 2007 [8] (US Open was the first Grand Slam and the first sport tournament in sports history, to pay equal prize money to men and women athletes as of 1973). We decided to study Wimbledon because of the fact that we

[7] Wimbledon, as the oldest tennis tournament in the world was first played in 1877 while Ladies' singles were initiated in 1884. Since its establishment it is held in Wimbledon, a south-west suburb of London, between late June and early July. It is the only Grand Slam which has kept playing on the original game's surface - grass (Wimbledon, 2017).

[8] Even though Wimbledon was the last Grand Slam which announced prize-money-parity, it paid approximately 90 % of men's reward to women athletes as early as in 1977 (ITF, 2016).

are able to encompass the whole period of prize-money-parity by taking the shortest range of years - from 2007 to 2016.

The structure of a regular tennis match is designed with an odd number of sets to ensure a winner come up at the end of the match. In Wimbledon, and in all Grand Slams, the amount of best-of sets played by women and men differs. Women are playing the best two of three sets which is typical for tennis matches, and men are playing best three of five sets. In other words, rounds in women's singles may end up with two or three sets (2,5 sets on average), while rounds in men's singles may end up with three, four or five sets (4 sets on average) [9]. Therefore, women athletes play on average only 62,5 % of amount of sets played by men in each round of each Wimbledon tournament. We also assume that the number of games played by both genders is proportional to amount of sets played, which yield the premise that female players perform only 62,5 % of amount of games performed by male athletes in the same round [10].

There are two competing circumstances, on one hand, men and women are rewarded equally in Wimbledon tournaments as of 2007. On the other, women are playing only 62.5 % of amount of games played by men in each round. Let us suppose that an average male player performed 100 games till the 3rd round of 2010 Wimbledon tournament. Then an average female player played only 62.5 games till this round, but both players would obtain the same prize money, let us say x £, if they would have ended in the 3rd round of 2010 Wimbledon. Applying a simple math to compute prize money obtained for a game played by each of the two players (x/100 £ for a man and x/62.5 £ for a woman) would directly imply that women are rewarded by 60 % more prize money for a game played than men. Such trend informs our research question: Women earn on average 60 % more prize money for a game played compared to men in all Wimbledon tournaments since 2007 when Wimbledon announced prize-money-parity. We address this inequality in financial rewards between male and female tennis players as prize money gap.

The paper is organized as follows. Section 2 offers a review of present literature studying the role of gender in sports. Section 3 describes data used in the analysis and proposes a methodology to be employed. The central part of the present study is formed in Section 4 in which we examine the results of our study and offer a general discussion of the analyzed phenomenon of a prize money gap. Finally, Section 5 delivers conclusions of this article.

2 Literature Review

In general, there is a big literature gap when considering gender inequality in sports. We failed to find and we are not aware of existence of a single article from the financial or economic field of study which would discuss this issue. Gender inequality and stereotyping is usually examined in articles from social, psychological, or marketing fields. Concepts such as gender inequality, or gender bias are in this type of literature inevitable, and results discussed in such papers might seem opinionated or subjective. Therefore, we feel that it is important to emphasize that the aim of this paper is to deliver factual numbers without assessing subjective views on gender stereotyping. In this part of the paper we will offer a short review of existing academic literature that might provide at least an insight into studied topic.

Trolan (2013) suggest that the leading problem of gender inequality in sports news lies in the way the media present female athletes, which is - bodies that only exist to be observed. The first studies considering gender stereotyping and inequality in sports examined data mainly from Olympic Games as the most sizable sport event advertised in both paper and electronic news (Eastman and Billings, 1999; Higgs et al., 2003). A pilot

[9] We assume that all possible amounts of sets in men's and women's singles are equally possible.

[10] We follow assumptions raised in (Svoboda and Rakovska, 2017, p.45).

study of gender stereotyping in everyday sports broadcasting was developed by Eastman and Billings (2000). Authors analyzed data extracted from printed and electronic sports broadcastings in order to deliver two types of statistics: time devoted to men and women by news announcers, and positivity/negativity towards women exhibited by sports commentators. Results of the study revealed significant gender bias in sports broadcasting in year 2000 - only 5 % of total period examined was devoted to women athletes, and women athletes were considerably stereotyped by commentators through use of adjectival descriptors [11].

Similar study was conducted by Billings and Young (2015). Authors extracted clock-times - the amount of time devoted to each gender by analyzing 118 hours recorded from sports channels FOX Sports Live, ESPN and SportsCenter. Results presented in this paper are significantly favoring hypothesis about gender stereotyping as women's stories were shown approximately 1 % of the total time studied and when shown, they represented approximately 70 % of the length of men's story.

Eastman and Billings (2001) studied gender and race stereotypes in college Basketball matches broadcasted in a number of US channels by analyzing the proportion of commentary about women and men athletes. Findings suggests that basketball announcers do not favor or underestimate any gender, what contradicted authors' hypothesis about stereotyping. Nevertheless, result of the study showed that only 37 % of broadcasting is devoted to women athletes in college basketball.

Literature presented above suggests considerable inequality between men and women in a question of sports media coverage. Gender inequality might be found in several other aspects of sports, but we will concentrate our discussion on phenomena linked to prize money. Study conducted by BBC in 2014 (BBC, 2014) showed that 35 out of 56 examined sports paid prize money at world level, from which 25 paid equal prize money and 10 did not in 2014. More interestingly, study showed that those 10 sport (30 %) paid more prize money to men than to women. Sports with highest disparity in prize money were identified to be football, golf, cricket or snooker, and the magnitude with which men were rewarded more ranged from two (surfing) to more than 300 times (Football FA Cup).

3 Methodology and Data

To calculate prize money gap we processed two sets of data: scoring tables for Gentlemen's and Ladies's Singles events for each Wimbledon tournament in years 2007-2016 [12] and respective Prize Money tables. Both sets of data were obtained from the official web site for Wimbledon tournament [13]. Resulting data set represents unique collection of observations on performance of each tennis player in studied Wimbledon tournaments and her prize money reward.

Each Wimbledon tournament is played by 128 players and consists of seven rounds. After the first round there are 64 losers resulting from initial 64 matches and in the seventh round, the winner is determined. The total prize money is apportioned based on rounds so as each player defeated in a certain round, let us say *j*th round, obtains the prize money assigned to *j*th round. This holds for all rounds except for the last seventh round in which runner-up and winner athlete obtain different amounts of prize money. Therefore, our aim was to calculate average prize money gap for each level of a payment

[11] Eastman and Billings (2000) states that men athletes are being attributed with personalities hence they obtain nick names, while women athletes do not. Moreover, authors found out that sports announcers often comment on women's age whereas men are described by age only time-to-time.

[12] We decided to examine Singles events because of the study design - to calculate a prize money gap between individual male and female players in Wimbledon tournaments.

[13] http://www.wimbledon.com/index.html

structure and then to construct the total prize money gap for each studied Wimbledon tournament.

Firstly, we calculated the number of games played by each player *i* corresponding to *j*th round (the round in which the player ended up) and denoted it by $games_{i,j}^{year,g}$, where *g* represents gender of a player and *year* ranges from 2007 to 2016. Secondly, we computed prize money obtained for a single game by each individual player *i* by using prize money amounts assigned to *j*th round - $Prize_j^{year}$. For $j = 7$, we determined which player was winner and which was runner-up and based on this specification we assigned respective prize money. As a next step, we took average per rounds to obtain average rewards payed to male and female tennis players for a single game played in Wimbledon as:

$$AVG\,\mathrm{Prize}_j^{year,g} = \frac{\sum_{i=1}^{N_j} \frac{\mathrm{Prize}_j^{year}}{games_{i,j}^{year,g}}}{N_j} \tag{1}$$

where N_j represents the number of players that ended up in the *j*th round, again taking in the account situation for $j = 7$. Finally, we denoted the prize money gap for each round *j* and *year* - how much are women athletes payed more for a single game played compared to men, as follows:

$$gap_j^{year} = \frac{AVG\,\mathrm{Prize}_j^{year,women} - AVG\,\mathrm{Prize}_j^{year,men}}{AVG\,\mathrm{Prize}_j^{year,men}} \tag{2}$$

The analysis in next Section will be conducted using variables defined in equations (1) and (2). In order to examine our research question we will conduct basic statistical analysis and visual representation of the data. Our aim is to express the prize money gap variable for years 2007 - 2016 which does not depend on nominal prize money itself but on actual difference in number of games played by male and female players. Hence, we will not adjust prize money amounts for historical Wimbledon tournaments with respect to yearly inflation levels in the United Kingdom. The nature of formulated research question and chosen variables does not allow for more complex statistical analysis, however the present study might serve as a starting point for our further research in which we will analyze prize money gaps of all Grand Slam tournaments.

4 Results and Discussion

Using equation (1) we calculated average prize money for a game played by men and women who ended up in one out of seven rounds denoted as: first round losers, second round losers, third round losers, fourth round losers, quarter finalists, semi-finalists, and runner-up and winner who represent athletes competing in the 7th round. Results are displayed in Table 1.

Firstly, looking at the numbers for male and female athletes, it is evident that women's rewards are higher than men's rewards in each level of payment structure. We will calculate the prize money gap later on, therefore we will comment on this difference more in next parts of this section. Secondly, the table shows that average financial reward for a game played is the lowest for the second and the third round losers, both men and women. What is more interesting, the first round losers and the fourth round losers obtain on average almost the same prize money for a game played. Further, male and female winners are compensated the most and their earnings represent on average 10 times the earnings of the first round loser. Last but not least, the average prize money for a game played is increasing with time what respects not only inflation but also tendency of a Wimbledon organizers to announce total prize money increase each year. The highest year-to-year rise in prize money per game happened between years 2012

and 2013 and represented almost 60 % on average for both men and women. The underlining increase in total prize money announced by organizers was 50 % - from 5.77 mil £ to 8.588 mil £.

Table 1 Prize money per game

	Level	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Men	Winner	3415	3012	3114	4000	4762	4873	6695	6377	7611	9174
	Runner-up	1362	1589	1284	1923	2282	2138	3390	3745	4178	3571
	Semi-Finalist	787	824	951	1297	1290	1452	1962	2131	2280	2278
	Qrter Finalist	456	467	578	677	762	795	1216	1281	1230	1318
	4th Rnd Losers	353	344	372	394	527	509	811	747	840	969
	3rd Rnd Losers	259	261	256	270	332	350	628	641	691	742
	2nd Rnd Losers	227	239	258	263	299	314	609	570	657	716
	1st Rnd Losers	304	332	328	327	347	454	721	835	850	842
		327	**343**	**351**	**375**	**422**	**483**	**789**	**839**	**894**	**930**
Women	Winner	4861	5396	5822	7752	8088	6805	11765	12847	12789	14599
	Runner-up	2303	2717	3972	3788	4435	3993	5333	6197	5912	6711
	Semi-Finalist	1431	1396	1692	2053	2254	2534	2886	3779	3825	3666
	Qrter Finalist	787	858	990	1265	1181	1274	1738	2101	2229	2369
	4th Rnd Losers	570	575	679	854	795	906	1281	1383	1428	1443
	3rd Rnd Losers	447	435	462	522	527	618	942	1034	1239	1178
	2nd Rnd Losers	427	386	415	455	480	559	998	1020	1080	1221
	1st Rnd Losers	517	492	510	559	586	725	1204	1336	1453	1493
		559	**545**	**593**	**674**	**698**	**800**	**1282**	**1412**	**1516**	**1587**

Source: authors own calculations

As a next step in our analysis we have calculated prize money gap for each level of payment structure in years 2007 - 2016. This part represents the core section in which we will answer our research question. Table 2 summarizes values calculated by employing formula (2).

Table 2 Prize money gap

Level	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	AVG Levels
Winner	42%	79%	87%	94%	70%	40%	76%	101%	68%	59%	71%
Runner-up	69%	71%	209%	97%	94%	87%	57%	65%	42%	88%	78%
Semi-Finalist	82%	69%	78%	58%	75%	75%	47%	77%	68%	61%	67%
Qrter Finalist	72%	84%	71%	87%	55%	60%	43%	64%	81%	80%	69%
4th Rnd Losers	61%	67%	83%	117%	51%	78%	58%	85%	70%	49%	69%
3rd Rnd Losers	73%	67%	80%	94%	58%	76%	50%	61%	79%	59%	67%
2nd Rnd Losers	88%	62%	61%	73%	60%	78%	64%	79%	64%	70%	70%
1st Rnd Losers	70%	48%	56%	71%	69%	60%	67%	60%	71%	77%	66%
AVG Years	**71%**	**59%**	**69%**	**80%**	**66%**	**65%**	**62%**	**68%**	**70%**	**71%**	**68%**

Source: authors own calculations

Looking at the results in the Table 2, we can see that the prize money gap ranges from 40 % to 209 %. This range is quite extensive and represents the variability in number of

games played within Wimbledon tournaments. The highest gap on average is identified in runner-up level of payment structure and suggests 78 %. This percentage is mainly driven by results in 2009 tournament in which runner-up female player, Venus Williams, ended up with 107 games played [14] on the one hand. On the other hand, the male runner-up athlete, Andy Roddick, ended up with the highest number of games played in studied period - 331. Consequently, prize money gap calculated for runner-up level in 2009 was 209 %. The minimum gap, 40 %, was calculated for winner level in 2012 and demonstrate the situation in which male winner, Roger Federer, played 236 games with 242 games as the average for male winners, while the female winner, Serena Williams, played 169 games what represents the overall maximum number of games delivered by female athletes in studied period. In other words, the more games conducted by women in the given round, the lower gap calculated.

Overall, computed average prize money gaps for years and levels validate our initial assumption, that women are rewarded by 60 % more than men for a game played. Moreover, the results showed that the average gap is even higher in all levels of payment structure and in all years except for 2008 in which gap represented 59 %. Given the fact that Wimbledon organizers announce increase in prize money each year and the systematic nature of prize money gap showed in the studied period, we can conclude that the nominal difference in financial rewards per game is increasing with time. The similar conclusion was made in (Svoboda and Rakovska, 2017, p.51). The fact that Wimbledon offer the equal prize money for both genders while women demonstrably play fewer best-of sets might seem unfair and intriguing. The other view, however, is that the International Tennis Federation together with individual Grand Slam national organizations exert effort flatten the present gender inequality in sports and that equal payment structure for male and female tennis players might stand as the pioneering example for future development of women's position in sports. Continuing in this debate is not the aim of our article therefore, we will leave the reader with open assumptions.

5 Conclusions

The present paper examined financial gap in prize money paid to female players compared to male players in Wimbledon tournaments through years 2007 - 2016. It represents an extension of study of Svoboda and Rakovska (2017) in which only one year was explored. We collected data from official site of the Championship and created an unique data set capturing performance of each participating tennis player and her financial reward in studied period. In the core part of our analysis we calculated prize money gap that resulted from two competing circumstances: prize-money-parity in Wimbledon tournaments as of 2007, and gender inequality in number of best-of sets - two best-of sets played by women and three best-of sets played by men.

Firstly, the results validated our assumption that women obtain on average 60 % more prize money than man for a single game played. Moreover, the average gap was showed to be even higher for all the studied years except for 2008 for which we computed 59 % gap and this result holds for all levels of payment structure - from first round losers to winners. Secondly, given the systematic difference in prize money paid for a game to male and female athletes, and the fact that total prize money announced by Wimbledon organizers is rising yearly by more than inflation rates (the highest increase was announced in 2013 - almost 50 %) we can conclude that nominal prize money gap will have increasing tendency in feature periods.

The topic discussing gender inequality in sports is very wide and covers several academic fields. We decided to study financial aspect connected to payment structure of one of the most famous tennis tournaments in the world. The aim of this paper was to access the

[14] The low number of games played resulted mainly from the fact that Venus Williams beat her competitor Agnieszka Radwanska in the quarter-final with score 6-1 6-2 and Dinara Sofina in the semi-final round with result 6-1 6-0 (Wimbledon, 2017).

prize money gap quantitatively and to deliver comprehensive examination of factual data without assessing gender stereotypes or opinionated views. We are aware of several shortcomings of the present study based mainly on the low complexity of used statistical methods. The future research should concentrate on data analysis by use of more advanced statistic or possibly by use of econometric models. Eventually, the analysis might incorporate data from other tennis tournaments organized by the Association of Tennis Professionals (ATP), and the Women's Tennis Association (WTA), or tournaments from other sports disciplines.

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Comparison of algorithmic trading using the homogeneous and non-homogeneous Markov chain analysis

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Abstract: *This empirical study deals with stochastic modelling of a short-term share price development. We use Markov chain analysis (MCA) to predict the share price development. When defining a state space we assume that the share price moves in three types of trends: primary, secondary and minor. The subject of our interest is a minor trend, which usually lasts for several days. During this trend the share 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 amount of the accumulated profit or loss. The aim of this study is to compare two approaches to modelling the state space. In the first approach, we assume homogeneous Markov chains, i.e. approximately the same volatility, and MCA is performed with unvarying state space. In the second approach, we assume non-homogeneous Markov chains, i.e. a changing volatility, and MCA is performed with varying state space. We create trading strategies for automatic generation of buying and selling orders based on these models. Three business systems have been created for each approach. The profitability of each business system is calculated and compared. The study was performed using historical daily prices (opening and closing) of CEZ shares from the beginning of 2006 until the end of 2016. This study has proved that trading models with varying state space, on the average, outperform trading models with unvarying state space.*

Keywords: algorithmic trading, Markov chain analysis, share price prediction

JEL codes: G17, C53

1 Introduction

In our long-term research we deal with models used to predict short-term share prices and their success in algorithmic trading. The results of this research are stated for example in Svoboda and Říhová (2016). We proceed from technical analysis (TA). TA is based on some scientific theories; however, it is, above all, based on a number of empirical findings. Based on these findings, individual methods are created and their number is practically unlimited. Principles and methods of TA are described, for example, by Murphy (1999) or Rejnuš (2011). TA is an extensive set of methods that predict future prices from past prices and trade volumes. The basis of TA can be summarized by the following three theses:

- The share price is determined only by a mutual interaction between supply and demand. Supply and demand are influenced by fundamental and psychological factors.
- Share prices move in trends which are inertial. A trend change is caused by a change of ratio between the selling and buying parties. These trend changes must be identified in time by studying historical prices and trade volumes. Technical analysts distinguish three types of trends. A primary trend which lasts from one

year to several years, a secondary trend which lasts for several months and a minor trend which lasts for several days to weeks.
- Development cycles and formations are repeated. It is caused by the nature of human behaviour that tends to react in a similar way under the same circumstances. This fact allows us to predict the future share price development.

The basic assumption for technical analysts is the second thesis. The trend identification in good time raises hopes for an above-average profit. Nowadays, the main focus of technical analysts is predicting of short-term price movements (the minor trend), where the price level is not important but the estimate of price changes plays an important role. We assume that the probability of this trend change is increasing with a rising accumulated loss or profit. A key question for us is what amount of the accumulated loss or profit is needed to change the trend. Considering the data character (daily opening and closing prices) we use the analysis of Markov chains (MCA) for modeling the probability of trend change.

The MCA is used very little for a stochastic description of the behaviour of stock markets. The infrequent application of MCA is probably also caused by some studies (Zhang and Zhang, 2009), (Doubleday and Esunge, 2011) and (Vasanthi at al., 2011). The common feature of these studies is the fact that they define the state space very simply. The state space is defined on the basis of the intensity of daily changes and it does not allow for suitable applications. Contrary to the above, the study (Svoboda, 2016) defines the state space on the basis of the intensity of daily cumulative changes in share prices. The study shows that in the state space thus defined there are states in which the minor trend changes with a high probability. This study is based on this approach. In the study (Svoboda, 2016), individual states are defined as multiples of the standard deviation of daily price changes and the deviation is calculated for the entire monitored period. We would like to modify this principle in this study and define the varying state space as multiples of the moving standard deviation.

The aim of this study is to compare the profitability of trading strategies to generate trading signals using MCA either with the unvarying state space or with the varying one.

2 Methodology and Data

Markov chain analysis theory is described for example in (Hillier and Lieberman, 1986). 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 $S = \{s_i\}$, $i = 1, 2, ..., N$ which is called a state space. Behaviour of the described process is determined by:

- Vector of unconditional probabilities $p(n)^T=[p_1(n), p_2(n), ..., p_N(n)]$, where T means transposition and $p_i(n)$ denotes probability that the process is in the moment n in the state i.
- Transition probability matrix **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 $i = 1, 2, .. N$ and $j = 1, 2, ... N$ 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.

For our needs, a suitable model of the state space is the one in which there are states from which the process will move into states with the opposite trend with a sufficiently high probability.

Data

The study was carried out using only the ČEZ shares for the 11-year period from the beginning of 2006 until the end of 2016. The data were provided by Patria Direct. During this period, the company paid out dividends. Paid and reinvested dividends are calculated. If we invested one unit of capital in ČEZ shares at the beginning of 2006 and reinvested the dividends paid, the value of capital would be 0.886 at the end of 2016. This passive strategy is called Buy & Hold (B&H). The yield of this passive strategy is compared with the yield of our trading strategies. A cumulative change of price Y_t is interpreted as short basic indexes of daily closing prices where the basic period is the day of the minor trend change, i.e. the transition from a decrease into a growth or vice versa. The trend duration is determined by the number of consecutive rising or falling closing prices. Y_t can be calculated according to the following relations:

$$Y_t = Y_{t-1}\frac{P_t}{P_{t-1}} \; if \; \left(P_{t-2} \le P_{t-1} \le P_t\right) or \left(P_{t-2} \le P_{t-1} \le P_t\right)$$
$$Y_t = \frac{P_t}{P_{t-1}} \; otherwise \quad , \tag{1}$$

where P_t is the daily closing price in time *t*, P_{t-1} is the daily closing price in time *t-1* and P_{t-2} is the daily closing price in time *t-2*. We define the state space by values y_t which are the percentage expression of Y_t. A set with eight states will be used for data classification. The state when the share price decreases is labelled D_i. State D_1 is the state with the lowest decrease in price, and, on the contrary, state D_4 is the state with the highest decrease in price. G_i is the state when the share price is rising. G_1 is the state with the lowest increase in price, and, on the contrary, G_4 is the state with the highest increase in price. A general model of the state space is defined by the following principle:

D_4: $y_t < -3\Delta_t$	G_1: $0 \le y_t < 1\Delta_t$
D_3: $-3\Delta_t \le y_t < -2\Delta_t$	G_2: $1\Delta_t \le y_t < 2\Delta_t$
D_2: $-2\Delta_t \le y_t < -1\Delta_t$	G_3: $2\Delta_t \le y_t < 3\Delta_t$
D_1: $-1\Delta_t \le y_t < 0$	G_4: $3\Delta_t \le y_t$

where Δ_t is the width of interval, according to which the individual states are assigned y_t values. In the case of unvarying state space, Δ_t is invariant for all *t*, it is equal to the standard deviation and its value is 1.842. In the case of varying state space, we calculate Δ_t as a moving standard deviation of length 20, which is calculated according to the following formula:

$$\Delta_{t,20} = \sqrt{\frac{1}{20}\sum_{i=0}^{19}\left(y_{t-i} - \bar{y}_{t,20}\right)^2} \quad , \tag{2}$$

where y_t is the daily change in the share price on day *t-i* and $\bar{y}_{t,20}$ is the moving average length *n* on day *t*. Length 20 was chosen more or less randomly, it corresponds to a length of one month, in another study we will try also other lengths. The procedure for assigning the states is shown in Table 1.

Table 1 Procedure for assigning the states

Date	P_t	Daily change %	y_t %	Unvarying model		Varying model	
				Δ_t	state	Δ_t	state
...	...	...	...	...	...	...	...
18-03-2009	722.0	1.91	2.56	1.842	G_2	2.527	G_2
17-03-2009	708.5	0.64	0.64	1.842	G_1	2.561	G_1
16-03-2009	704.0	-1.26	-1.26	1.842	D_1	3.102	D_1

13-03-2009	713.0	2.89	2.89	1.842	G_2	3.125	G_1
12-03-2009	693.0	-0.45	-0.45	1.842	D_1	3.066	D_1
11-03-2009	696.1	3.66	8.28	1.842	G_4	3.071	G_3
10-03-2009	671.5	2.52	4.45	1.842	G_3	2.960	G_2
09-03-2009	655.0	0.46	1.88	1.842	G_2	2.932	G_1
06-03-2009	652.0	1.42	1.42	1.842	G_1	3.252	G_1
05-03-2009	642.9	-3.03	-3.03	1.842	D_2	3.236	D_1
...	...	...	...	...	...	...	...

Source: data Patria, own calculation

Trading strategies

Trading strategies are created on the following principles. When a share price reaches a certain fall level, a buying signal is generated. When a share price reaches a certain growth level, a selling signal is generated. Trading strategies are always implemented according to the following rules:

- One trade (transaction) means the buying and subsequent selling of shares.
- If a buying or selling signal is generated on one day, the trade is implemented for the opening price from the following day.
- The whole capital is always invested (it means that it is theoretically possible to buy a part of a share).
- We do not take any transaction fees into consideration.
- We count and reinvest the paid out dividends after tax in case that we obtained the shares on the record day.
- A short selling is not taken into account.
- Two consecutive purchases are not possible.

The invested capital value is calculated according to the following relation:

$$C_n = C_0 \prod_{i=1}^{n} \frac{S_i + D_i}{B_i}, \tag{3}$$

where C_0 = 1.000 is the initial value of the capital, C_n is the value of the capital after the n^{th} transaction, S_i is the selling price in the i^{th} transaction, D_i is dividend after taxation in case that during the i^{th} transaction there was ex dividend day, B_i is the purchasing price in the i^{th} transaction. To compare the success rate of the individual models, we also determine the average yield of $\bar{C}$, which can be ascertained according to the formula mentioned below:

$$\overline{C} = \frac{C_{D_2-G_2} + C_{D_2-G_3} + \ldots + C_{D_4-G_4}}{9}, \tag{4}$$

where $C_{Di\text{-}Gj}$ is the achieved appreciation of the trading strategy in which the buying signal generates state D_i and the selling signal generates state G_j.

Altogether, we calculate three business models. In the first model, certain states generate the buying and selling signals. In the second model, the buying and selling signals are generated when a certain level of growth or decrease has been exceeded. In the third model, the signal is generated only after the end of the growth and decrease, with the minimum required level of growth or decrease being reached.

3 Results and Discussion

For each model we calculated 9 (3x3) trading strategies. The buying signals were gradually generated by states D_2, D_3, D_4 and the selling signals were gradually generated by states G_2, G_3, G_4. States D_1 a G_1 were not used for generating signals, as a certain minimum decrease or growth of the share price was required. Firstly, we examine probabilities of transition between individual states.

Transition probabilities

As well as Svoboda (Svoboda, 2016), we firstly carry out filtration of MC. Filtration is leaving out the consecutive, identical states. By means of filtration we remove the states where the share price stagnates (or, more precisely, it changes only a little within the same trend). These states are not interesting from the trading point of view. To illustrate this, let us give a part of the chain before filtration: … D_4, G_1, G_1, G_1, G_2, D_1, D_1, D_2, G_2, D_2, D_2, … and after the filtration … D_4, G_1, G_2, D_1, D_2, G_2, D_2, ... We then determine a probability matrix of transition **P** for the filtrated MC. The transition probabilities are given in Table 2. The found probabilities are shown only up to two decimal places, and therefore the sum of probabilities may not equal 1 precisely. Direct transitions between some states are impossible and in these impossible transitions there is null without decimals. Columns $\sum D_i$ and $\sum G_i$ state the probability of continuance in a trend or a change in a trend. The number of occurrences of individual states is given in the last column.

Table 2 Transition probabilities

		D_4	D_3	D_2	D_1	G_1	G_2	G_3	G_4	$\sum D_i$	$\sum G_i$	n
D_4	unvarying	0	0	0	0	0.36	0.45	0.13	0.06	**0.00**	**1.00**	64
	varying	0	0	0	0	0.54	0.31	0.14	0.01	**0.00**	**1.00**	106
D_3	unvarying	0.29	0	0	0	0.55	0.13	0.03	0.00	**0.29**	**0.71**	106
	varying	0.43	0	0	0	0.38	0.16	0.03	0.00	**0.43**	**0.57**	158
D_2	unvarying	0.08	0.26	0	0	0.54	0.10	0.01	0.00	**0.35**	**0.65**	284
	varying	0.09	0.30	0	0	0.43	0.16	0.02	0.00	**0.39**	**0.61**	322
D_1	unvarying	0.01	0.03	0.31	0	0.55	0.09	0.01	0.00	**0.35**	**0.65**	537
	varying	0.02	0.06	0.33	0	0.44	0.13	0.01	0.00	**0.41**	**0.59**	471
G_1	unvarying	0.00	0.01	0.09	0.52	0	0.33	0.04	0.01	**0.63**	**0.37**	530
	varying	0.00	0.04	0.13	0.41	0	0.33	0.09	0.00	**0.58**	**0.42**	464
G_2	unvarying	0.00	0.01	0.11	0.55	0	0	0.25	0.08	**0.67**	**0.33**	291
	varying	0.00	0.02	0.13	0.44	0	0	0.30	0.11	**0.58**	**0.42**	325
G_3	unvarying	0.01	0.02	0.10	0.51	0	0	0	0.37	**0.63**	**0.37**	114
	varying	0.00	0.02	0.17	0.46	0	0	0	0.35	**0.65**	**0.35**	175
G_4	unvarying	0.03	0.03	0.36	0.59	0	0	0	0	**1.00**	**0.00**	75
	varying	0.00	0.04	0.37	0.59	0	0	0	0	**1.00**	**0.00**	101

Source: own calculation

The results in Table 2 show that the unvarying model has a higher probability of the trend change, because the trend probability values are around 0.66, while the varying model values are around 0.60. Therefore, the model with unvarying state space should theoretically be more suitable for speculative trading.

Next, we will examine the evaluation of individual models. The total appreciation and the number of realized transactions were calculated for individual trading strategies in each model. Cases where the model with varying state space exceeded the model with unvarying state space are marked in bold type. Also the average yield and its standard deviation are calculated for each model. Its development over time, including its comparison with B&H strategy are graphically represented.

Model 1

In this basic model, the individual buying orders are sequentially generated directly by states D_2, D_3 and D_4, and the selling orders are gradually generated directly by states G_2, G_3, and G_4. The achieved appreciation is presented in Table 3.

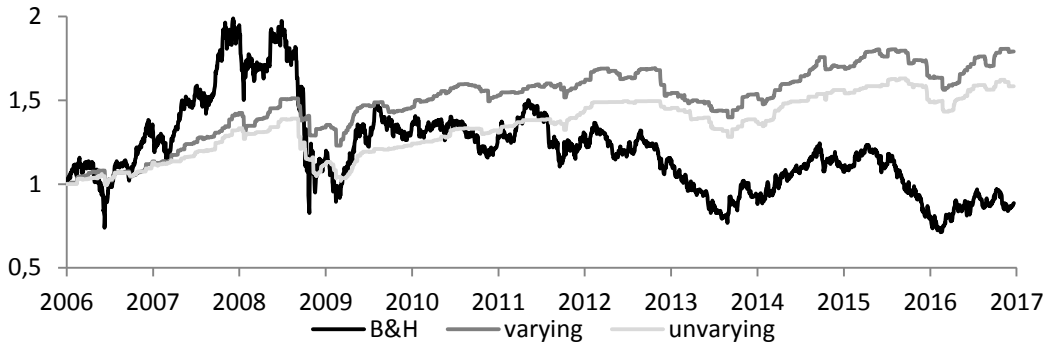
Table 3 Results of Model 1

	sell	G_2		G_3		G_4	
buy		C_n	**n**	C_n	**n**	C_n	**n**
D_2	unvarying	1.764	189	1.546	101	1.321	62
	varying	1.178	218	1.504	143	1.298	87
D_3	unvarying	2.167	88	0.923	61	1.190	46
	varying	2.147	135	**2.055**	101	**1.635**	73
D_4	unvarying	2.115	56	1.586	43	1.643	38
	varying	**2.613**	91	**2.064**	81	1.628	56

Source: authors, own calculation

The results in Table 3 show that all trading strategies with both models have outperformed the B&H strategy. The unvarying state space model had an average value of 1.791 and a standard deviation of 0.434. The unvarying state space model had an average value of 1.584, and a standard deviation of 0.383. The development of the average value of invested capital over time for both models is shown in Figure 1.

Figure 1 Development of capital value in model 1



Source: authors, own calculation

Model 2

A drawback of Model 1 is the fact that a signal does not have to be generated even if there is a marked price change. For example, when generating the selling signal by G_2, the selling signal was not generated in the following sequence of states G_1, G_3, G_4, G_4. This shortcoming is eliminated in model 2, where the B_i state is a minimum decrease to generate the signal and S_i is a minimum growth to generate the signal. That is $S_2 = \{G_2, G_3, G_4\}$; $S_3 = \{G_3, G_4\}$; $S_4 = \{G_4\}$; $B_2 = \{D_2, D_3, D_4\}$, etc. The obtained results are shown in Table 4.

Table 4 Results of Model 2

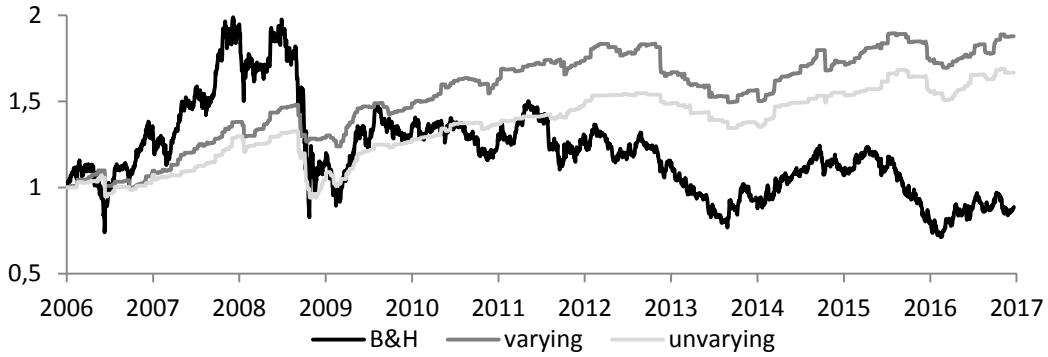
	sell	S_2		S_3		S_4	
buy		C_n	**n**	C_n	**n**	C_n	**n**
B_2	unvarying	1.319	233	1.434	129	1.246	67
	varying	1.140	297	**1.522**	182	**1.525**	93
B_3	unvarying	2.475	124	1.410	88	1.121	54
	varying	2.437	173	**1.965**	130	**1.749**	79
B_4	unvarying	2.133	61	2.217	54	1.643	38
	varying	**2.342**	96	**2.587**	86	1.628	56

Source: authors, own calculation

We can conclude from the results in Table 4 that all the trading strategies with both models have once again outperformed the B&H strategy. The average value of capital in the unvarying state space model was 1.877 and the standard deviation was 0.461. The

average value of capital in the unvarying state space model was 1.667 and the standard deviation was 0.458. The development of the average value of the invested capital over time for both models is shown in Figure 2.

Figure 2 Development of capital value in model 2



Source: authors, own calculation

Model 3

In the last model, we use the full length of the minor trend. The trading signal is generated only after the change in the minor trend. Thus, for example, the S_2 sales signal at time *t* occurs if at *t*-1 the process is in one of states G_2, G_3, and G_4 (the minimum growth at G_2 level) and at time *t* is the process in one of states D_1, D_2, D_3, and D_4 (the declining trend started). Similarly, for example, the buying signal B_3 at time *t* occurs if at time *t*-1 the process is in one of states D_3 or D_4 (the minimum fall to level D_3) and at time *t* the process is in one of states G_1, G_2, G_3, and G_4. The results are shown in Table 5.

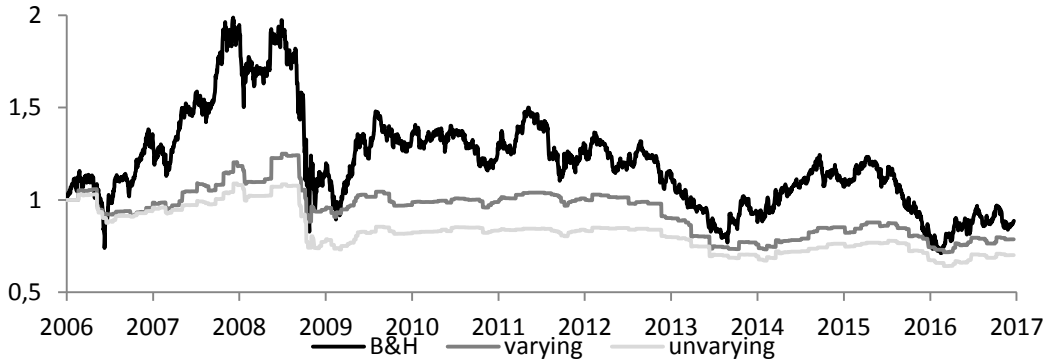
Table 5 Results of Model 3

	sell	**S_2**		**S_3**		**S_4**	
buy		**C_n**	**n**	**C_n**	**n**	**C_n**	**n**
B_2	unvarying	0.878	672	1.077	342	1.075	147
	varying	0.878	672	1.077	342	1.075	147
B_3	unvarying	0.504	325	0.659	233	0.763	129
	varying	0.472	391	0.628	253	0.806	126
B_4	unvarying	0.441	139	0.584	124	0.467	88
	varying	0.744	204	1.098	163	0.810	97

Source: authors, own calculation

In most trading strategies, Model 3 did not outperform the B&H strategy. It turned out that what we got in the remaining duration of the trend was lost at the start of the opposite trend. The average value of capital in the unvarying state space model was 0.787 and the standard deviation was 0.144. The average value of capital in the varying state space model was 0.702 and the standard deviation was 0.157. The development of the average value of invested capital over time for both models is shown in Figure 3.

Figure 3 Development of capital value in model 3



Source: authors, own calculation

4 Conclusions

In this initial study, we compared the profitability of trading strategies using MCA with unvarying state space and varying one to generate trading signals. The study has proved that trading models with varying state space, on the average, outperform trading models with unvarying state space. Our assumption that models with varying state space may be more suitable for modeling the short-term development of share prices than models with unvarying state space has been confirmed. The promising results of this study are the reason why we are going to continue in the research in the future. We intend to concentrate on the following areas:

- to find the best length of the moving standard deviation;
- to confirm the results of this study by applying them to other shares;
- to perform a detailed analysis of the individual trading strategies and to find out the ratio of profitable transactions and the average yield stemming from profitable trading transactions;
- to perform a more detailed analysis of successfulness of trading strategies based on growth, digressive and sideway primary trends.

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Analysis of quality of life in Poland based on selected economic indicators

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Abstract: *The standard of living in Poland is diverse. This level is determined by many factors. The article analyzes the level of life of the population in particular voivodships. Attention was drawn to several indicators that determine the quality of life. The article analyzed, among other things, income and wealth, health status, education in particular voivodships. For the analysis in the paper the statistical data has been used from the Central Statistical Office of Poland (Statistical Yearbook of the Regions – Poland 2016). The object of the analyses were all the Polish voivodships in 2015. Indices were selected so the provinces could be identified with high, medium and low living standard.*

Keywords: quality of life, the health of the region, the level of poverty, education level

JEL codes: I00, I30, I11, I32, I20

1 Introduction

Quality of life is important not only for individuals but also for the society as a whole. At a time when basic vital needs are met, every human being begins to strive for "higher" goals in life, such as happiness, self-fulfilment, independence, the need for knowledge and aesthetics. People who feel that their quality of life is high have a better approach to challenges, life problems, are more productive at work, more often and more actively get involved in social activities. A society gains more benefits from people with a higher quality of life than from those with low one.

Quality of life depends on external and internal factors. External factors are established by the community in which we live, e.g. income, material possessions, social welfare, medical care, sense of security. Internal factors relate to an individual, for example, his or her optimism, adaptation to the environment, a sense of satisfaction with one's achievements, health condition, way of living.

The purpose of the article is an attempt to analyse the quality of life in Poland in particular voivodships. The quality of life was examined in economic terms. Indicators determining the level of poverty, health care and education level were selected for the analysis.
Data from the Central Statistical Office in Poland were used in the passage.
This article is of a review nature.
Many authors are investigating the quality of life.(Glebocka, Gawor, 2008), (Panek, 2016).

2 Material situation of the population in Poland

An important area for determining the economic level of citizens is the level of satisfaction of material needs and the condition of material possessions.

The first measure determining the material level of the population is the average gross wage. (Panek, 2014)

Table 1 shows the average gross remuneration in 2015 in individual voivodships in Poland.

Table 1 Average monthly gross wages and salaries in 2015 in Poland

	voivodship	**PLZL**	**Euro**
1.	**dolnośląskie**	3960,48	942,97
2.	**kujawsko-pomorskie**	3369,85	802,35
3.	**lubelskie**	3497,98	832,85
4.	**lubuskie**	3375,72	803,74
5.	**łódzkie**	3574,72	851,12
6.	**małopolskie**	3667,02	873,1
7.	**mazowieckie**	4801,53	1143,22
8.	**opolskie**	3565,04	848,82
9.	**podkarpackie**	3371,47	802,73
10.	**podlaskie**	3455,57	822,75
11.	**pomorskie**	3851,68	917,07
12.	**śląskie**	3969,67	945,16
13.	**świętokrzyskie**	3374,56	803,47
14.	**warmińsko-mazurskie**	3324,04	791,44
15.	**wielkopolskie**	3543,24	843,63
16.	**zachodniopomorskie**	3526,96	839,75
	Poland	3907,85	930,44

Source: Statistical Yearbook of the Regions – Poland 2016

The average wage in Poland is PLN 3,907.85 (EUR 930). The highest average wage is in the mazowieckie voivodship: PLN 4,801.53 (EUR 1,143.22), then in the śląskie voivodship PLN 3,969.67 (EUR 945.16), with dolnośląskie to follow with the average wage of PLN 3,960.48 (EUR 942.97). The lowest income is earned by the population of warmińsko-mazurskie voivodship, where the average wage is PLN 3,324.04 (EUR 791.44), with slightly more earned by the residents of kujawsko-pomorskie: PLN 3,369.85 (EUR 802.35) and of the podkarpackie voivodship PLN 3,371.47 (EUR 802.73). The above data shows that the level of earnings in individual voivodships in Poland is varied. The difference between the average wages between the highest-earning and the lowest-earning voivodships is PLN 1,477.49 (EUR 351.78). That makes a significant difference.

Another measure that determines the economic level of citizens is the possession of selected material goods, i.e. washing machine, car, computer and usable floor space per person. The table below shows the percentage of persons who own an automatic washing machine, a car, a computer in particular voivodships in Poland. The last column of the table below shows the usable living space in m^2 per person.(Bieńkuńska , 2017)

Table 2 Households equipped with selected durable goods in 2015

voivodship	automatic washing machine	passenger car	personal computer	**useful floor area in m^2 per person**
dolnośląskie	96,9 %	59%	73,8%	28,3
kujawsko-pomorskie	95,3%	56,1%	71,3%	24,5
lubelskie	91,7%	66,4%	70,5%	27,4

lubuskie	96,7%	63,7%	75,3%	26,3
łódzkie	93,7%	65,0%	73,4%	27,6
małopolskie	95,7%	62,2%	76,3%	26,5
mazowieckie	95,7%	64,7%	78,5%	29,5
opolskie	97,6%	64,3%	70,7%	28,4
podkarpackie	92,5%	72,2%	75%	24,7
podlaskie	91,9%	63,4%	67,9%	28,2
pomorskie	95,9%	58,1%	76,2%	26
śląskie	96,8%	62,5%	75,9%	26,8
świętokrzyskie	91,9%	63%	67,9%	25,9
warmińsko-mazurskie	95,5%	55%	68,4%	23,9
wielkopolskie	97,7%	68%	74,4%	27,4
zachodniopomorskie	97,5%	54,9%	72,3%	26,3
Poland	95,5%	62,8%	74,2%	27

Source: Statistical Yearbook of the Regions – Poland 2016

Analysing the above data, it is noticeable seen that the possession of material goods is not always correlated with the level of income in a given voivodship. For example, the highest percentage (72.2%) of persons with cars is in the podkarpackie voivodship, while at the same time it is the voivodship with one of the lowest incomes in Poland. It is also podkarpackie that has a high percentage of people owning a personal computer - 75% of the population. A similar situation is in the lubuskie voivodship, where wages belong to the lowest in Poland, while the possession of selected goods is at quite a good level. E.g. automatic washing machine is owned by 96.7% of the population of this voivodship. Also a high percentage of ca. 75.3% possesses a PC.

Mazowieckie voivodship has the largest in Poland percentage of people with a computer: 78.5% of the population. Also the best housing conditions in Poland are in Mazowieckie voivodship. There is 29.5 m^2 of useful floor area per person.

Another important indicator that determines the economic level of a given society is the poverty rate. It provides information on what percentage of people in a given population is at the risk of poverty. It is expressed in percentages. The average of 14% of population is at the risk of poverty in Poland. In 2015 it was assumed that the poverty threshold for a single-person worker's household was PLN 1,043 (EUR 248.33). A person whose income is below this amount is at risk of poverty.(Dercon, 2005)

The table below shows the percentage of population at risk of poverty by voivodships.

Table 3 Percentage of people at risk of poverty

voivodship	
dolnośląskie	11%
kujawsko-pomorskie	17%
lubelskie	27%
lubuskie	11%
łódzkie	15%
małopolskie	15%
mazowieckie	11%

opolskie	11%
podkarpackie	21%
podlaskie	17%
pomorskie	13%
śląskie	9%
świętokrzyskie	24%
warmińsko-mazurskie	17%
wielkopolskie	13%
zachodniopomorskie	16%
Poland	14%

Source: Statistical Yearbook of the Regions – Poland 2016

Based on the above data it can be stated that the proportion of persons at risk of poverty is very diverse. The worst situation is in lubelskie voivodship, where as much as 27% of the population lives below the poverty threshold. Another voivodeship with a high percentage of people living below the poverty threshold is the świętokrzyskie voivodship, where 24% of the population is at the risk of poverty. A high 21% percentage of poverty is also present in the podkarpackie voivodship. The best situation is in the śląskie voivodship, where the proportion of persons at risk of poverty is 9%. Fair situation is in mazowieckie and opolskie voivodships, where the proportion of persons at risk of poverty is 11%.

3 Level of health care in individual voivodships

Other indicators that show the quality of life in a given country and on the health of a society are the life expectancy of the population and the infant mortality rate per 1,000 live births. [Dolan, Olsen, 2002) The longer the average life expectancy in a given country, the health of the region is higher. On the other hand, a low infant mortality rate per 1,000 live births indicates a better health of the region.

Table 4 The average life expectancy in 2015

voivodship	man	women
dolnośląskie	73,2	81
kujawsko-pomorskie	73,5	81,3
lubelskie	73,3	82,4
lubuskie	72,8	80,9
łódzkie	71,4	80,4
małopolskie	75,1	82,4
mazowieckie	74,0	82
opolskie	73,8	81,4
podkarpackie	74,9	82,5
podlaskie	73,8	82,6
pomorskie	74,2	81,4
śląskie	73	80,3
świętokrzyskie	73	82,2

warmińsko-mazurskie	72,7	81,1
wielkopolskie	73,7	81,2
zachodniopomorskie	73,5	81,1
Poland	73,6	81,6

Source: Statistical Yearbook of the Regions – Poland 2016

The longest life expectancy of men is in małopolskie voivodship and lasts 75.1 years. Then there are the provinces of podkarpackie, with the average life expectancy of men of 74.9, and pomorskie voivodship with the average life expectancy of men of 74.2 years. It is clearly visible that the health level of these regions is better than others. The reason for this situation is that in these voivodships the condition of the natural environment is better than in other regions.

The worst health situation is in the łódzkie voivodship, where the average life expectancy for men is 71.4 years.

Analysing the average life expectancy of women, it can be seen that the highest life expectancy of women is in podlaskie (82.6), podkarpackie (82.5), małopolskie (82.4) and lubelskie (82.4). All those Polish regions are characterized by a better condition of the environment than others. This is especially visible in the average age of women in the śląskie voivodship. At 80.3 years it is the lowest in comparison with other regions of Poland. This region is heavily polluted, hence the health level of this area is one of the worst in Poland.

This situation is particularly evident in the data below, which illustrate the mortality of infants per 1,000 live births. In Silesia this indicator is 4.7 (IMR per 1,000 live births) and is one of the highest in Poland. This is due to the poor condition of the environment. It is also confirmed in this aspect that the worst health situation is in the łódzkie voivodship where the IMR is 4.8 (infant mortality rate per 1,000 live births). The best situation is in the małopolskie voivodship, where the mortality rate of infants is 2.8 (IMR per 1,000 live births).

Table 5 Infant deaths per 1000 live birth

voivodship	
dolnośląskie	3,8
kujawsko-pomorskie	4,1
lubelskie	3,8
lubuskie	4,1
łódzkie	4,8
małopolskie	2,8
mazowieckie	3,8
opolskie	4,1
podkarpackie	4,1
podlaskie	4,5
pomorskie	3,7
śląskie	4,7
świętokrzyskie	3,8
warmińsko-mazurskie	4,0
wielkopolskie	4,5

zachodniopomorskie	3,6
Polska	4,0

Source: Statistical Yearbook of the Regions – Poland 2016

4 The situation of higher education in Poland

The situation of higher education in particular voivodships varies. The table below shows the number of higher schools in particular voivodships, the number of academic teachers and the number of graduates in the academic year 2014/2015.

Table 6 Higher education institutions in 2015/2016 academic year

voivodship	university	academic teachers	graduates*
dolnośląskie	36	8627	34717
kujawsko-pomorskie	18	4181	17590
lubelskie	18	6374	22700
lubuskie	6	1189	4821
łódzkie	26	6226	21905
małopolskie	31	12610	50358
mazowieckie	102	17428	70323
opolskie	6	1528	8424
podkarpackie	14	3028	18970
podlaskie	16	2773	10855
pomorskie	27	5841	24427
śląskie	38	8725	38683
świętokrzyskie	14	1774	9779
warmińsko-mazurskie	7	2443	10214
wielkopolskie	37	9318	38062
zachodniopomorskie	19	3855	13159
Poland	415	95919	394987

Source: Statistical Yearbook of the Regions – Poland 2016 (*graduates in the academic year 2014/2015)

Analyzing the above data it can be concluded that the best situation of higher education in Poland is in the province mazowickie, śląskie, wielkopolskie, dolnośląskie. Most of the higher schools are in the capital of Poland, in Warsaw. There are also the most academic teachers and graduates. Second place in terms of the number of academic teachers and graduates occupy the młopolskie voivodeship. The smallest institutions of higher education, academic teachers and graduates of higher schools are in the province of lubuskie.

5 Conclusions

Based on the analysis of various indicators, it can be stated that the quality of life in individual voivodships in Poland is varied. The voivodships which are on the best material level are mazowieckie, śląskie and dolnośląskie. The worst material situation is in lubelskie, świętokrzyskie and podkarpackie voivodships.

On the other hand, the best health situation of the population is in the małopolskie, podkarpackie and podlaskie voivodships. These voivodships enjoy a better condition of their natural environment. The worst health situation is in the łódzkie and śląskie voivodships. These are the voivodships characterized by high environmental pollution due to the large number of industrial plants.

It is clear that it is impossible to unequivocally determine which voivodship has the highest level of the quality of life. It is not always that the voivodships with a high material status have healthier population, as we see on the example of the śląskie voivodship.

The best level of education is in mazowieckie, małopolskie, dolnośląskie and śląskie voivodships. These are the regions with the highest number of universities. It is clear that wages are also highest in these voivodships. That is caused by the fact that most educated people decide to stay in these academic cities and undertake a well-paid job.

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Effective Risk Culture in Banks: Responsibilities and boundaries of the Risk Management

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Abstract: *The Financial Crisis of 2007-09 showed, that a not appropriate risk culture as well as deficiencies in the risk management played a major role in banking failures. To establish a "good" risk culture has become an object of focus by regulators. They are focusing on the bank's norms, attitudes and behaviors, linked with the risk taking and risk awareness. There is not an ideal, how banks should manage their risk taking, but it becomes clear, that the enterprise-wide risk oversight should be improved, the chief risk officers' role in corporate governance should be strengthened. Effective risk culture contributes to the bank's ability to act with risk changes. Because taking risks is a part of the bank business, there still will be a chance, even if a small one, that some undesirable outcomes will appear. A good risk management contributes to avoid unpredictable and unwanted developments. The appropriate risk management framework must be designed in accordance with the banks optimal risk level and the business strategy. To change a risk culture in a bank is not an easy task, because it requires not only improvements in risk measurement, governance and communication process. Behavioral aspects should also be taken into account. The cycle of an appropriate risk level setting in line with the business strategy, risk taking in line with value-growth opportunities and timely, transparent and honest communication of risks should be reconsidered. The risk management should gain a higher weight in the decision-making process. This paper provides an explanatory framework for the setting the right risk level and discuss the responsibilities and boundaries of risk management in the new light of the current regulatory environment. It shows, that risk management is closely related to governance structure and business model.*

Keywords: risk taking, corporate governance, risk management, Value at Risk, banking regulation

JEL codes: G21, G28, G32, G34, C15

1 Introduction

The discussion about risk culture is not a new theme as it is not a new risk management approach. Despite it, till now, it is still a very relevant issue. There are many international institutions as International Monetary Fund (IMF), The Institute of International Finance (IIF) or Financial Services Authority (FSA) among other researchers and regulatory authorities, who dedicated their work to this subject. Their findings show, that corporate culture plays a substantial role by taking risks as well as it can foster fraudulent employee behavior.

The financial crisis 2007-08 showed shortcomings in identification and assessment of risks as a possible consequence of a week risk control and risk culture. (Power et. al., 2012, FSB, 2014). The aim of the new regulatory requirements, as European market infrastructure regulation (EMIR), Basel III and its implementation into the EU law, Bank Recovery and Resolution Directive (BRRD, 2014/59/EU), is to avoid a similar crisis as well as to restore public trust in the banking system and to enhance financial stability. The banks have to satisfy a range of liquidity and capital ratios to strengthen their capital basis and make themselves more resilient. To establish a strong risk management and an effective and an exactly fitting risk culture is necessary.

Risk culture as a part of the corporate culture

The lived culture of an organization affirms every task that should be done, every decision should be made. It also determines the meaning of risk and how to handle it. (Muchova, Klimikova, 2016, p.3.). There is an overall accepted definition of risk as a deviation of a target value. But speaking about risk, most people think about danger. The positive risk, called chance, seems not to be the point of interest. Which role the risk, in the sense of the definition above, plays in an organization and when it should be taken or mitigated, depends on the personal judgement. The perception of the company leaders affect directly the role of risk and risk management.

Risks are usually interconnected. The change of one risk type causes changes in risk of another type. How to deal with these changes, especially how are they communicated across bank and which are incentives for risk-taking is a part of risk culture. There is not a general definition of a risk culture yet and there probably is not a universal risk culture that fits all institutions, because it depends on external and internal factors. (For definitions of organizational culture, see f. e. Power et. al., 2012, p. 16.):

The Basel Committee on Banking Supervision (BCBS) who plays a major role in improvement the quality of banking supervision worldwide, deals with the question of the risk culture in bank institutions. In the GL 328 (2015, p. 2) the term risk culture is defined as: "A bank's norms, attitudes and behaviors related to risk awareness, risk-taking and risk management, and controls that shape decisions on risks. Risk culture influences the decisions of management and employees during the day-to-day activities and has an impact on the risks they assume."

The Financial Stability Board (FSB, 2014, p. 1) highlights the connection between the risk culture and an effective risk management: "A sound risk culture consistently supports appropriate risk awareness, behaviors and judgements about risk-taking within a strong risk governance framework. A sound risk culture bolsters effective risk management, promotes sound risk-taking, and ensures that emerging risks or risk-taking activities beyond the institution's risk appetite are recognized, assessed, escalated and addressed in a timely manner."

Consequently, risk culture supplements the quantitative risk management framework with behavior-related components.

Two important inquests relating to an effective risk culture

The first step to reach an effective risk culture is to define what the notion "risk culture" exactly means and what characteristics does it include. There is a question, if a uniform definition fits for all banks equally. Since some recent studies show the heterogeneity in the risk culture among the financial institutions (Sheedy and Griffin, 05/2016), the answer seems to be "no". Sound risk culture and a proper risk-taking behavior are supported by an effective risk control function, a framework for an appropriate risk appetite and remuneration practices (FSB, 04/2014). There are also various factors which influence the lived risk culture, as:

- Societal influences: Country, technology, economic/market environment,
- Industry influences: Regulatory requirements, competition, clients,
- The enterprise patterns itself: Ownership structure, corporate strategy and politics, corporate structure, internal communication, lived ethics, risks and transparency about taken risks or handling risks, risk bearing capacity, management,
- Individuals: Social background, qualification, age, nationality, family, position in the company, individual merits.

Alongside this multidimensionality, there are two different views on a risk culture, which affects its implementation: the regulatory view and the bank view. For the regulatory purpose, it has to be measurable. It should be audited and examined. The regulatory

authority should be able to set up suitable improvement suggestions. A financial institution puts prevention of risks and controlling of existing risks in the foreground. The balance between risk taking, which is necessary for the further stage, competitiveness as well as for performance improvement and an appropriate risk limitation should be found. Hence, which is an "appropriate" level of risk depends on the business model and strategy of the respective financial institution. Whereas, the role of a risk management should be intensified. As an integral part of the bank, it has to reach more weight in the decision-making process and be fully in line with the risk culture.

The second step is to answer the question, how to establish or redefine risk culture in the financial institution and how to deepen the acceptance of the risk management role. There are different approaches as adopting and holding on measures, for example ratios, or installation of rules for a requested behavior, defining of incentive structures and an appropriate remuneration. Focusing this theme, it is necessary to look more on the motivation for a behavior which supports a risk-aware working atmosphere.

The answers in the literature

In the literature both inquests were examined. Until now, no distinct answer could be showed. In 2013 the Financial Stability Board (FSB) presented four important indicators for appraisal a good risk culture: (i) the ton from the top, (ii) accountability, (iii) effective communication and challenge, (iv) incentives. The guidance shows standards which helps regulatory authorities to achieve a picture about the lived risk culture in the investigated financial institution.

In 2014 Ernest Young (EY) interviewed 52 banks around the world to investigate key attributes of a sound risk culture and the relevance of an open communication, which should be reinforced by the management acting. The authors find, that the risk appetite, positioned in all business activities consistently, is an important indicator of a good risk culture.

The Group of Thirty (G30, 2015) interviewed about 80 employees in central banks, regulatory bodies and governance figures in 17 countries. On this base, the study includes specific recommendations for the board members and regulatory authorities. The authors state four driver of a good risk culture: (i) „Governance and accountability", (ii) „Performance Management and Incentives", (iii) „Staff development" and (iv) „Three lines of defence".

The aim of the Basel Committee on Banking Supervision Guidelines, GL 328 (BCBS, 2015), is to underline some important components of risk governance, as risk appetite, but also to reinforce risk governance responsibilities of the board, its specific role, board risk committees, senior management and the control functions. GL 328 describes 13 principles, where the increased focus on responsibilities of different parts of bank for addressing and managing risk and the compliance function are highlighted.

Sheedy and Griffin (2014) measure the risk culture, based on interviews, by using the "risk culture score". Their results show marked differences in the risk culture among the banks, but the relevant factors are not available from publicly accessible sources.

Fritz-Morgenthal, Hellmuth and Packham (2016) closed this gap and defined risk culture indicators, which can be derived from banks' public information. They examine 81 banks, which were directly supervised by the European Central Bank (ECB). For every bank, they determine its special risk culture score and validate it against outcomes of the Comprehensive Assessment and ECB-Stress-test. Their results show a week, but visible correlation between the risk culture indicator and the stress-test indicator. A significant contribution to explain the stress-test results presents the risk indicator governance (which comprise for example a qualification and an appropriate size of board and supervisory council) and the effect of regulatory adjustments. Among the ratios, the leverage ratio is the one with the strongest impact on the risk culture score. It is interesting, that in this study, the risk culture indicators of a stable bank structure are

connected to the successful ECB-stress-test. Even if these outcomes not necessarily display a causal relation, they give useful clues for the measuring of financial institutions' risk culture.

Power, Ashby and Palermo (2012) in an interim research study, which base on talks to different organizations as banks, insurers and their advisors as well as readings of academic studies, observed how the risk culture manifests within an entity and show it as the outcome of a series of trade-offs across a number of dimensions. They also identify pivotal subjects that may impede the development of a good risk culture.

Landier, Sraer, Thesmar (2009) focus on organization design and show a model which helps to explain risk management failures. They found, that increase in the risk of assets traded reduces the impact of risk management independence and that risk-budgets contingent on information help to implement the efficient asset choice, when the information is not noisy. They also show, that an increase in side payments (as career opportunities) make risk management ineffective.

Stulz (2016) provides the framework for a better understanding of the risk management limitation from the perspective of increasing the bank's shareholder value. He shows, that risk management can destroy value, if (i) it fails to ensure that the bank has the right amount of risk and (ii) it prevents risks which would be valuable. Risk measurement tools play an important role for incentives and for the culture. Risk-taking decisions must be assessed in line with the overall bank risk: If a good risk management is in place, there is no reason for a bank to have low risk.

This paper is organized as follows: The first section introduces risk culture as a part of an organization culture and effective risk culture as a building block for strong risk management, the second section describes methodology, the third section depicts the framework for a risk culture focusing the role and responsibilities of risk management, the final section concludes and outlines further research areas.

2 Methodology and Data

This paper provides an explanatory framework for a link between an effective risk culture and a comprehensive risk management in the new light of the current regulatory environment. The aim of this paper is to offer a better understanding of the underlying aspects of risk management responsibilities and boundaries in respect to a risk culture. It highlights the relevance of the understanding of risk taking. The following approach also shows connection of rules and quantitative methods in the risk management. For this reason, the explanatory manner is more suitable than a normative. The methods of description, analysis, synthesis and deduction are used.

3 Results and Discussion

This section outlines an approach for a risk management as an integral part of a business strategy, its responsibilities and boundaries and the influence of a risk culture.

The base of a comprehensive risk management is an effective risk culture

Risk culture is a multidimensional concept. It includes risk and culture which are complex scopes. To manage risk culture would imply, that it can be reduced to some observable properties which can be audited. Additional to quantitative assessment of a risk culture as the calculation of ratios, the qualitative appraisal is necessary: the identification of risk culture indicators, which base on binding behavior rules, ethics and the risk culture in the risk management. Regarding ECB Supervisory Review and Evaluation Process (SREP) requirements, regulators have to intensify focus on this subject. "Financial and non-financial incentives play in misconduct a crucial role" said Danièle Nouy, the head of ECB-Banking supervision. (EZB, 21.06.2016) Referring to Bundesanstalt für Finanzdienstleistung (BaFin) Conference in May 2016, the assessment of internal

governance adequacy and of internal control system should focus following scopes, relating to risk: (https://www.bafin.de/SharedDocs/Downloads/DE/Rede_Vortrag/dl_160504_Neues_SREP_Konzept_vortrag_1.pdf?__blob=publicationFile&v=, p. 12.)

- Corporate- and risk culture,
- Structure and execution of tasks of the corporate management (executive board, supervising body),
- Risk management: Risk appetite, risk strategy, ICCAP and ILAAP, Stress-test,
- Internal control system: Risk governance and controlling processes.

The European directive Capital Requirements Directive IV (CRD IV), recital 54, claims the introduction of standards for an effective risk control through the executives. These principles, as a part of risk management, should promote a sound risk culture. The role of risk management is also one of the objectives of BCBS GL 328.

If an organization wants improve its risk management, it has to redesign its risk culture as well and vice versa. An effective risk culture means the ability to take valuable risks, which the financial institution is able to manage in the way to enable an achievement of a sustainable business strategy. (Fritz-Morgenthal et. Al., 2016, p. 72.) For this purpose, two initial questions have to be answered:

1. The already lived risk culture and the role risk management plays in the financial institute have to be understood,
2. The vision of the target risk culture: The aim, how the institute wants to handle it's risks in the future should be set. Especially: Is the understanding of risk still the same? How should be the risk taking/risk reduction interpreted through the organization in the future?

The way, how a financial institution fulfills the regulatory requirements facing risk culture is up to it. (Muchova, Klimikova, 2016, p. 6.) The following steps outline an approach for a realignment of the risk culture:

Step 1: Define the risk.

Step 2: Define what kind of a risk culture will suit for the individual business strategy.

Step 3: Identify paths for the implementation of the risk culture and the communication.

Step 4: Deploy arrangements for encouragement of requested behavior.

Step 5: Specify control mechanisms and documentation.

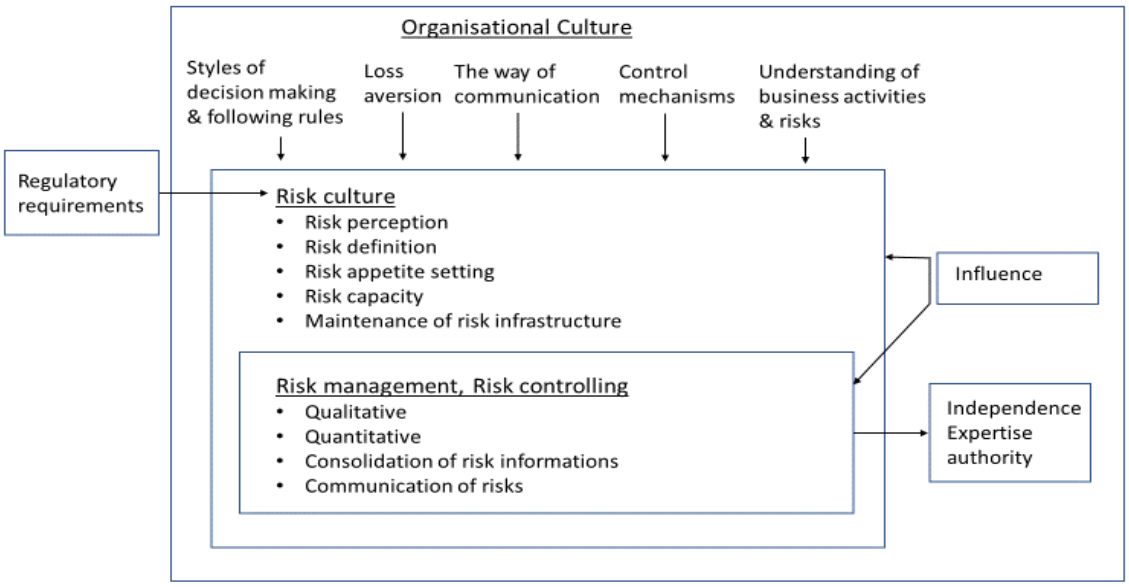
Step 6: Ensure a backflow of the risk culture into the decision-making process.

Hence, there are formal and informal processes to be set. An important point about the fulfilling the regulatory requirements is to be aware how the institution behave to rules, because rules influence behavior. But the behavior is influenced by culture background, relationships, kind of decision making too. The risk culture, as the steps above may suggest, cannot be rearranged only by following an ordinance. The behavior – how the management and the employees are used to apply rules should be investigated as well, when the risk culture program is operationalized. The compliance focused acting is not enough anymore. Values and key risk driving events gain importance and should be flexible applied within the guidelines. The balance of using rules and good judgement should be found, factors that create risk, especially a behavioral one, have to be identified.

Regulators enforced, among others, rules for sanctioning excessive risk-taking behavior, as cutting bonus payments (a part of CRD IV) and the reversal of proof for senior management, who have to prove they have done everything to ensure a rule-consistent behavior of their staff. The assumption for these rules to work is, that sanctioning of misbehavior leads to improvement of risk culture. (Fritz-Morgenthal et. Al., 2016, p. 73)

The following figure shows the descriptive model of risk management in a risk culture framework.

Figure 1 Explanatory Model of Risk Management in Risk Culture Framework



Source: Own processing.

The approach: Risk Management as an integral part of a financial institution

Since taking risks is the core of the bank business, the first step to imbed the risk management into a risk culture is to define risk on the organizational level. As a part of the business strategy should be designated, which risks the company intends to take and which are not wanted. (Stulz, 2016, p. 43.) The requested risks accompany all activities, which can be profitable on a special probability level. For this purpose, questions about how to invest should be asked: how much exposure is reasonable to carry in respect of the unanticipated changes and how can loss, due to extreme risk events, be minimized. The risk appetite, the optimal risk-return profile and the proper optimal risk level should be set by the executives. Instead of risk mitigation, the risk optimization should be targeted. If and how these themes will be translated into the business life, determinates the risk culture and the appropriate ethical values. (Sants, 2010.)

Hence, risk management must be visible within the institute: It should be understood as an issue of every employee. Risk managers shouldn't be seen as devil's advocates. The decisions about risk-taking are made daily across the bank divisions, so everyone has to be aware of them. Every decision implies a probability, even if a small one, of financial distress, so every single risk must be taken in accordance with the overall bank's risk. Consequently, embedding the risk manager function into business units leads to greater awareness of risk. But: the independence cannot be achieved any more. To ensure the objectivity as well as the relevance to the decision have been made, a strong and an independent central risk management, which is not driven by the markets, is necessary. It also monitors the risk of business units. (Stulz, 2008, 2014, Landier et. Al., 2009, Ellul, 2015.). If an effective communication between units is in working order, greater understanding of risk across the bank can be achieved.

Setting optimal risk level: An executive function

The optimal risk level has to be defined by executives, the measurement and monitoring of risks is the purpose of risk management. (BIS, 2010: BCBS 176, p. 18, Stulz, 2008, p. 45.) Hence, the task of a risk management is not to mitigate risks in general. It has to measure risk and compare it to the optimal risk level. It has not to detain the authorities from the risk-taking, whilst the risks contribute to create value. (Ellul, 2015, p. 8.) Consequently, risk management can reduce costs, which would be too high or existence-

threatening in case of a distress. Its aim is to mitigate the tail risk which could be destroying and to communicate it to the management and board. Such risks have an impact to the business strategy (Stulz, 2008, Ellul, 2015).

Failures in communication of risk is a failure of risk management. But the one, who decides about the risk-taking after being prompt and understandable informed, is the top management. "A company's risk managers must keep track of and manage the firm's risks to ensure they remain within the established guidelines, a task that could involve hedging risks and rejecting proposed trades or projects." (Stulz, 2008, p. 41.)

Risk quantification and styles of decision making

The responsibility of the risk management is to make sure, that the bank takes risks which it intends to take. For this purpose, the risks have to be appropriately measured and continuously monitored. To meet the objective of the top management, the risks also have to be hedged. But, some risks can change rapidly, even if the bank doesn't make any changes in its position, for example in the portfolios of complex derivatives. Some risks also may be hidden for some time period. Then, the risk monitoring is shedding more light to the risk situation, but it can turn to be costly quite fast. Incentives of employees aligned to risk taking makes the detection of risks more effective. (Stulz, 2008, p. 47.)

Five risk categories a financial institution is facing can be distinguished: financial, operational, strategic, compliance and other risks. All of them are important, but not all of them can be measured by standard statistical tools. The key of the quantitative risk management is to choose an appropriate risk metrics which suits the risk strategy. Usually the Value at Risk (VaR) approach is adopted, because the aggregation of various types of risk is possible. VaR measure is easy to understand: It is the maximum potential loss of a portfolio of financial instruments with a given probability p over a certain time horizon. (Schmitt, 2016, p. 693, 694.) There are two main problem areas by measuring risks: (i) risks are not measured adequately, (ii) risks are ignored because they couldn't be identified or they are wrongly viewed. (Stulz, 2008, p. 41.) Further, the modern risk models are not designed for measuring risks of crisis. Using historical data are lacking in predictability of future events. (Schmitt, 2016, p. 697.) During a distress, the daily measured VaR will be exceeded. Hence longer-term measures and scenario analyses should complement the VaR. Even the Extreme Value Theory (EVT) which base on statistical models too, cannot exactly capture such complex events. Limitations in models cannot be seen as a failure of risk management.

4 Conclusions

In the past decades supervisors and banks increased their focus on strengthening the risk culture. (FSB, 2014). A lot of statistical approaches for measuring risks precisely were developed. Despite that, even high sophisticated tools like EVT cannot prevent financial institutions from suffering large losses, which may occur as a consequence of a not appropriate employee behavior. Hence, it is necessary to focus more on incentives for excessive risk taking or taking risks with no appropriate risk management in place.

To establish an efficient risk culture deals with feelings and values. It rests on conditions evolved historically, bases on interpersonal relationships. It is a process which cannot be implemented in a short time, but it is worth the effort: reputation and employee satisfaction rise, decision-making process improves, financing costs and earning-loss volatility decrease. Focusing on the risk identification and mitigation before it materializes is the target key of an anticipatory risk management. An effective risk culture must be formed according to the individual characteristics of each organization. There is need for more research into factors that boost or impede the realization an effective risk culture in financial organizations and incentives for monitoring of risk taking.

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Testing the Semi-strong Form of Efficiency in Czech Stock Market

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Abstract: *The efficient market hypothesis represents possible analytical approach when analyzing behaviour of financial markets. The aim of this paper is to test the efficient market hypothesis in its semi-strong form using data from Czech stock market. Information efficiency of the Czech stock market is assessed in relation to seven announcement of Moody´s rating agency regarding changes of credit rating of Greek government bonds in the period of 2009-2012 years. For the purpose of this paper, the event study method is applied. The basic idea of this statistical method is to determine values of abnormal returns, which can be defined as a difference between actual and equilibrium returns. In order to calculate equilibrium returns the Capital Asset Pricing Model is used. Observed differences between actual and equilibrium returns were verified with a help of selected nonparametric statistical tests. Namely, the exact sign test and the Wilcoxon sign-ranked test were utilized. Based on results of statistical tests, the null hypothesis of efficiency was rejected.*

Keywords: CAPM, Czech stock market, event study, semi-strong form of efficiency, statistical tests

JEL codes: C12, G14, G18

1 Introduction

Public announcements of important macroeconomic data about inflation, production, profit and other economic issues cause considerable attention in both financial literature and practically oriented analyses. Practitioners and academicians are interested in knowledge which macroeconomic information are reflected in prices of financial instruments and how. Impact of macroeconomic information on equity prices for assessment of stock market efficiency and possible forecasting of stock market reactions (Gurgul and Wójtowicz, 2015). Most theories claim that prices on stock markets are efficient and therefore cannot be forecasted. However, practitioners have never believed in it, and logically tried to maximize profit using sophisticated forecasting methods. Information efficiency therefore depends on fact how market prices reflect all relevant information (Fama, 1970). In other words, the market efficiency means that prices of financial instruments fully reflect all available information (Seďa and Jimber del Río, 2016).

Market efficiency is defined within a hierarchy of three nested information sets. According to Fama (1970), there exist the weak, semi-strong and strong forms of efficiency. Semi-

strong form of efficiency means that equity prices contain not only historical data but also publicly available information. Testing the semi-strong form of efficiency is usually focused on a measurement of a speed with which new information is absorbed in stock prices. The event study method is a suitable tool for testing the information efficiency in its semi-strong form (MacKinley, 1997).

The global financial crisis significantly hit stock markets worldwide. Czech Republic, as an export-oriented economy with substantial reliance on foreign capital, was not an exception. The fund withdrawal led by foreign investors in the Czech stock market exacerbated volatility in stock market and decline of the whole market by more than 60% (Seďa, 2012). Greece is one of the countries that were affected by the global financial crisis and subsequent debt crisis fatally. This fact led to a repeated credit rating downgrade. Since mutual relations among stock markets were growing during the global financial crisis (Seďa and Jimber del Río, 2014), crucial events in Greek stock markets could led to significant reaction also in Czech stock market.

Central European stock markets with respect to the semi-strong form of efficiency have been investigated very rarely (Gurgul and Wójtowicz, 2014). Investigators usually assessed just the weak form of efficiency of those markets. In addition, research studies are not up-to-date (e.g. Tran, 2007). However, Hanousek et al. (2009) investigated the reaction of Central European stock markets to announcement of news from USA and eurozone. More precisely, they examined how stock prices in the Czech Republic, Hungary and Poland responded to macroeconomic news coming from USA and eurozone. They found that the strongest reaction to data announcements from USA was observed in the Czech stock market. Hence, this paper contributes to discussion on the efficiency of newly emerged stock markets in transition economies.

The main aim of this paper is empirical testing the semi-strong form of efficiency of Czech stock market. There will be measured a response of Czech stock market to changes of credit rating of Greek government bonds as published by Moody´s agency in the period of 2009-2012 years. For the purpose of this paper, the event study method will be utilized.

Our paper is organized as follows. In chapter 2, there will be discussed the theoretical basis of the event study method. Moreover, the development of Greek government bonds rating will be described. In addition, the methods of calculation the actual, equilibrium and abnormal returns will be defined. Finally, selected non-parametric tests, which are usually used for statistical evaluation of abnormal returns, will be described. Application part of this paper contains mainly empirical testing the semi-strong form of efficiency of Czech stock market and statistical evaluation. In particular, there will be investigated response of Czech stock market on seven changes of credit rating of Greek government bonds. Conclusion summarizes this paper and opens possible extensions of investigated topic.

2 Methodology and Data

In this section, a brief description of the experimental material and methods used in this paper will be given. The semi-strong form of efficiency will be investigated using data from Czech stock market in the period of 2009-2012 years. We will use log-returns of just 12 shares, which were included in the PX index base during complete testing period.

Greek Crisis

Changes of credit rating of Greek government bonds as published by international rating company Moody´s in the period of 2009-2012 years have become a key motivation for this paper. Poor state of Greek public finances was a major reason for credit rating downgrade from grade A1 to A2 on December 22, 2009. Rating downgrade resulted in a fall of prices of Greek securities and decline of euro currency. The reason for credit rating downgrade from A3 to Ba1 was especially a high rate of economic risks associated with

the implementation of the rescue program. A further decline in credit rating happened on June 14, 2010 when Moody's downgraded Greek credit ratings to a speculative level. Next, Greek credit rating was downgraded by Moody's on March 7, 2011 by three steps deeper from Ba1 to B1 level. In that case, the reason of credit-rating downgrade was a lack of confidence in reforms that should help to correct deficit financing and lack of government revenue. Moody´s downgraded the credit rating of Greek commitments to Caa1 level on June 1, 2011 because of increasing risk of government's inability to stabilize their debt. Greek rating downgraded again as the result of extraordinary summit of euro members on July 27, 2011. Credit rating was reduced at lowest possible grade C on February 3, 2012. The development of credit rating of Greek government bonds is shown in Table 1.

Table 1 Changes in credit rating of Greek government bonds

Date	Rating
22. 12. 2009	A2
27. 4. 2010	A3
14. 6. 2010	Ba1
7. 3. 2011	B1
1. 6. 2011	Caa11
25. 7. 2011	Ca
3. 2. 2012	C

Source: www.moodys.com

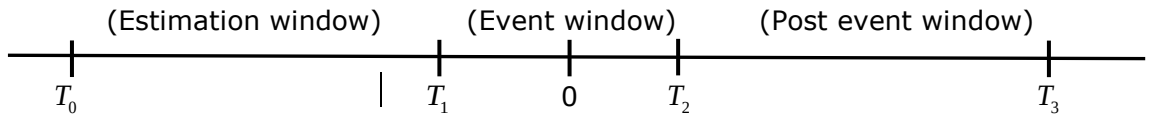
Event Study Method

The most commonly used approach to assess potential impact of macroeconomic news announcements on stock prices is based on regression with dummy variables (Harju and Hussain, 2011). However, this method has some serious imperfections because of intraday volatility patterns and overnight returns. In order to avoid these imperfections, we utilized the event study method. This method has been applied when investigating an impact of news announcements on daily data (Corrado and Troug, 2008). An event study is a statistical method to assess an impact of economic event on the value of financial assets. The event study approach can be also used to elicit potential effects of practically any type of economic event on direction and magnitude of stock price changes. This approach is thus commonly used in various research areas, such as accounting, finance and so on (Jelínková, 2013). History of the event study is relatively long. Fama (1969) utilized this approach in finance for the first time. In later years, there were defined a lot of modifications that should eliminate complications resulting from violations of statistical assumptions (MacKinley, 1997). When applying the event study approach on testing the semi-strong form of efficiency, it is possible to describe it in the following five steps:

- definition of an event and timeline,
- calculation of actual returns,
- determination of equilibrium returns,
- calculation of abnormal returns,
- verification of statistical significance and economic interpretation of results.

The structure of an event should be defined prior to testing a response of market to announcement of new information. It consists of three basic windows or periods that do not overlap. These periods are: the estimation window, event window and post event window. The timing sequence is illustrated in Figure 1.

Figure 1 The general time line for an event study



Source: MacKinley (1997)

The estimation window is a period preceding the event window. The estimation window represents an interval with length of $L_1 = T_1 - T_0$. The estimation window is a period that is used for calculation the actual returns and coefficients of financial models. It is usually 100-250 days long when using daily data. The event window represents a period when new information has been published. Even if the event is represented by an announcement on a given date, it is recommended to set the event window length to be larger than one day (MacKinley, 1997). This facilitates the use of abnormal returns around the event day in the analysis. The event window is defined as an interval with the length of $L_2 = T_2 - T_1$. Finally, the post event window is defined as an interval with the length of $L_3 = T_3 - T_2$. After identification of an event and definition of term structure, it is necessary to establish criteria for selection of companies used for the purpose of the event study.

Equilibrium Returns

The principle of the event study method is to compare actual returns with their equilibrium returns during the event window period. Equilibrium returns can be defined as returns that would be achieved by trading agents if new information had not been published at all. The differences between actual and equilibrium returns represent abnormal returns. Equilibrium returns are based on values of coefficients of financial models used for the purpose of the event study. Equilibrium or expected returns represent a benchmark which actual returns are compared with. The Capital Asset Pricing Model (CAPM) is the most common economic model that may be used to determine equilibrium returns in financial modeling. The CAPM model was built on diversification and modern portfolio theory (Sharpe, 1964). Expected return can be according to CAPM model calculated as follows:

$$E(R_{i\tau}) = r_f + \hat{\beta}_i \left(E(R_{M\tau}) - r_f \right), \tag{1}$$

where $E(R_{i\tau})$ is expected return, r_f is risk-free rate, $\hat{\beta}_i$ represents parameter of share sensitivity and $E(R_{M\tau})$ is expected return of market portfolio. When testing the semi-strong form efficiency, a necessary condition is to measure values of abnormal returns. Let $AR_{i\tau}$ be a sample of L_2 abnormal returns for *i*-th share in the event window. The sample abnormal return is given by:

$$AR_{i\tau} = R_{i\tau} - E(R_{i\tau}), \tag{2}$$

where $R_{i\tau}$ is normal return. In order to evaluate the semi-strong form of efficiency and assess the absorption rate of newly published information, it is necessary to sum calculated values of abnormal returns of the event window period. The abnormal return observations must be aggregated in order to draw overall inferences for the event of interest. The aggregation should have two dimensions - through time and securities. Let´s define $CAR_i(\tau_1, \tau_2)$ as the sample cumulative abnormal return (*CAR*) from τ_1 to τ_2 where $T_1 < \tau_1 \leq \tau_2 \leq T_2$. The *CAR* from τ_1 to τ_2 is the sum of abnormal returns:

$$CAR_i(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau_2} AR_{i\tau}. \tag{3}$$

The abnormal returns must be aggregated for the event window. The absence of any overlap and distributional assumptions imply that the abnormal returns and the cumulative abnormal returns will be independent across securities. The abnormal returns of individual shares can be aggregated using $AR_{i\tau}$ from (2) for each event period $\tau = T_1 + 1,...,T_2$. Given *N* events, the sample average aggregated abnormal returns for period τ is given by:

$$\overline{AR_\tau} = \frac{1}{N}\sum_{i=1}^{N} AR_{i\tau}, \tag{4}$$

where N is a number of events included. The average cumulative abnormal returns can then be aggregated over the event window using the same approach that was used to calculate the cumulative abnormal return for *i*-th security. For any interval in the event window, it can be calculated as follows:

$$\overline{CAR}(\tau_1,\tau_2) = \sum_{\tau=\tau_1}^{\tau_2} \overline{AR}_\tau. \tag{5}$$

Testing the semi-weak form of efficiency will be carried out just on the basis of f $\overline{AR_\tau}$ and $\overline{CAR}(\tau_1,\tau_2)$.

Nonparametric Statistical Tests

The basic idea of semi-strong form of efficiency can be expressed as follows: if stock market is efficient, there should not be a statistically significant difference between actual and equilibrium returns. When the assumption of normality of abnormal returns is violated, some nonparametric tests should be used. The most commonly used nonparametric tests are the sign test and the Wilcoxon signed-rank test (Hendl, 2009). The null and alternative hypothesis can be therefore defined as follows:

$$H_0 : \overline{AR}_{i\tau} = 0,$$
$$H_1 : \overline{AR}_{i\tau} \neq 0.$$

If stock market is efficient, an announcement of new information should be reflected in stock prices immediately. It is apparent that in the case of efficient market, there should not be observed any statistically significant differences between actual and equilibrium returns. In other words, abnormal returns should not be significantly different from zero.

3 Empirical Results and Discussion

In the application part of this paper, we will focus on empirical testing the semi-strong form of efficiency of the Czech equity market using the event study method. All calculations and estimations will be carried out with a help of MS Excel and SPSS.

Calculation of Abnormal Returns

When testing the semi-strong form of efficiency using the event study method, the most important and significant periods are the estimation window and event window. In this paper, the length of the estimation window is one year. The event window is a period within which the speed of absorption of new information is tested. For the purpose of this paper, the event window consists of 15 trading days before publication of new information and 15 trading days after publication of new information. "Zero day" is set on the date of announcement of new information. The event window consists of 31 trading days. Response of the Czech stock market on announcements of changes of Greek credit

rating will be tested with a help of values of abnormal and cumulative abnormal returns, which will be calculated according to equations (2) and (3). In order to estimate equilibrium returns according to CAPM model it is necessary to set risk-free rates r_f. The values of r_f will be calculated as average gross yields of Czech government bonds (Březinová, 2013). In this paper, the risk-free rate for the period of 2009 – 2012 years was determined by gross monthly returns of 3-year government bonds as shown in Table 2.

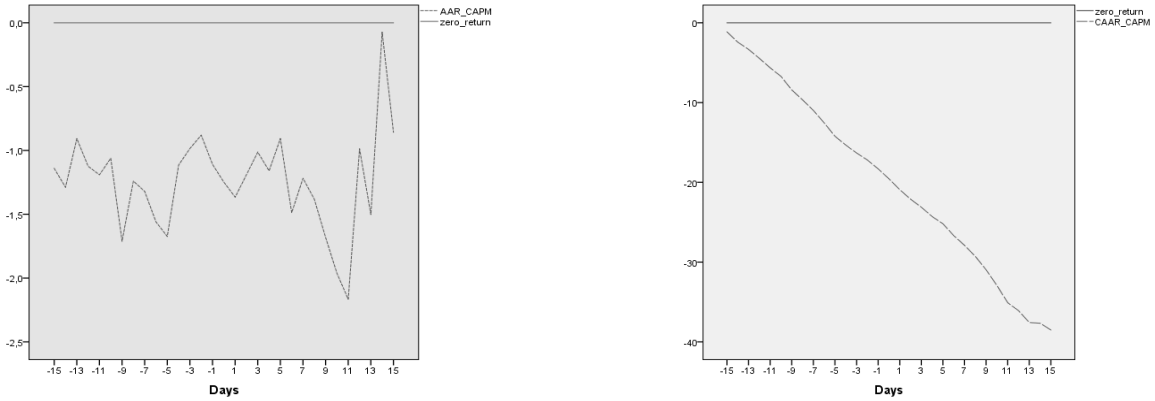
Table 2 Value of risk-free rate (in %)

	2009	**2010**	**2011**	**2012**
Yields of Czech government bonds	2.945	1.762	1.926	0.926

Source: Březinová (2013)

In order to assess response of Czech equity market on new information, it was necessary to determine average aggregate abnormal returns and cumulative average abnormal returns for the event window. Equilibrium returns have been calculated using the CAPM model. The difference between these two values represents abnormal returns. By averaging of abnormal returns for each day of the event window, we obtained aggregated abnormal returns. Next, we calculated cumulative abnormal returns. Since credit rating of Greek government bonds has changed seven times in the period of 2009-2012 years, it was necessary to calculate average values of aggregated returns. The aggregated abnormal returns achieved negative values only. It means that actual returns reached lower values than returns estimated according to CAPM model on average. Regarding publication of information on "zero day", it can be concluded that there have not been observed any significant deviations from reference values. Thus, it is clear that publication of new information did not result in jump drop. Values of average aggregated abnormal and cumulative abnormal returns of the Czech stock market for a period of fifteen days before and after announcement of seven credit rating changes are shown in Figure 2.

Figure 2 Average abnormal and cumulative average abnormal returns



Source: own calculations

Figure 2 also shows values of cumulative average abnormal returns based on equation (5). Market response to announcement of new information is evident. The cumulative abnormal losses on the day of announcement achieved the value of 19.56%. Moreover, the cumulative abnormal loss reached the value of 38.51% on the 15th day following the publication of new information. The abnormal returns calculated according to CAPM model started to decrease already fifteen days before announcement of new information.

When testing the efficiency of stock markets, the values of abnormal stock returns of all companies included in PX index in the event window are compared with zero abnormal returns that are considered as a hallmark of efficient market. In order to accept the null

hypothesis, it is necessary that values of abnormal return for the event window on both sides of median should be approximately equal. Table 3 shows the values of average abnormal returns of all shares included in PX index in %.

Table 3 Average abnormal returns of shares traded on PSE in %

AAA	**-1.323**	**ORCO**	**-1.889**
CETV	-1.648	**Pegas Nonvowens**	-1.268
ČEZ	-0.664	**Philip Morris**	-1.247
Erste group	-1.151	**Telefonica**	-0.958
Komerční banka	-1.167	**Unipetrol**	-0.979
NWR	-1.354	**VIG**	-1.256

Source: Březinová (2013)

Results of Nonparametric Statistical Tests

When calculating the values of abnormal returns based on the CAPM model, none of returns reached positive values $(Z_+ = 0, Z_- = 12)$. First, testing the semi-strong form of efficiency or evaluation of abnormal returns was carried out using the sign exact test since the scale of our sample is less than 25. Under the null hypothesis, positive and negative values of abnormal returns have binomial distribution B(0.5, 12). Table 4 shows cumulative probabilities for binomial distribution B(0.5, 12).

Table 4 Cumulative probabilities of binomial distribution B(0.5, 12)

Value of *x*	**0**	**1**	**3**	**4**	**5**
Probability *P*(*X*≤*x*)	0.00024	0.00317	0.01929	0.07300	0.19385

Source: Hendl (2009)

If the efficiency of Czech stock market is tested using the CAPM model, **the null hypothesis of efficiency can be rejected** and the stock market can be considered inefficient at 5% significance level (*p*-value = 0.00024 < 0.05). Second, the Wilcoxon sign-ranked test was applied. This test is more powerful and is based on absolute values of differences between actual returns and expected values of median. These differences are sorted by their size. The null hypothesis is not rejected if the sum of sequences of positive abnormal returns T_+ and the sum of sequences of negative abnormal returns T_- are approximately equal. Since abnormal returns achieved negative values only, the value of T_+ is equal to zero while the sum of sequences with negative values T_- reached the value of 78. Testing the null hypothesis is performed by comparison of smaller value of T_+ and T_- with precise critical values $w_{12} = 13$ (at 5% significance level). The value of $T_+ = 0$ lies within interval of critical values of $W = \langle 0,13 \rangle$. Thus, **the null hypothesis of efficiency can be rejected** again. Results of both nonparametric tests are summarized in Table 5.

Table 5 Comparison of results of the sing test and Wilcoxon sign-ranked test

	Sign test		**Wilcoxon sign-ranked test**	
	H_0	H_1	H_0	H_1
CAPM	Rejected	Not rejected	Rejected	Not rejected

Source: own calculations

Based on statistical tests provided, it can be concluded that results does not depend on type of statistical nonparametric test that was applied. If we use for determination of equilibrium yields the CAPM model, Czech stock market cannot be considered efficient.

Discussion

Empirical results we achieved indicated that Czech stock market is inefficient in terms of semi-strong form efficiency. Our results have shown that, as it would be expected in a rational marketplace, prices do not respond to new information immediately. Our results are in harmony with findings of empirical studies being performed before. Tran (2007) rejected the weak form of efficiency in Czech market. Hanousek et al. (2009) found that news originating in the EU affected the returns in Czech, Hungarian and Polish markets. Contrary to that, U.S. announcements have an impact on the Czech and Hungarian markets only. The results delivered for the Czech market do reflect the fact the significant part of traded volume in Czech market is caused by foreign investors that put more weight on foreign announcements. Gurgul and Wójtowicz (2014) examined the reaction of the Polish stock market to U.S. announcements based on intraday data. They found that Polish market reacted to unexpected news from the USA just one minute after a news release.

Our findings could have some important implications for regulators and investors. For regulators, our research provides empirical assessment of the current state of information efficiency and detects areas for potential improvements. For investors, fundamental analysis can bring above average returns since share prices do not reflect their inner value. Moreover, our results may also have important implications for diversification and risk management strategies since Czech Republic prepare to enter the eurozone. We can expect that Czech market will be more sensitive to macroeconomic shocks, especially those coming from the eurozone. Investors should apprise this expected higher volatility when investing in Czech market. This paper examined the speed of information dissemination, so that investors may anticipate the effect of news announcement on their portfolios.

4 Conclusions

Rational investors seek for mispriced stocks to make a profit on purchase or sale. However, activities of investors on efficient market lead to the fact that no market participant is able to overcome respective market and achieve above-average returns. In this paper, we examined the semi-strong form of efficiency of Czech stock market in the period of 2009-2012 years. Efficiency of Czech stock market was assessed in relation to publication of credit rating change of Greek government bonds as published by Moody's rating agency. For the purpose of this paper, the event study method was applied. All computations were based on daily log-returns of the share included in PX index. Based on results of the sign test and the Wilcoxon sign-ranked test, we found that results of our analysis does not depend on a type of selected statistical nonparametric test that was applied. If the semi-strong form of efficiency is based on the CAPM model, it is possible to classify Czech stock market as inefficient. This fact may led to implications for investors and regulators.

Our findings may lead to possible extensions of investigated topic. The semi-strong form of market efficiency can be further examined by separating positive and negative news announcements. In addition, the effects of news announcements could be investigated on different types of companies (according to size, value or growth). Finally, the reaction of stock market could be theoretically related to behavioral aspects of market participants.

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Tax burden and interest burden on business in the agriculture, fishing and forestry sector

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Abstract: *Financial burden on enterprises is determined by negative cash flows, which brings down the value their assets and owner's equity. The aim of this paper is to analyze the financial burden on Czech business in the agriculture, forestry and fisheries in the past six years and point out the factors that influenced their capital structure and performance. According to Du Pont equations the financial burden is given as reduction of interest and taxes from earnings before interests and taxes. The value of financial burden of enterprises is dependent on macroeconomic environment, in which the enterprises exist. It was detected asynchronously dependence between real payments and changes of rates of interests and tax rates in the analysis. Reducing both rates had a positive effect on the performance of Czech enterprises, their capital base has increased, it has become more attractive to foreign investors and improved return on invested capital. In following up the results of analysis is performed an estimate of the development of financial results of companies in 2016 - 2018.*

Keywords: financial burden of business, tax burden, interest burden, accounting statements, financial analysis, performance and efficiency

JEL codes: M21, M41, G32

1 Introduction

The financial burden on a business[15] is closely associated with the financial flows of a business with the purpose of performing all of its activities. Financial flow takes an opposite direction to the flow of assets. Purchase and production are associated with expenditures while sales are associated with revenues. Other financial flows are related to the profit distribution, investments, financial instruments, research and development, etc. Financial flows do not include cash flows only, but also the flows of financial resources (capital) of the business. Based on accounting rules, money and its equivalents have a form of assets of a company while the capital represents the source of the company financing (as a liability or debt).[16] This financial resource is necessary not only to purchase the assets, but also to bridge the time lag between the expenditures spent on the production of the final product (purchasing services, payments for the energy, wages and other operational or financial expenses), and the reception of the money for its sale. Positive financial flows (inflows) should prevail over the negative ones (outflows).

Based on the place where the financial flows arise, they are divided into the internal and the external ones (Wagenhofer, 2003). The first source of finance is the internal flow resulting from the sales of products, services, or goods. Additional capital flows in a business created by its own activity to be re-used.[17] The second source is external financial flows, which are both investors' deposits arising from the purchase of shares (equity), and the means obtained in the forms of credits and loans or issued debt

[15] The word business includes all the legal forms of entrepreneurial entities that operate in the monitored sector of the Czech economy.

[16] The Czech accounting legislation does not differentiate between liabilities and capital, while the financial books of companies use the word capital meaning long-term capital which is used to finance company's fixed assets and the permanent part of circulating assets.

[3]This is 'self-financing' done from sales, withheld payments and the profit.

securities (liabilities). The price at which the company gets the capital represents a financial burden (including levies imposed by the state), which is measured by the cost of capital. The company looks for such a relationship between the amount of equity and liabilities (capital structure) at which it achieves the lowest cost of capital (Ohlson, 1980). Bokpin (2009) or Nurmet (2011) pointed out that when optimizing the capital structure, not only the cost of capital and the tax shield but also the company's financial distress cost should be taken into account. Financial flows flowing towards the bearers of liabilities and equity take out a part of the generated equity (profit) from the company and thereby reduce the economic efficiency of their activities as well as value (Brealey et al., 2006).

2 Methodology and Data

The aim of this paper is to analyze the financial burden on businesses in the Czech agriculture, fishing industry and forestry over the past six years and point out the factors that have affected their capital structure and performance.

The basic criterion for measuring the production power of a business is the Earnings Before Interest and Taxes ratio indicator (EBIT) calculated from the profit and loss account as a surplus of sold performance over the performance consumption after deducing the work consumed, depreciation and other operating costs and the financial profit or loss (Damodaran, 2000). After withdrawing the contribution for the creditors (capital costs), the Earnings Before Taxes (EBT) remain to the company. According to Rajan and Zingales (1998), the last contribution is the income tax on legal persons, designated for the state; after this is paid, the owners are left with the Earnings After Taxes (EAT).

The EAT achieved by the company for a marketing year is placed within the equity in the balance and it increases the accounting value and often also the market value of the company (Kislingerová et al., 2010). It is intended for allocation after approval by the general meeting. To measure the impact of the financial burden on the profitability of the company, it is possible to use the decomposition of the second Du Pont equation (Sedláček, 2007) as follows:

$$\mathrm{ROE} = \frac{\mathrm{EAT}}{\mathrm{E}} = \frac{\mathrm{EBIT}}{\mathrm{S}} * \frac{\mathrm{EBT}}{\mathrm{EBIT}} * \frac{\mathrm{EAT}}{\mathrm{EBT}} * \frac{\mathrm{S}}{\mathrm{A}} * \frac{\mathrm{A}}{\mathrm{E}} \qquad (1)$$

Where:

ROE	- Return on Equity is a measure of the rate of return to stockholders.
EBIT	- Earnings Before Interest and Taxes is determined as the sum of the operating and the financial profit or loss.
EBT	- Earnings Before Taxes represent EBIT reduced by the cost interests reported by the company
EAT	- Earnings After Taxes represent a net (disposable) income of a company
S	- Net Sales from the sale of products, goods and services
A	- Total Assets
E	- Total Equity
EBIT/S	- Return on Sales (ROS)
EBT/EBIT	- is known as the company's interest burden (IB). It expresses the impact of the price of liabilities on the profitability of the business. The price of liabilities is determined by the macro-environment and indirectly characterizes the conditions under which the company gets outside funds. If a company uses liabilities, then inequality EBT/EBIT< 1 is applicable
EAT/EBT	- expresses the company's tax burden (TB), i.e. the effect of the state's tax policy on the profitability of the business. It is a factor that is objectively given by the environment where the business is located. If the business achieves a positive profit or loss account, then inequality EAT/EBT< 1 is applicable

S/A - Asset Turnover, characterizes the degree to which the company uses the assets.

A/E - Equity multiplier expresses the level of company indebtedness and is also known as financial leverage (FL).

To analyze the financial burden on businesses, or their financial stability, the data that are published at the Ministry of Industry and Trade (MIT) of the Czech Republic website (MIT, 2016) will be applied. They represent the aggregate values from the statements of businesses from the fields of agriculture, forestry and fishing (AFF), whose data are summarized in Table 1. The state quantities are calculated as means of the values reported by the companies at the beginning and the end of each year. Tax rates of legal person's income and the interest rates on loans to non-financial companies presented on the last two table lines were taken from the Czech National Bank (CNB, 2016)) website. In addition, the income tax rates from years 2008 (21%) and 2009 (20%) and the interest rate of the year 2008 (4.80%) and 2009 (3.72%) were used in the calculations.

Table 1 Input data for the analysis of the financial burden on business in the AFF sector

Item (in bill. CZK)	2008	2009	2010	2011	2012	2013	2014	2015
Assets			98.2	105.0	112.4	113.7	108.0	108.0
Equity			86.7	93.3	98.3	95.9	92.6	94.0
Sales			25.1	30.6	29.1	27.5	28.1	32.5
EAT			3.2	5.3	5.1	5.2	6.5	6.3
EBT			4.0	6.6	6.4	6.4	7.8	7.6
EBIT			4.088	6.670	6.485	6.482	7.862	7.659
Interest paid (I)			0.088	0.070	0.085	0.082	0.062	0.059
Income tax (T)			0.8	1.3	1.3	1.2	1.3	1.4
Interest rate (I%)	4.80	3.72	3.47	2.86	2.61	2.26	2.22	1.74
Tax rate (T%)	21	20	19	19	19	19	19	19

Source: own calculation based on the data of the MIT CR and CNB

Tax burden

Tax is defined as an obligatory, regular, non-refundable and non-specific payment determined by the act allotted to the public budget. By that, a part of income is withdrawn from predefined entities on an irreversible principle[18] (without a right to consideration from the public sector corresponding to the amount of tax paid). According to the OECD classification, also duties, health and social insurance premiums as well as local fees are considered taxes. A company is burdened with all of these taxes, provided that the circumstances that require payment have arisen.

Indirect taxes (value added tax and excise tax) treat a business that is a registered payer neutrally. In this case, the business is only a 'collector' of the tax and the real taxpayer is the end consumer who purchases the product or the service. Tax non-payers have the tax included in the price of purchased inputs (materials, energy, machinery, etc.), but they do not add tax to their outputs and are not entitled to a tax deduction. The tax becomes part of the assets measurement.

Direct taxes are paid by the business (as a taxpayer) from its assets (they withdraw a part of its revenues). These include property taxes (real estate tax, property transfer tax and road tax) as well as income tax of legal persons. Property taxes are an expense which is at the same time considered a tax expense (expenditure) in compliance with the income tax act[19]. The subject of income tax is the accounting profit (loss), determined

[18] This differentiates it from the charges that are included in the revenue side of the public budget but take the form of payments for the public sector services.

[19] Tax expenses are also the contributions paid by a business per an employee to statutory health insurance and social security.

from the difference between revenues and expenses before taxation, which is subsequently adjusted for:

- the sums which cannot be included in expenses in compliance with Income Tax Act (e.g., shortages exceeding their compensations, the costs of company promotion, the differences between the tax and accounting depreciations);
- the sums that are included in the costs in the wrong amount;
- any sums unduly reducing the income;
- tax exempt incomes (e.g. incomes from the operation of small power plants);
- incomes not included in the tax base (e.g. incomes taxed as earned at the source).

These adjustments turn the accounting profit into the tax base, which is then used to calculate the tax by the corresponding rate. Income tax is an accounting and not a taxation expense, i.e. it does not enter the company's profit and loss account before taxation or the income tax base. On the contrary, tax payment means a reduction of the company's assets (money) and a withdrawal of produced profit or loss for the current period (EBT). The amount of money flowing towards the state is expressed by the tax reduction of the profit - tax burden (TB), which is determined by the following equation:

$$TB=EAT/EBT \qquad (2)$$

Table 2 shows that the value of the tax burden (TB) does not have a clear trend, which corresponds to the TB effect on the development of shareholders' equity profitability in the second Du Pont equation (DeAngelo and Masulis 1980). The indicator shows a positive influence of macro-economic policy of the state in the form of income tax rate reductions. The correlation of temporal series can be used to measure the impact of tax rates on the amount of taxes paid. Table 2 presents the income tax rates as values of the independent variable x_i and the values of percentage of the paid income tax in the profit before tax (T/EBT) as the dependent variable y_i. The tightness of the two temporal series is expressed by the correlation coefficient calculated from the following formula:

$$r_{xy} = \frac{\overline{xy}}{\sqrt{\left(\overline{x^2} - \overline{x}^2\right)\left(\overline{y^2} - \overline{y}^2\right)}} \qquad (3)$$

The ratio of T/EBT also expresses how the company shared its profit with the state. Although the income tax on AFF businesses increased in absolute values from 0.8 billion CZK in 2010 to 1.4 billion CZK in 2015, the relative tax burden decreased by 1.58 percentage points. In 2015, an average business in this sector paid 18.42% of its operating profit reduced by interests while the applicable tax rate was 19%. The calculations confirmed that the fair value of the paid taxes is delayed behind the tax rate by two years, when the coefficient of asynchronous correlation of temporal series amounted to 0.89516.

Table 2 Development of tax reduction and state share in profit of an average company in the AFF sector

Year	EAT	EBT	TB	T%	T	T/EBT	E	E/A	ROE %
2008	x	x	x	21	x	x	x	x	x
2009	x	x	x	20	x	x	x	x	x
2010	3.2	4.0	0.80000	19	0.8	0.20000	86.7	0.8829	3.691
2011	5.3	6.6	0.83030	19	1.3	0.19696	93.3	0.8886	5.681
2012	5.1	6.4	0.79687	19	1.3	0.20312	98.3	0.8745	5.188
2013	5.2	6.4	0.81250	19	1.2	0.18750	95.9	0.8434	5.422
2014	6.5	7.8	0.83333	19	1.3	0.16666	92.6	0.8575	7.019
2015	6.3	7.6	0.82894	19	1.4	0.18421	94.0	0.8704	6.702

Source: own calculation based on the data of the MIT CR and CNB

The reduction in the tax burden is positively reflected in the growth of companies' equity as a source of self-financing. The positive trend stopped in 2013, in response to the reduction in the value of equity ratio (E/A) in the preceding year. During the reference period, a constant tax rate allowed businesses to do their operations with net operating surplus, which increased the owners' equity and allowed investments in the expansion of the production, thereby strengthening the company's position and independence.

Interest burden

The lack of equity in the form of retained profits and depreciations forces companies to get finances in the form of liabilities (L). They can be short-term debts (short-term bank and trade credits, debts to employees, issued debt securities, loans, etc.) or long-term liabilities to creditors who have lent their money to the company for more than one year or have invested in long-term bonds issued by the company (Sedláček, 2016). The relationship between the equity and liabilities depends on the nature of the business, the macro-economic environment in which the entity is situated, and the risk associated with obtaining resources. Generally, the price of equity paid in the form of dividends or profit share is higher than the price of liabilities in the form of paid interests (Higgins, 1995; Hýblová et al., 2013). This is due to the fact that the investors are the main carriers of the risk associated with poor management or even the company decline, and they can lose their capital.

The optimum capital structure of a company is formed with minimum cost of capital (C), which is calculated as the sum of the weighted costs of liabilities (n_L) and equity (n_E) based on equation:

$n_C = n_L + n_E = (1 - T\%)\ L/C + (\text{dividend yield} + \text{dividend growth rate})\ E/C \rightarrow \text{minimum}$

A company should only use liabilities for financing in the event of a positive effect of financial leverage. The leverage rises (strengthens), like in physics, the profit capacity of the equity by means of liabilities (Otavová, 2017). Therefore, the owners look for greater leverage to multiply their earnings (issue of new shares would mean a reduction in ownership and voting rights of the existing shareholders). However, the positive effect of the debt ratio on the profitability of equity occurs only when the Return on Assets (ROA) is greater than the interest rate (I%). Otherwise, the leverage has a negative effect. In contrast, creditors prefer the lowest possible debt ratio (L/A), as a larger share of equity means greater safety cushion against their losses in the case of business liquidation (Bauer, 2004; Levy and Sarnat, 1999).

The conditions under which the business obtains liabilities are expressed in the price of the liabilities that the business pays for the provision of capital to the creditors, i.e. the interest burden (IB):

$$IB = EBT/EBIT \qquad (4)$$

The growing trend of the IB indicator reinforces the profitability of the capital invested by owners, like the tax reduction, corresponding to the second Du Pont decomposition. The release of the state monetary policy in the form of reducing interest rates of loans to non-financial companies and better availability of credits have meant a gradual reduction of the financial burden of businesses. The interest burden as measured by the share of interests paid in the profit before tax and interests (I/EBIT) decreased during the years observed from 2.15% to 0.77%. To explore the dependence of this share in the interest rate on loans (see Table 3) we again use the formula to calculate the correlation coefficient r_{xy}.

Table 3 Development of interest reduction and creditors' share in profit of an average company in the AFF sector

Year	EBT	EBIT	IB	I%	I	I/EBIT	L	L/A	ROA %
2008	x	x	x	4.80	x	x	x	x	x
2009	x	x	x	3.72	x	x	x	x	x
2010	4.0	4.088	0.98747	3.47	0.088	0.02152	11.5	0.1171	4.16
2011	6.6	6.670	0.98950	2.86	0.070	0.01049	11.7	0.1114	6.35
2012	6.4	6.485	0.98689	2.61	0.085	0.01307	14.1	0.1255	5.77
2013	6.4	6.482	0.98735	2.26	0.082	0.01265	17.8	0.1566	5.70
2014	7.8	7.862	0.99211	2.22	0.062	0.00788	15.4	0.1425	7.28
2015	7.6	7.659	0.99229	1.74	0.059	0.00770	14.0	0.1296	7.09

Source: own calculation based on the data of the MIT CR and CNB

Table 3 shows that the interest burden on businesses, both in absolute and relative values decreased significantly during six past years. In absolute values, the share of operating profit[20] attributable to the creditors and produced by the analysed companies decreased from 88 million CZK to 59 million CZK between 2010 and 2015. Thus companies in the AFF sector produced resources for a possible enhancement of capital availability in the amount of 6.3 billion CZK in 2015, compared with 3.2 billion CZK reported in 2010. The tightest dependence between the interest rate and paid interests (I/EBIT) occurred, with a delay of one year, when the delayed correlation coefficient reached a value of 0.98723. Liabilities (L) in absolute values increased compared to the initial year and the total indebtedness (L/A) developed as supplementary to the opposite value of financial leverage.

3 Results and Discussion

A company starts to generate the Economic Value Added (EVA) for the owners (Kislingerová and Neumaierová, 2000) only at the moment when the return on capital invested exceeds the alternative cost (rate of return).[21] In the second Du Pont equation, the main factor affecting the return on equity is the profitability of sales (EBIT/S), which should be positive, while EBIT should grow faster than sales ($I_{EBIT} > I_S$). In the sample examined, this requirement was met with the exception of the year 2015, as shown in Table 4. The positive effect of interest reduction caused a mean annual growth of the EBT indicator by 16.26%; together with the effect of tax reduction they caused the growth of net profit by 17.14% annually on average. The index of the mean growth in the company's disposable income caused by the reduction in the financial burden (after elimination of the EBIT change impact) was 1.36%. Also the profit growth indexes listed in Table 4 should be in compliance with the inequality:

$$I_{EAT} > I_{EBT} > I_{EBIT} \quad (5)$$

Similar behaviour is observed in the turnover of assets, which supports the ROA indicator, if it grows and the growth index should meet the condition $I_S > I_A$. The last factor is the financial leverage, which reflects the impact of the involvement of liabilities in the company financing and has a variable character.

Table 4 The indexes of the growth rates of basic indicators within the AFF sector

Index	2011	2012	2013	2014	2015	Average
$\mathbf{I_A}$	1.071	1.070	1.011	0.949	1.000	2.02 %
$\mathbf{I_E}$	1.076	1.053	0.975	0.965	1.015	1.68 %
$\mathbf{I_S}$	1.219	0.951	0.945	1.022	1.156	5.86 %

[20] These are absolute values of the produced profit after deduction of total losses reported by the companies in the years observed.

[21] The Economic Value Added is determined by relation $EVA = (ROE - r_e) * E$ or $EVA = EAT - E * r_e$.

I_{EBIT}	1.631	0.972	0.999	1.213	0.974	15.78 %
I_{EBT}	1.650	0.970	1.000	1.219	0.974	16.26 %
I_{EAT}	1.656	0.962	1.020	1.250	0.969	17.14 %

Source: own calculation based on the data of the MIT CR and CNB

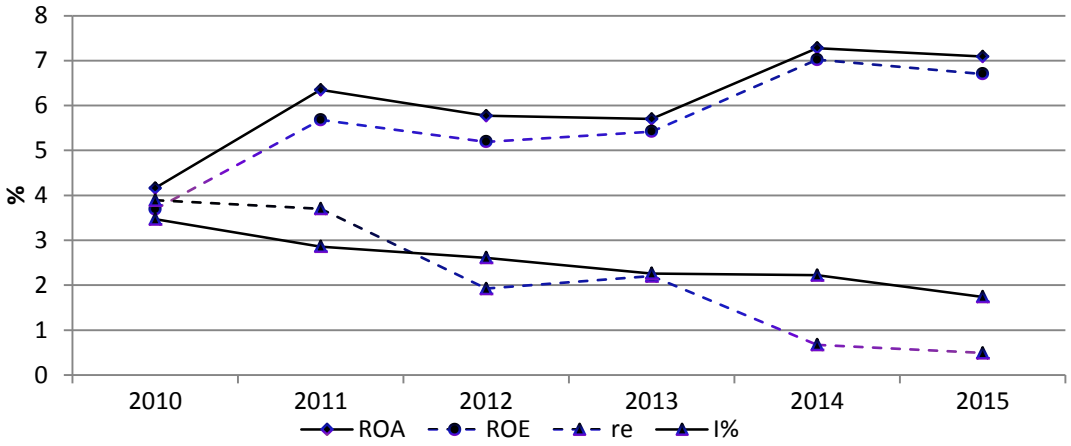
The moment at which an average company in the AFF sector starts to create value for its owners is indicated in Figure 1, comparing the ROE indicator with alternative return on equity (r_e)[22]. The economic value added started to be generated in 2011 (see Table 5), when the return on equity exceeded the return on the capital invested expected by investors, and it is located in the area where inequality (ROE - r_e) > 0 is valid. Additionally, the return on total assets behaves positively, as it is located over the price of liabilities for the entire observed period (see Table 3). Therefore, it pays to involve further capital in the company financing, as increasing the debt ratio already helps to improve the rate of return for the owners. The differences between the values of the indicator of return on total capital of an average company and the prices of liabilities (called spread) are again shown in Figure 1, showing the two series moving apart and thus the increase in positive spread ROA – I% > 0.

Table 5 The development of the spread of an average Czech company in the AFF sector

Indicator	2010	2011	2012	2013	2014	2015
ROE	3.69	5.68	5.19	5.42	7.02	6.70
r_e	3.89	3.70	1.92	2.20	0.67	0.49
ROE - r_e	-0.20	1.98	3.27	3.22	6.35	6.21
ROA	4.16	6.35	5.77	5.70	7.28	7.09
I%	3.47	2.86	2.61	2.26	2.22	1.74
ROA - I%	0.69	3.49	3.16	3.44	5.06	5.35

Source: own calculation based on the data of the MIT CR and CNB

Figure 1 The development of the spread of an average company in the AFF sector



Source: own calculation based on the data of the MIT CR and CNB

Prediction of the development of the financial burden on companies in the AFF sector

The growth trend of performance series of companies in the sector, which was manifested in the period observed, is determined by positive macroeconomic effects, including the tax and interest burden reductions (Oxelheim, 2003; Svoboda and Bohušová, 2017; Hýblová, 2011). The pro-growth environment of the Czech economy, favourable for the companies' balance, is likely to remain in the coming years. The

[22] Alternative return (cost of equity) is considered in its simplest form in the graph for illustrative purposes, i.e. at the level of state bond revenues for convergence purposes 10R based on CNB – interest rates.

businesses have their own resources for further development, and there is no obstacle to access loan issues. The total indebtedness of companies (L/A) decreased as well as the indebtedness to the banking sector. The decline was a consequence of lower interest rates on loans, and at the same time it was associated with the increase in assets and equity of companies that create value for owners and potential investors. The decline in interest rates also led to reduced costs of debt services.

To calculate the expected loan burden in the future period it is necessary to establish the values of the input data for the years 2010 to 2015. The future values of EBIT are determined by the extrapolation of the temporal series presented in Table 3 using linear function (Hindls et al., 1997) and the expected interest rates on loans to non-financial companies from the macroeconomic prognosis of the Ministry of Finance of the Czech Republic are used – see Table 6. Taking into account the observed asynchronous correlation of temporal series, we can estimate the values of actually paid interests on loans, or the values of the interest burden, and finally we can calculate the EBT values of an average company.

$$EBIT_t = a_0 + a_1 t \tag{6}$$

where the constants are calculated by the following equations:

$$a_0 = \frac{1}{n}\left(\sum y_t - a_1 \sum t \right) \tag{7}$$

$$a_1 = \frac{n \cdot \sum t \cdot y_t - \sum t \sum y_t}{n \cdot \sum t^2 - (\sum t)^2} \tag{8}$$

After fitting the calculated constants in equation (6) we obtain the equation to calculate the expected values of EBIT:

$$EBIT_t = 4{,}3067 + 0{,}6171t \tag{9}$$

Table 6 Prediction of the financial burden on companies in the AFF sector

Item (in bill. CZK)	2015	2016	2017	2018
EBIT	7.659	8.63	9.24	9.86
Interest paid (I)	0.059	0.03	0.04	0.06
IB	0.923	0.9965	0.9957	0.9939
EBT	7.6	8.6	9.2	9.8
Income tax (T)	1.4	1.5	1.5	1.5
TB	0.8289	0.8255	0.8953	0.8469
EAT	6.3	7.1	7.7	8.3

Source: own calculation based on the data of the MIT CR and CNB

A similar procedure is taken to determine the actually paid income tax, or the value of tax burden, from the estimated tax rate, and this is then used to calculate the value of the mean EBT. The positive trend of the tax and interest burdens of businesses will not be manifested as intensely in the future, for the macroeconomic forecasts assume a shift away from interest rate reductions and taxation issues are currently being intensively discussed. However, changes in the interest burden on businesses can be expected to take effect in 2017 at earliest and a year later in the taxation area.

4 Conclusions

After the financial and economic crisis that hit the global economy in 2009, the performance of the Czech economy has been on gradual increase. The growth trend of ROA and ROE series in the AFF sector is attributed to the effects of the external environment in particular, which include reduced tax and interest burden. The turning

point for the Czech businesses was the year 2011, when their performance as measured by ROA and ROE indicators improved substantially. This turnover in the development of companies was helped by the release of the macroeconomic policy (reduction of interest rates on loans and a low rate of income tax of legal entities), the stage of economic growth, and the strengthening of the offer side of the economy. Businesses were able to create a new financial structure in accordance with the capital structure, so that after the deduction of some profit for the creditors and the state, still a value remained for their own development.

The analysis has proved one- to two-year delay in the effects of changes in income tax rates and paid interests. The value for owners also increased due to the reduction of interest burden for companies, which originally took 2.15% from their gross profit and then decreased to the current 0.77%. This trend is not going to be as intense in the future for the macroeconomic forecasts assume a gradual rise in interest rates. The reduction of the tax burden was slightly slower - the contribution for the state from EBIT decreased from the original 19.57% to 18.27%, due to the constant income tax rates and the time delay behind the change. In the future, the reduction of the tax burden is going to stop due to the discussed progressive taxation of entrepreneurial entities.

The positive development of the Czech companies' performance in the AFF sector in subsequent years will probably not be supported by external factors, but by the involvement of internal factors, such as innovation in production and technology, leading to reduced share of the costs in revenues, increase in the production power of companies (EBIT), and creation of value added for owners.

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The analysis of Slovak Republic's competitiveness

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Abstract: *The aim of the article is to analyse the competitiveness of Slovak republic. There are many organisations, that evaluate the competitiveness of the countries. We choose the Global Competitiveness Index published by World Economic Forum as the key competitiveness index. We analyse the position of selected countries including the Slovak Republic in this yearly published ranking for the 5 years. We try to answer, in which pillar has our country competitiveness advantage, in which not. It is important to learn the model of successful countries to make our country more competitive. According to this, we choose countries from European Union, which take the top position in the Global Competitiveness Index and the countries with similar position in this index that have Slovak Republic. Besides this index, we analyse other factors, which may affect competitiveness advantage in the future. We analyse the dependence between selected indicators. This dependence will be verified using statistical tests. We will use data from Statistical Office, Eurostat, World Economic Forum and other institutions.*

Keywords: Global Competitiveness Index, Slovak Republic, Ranking, World Economic Forum

JEL codes: O11

1 Introduction

Competitiveness is, in many ways, an important indicator for the countries. In a market economy, this concept affects all activities that are associated with man and society. (Jenčová et al., 2015) Among the first authors to express the competitiveness of the nation are Freeman, Lundvall and Porter, who have defined national competitiveness as the output of national ability to innovate and gain a competitive advantage (Cooke, 2002). The developed region is an accelerator for the growth of the country's economy, thus affecting its competitive position. (Štefko et al., 2010) Countries can create competitive advantages by improving their position through innovative and inventive potential. These are dynamic competitive advantages based on human capital, an educated workforce and a high level of active scientific research potential (Kollar, 2013).

Competitiveness is the ability of the economy to create goods and services to ensure external economic equilibrium, while ensuring the growth of per capita income, a sufficient level of utilization of national factors and the attainment of social and environmental goals (Hečková and Chapčáková, 2012). Competitiveness reflects the extent to which the country can operate on the international market while preserving or expanding the real income of citizens under the conditions of a free market. (Waheeduzzaman and Ryans, 1996). The basic prerequisite for the growing living standard of the country's population is long-term sustainable competitiveness of the domestic economy, which is conditioned by the competitiveness of its businesses. (Hečková and Chapčáková, 2011)

Although there is no precise and unambiguous definition of national competitiveness in the literature, many international organizations devote much attention to this area. Of

particular importance is the ability to compare country data, create order and evaluate information. (Gordiakova, 2011)

Competitiveness can be measured from a number of perspectives. Institutions aimed at assessing the competitiveness of countries can be divided into:

1. assessing international and global competitiveness,
2. testing independent credit rating agencies,
3. Impact on their economic outcomes (Burda, 2014).

International competitiveness is assessed by the Swiss Institute of IMD and global competitiveness is assessed by the World Economic Forum WEF. Both compare national economies and their living standards and national profile. They are the most famous world institutions dealing with the competitiveness of the national economy. (Gavurova et al., 2016)

The Global Competitiveness Index (GCI), published by the World Economic Forum, is also used to assess the competitiveness of the country. The World Economic Forum is an international organization for co-operation between the private and the public sector, dealing with political, commercial and other facts that shape global, regional and industrial programmes. Since 1979, this institution has published the Global Competitiveness Report on selected countries of the world since 1979. In 1979 Klaus Schwab was the creator of this idea. Since 2005, this initial index has been completed and redesigned by Xavier Sala and Martin in collaboration with the World Economic Forum. (Schwab et al., 2016) The Global Competitiveness Report is devoted to 114 indicators, which are grouped into 12 pillars.

2 Methodology and data

The aim of the article is to analyse the competitiveness of the Slovak Republic. After the analysing of the Slovak Republic's performance according to Global competitiveness index (GCI) in the period of 5 years, we identify the pillars, in which Slovakia has had the worst results. In the next step, we have compared Slovak's results with the results of other selected countries, and then we have identified, which were the key areas that made the other countries successful.

For comparison, we have chosen these 5 countries: Switzerland, Netherlands, Germany, Romania and Macedonia. The selection of these countries was not random, because we have chosen only countries geographically belonging to Europe. Firstly, we pick out 3 most competitive countries according to results of Global competitiveness index 2016/2017 from the Europe. 2 countries were from the European Union and one is a separate state, Switzerland. Secondly, we have selected states on better and/or worst position than Slovakia in GCI 2016/2017 from Europe. Also, one state is the EU member and one is not. The results from GCI 2016/2017 are in the table 1.

Table 1 The position of selected countries in GCI 2016/2017

Rank 2016/2017	Country	Rank 2015/2016
1.	**Switzerland**	**1.**
2.	Singapore	2.
3.	United States	3.
4.	**Netherlands**	**5.**
5.	**Germany**	**4.**
	.....	
62.	**Romania**	**53.**
63.	Jordan	64.
64.	Botswana	71.
65.	**Slovakia**	**67.**
66.	Oman	62.
67.	Peru	69.
68.	**Macedonia**	**60.**

Source: own processing according to Global competitiveness report

We have examined if there is the dependence between the 5th pillar of higher education and the 12th pillar of innovation. In particular, among the indicators of tertiary education enrolment rate and quality of scientific research institutions. We have verified this dependency on a sample of 6 selected countries.

We have used data from Statistical Office, Eurostat, World Economic Forum and other institutions.

3 Results and Discussion

When analyzing the development of the country's ranking or the score itself, it is clear that the development of the countries is not unambiguous. Only Switzerland has still been ranked the 1st in this ranking. Slovakia has a tendency to improve its position when it got 65 points from GCI 2013/2014. Other countries surveyed have not shown a clear trend. Their ranking is unstable.

Table 2 Ranking of selected countries in the 5 year period

Rank	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Switzerland	1	1	1	1	1
Netherlands	5	8	8	5	4
Germany	6	4	5	4	5
Romania	78	76	59	53	62
Slovakia	71	78	75	67	65
Macedonia	80	73	63	60	68

Source: own processing according to Global competitiveness reports

Score development has been increasing since the GCI 2013/2014 in both the Netherlands and Germany. Their overall score has grown every year. Romania recorded a slight decline in GCI 2016/2017 as well as Macedonia. By then their development was growing. Slovakia also has had a growing trend since 2013/2014. However, the values achieved

by Slovakia are significantly lower than these of Switzerland, Netherlands and Germany, which is also expressed by the location in the second half of the evaluated countries.

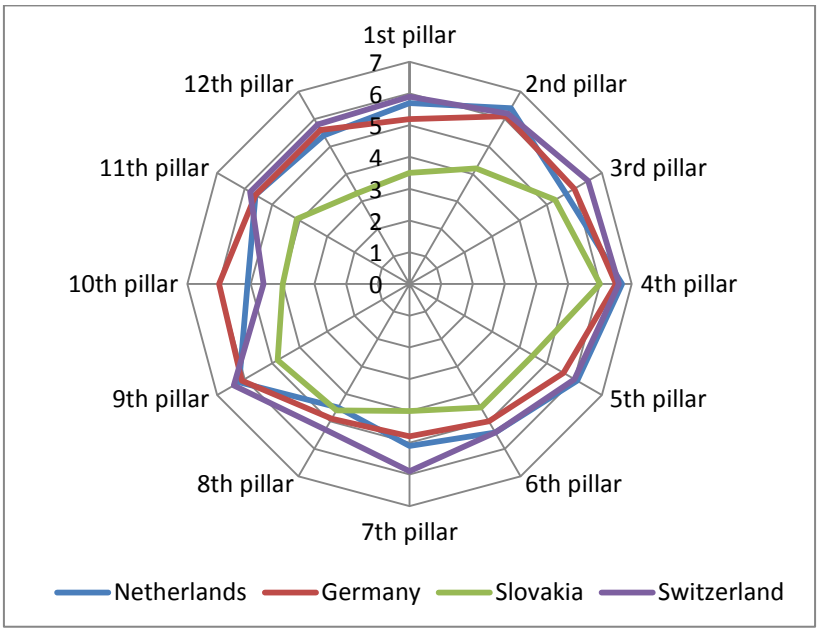
Table 3 Score of selected countries in the 5 year period

Score	2012/2013	2013/2014	2014/2015	2015/2016	2016/2017
Switzerland	5,722	5,666	5,704	5,759	5,800
Netherlands	5,502	5,425	5,454	5,505	5,600
Germany	5,477	5,510	5,488	5,529	5,600
Romania	4,069	4,125	4,302	4,324	4,300
Slovakia	4,144	4,103	4,148	4,220	4,300
Macedonia	4,045	4,136	4,256	4,281	4,200

Source: own processing according to Global competitiveness reports

However, this was an overall assessment of the competitiveness of the countries. As we have already mentioned, this assessment is made up of 12-pillar sub-ratings. A closer analysis of these pillars over the period 2016/2017, can help better understanding of the strengths and weaknesses of the analyzed countries. First we have compared the results of Slovakia for individual pillars with the best rated countries.

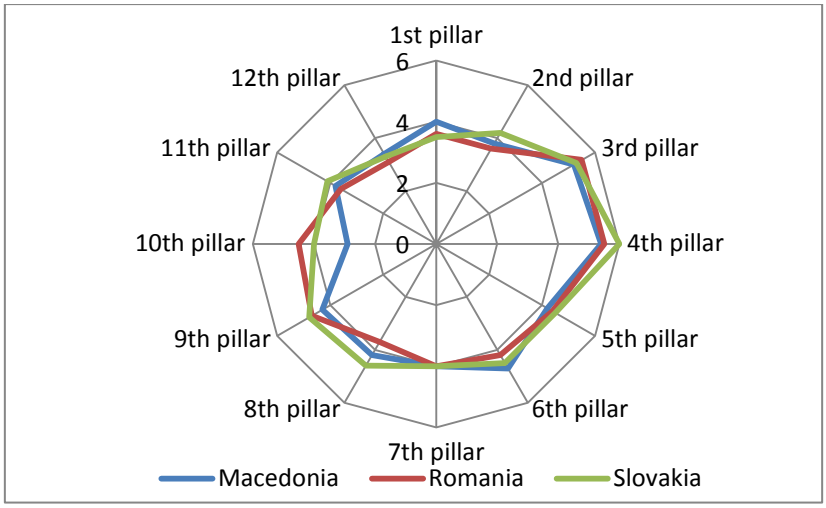
Figure 1 Pillar analysis of Slovakia and leading countries



Source: own processing according to data from WE Forum

Slovakia, compared with the leading countries in the ranking, has comparable values in these pillars: 8th - financial market development, 4th - health and primary education and the third pillar - macroeconomic environment. On the contrary, Slovakia has a significantly different value for the 12th pillar - innovation, 1st pillar - institution and 2nd pillar - infrastructure.

Figure 2 Pillar analysis of Slovakia and similar competitive countries



Source: own processing according to data from WE Forum

When we compare performance of Slovakia with European countries placed on similar positions, we can see, that Slovakia is better in the 2nd pillar - infrastructure, 4 th pillar health and primary education, 8th pillar - financial market development and 11 th pillar - business sophistication.

When we want to be more competitive, we must find out, what our weaknesses and strengths are. According to complete competitiveness evaluation made by World economic forum in Word competitiveness yearbook, we can see, that Slovakia has the biggest problems in the 1st pillar - Institution, especially in "Efficiency of legal framework in settling disputes" and others. Slovakia has had long-term problems in the area of institutions. (Xhala and Nemec, 2016). Another problematic pillar is 12th pillar - Innovation. So, the most problematic factors for country's competitiveness and for performing business are corruption, tax rates and inefficient government bureaucracy.

We supposed, that to be more competitive in Slovakia, we must improve our pillars institution, innovation and education. In pillar institution, there are big problems with corruption. One notion, how to improve mentioned area Institution, especially corruption is mentioned by Grega and Nemec (2015). They found out, that for Slovakia fully competitive procurement is, if there are 5 or more competitors. So, when we prepare competitive procurement, this could be the first step to remove corruption in the Slovakia.

To make improvements in the pillars Innovation and Education, we have examined if there is the dependence between the 5th pillar of higher education and the 12th pillar of innovation. In particular, among the indicators of tertiary education enrolment rate and quality of scientific research institutions. Based on the results of statistical testing among analysed countries, there are big direct linear dependence between analysed variables. Correlation coefficient R is 0,667542, at the level of significance of alfa 5 %. The adjusted R-Squared value was only 0,445612, which seems to be too low to make predictions or draw conclusions.

4 Conclusions

The development of Slovak competitiveness has a desirable, improving tendency. The position in the Competitiveness Ranking is steadily improving. Still, the country faces considerable problems. Until we change access to the problematic areas of Innovation and Institutions, our competitiveness will not be able to progress. One notion, how to improve mentioned area Institution, especially corruption is, if there are 5 or more competitors in fully competitive procurement.

Stabile leading countries are stabile, innovation leaders, have almost zero corruption and one of the few problems are lack of capacity for research and innovation, because there are many research centres and innovation enterprises.

Following these Leader countries in their competitive advantages should be a priority of Slovakia. By learning from the very best, we can move our country forward.

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Legal Background for an Expert Witness to a Corporate Name Valuation

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Abstract: *According to American Marketing Association, brand is a name, term, design, symbol, or any other feature that identifies one seller's good or service as distinct from those of other sellers. A corporate name is one of the possible forms of the brand. In the sense of the Czech Civil Code, a corporate name is a name under which the entrepreneur is registered in the commercial register. An entrepreneur may not have several corporate names. The role of an expert witness is to provide the court with an independent and neutral assessment (e. g. valuation) based on his expertise. The aim of this paper is within the legal system of the Czech Republic to define legal background of the institute of a corporate name so that it can subsequently result in a reliable valuation by an expert witness. For this purpose, the paper examines the legal nature of a corporate name and its possible dispositions that might require an expert valuation.*

Keywords: expert witness valuation, corporate name, brand

JEL codes: M21,K22

1 Introduction

The issue of the brand (and eventually its valuation) deals with several economic disciplines such as marketing, strategic management, corporate finance. The brand also has its accounting connotations as well as microeconomic understanding. The views occupied by these disciplines often highlight different aspects of the brand, often overlapping and expressing the same message in different languages.

The most widely cited and widely respected definition of the term "brand" is the definition of the American Marketing Association: *"a name, term, design, symbol, or any other feature that identifies one seller´s good or service as distinct from those of other sellers*"(American Marketing Association, 2017). A corporate name meets this definition as well.

What is a legal definition of a corporate name? According to the Civil Code, a corporate name is a name under which the entrepreneur is registered in the commercial register.

Issues with the valuation of things - measuring the value of things among themselves - are among the important and perhaps fundamental questions of economics. Answers to these questions find practical application in the context of everyday life when deciding economic subjects about their further action. These questions can be considered in relation to individual things, but also to sets of them. The answer can be usually found through market prices as an objectified, indivisible independent measure.

However, market prices are not available for all individual things or sets of them. Over time, a whole range of methods have been derived that attempt to derive at least estimates of these prices in various ways.

"The value of a thing, if it can be expressed in pecuniary terms, is its price. The price of a thing is determined as a usual price, unless otherwise agreed or provided by a statute." (Civil Code, 2012)

The role of an expert is to provide the court with an independent and neutral assessment based on his expertise. (Bělohlávek, 2011)

In his practice, the expert witness can be confronted with the need for a corporate name valuation, especially in connection with a business enterprise. A corporate name can be one of the determining factors of the cost of a business enterprise, as the client valuating things identifies the entrepreneur or his business enterprise just by the corporate name (Večerková, 2014).

In the Czech Republic, the issue of a business enterprise and a corporate name is regulated by the Civil Code. For an expert witness, the legal background of a corporate name valuation is important, perceived in the concrete context of his individual case and in the context of the economic framework. The relatively recent recodification of private law, which took effect in the Czech Republic since 2014, has brought new possibilities for dispositions with a corporate name in this field. The aim of this paper is within the legal system of the Czech Republic to define legal background of the institute of a corporate name so that it can subsequently result in a reliable valuation by an expert witness.

2 Methodology and Data

The paper deals exclusively with a corporate name as one of the possible brand forms. It focuses only on cases of dispositions with a corporate name; it does not deal with, for example, compensation for damage.

To achieve the aim of this paper, the legal nature of a corporate name and its inclusion in the systematics of the Civil Code were detected. In addition, it was necessary to define within the Civil Code the dispositions to which it could actually be present with the corporate name.

This research assesses the legal nature of a corporate name and its possible dispositions as a legal background for a reliable valuation provided by an expert witness. The analysis is founded on the assumption that the role of an expert witness is to provide the court with an independent and neutral assessment. (Bělohlávek, 2011)

The research approach was developed after an extensive review of academic literature and research on branch and valuation (Aaker, 1996; Bharadwaj et al., 2011; Coopland, 2005; Damodaran, 2008; Dommer at al., 2013; Feldwick, 1996; Himme, Fischer, 2014; Chen, Zhang, 2013; Keller, 2003; Larkin, 2013; Liberman, Herbden, 2012; Kotler, Armstrong, 2015; Raggio, Leone, 2009; Rego et al., 2011; Salinas, Amber, 2009; Shrinivasan, Hanssens, 2009; Simon, Sullivan, 1993; Smith, Richey, 2013; Taylor, 2007).

As the phenomenon under study is complex and explanatory in nature, qualitative data with content analysis proved to be the best way to assess a legal background for a reliable expert valuation. As essential source of secondary data represents Acts of Collection of Laws of the Czech Republic and their Explanatory Memoranda and commentaries on law. Experts witnesses were interviewed to gain primary data.

To achieve the aim of this paper, material regulation of a corporate name in the Czech Republic current legal system was examined. Relevant laws were examined, especially the Civil Code (2012), explanatory memoranda, comments on laws (secondary data). Considering the fact that the subject is an intersection of the law and the area of economics, the methods used for the study were mainly content analysis, deduction, induction, compilation and comparison. The description and method of analogy were used for more advanced considerations.

3 Results and Discussion

The Legal Nature of a Corporate Name

According to the present Civil Code a corporate name is a name under which the entrepreneur is registered in the commercial register. In the case of a legal person it is the name indicated in the forming juridical act. An individual shall register in the

commercial register under the corporate name generally consisting of his name. If his name changes, his former name may continue to be used in the corporate name; however, he shall publish such a change of name. (Civil Code, 2012)

A corporate name must be distinguished from a so-called special designation, typical for restaurants, for example, which is another type of brand, unless it is identical with the corporate name.

Examining the legal nature of a corporate name, we will come to a conclusion, that a corporate name is, within the framework of the Civil Code, a thing in a legal sense (legal abbreviation and hereinafter a "thing"), meeting its definition "everything that is different from a person and serves the needs of people". According to the explanatory memorandum, a corporate name is explicitly included among incorporeal things *("rights whose nature allows it, and other things without corporeal substance"*). A corporate name is a movable thing (all other things except defined immovable things, whether of a corporeal or incorporeal nature, are movable). A corporate name is a non-fungible thing (cannot be substituted with another thing of the same kind) and, finally, non-consumable thing (common use does not consists in its consumption, processing or alienation). The summary of the analysis is shown in Table 1.

Table 1 The legal nature of a corporate name as a thing in a legal sense in the systematics of the Civil Code

	description
Incorporeal thing	rights whose nature allows it, and other things without corporeal substance
Movable thing	is not immovable thing
Non-fungible thing	cannot be substituted with another thing of the same kind
Non-consumable thing	common use does not consist in its consumption, processing or alienation

Source: own elaboration on the basis of the literature research (The Civil Code (2012)).

A corporate name is within the Civil Code a part of a business enterprise (an organized set of assets and liabilities created by an entrepreneur which, based on his will, are used to pursue his activities). A business enterprise is presumed to comprise everything that is typically used for its operation.

By definition, a person who owns a corporate name can only be an entrepreneur, both a legal person and a natural person. Therefore a corporate name is a part of entrepreneur property, belonging to this person as so as *"The totality of what belongs to a person constitutes his property."* (Civil Code, 2012)

A corporate name is rather a property right than a personal right. (Explanatory Memorandum, 2012) The Civil Code differentiates the approach to absolute and relative property rights. Absolute and relative property rights that can be in the systematics of the Civil Code theoretically considered in connection with a corporate name were analyzed, whereas the summary of the analysis is shown in Table 2.

Table 2 Absolute and relative property rights, which can be in the systematics of the Civil Code theoretically considered in connection to a corporate name

Absolute property rights	**Rights in rem**	**Possession**	
		Ownership	
		Co-ownership	
		Rights in rem in things of others	Pledge
		Administration of property of others	
	Law of succession		
Relative property rights	Obligations arising from juridical acts	Transfer of a thing into the ownership of another	Donation
			Purchase
			Exchange
		Relinquishing a thing to be used by another	Precarious loan
			Loan for use
			Lease
			Usufructuary lease
			License
			Loan for consumption
	Obligations arising from torts	Compensation for pecuniary and non-pecuniary harm	
		Abuse and restriction of competition	
	Obligations arising from other legal causes	Unjust enrichment	
		Agency without mandate and the use of a thing of another for the benefit of another person	

Source: own elaboration on the basis of the literature research (Explanatory memorandum of Act No. 89/2012 Coll, The Civil Code. (2012)).

As can be seen from the table, the spectrum of situations where a need for an expert witness valuation may arise is very broad. After this precise definition, this paper will focus only on the basic corporate name dispositions.

Dispositions with a Corporate Name

The elementary option of a corporate name disposition is the acquisition of the right of ownership. The elementary option of the acquisition of the right of ownership in the case of a corporate name is shown in Table 3.

Table 3 Elementary options of the acquisition of the right of a company name ownership

Originary		**Establishment**
Derivative	Transfer	Donation
		Purchase
	Passage	As a result of the death of a physical person
		As a result of the dissolution of a legal person

Source: own elaboration on the basis of the literature research (The Civil Code. (2012)).

To focus on these elementary acquisition options, a need for an expert witness corporate name valuation may arise mainly in the case of a derivative acquisition, although a need of valuation in the case of originary acquisition is also possible, especially in the situation, when name, which shall become a corporate name, does exist before a registration in the commercial register for quite long time and is therefore another form of valuable brand. In any matter, the Civil Code requires a corporate name to be unmistakable, such as there is a prohibition on misleading. Other requirements for a corporate name are set by other laws, such as the Business Corporations Act or the Banking Act.

The transfer of a corporate name will take place either alone or together with the transfer of a business enterprise. In the case of transition, it is probably possible to consider the transfer of a corporate name together with the business enterprise, but the separate transfer of a corporate name cannot be excluded a priori.

It should be borne in mind that the registration in the commercial register is constitutive. Before the registration, there is no corporate name, but it is a different designation, which is not the subject of this paper. Thus, titulus of the transfer is the contract, the decision about the application for entry in the commercial register and its implementation is a modus.

It is also essential for this issue that a corporate name uses legal protection (beyond which it may still be protected by, for example, a trademark), with the help of means of protection against unfair competition. Special rules apply in this case for so-called business groups.

A person who acquires a corporate name has the right to use it subject to the consent of his predecessor or the legal successor thereof; however, he is required to attach to the corporate name information indicating legal succession.

In addition to situations of corporate name acquisition, it is also possible to consider cases of transfer of usable rights to a corporate name belonging to another, e.g. in the case of franchise (Skalický, 2015). As the most appropriate, licensing for the corporate name appears to be the case here. According to Večerková (2014), a procedure analogous to that of the grant of a trademark license should be applied in such a case. This will be particularly practical if the entrepreneur's corporate name is identical to its trademark and both intend to provide it to another entrepreneur. Some authors, however, believe that the provision of a corporate name is in use for example by a license agreement and is not possible because the deletion of a corporate name from the commercial register will terminate it and consequently all the rights of the entrepreneur to a corporate name (srov. Knoblochová, V., Lavrushin, K, 2016).

Therefore, an entrepreneur has only one corporate name within the framework of the Civil Code (even though he may have more business enterprises). Thus, if an entrepreneur transfers a corporate name to another, he can no longer use it on his own, and vice versa, if an entrepreneur acquires a new corporate name, he cannot retain his original one.

For an expert witness, this issue is important because his valuation can be significantly determined whether, for example, in the case of a sale of a corporate name, the buyer can provide the corporate name with another or not. The author of this paper believes that theoretically it is necessary to admit this possibility, but the practical implementation prevents the way of entry in the commercial register. If it would be possible to synchronize the registration and deletion of a corporate name to the same moment with two entrepreneurs at the same time, licensing a corporate name would not hinder anything. However, in view of the current practice of the registry courts, this is practically excluded for the time being.

4 Conclusions

A corporate name is one of the forms of the brand. After the recodification of Czech private law, the possibility of dispositions with a corporate name expanded (the transfer of a corporate name was not possible under previous legal regulation), thus creating a requirement for an expert witness to be able to find the reliable corporate name value. For this purpose, the expert witness needs to know the legal nature of a corporate name, to include a corporate name in the system of the Civil Code and to have an idea of the situations with which the corporate name can take place and of their possible limitations or confusion in their interpretation.

In the context of a corporate name and the requirement of its valuation, an expert witness can be confronted with a variety of situations. This paper only dealt with dispositions with a corporate name.

Firstly, the legal nature of a corporate name as a thing in a legal sense has been determined with its inclusion in the system of the Civil Code. The result was summarized in Table 1. Furthermore, absolute and relative property rights within the framework of the Civil Code were defined, which can be considered in real terms in relation to a corporate name. The results are summarized in Table 2. The following options have been selected and Table 3 summarizes the basic options that can be found under the Civil Code and corporate name be acquired.

The paper also deals with the possibility of transferring a corporate name to another, for example, under a license agreement where the professional public does not entirely agree on whether such a situation can be realized with a corporate name.

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The Development of the Excise Gap on Mineral Oils: Recent Evidence from Slovakia

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Abstract: *Tax evasion and avoidance are both phenomena that are probably as old as taxation itself. Wherever and whenever authorities decide to levy taxes, individuals and firms try to avoid paying them. Though this problem has always been present, it becomes more pressing in the course of globalization as this process extends the range of opportunities to circumvent taxation while simultaneously reducing the risk of being detected. In recent years, an increasing numbers of tax authorities have attempted to estimate the amount of tax that is legally owing to their government but not collected. This amount is commonly referred to as "tax gap" which is the difference between the theoretical tax liability due in accordance with the tax legislation and the actual revenue collected. The aim of this paper is to analyse the collection efficiency of the excise duty on mineral oils in Slovakia.*

Keywords: Indirect taxes, Excise duty collection, Excise gap on mineral oils

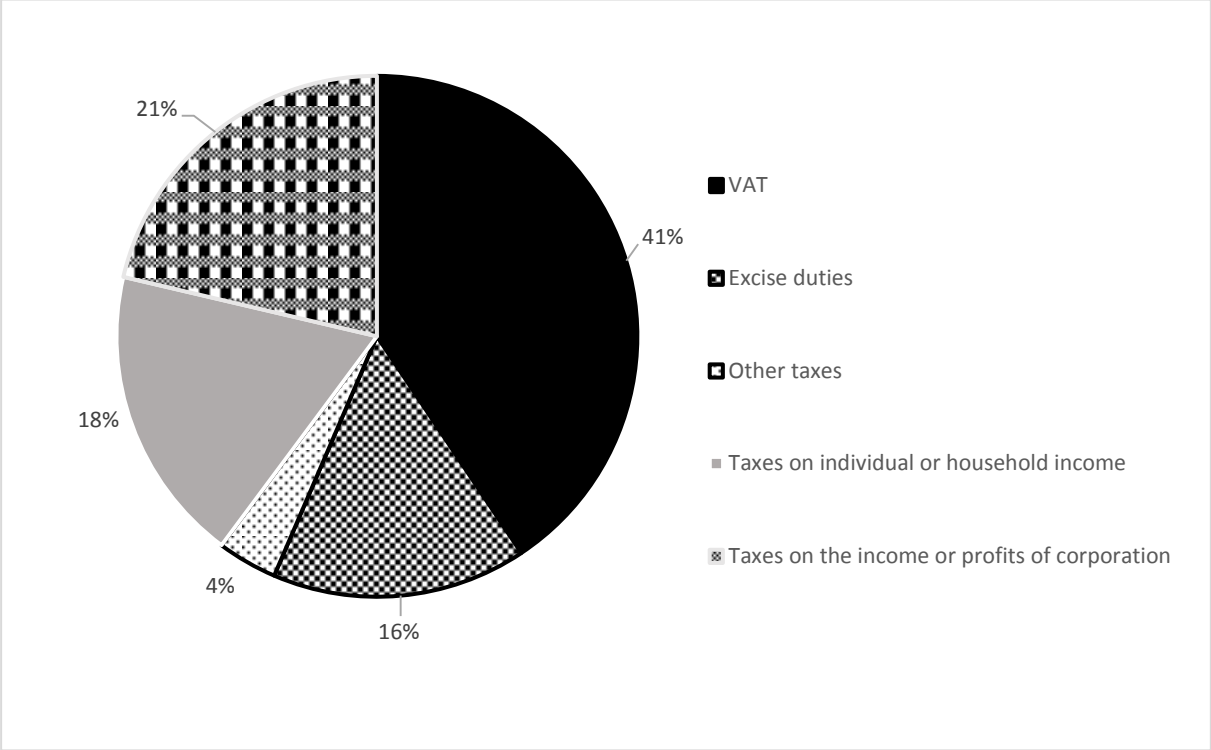
JEL codes: H26, H29, H39

1 Introduction

Excise duties are indirect taxes on the consumption or sales of specific products. Excise duties are collected for fiscal reasons but they are also intended to promote social and health policy objectives as well as environmental and energy policy goals. In contrast to the Value Added Tax (VAT), excise duties are mainly specific taxes, i.e. expressed as a monetary amount per quantity of the product. Typical examples of these "excise" goods and services include alcohol, tobacco, fuel and gambling, where the perceived negative externalities of their consumption are given as justification for the payment of a special tax.

While the most common explanation for these excise duties is that they compensate the social costs of the consumption of these harmful commodities, they also provide an important and sizeable source of revenue for national budgets (Roštárová, Janać, 2014). These two reasons both contribute to the general consensus among national states and international organizations that excise duties should remain in place and the imposed rates could potentially be increased (Semerad, David, 2015).

Figure 1 Tax structure in Slovakia (2015)



Source: Financial Administration of the Slovak Republic

The excise gap, as defined in our paper, is the difference between potential revenue and actual revenue for a given excise. Under this broad definition, the excise gap can be separated into two main components: the impact of non-compliance (the compliance gap) and the impact of policy measures (the policy gap). We have identified the tax gap using top-down approach, as the difference between total (potential) petrol and diesel consumption and the actual tax revenue collected by the Financial Administration of the Slovak Republic.

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 Market environment

Excise duties are product-specific, which means that the amount of duties paid is based on the number of products consumed in taxable use or products supplied for taxable use. EU legislation on excise duties was largely prompted by the launch of the Single Market in 1993. As tax controls at the borders between Member States were abolished, common rules were needed to facilitate cross-border trade in certain products and to prevent competitive distortions (Rentková, Panevski, 2017). There are two types of excise duty in the European Union: excise duties that have been harmonised by directives and excised duties that are set by individual Member States. Harmonisation means that the products are subject to excise duty in all EU Member States and that minimum tax rates have been set for these products.

The harmonised excise duties are as follows:

- Excise duty on tobacco products
- Excise duty on alcohol
- Excise duty on liquid fuels

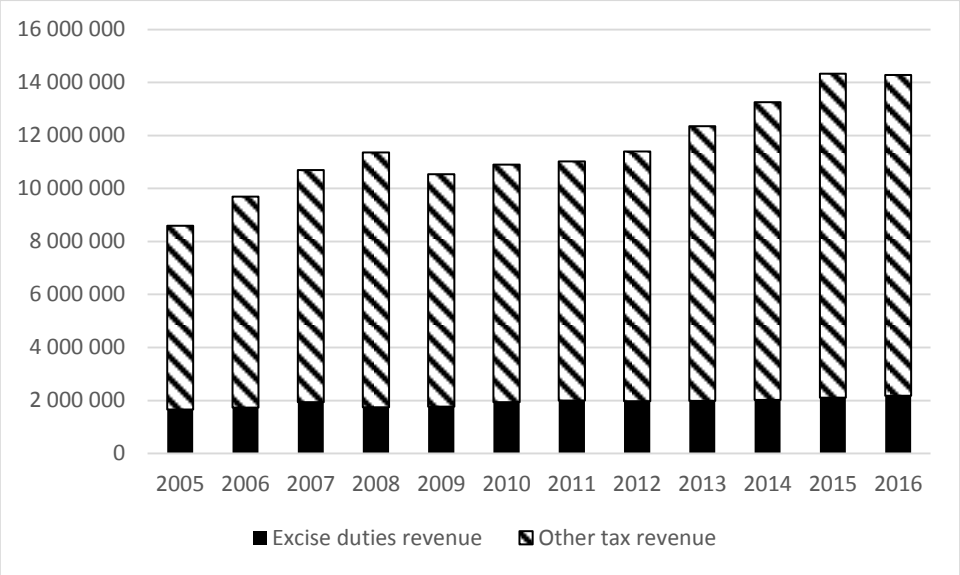
- Excise duty on electricity and certain fuels.

National excise duties and tax-like charges:

- ✓ Excise duty on soft drinks
- ✓ Excise duty on beverage containers
- ✓ Waste tax
- ✓ Oil waste duty
- ✓ Oil damage duty
- ✓ Strategic stockpile fee.

In 2016, a total of EUR 2,174 billion in excise duties were collected in Slovakia. The largest excise tax bracket includes energy taxes, with a total tax revenue of EUR 1,194 billion in 2016. Economically significant tax brackets also include the excise duty on tobacco products and the excise duty on alcohol and alcoholic beverages (Eurostat, 2017).

Figure 2 Tax revenue and excise duties revenue (thousand of EUR)

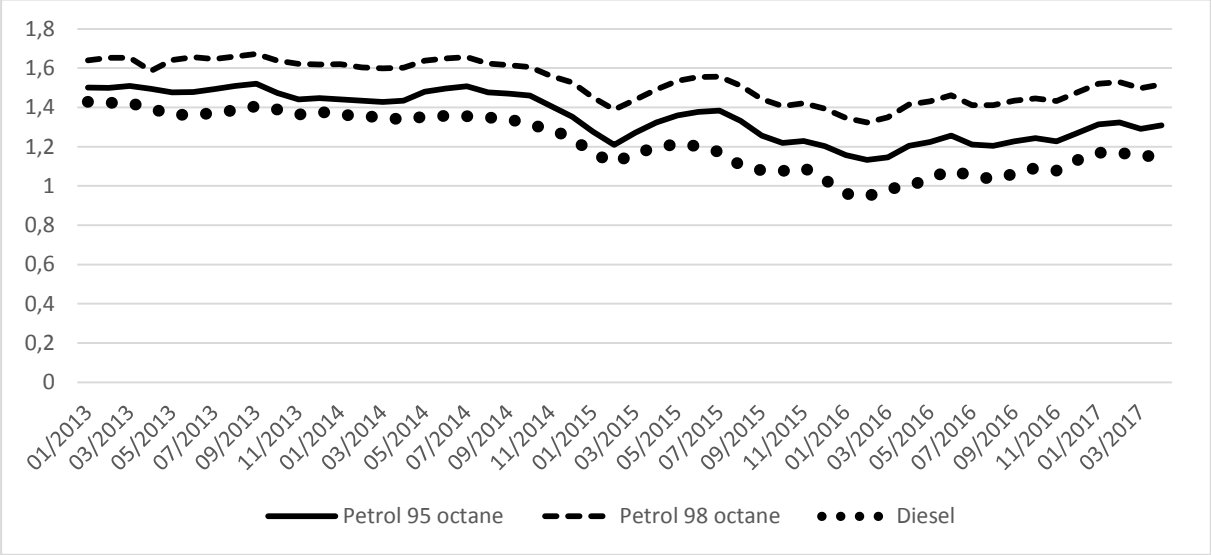


Source: Eurostat

The excise duty on liquid fuels is levied on motor and heating fuels, such as petrol, diesel oil, light and heavy fuel oil, biofuels, liquefied petroleum gas and jet fuel. Oil waste duty is levied on lubricating oils and preparations to cover the expenses arising from the treatment of oil waste. Motor and heating fuels are exempt from the oil waste duty as they do not generate oil waste. The oil damage duty is levied on oil which is imported into or transported through Slovakia and which is subject to oil damage duty.

The fuel industry in Slovakia is highly regulated and generally compliant with its obligations. A small number of clients dominate the fuel industry. They account for the majority of excise and duty collections. Monitoring strategies identify large-scale non-compliance, helping to keep the gap smaller. Figure 3 represents average fuel prices in Slovakia from 2013 to 2017 in EUR per litre. It shows that the average prices slowly decreased over this period (Statistical Office of the Slovak Republic, 2017).

Figure 3 Average fuel prices in Slovakia



Source: Statistical Office of the Slovak Republic

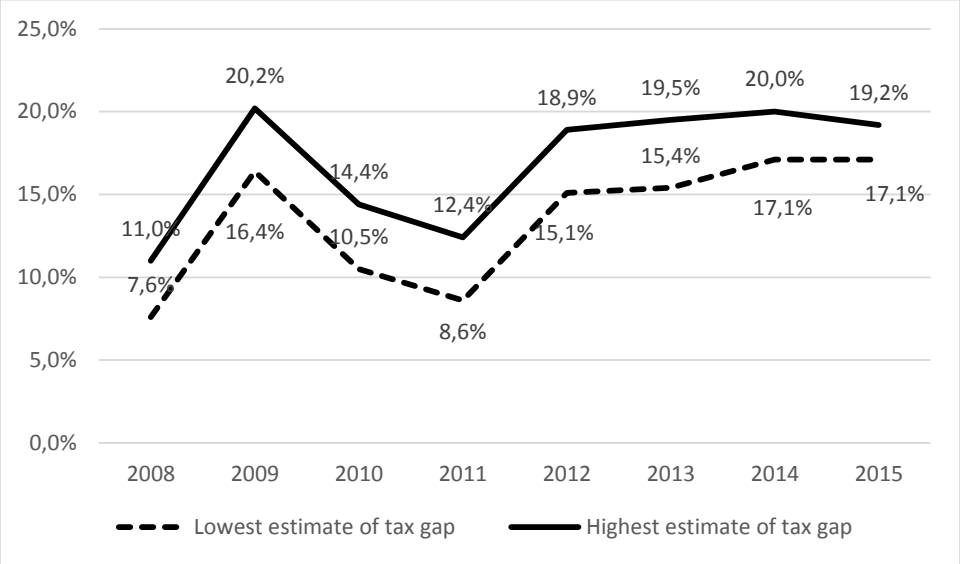
3 Methodology and Results

All tax systems will have a tax gap. It is inevitable that there will be some differences between the planned tax take and what actually comes in. There are many opinions, across the world, on the best way in which to provide robust estimates on the scale of the tax gap (IMF, 2017). Apart from numbers produced by individual countries, some of these come from academic studies by economists and statisticians, some from campaigning groups, and some from official bodies such as the Financial Administration of the Slovak Republic.

One way of describing the tax gap is to call it the difference between actual and anticipated tax revenues. Put like this it seems simple but, in fact, it is full of pitfalls and dispute over what certain terms mean, consequently it is hard to get universal acceptance of any number. It is worth stressing that calculating the tax gap is more of an art than a science. It requires the use of judgements, estimates and assumptions. So it is seems unlikely that there will be a consensus on the final figures.

We have identified the tax gap using top-down approach, as the difference between total (potential) petrol and diesel consumption and the actual tax revenue collected by the Financial Administration of the Slovak Republic. The Figure 4 below shows the trend in duty gap over the period 2008-2015.

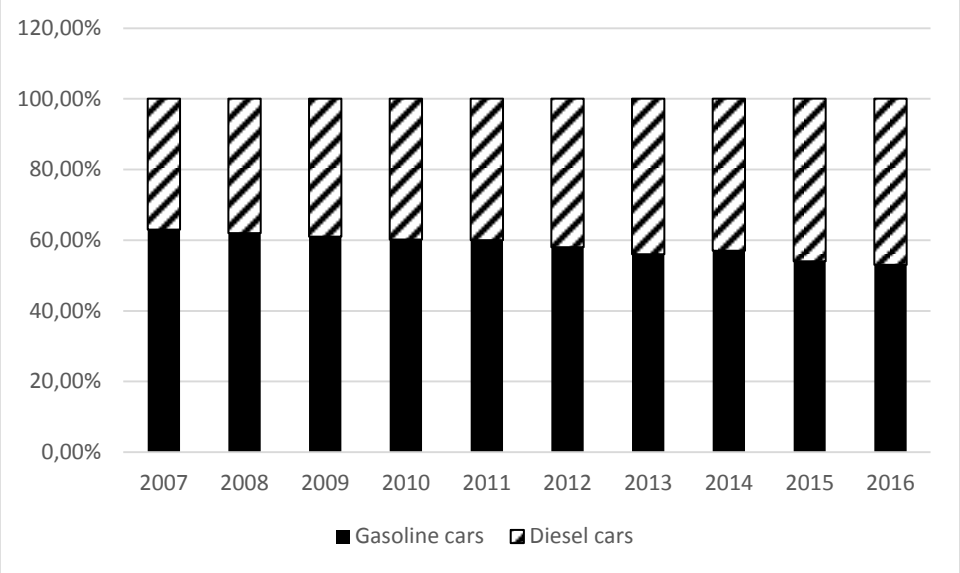
Figure 4 Lowest and highest tax gap estimation



Source: Author's calculations

The upper and lower estimates corresponding to confidence intervals indicate the range where the true value of the illicit market may lie and arises because of random sampling error and the uncertainties associated with model input data. For example, to estimate total fuel consumption we use estimates of how many kilometres are driven in total by different types of vehicle on different types of road and estimates of fuel efficiency corresponding to those journeys, as we cannot directly observe how much fuel is used in a year (Ministry of Transport and Construction of the Slovak Republic, 2017, Ministry of Interior of the Slovak Republic, 2017).

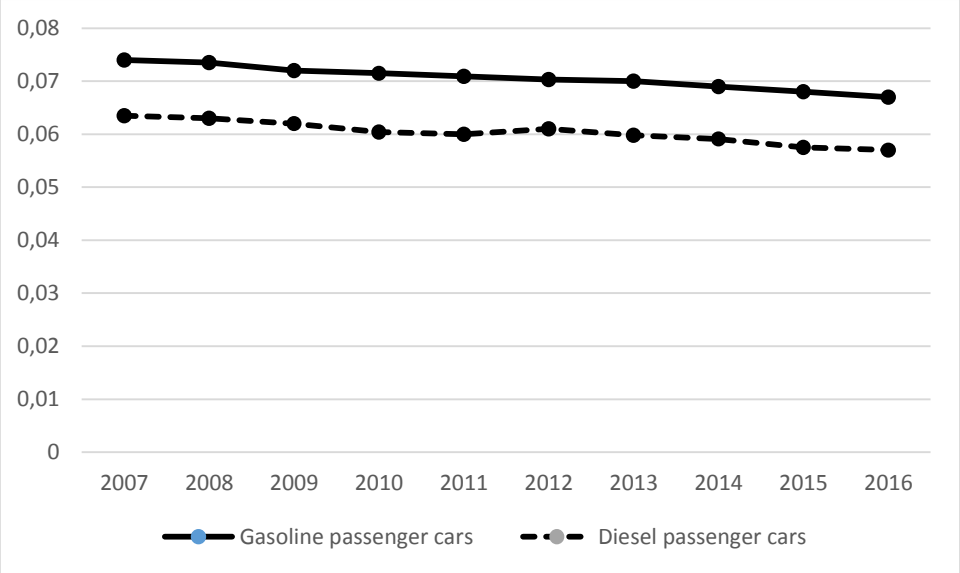
Figure 5 Gasoline cars and diesel cars in Slovakia



Source: Ministry of Transport and Construction of the Slovak Republic

If our estimate of distance travelled is too high or too low, or our estimates of fuel efficiency are too generous or too conservative, this will have an impact on the tax gap. The confidence intervals reflect the uncertainty in model inputs such as these.

Figure 6 Fuel consumption



Source: Ministry of Interior of the Slovak Republic, author's calculations

Due to the methodologies used, all tax gap estimates are subject to error, are uncertain and can change from year to year due to improvements in method and data updates (Vossler, McKee, 2017). The main sources of error are systematic errors in the assumptions used to calculate the estimates and sampling errors in the data used. The methodologies used to calculate tax gaps are subject to regular review which could result in revisions to any of the published estimates (Kuchumova, 2017).

4 Conclusions

The tax gap covers a range of behaviours which include: the tax that is lost through non-payment, use of avoidance schemes, the interpretation of the tax effects of complex transactions, error, failure to take reasonable care, evasion, the hidden economy and criminal attack on the tax system (Šlahor, 2015).

Excise tax gap is estimated using a top-down approach by comparing consumption expenditure data with tax receipts. At first, independent, external data on consumption is used to estimate tax base. Next, this tax base is used to calculate a theoretical value of tax that should be collected. As the last step, the actual amount of tax collected is subtracted from this theoretical value to estimate the tax gap.

Excise duties make a significant contribution to Slovakia government revenues. In 2014-2016, the duties levied on fuel, tobacco and alcohol raised EUR 170 million, comprising approximately 15 % of total receipts (MF SR, 2016). However, the future of these taxes is uncertain. Revenues from existing duties are set to decline in coming years, and new planned and proposed regulations, such as plain packaging for cigarettes and minimum pricing for alcohol, would likely to act to accelerate this process if enacted.

Based on the data presented in this paper, we can draw the following two fundamental conclusions:

- Our results suggest that the tax gap has increased between 2011 and 2015.
- The more information one has on the taxation basis from sources other than the taxpayers themselves, the smaller the scope for errors.

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Analytical view on performance evaluation of service enterprises

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Abstract: *Recently, there have been several changes in performance measurement approaches as well as in the application of performance evaluation methods and tools. In the past, business performance was evaluated using a profit margin, later evaluated by profit maximization and various profitability indicators. Currently, the main indicator of performance and competitiveness measurement is the Economic Value Added indicator, which is an important benchmark for determining value added for owners. The aim of our paper is to find out and identify key performance indicators of service enterprises and their mutual influences by applying selected mathematical and statistical methods. To evaluate performance, 55 financial indicators have been selected, divided into 7 groups. Key performance indicators have been identified by selected mathematical and statistical tools to uncover the interrelationships and links between selected financial indicators and the Economic Value Added indicator, which is a modern tool for evaluating the performance and competitiveness of enterprises. The contribution of the paper is to identify the key determinants of the performance and competitiveness of service enterprises and to identify strengths and weaknesses in the area of financial performance assessment and competitiveness for the service sector.*

Keywords: Financial indicator, Economic Value Added, performance

JEL codes: M210, G300

1 Introduction

Performance as an economic category is a complex issue with a differentiated approach to its measurement and evaluation. Measuring the performance of an enterprise is nowadays a very topical issue. In its historical development it has passed from the normal reporting of profit margins through profit maximization, various types of profitability indicators and up to the criteria for achieving value for owners. The traditional way of tracking the performance of enterprises based on assessment of their ability to achieve desired financial indicators - profits, turnover or market share. The enterprise is ranked as powerful when it reaches the planned financial results.

By Kislingerová et al. (2011), the performance evaluation is traditionally carried out in three ways: evaluation by a set of indicators usually of five evaluation areas, namely liquidity, activity, capital structure, profitability and market value; evaluation by a set of indicators that are arranged in a pyramidal breakdown products; evaluation using a single aggregate indicator that is the synthesis of partial indicators and other statistical data into one unit, which is one of prediction models.

The latest approaches to performance are aimed at assessing the level of the production system functioning, where it is necessary to measure the effectiveness of the

transformation process and to implement for the measure except for financial indicators also the indicators of effectiveness and severity (Hyránek et al., 2014). Key tool in increasing the overall economic performance of the enterprise in the selected Slovak industries seems to be employing a system of strategic performance management of the firm, supported by a knowledge-based Business Intelligence Information System (Rajnoha et al.,2016).

Stewart (1991) defines the economic value added (EVA) by a simple wording "EVA is a residual income that remains after, when the operating profit covers the full cost of capital."

Economic value added, unlike accounting profit, also reflects the levels 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 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. (Neumaierová and Neumaier, 2016, s. 503)

Several authors such as Neumaierová and Neumaier (2002), Marinič (2008), Mařík and Maříková (2005), Petřík 2009, Kiseľáková et al., (2016), Wagner (2009), describe methods for the calculation of EVA indicator have a few modifications:

- the *method of entity* (ie. the gross method, the method of Capital Charge),
- *the equity method* (ie. the net method, the Value Spread),
- *the method APV - the present value* (*Adjusted Present Value Approach).*

Although the method of Capital Charge is considered the most accurate method of calculating the economic value added in the Slovak legislation more appropriate seems to be Value Spread method. The essence of this method is to compare the Return of Equity (ROE) with the Cost of Equity (re). The difference between these two values is called value spread (Value Spread). By Mařík and Maříková (2005, p. 365), in spite of the declared, generally most used method is entity method.

Recently, when evaluating enterprise performance relative indicators EVA are coming to the fore that are gaining higher information value compared to the absolute indicator.

Equity method

The calculation of the EVA equity indicator represents the return on equity, which is reduced by equity and equity costs. The basic relationship for the EVA equity estimate states (Damodaran 2010) as follows:

$$\text{EVA equity} = (\text{ROE} - \text{r}_\text{e}).\text{E} \quad (1)$$

ROE – Return of Equity, r_e – alternative costs of Equity, E - Equity

Entity method

The calculation of economic value added according to the EVA method represents the difference between the achieved NOPAT (Net Operating Profit After Taxes) and the average cost of capital, multiplied by the total invested capital. Below we describe the EVA calculation formula by Mařík and Maříková (2005):

$$\text{EVA entity} = \text{NOPAT} - \text{WACC} \times \text{C} \quad (2)$$

NOPAT – Net Operating Profit, WACC – alternative costs of Equity, C – Capital (Equity + Debt)

Capital represents the value of all the financial resources invested by the investors. The calculation of the volume of invested capital can take place in two ways, either from the operational point of view through the assets (assets) or financially through the liabilities. The conversion of the amount of capital invested through assets is the sum of fixed assets (long-term operating assets at residual prices) and working capital. The

calculation of invested capital through liabilities is equal to the amount of the carrying amount of equity and interest bearing liabilities. The calculation in both ways is the same because the balance principle applies (Kislingerová et al., 2011).

APV method

In the adjusted current value (APV) approach, we start with the value of the company without debt. If we add company debt, we think about the overall impact on value by considering the benefits and costs of loans. The value of a company that finances its operations through borrowing can then be estimated at different levels of debt, and the level of debt that maximizes the firm's value is the optimal credit risk. The credit value of an enterprise is not a function of the expected leverage and can be estimated as described in the previous section by discounting the enterprise's free cash flows to capital costs. In fact, if the company does not want to estimate this value and is willing to assume that the current market value of the firm is right, it could leverage the value of the firm with a long deduction from the tax benefit and adding the expected bankruptcy costs from the existing debt (Damodoran 2012). Following is the concept of calculation in the adjusted enterprise current value approach:

$$\mathrm{EVA\,APV} = \mathrm{NOPAT} - \mathrm{r_e} \times \mathrm{NOA} \tag{3}$$

NOPAT – Net Operating Profit, r_e – alternative costs of Equity, NOA – Net Operating Assets

For an enterprise, it is required to have the positive value of EVA indicator and the positive "spread" that means the difference ROE and re. Positive value is the fact that an enterprise generates economic gain and produces value for owners. Otherwise, i.e. if the negative value of the indicator is reached, that means the cost of capital is higher than the return, the enterprise does not create a value for shareholders.

2 Methodology and Data

The paper working-out was based on secondary data from the financial statements of the selected service enterprises that we obtained from publicly available data from the financial statements register. The selection file consisted of 80 Slovak service enterprises and their structure was the following 44 hotel companies and 36 travel operators and agencies for period 2013 - 2015. We removed the enterprises from the sample, which had a negative net profit.

The performance of analyzed service enterprises was evaluated by EVA indicator, which has several modifications and for our realized analysis we chose the indicator EVA - equity and applied the following relationship (1). We have chosen top indicator EVA as the synthetic indicator, in the design of the ratio indicator EVA_{ROS}. This choice can be justified by the fact that all the indicators entering correlation analysis are proportional, so the top synthetic indicator is ratio indicator. There are several models to determine the equity costs as CAPM (Damodaran 2010), a complex modular model (Neumaierová and Neumaier 2002).We applied the same method as Neumaierová and Neumaier (2016) namely the INFA methods, which is also used by the Ministry of Industry and Trade of the Czech Republic.

As other analyzed parameters there were selected financial indicators (55), which were divided into 7 groups:

- the group of liquidity ratios (**Liquidity & Cash Flow**)
  Quick Ratio (L1) Current Ratio (L2), Total Ratio (L3) Security Indicator (L4), solvency (F1), financial return on assets (F2), financial profitability of equity (F3), degree of de-commitment (F4), loan repayment rate (F5), financial interest coverage (F6),
- the group of activity and stability indicators (**Activities & Stability**)

Turnover of Receivables (A1), the Turnover of Short-term Liabilities (A2), Stock Turnover (A3), Cash to cash (A4), Debt Ratios (A5), the Stability of the company (S1),

- the group of profitability indicators (**Profitability**)
  Return on Assets ROA (P1), Return on Equity ROE (P2), Return on Revenues ROR (P3), Return on Sales ROS (P4), Return on Costs (P5), Return on Investment (P6), Return on Long-term Assets (P7) Return on Value Added (P8), Return on Personnel Costs (P9), Share of Total Revenue to Total Capital P(10),
- the group of cost indicators (**Intensity**)
  Total Cost Ratio (I1), Manufacturing - consumer Cost Ratio (I2), Personnel Cost Ratio (I3), Depreciation Cost Ratio (I4), Financial Cost Ratio (I5), Material Cost Ratio (I6), the Economic Cost Ratio (I7),
- the group of efficiency indicators (**Effectiveness**)
  Cost Effectiveness (E1), the Effectiveness of Operating Expenses (E2), the Efficiency of Assets (E3), the Effectiveness of Long-term Assets (E4), the Efficiency of Inventory (E5), the Effectiveness of Debt Capital (E6), the Effectiveness of Equity (E7), Material Efficiency (E8),
- the group of commitment indicators (**Commitment**)
  Committed Assets (C1), Committed Long-term Assets (C2), Commitment of Stocks (C3), Committed the Debt Capital (C4), Committed Equity (C5),
- the group of value added tax indicators (**Value Added**)
  the Share of Value Added in Sales (VA1), the Share of Value Added in Total Revenues (VA2), Financial Productivity through Added Value (VA3).

Correlation analysis was the tool to reveal the interrelations between indicators for assessing the performance of the Slovak services enterprises EVA_{ROS} and the selected financial indicators and from the statistical tools there was Kendall tau's test (τ) used. MS Excel 2007 and program STATISTICA was used for processing the interrelations.

3 Results and Discussion

To meet the objective, which was to identify the key performance indicators, it was necessary to construct a correlation matrix. Performance in this matrix was quantified by ratios EVA_{ROS}, which is more meaningful than absolute EVA indicator. This indicator provides the new perspective to measure enterprise performance, while identifying key indicators that determine the creation of added value for shareholders. In the next part of the paper we deliver the results of correlation analysis, into which 55 selected financial ratios were included to confirm statistically significant dependencies on the indicator EVA_{ROS}. Of the 55 indicators analyzed, statistically significant dependence on the EVA_{ROS} indicator was confirmed for 32 indicators.

The Liquidity & Cash Flow indicator group was first analyzed. The mutual statistically significant dependence was confirmed among the 4 selected indicators from the Cash Flow group and the EVA_{ROS} indicator, and only for solvency (F1) and the Degree of de - commitment (F4) indicator the statistically significant dependence was not confirmed. In the Liquidity indicator group, statistically significant dependence between any liquidity indicators and the EVA_{ROS} indicator was not confirmed.

Table 1 Correlation among EVA_{ROS} and indicators of Cash Flow

	Correlation EVA_{ROS} a indicators of CASH FLOW $p < 0.05$ N=158			
VARIABLE	**F2**	**F3**	**F5**	**F6**
EVA(ROS)	0.2205	0.1599	-0.1422	-0.1131
	p=0.00	p=0.003	p=0.008	p=0.036

Source: own processing in software STATISTICA

Indicator Financial Return on Assets (F2), reached the highest positive dependence (0.2205) within this group and F4 - Loan repayment rate on the other hand, the highest negative dependency (τ = - 0.1422).

The second set of indicators were the indicators of Activities and Stability. For this group of indicators we can state that there is not one statistically significant dependence on the EVA_{ROS} indicator. These results show that, within the second set of indicators analyzed, it was not possible to identify a key performance indicator.

The third set of indicators analyzed were Profitability indicators, with a statistically significant positive dependence on the EVA_{ROS} for all indicators from the group of 10 indicators. The highest positive impact on the EVA_{ROS} indicator has P1 - ROA and P6 - ROI (τ = 0.3711) and the lowest P10 - Share of Total Revenue to Total Capital Ratio. None of the analyzed indicators from the Profitability group showed a negative relationship with the EVA_{ROS} indicator.

Table 2 Correlation among EVA_{ROS} and indicators of Profitability

	Correlation EVA_{ROS} and indicators of PROFITABILITY p < 0.05 N=158									
Variable	**P1**	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**
EVA_{ROS}	0.3711	0.2154	0.2726	0.2724	0.2728	0.3711	0.2314	0.3418	0.3508	0.1423
	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.00	p=0.008

Source: own processing in software STATISTICA

For cost indicators, a statistically significant dependence, but indirectly proportional to the EVA_{ROS}, was confirmed for all indicators except for I5 - Financial Costs Ratio (t = 0.1604), where the positive dependence was shown and the I2 - Manufactoring - consumer cost Ratio as the only one of this group of indicators did not reach statistically significant dependence (p = 0.1443). Cost is one of the two important factors that determine the performance of an enterprise, so this dependence is significant. The strongest dependency was confirmed in the Total Cost Ratio (I1), but also in the Depreciation Cost Ratio (I4) and Material Cost Ratio (I6).

Table 3 Correlation among EVA_{ROS} and indicators of Intensity

	Correlation EVA_{ROS} and indicators of INTENSITY p < 0.05 N=219					
Variable	**I1**	**I3**	**I4**	**I5**	**I6**	**I7**
EVA_{ROS}	-0.2576	-0.1744	-0.2425	0.1604	-0.1952	-0.1165
	p=0.00	p=0.001	p=0.00	p=0.003	p=0.00	p=0.03

Source: own processing in software STATISTICA

In analyzing and identifying key performance indicators, it was necessary to focus on the choice of indicators determining the performance of an enterprise, both on input and on output. We also applied Effectiveness in our analysis. In this group of indicators 8 were included, only 5 of which had a statistically significant positive dependence and E5 - Efficiency of Inventory (p = 0.1446), E6 - the Effectiveness of Debt Capital (p = 0.1043) and E7 - The Effectiveness of Equity (p = 0.3939), the dependence on the EVAROS indicator was not confirmed. Statistically significant dependencies were achieved in the case of both Efficiency (E1) and Material Efficiency (E8).

Table 4 Correlation among EVA_{ROS} and indicators of Effectiveness

	Correlation EVA_{ROS} and indicators of Effectiveness p < 0.05 N=158				
Variable	**E1**	**E2**	**E3**	**E4**	**E8**
EVA_{ROS}	0.2576	0.1165	0.1423	0.1310	0.1952
	p=0.00	p=0.00	p=0.008	p=0.015	p=0.030

Source: own processing in software STATISTICA

An important branch that determines the performance of an enterprise is the chain of ownership of assets and resources. In this group of 5 indicators, a statistically significant negative relationship between the 4 of the group and EVA (ROS) indicators was confirmed. Only the C4 - Committed the Debt Assets indicator was not confirmed a statistically significant dependence, because in this case it reached p = 0.2239, which was more than the level of significance α = 0.05. The most severe negative dependence on the EVA indicator (ROS) was confirmed by the C5 - Committed Equity Ratio.

Table 5 Correlation among EVA_{ROS} and indicators of Commitment

	Correlation EVA_{ROS} and indicators of Commitment p < 0.05 N=158			
Variable	**C1**	**C2**	**C3**	**C5**
EVA_{ROS}	-0.1217	-0.2202	-0.1606	-0.2998
	p=0.00	p=0.00	p=0.003	p=0.023

Source: own processing in software STATISTICA

Finally, we analyzed indicators based on added value, as the added value is the bearer of the company's personnel performance. We can confirm the statistically significant dependence between these indicators and the EVA_{ROS} indicator. The strongest negative dependency was identified for the value-added indicator of the Share of Value Added Value in Total Revenues (VA2) and the statistically positive dependence on the EVA_{ROS} indicator for the Productivity Value through Value Added (VA3) indicator.

Table 6 Correlation among EVA_{ROS} and indicators of Added Value

	Correlation EVA (ROS) and indicators of Added Value p <0.05 N=158		
Variable	**VA1**	**VA2**	**VA3**
EVA_{ROS}	-0.1128	-0.1300	0.1305
	p=0.035	p=0.015	p=0.015

Source: own processing in software STATISTICA

The following table summarizes the indicators that have the confirmed statistically significant dependence with the EVA_{ROS} indicator.

Table 7 List of indicators correlating with EVA_{ROS}

Group of indicators	**Name of indicators**									
LIQUIDITY & CASH FLOW	**F2**	**F3**	**F4**	**F5**						
Kendall tau (τ)	0.2205	0.1599	-0.1422	-0.1131						
ACTIVITY & STABILITY										
PROFITABILITY	**P1**	**P6**	**P9**	**P8**	**P5**	**P3**	**P4**	**P7**	**P2**	**P10**
Kendall tau (τ)	0.3711	0.3711	0.3508	0.3418	0.2728	0.2726	0.2724	0.2314	0.2154	0.1423
INTENZITY	**I5**	**I7**	**I3**	**I6**	**I4**	**I1**				
Kendall tau (τ)	0.1604	-0.1165	-0.1744	-0.1952	-0.2425	-0.2576				
EFFECTIVENESS	**E1**	**E8**	**E3**	**E4**	**E2**					
Kendall tau (τ)	0.2576	0.1952	0.1423	0.1310	0.1165					
COMMITMENT	**C5**	**C2**	**C3**	**C1**						
Kendall tau (τ)	-0.2998	-0.2202	-0.1606	-0.1217						
ADDED VALUE	**VA3**	**VA2**	**VA1**							
Kendall tau (τ)	0.1305	-0.1300	-0.1128							

Source: own processing

Based on the Table 7 above, we chose from each group one key indicator that had the highest positive or negative dependence on the analyzed EVA_{ROS} indicator. No indicator

was selected from the Activity & Stability group because our analysis did not confirm statistical significance in either case.

Key business performance indicators of service enterprises of our choice include:

- **F2 - Financial Return on Assets** as a representative of the profitability indicator with the cash flow application,
- **P1 - Return on Assets (ROA)** as a representative of the company's production power,
- **I1 -Total Cost Ratio** as one of the inputs to the enterprise, which also ensures the determination of performance by financial costs,
- **E1 - Cost Effectiveness** as output Indicator from Enterprise,
- **C5 - Committed Equity** as counterpart to equity and input indicator,
- **VA2 - the Share of Value Added in Total Revenues** as a profit potential indicator.

The above-mentioned key performance indicators could be appropriate input indicators for creating an Enterprise Performance Model that would assess the performance of Slovak service enterprises.

4 Conclusions

In this paper we addressed the analysis and identification of key performance indicators of the selected Slovak services enterprises through selected statistical methods - correlation analysis.

For the analysis, 55 ratios were selected, divided into 7 groups, each group containing a different number of indicators. The Liquidity & Cash Flow Group consisted of 4 liquidity indicators and 6 indicators in which the cash flow indicator was applied. The Activity & Stability Group included 5 activity indicators and 1 Stability indicator. The most numerous group was the Profitability indicator group, where up to 10 different profitability indicators were selected. The Intensity Indicators Group was composed of 7 indicators, a set of indicators of Effectiveness of 8 indicators, and 3 indicators were selected in the last Value Added Group.

The total number of indicators for which statistically significant dependence was confirmed with the EVA_{ROS} indicator there were 32. Of these indicators the direct proportional dependence was confirmed for the 19 indicators and for the 13 indicators the indirect dependence with EVA_{ROS} was confirmed.

Finally, correlation analysis of all analyzed enterprises was elaborated, namely those with positive but also the negative value of the indicator EVA_{ROS}. The total number of the indicators for which statistically significant dependence with the indicator EVA_{ROS} was confirmed is 32. Of these indicators are the directly proportional dependence was confirmed in the case of 19 indicators and at 13 there was confirmed inversely proportional dependence with EVA_{ROS}.

From the 55 selected financial indicators applying correlation analysis we have identified the following 5 key financial performance indicators of the service enterprises: Return on Assets (P1), Cost Effectiveness (E1), Financial Return on Assets (F2), Committed Equity (C5), Total Cost Ratio (I1) and the Share of Value Added in Total Revenues (VA2), that positively or negatively affect the indicator EVA_{ROS} belonging to modern tools for assessing enterprises performance.

The above-mentioned key performance indicators could be appropriate input indicators for creating an Enterprise Performance Model that would assess the performance of Slovak service enterprises.

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Determination of Revenue Potential of Financial Transaction Tax and its consideration as own resource of the EU budget

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Abstract: *Although the responsibility for realizing the Europe 2020 strategy is shared between the EU and its 28 member states, the main criticism of the current EU budget relates to the lack of a link between the budget and Europe 2020 strategy. Therefore a new budget design as well as alternative revenue sources is currently explored within a mid-term review. One of the possible candidates is a Financial Transaction Tax (FTT). To research FTT revenue potential, a model based on a remittance system was designed. We analyze full or partial replacement of VAT- and GNI-based own resources by the transfer of the tax revenues from a FTT raised on a national level to the EU budget. Our research revealed that the introduction of a FTT would be able to fully replace VAT-based own resources (except of variant B and E). In the case of GNI-based own resources, the full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved.*

Keywords: Sustainability, funding, FTT, European Union, budget

JEL codes: H25, H61

1 Introduction

The idea about taxation of financial market usually came after economic crisis. The last one came after the economic and financial crisis in 2008. The European Commission (2011a-e) assumes that taxes could enhance the efficiency and stability of financial markets and reduce their volatility and the harmful effects of excessive risk-taking which can create negative externalities for the rest of the economy. Therefore, the European Commission published a draft of a directive introducing a common FTT system in September 2011. However, the proposal was rejected, and eleven EU member states started to negotiate its introduction through enhanced cooperation based on the Article 20 of the Treaty on the EU and Articles 326 and 334 of the Treaty on the Functioning of the EU.

After the introduction of a FTT proposal, the potential FTT tax revenues have been often discussed in the literature. Schulmeister and Sokoll (2013) predicted revenue of EUR 56 bn. employing the relocation effect (i.e., introducing the factor of reaction of the market participants on the introduction of the tax) and considering implementation through enhanced cooperation. European Commission (2013a,b) estimated that the introduction of FTT through enhanced cooperation could raise the revenue in the range of EUR 30-35 bn. Nerudova and Dvorakova (2014) estimated the revenue in the range of EUR 24.9 – 28.3 bn. in case of introduction of FTT through enhanced cooperation. The only two studies employing the introduced issuance principle are by Naess-Schmidt, Hansen and Ringsted (2014) and Schäfer (2015). The former estimates the FTT revenues only for Germany on EUR 57.3-87.5 bn. in the case of a static model and EUR 17.6-33.4 bn. in the case of a dynamic model.

Although initially the effort to impose a FTT was to ensure a fair contribution of the financial sector for repaying the public funds invested into the sector during the crisis, it was also considered as a potential candidate for a new own resource to finance the EU

budget. Based on the estimations of the European Commission (2012) it is expected an almost 50% reduction of GNI contributions of all member states in case of the mandatory implementation of FTT within EU-27. Similarly as a FTT, the common consolidated corporate tax base system (CCCTB) was also considered with the result of full replacement of VAT-based own resource by CCCTB-based own resource with the only exemption, which is Cyprus (Nerudová et.al, 2017).

When considering FTT as an own resource of the EU budget, one must consider the design of the tax-based system of own resources (Heinemann, Mohl and Osterloh 2008). The possible design of an EU-tax based system of own resources was studied by Raddatz and Schick (2003). The authors discussed three possible designs, namely linked system, surcharge system and separation system. In this paper we further develop the methodology of the authors by adding another design option: a remittance system. This design of a FTT-based own resource foresees replacing VAT- and GNI-based own resources by the remittance of tax revenues from a FTT collected on the national level to the EU budget.

The aim of this paper is to determine the revenue potential of FTT in the EU28 and consider the possible replacement of a VAT- and GNI-based own resources by FTT-based own resources through a remittance system as one element of sustainability-oriented future EU funding.

2 Methodology and Data

This section is dedicated to the presentation of the methodology used in this paper for the estimation of the potential revenues from a FTT in the EU and the possible replacement of the VAT-and GNI-based own resource by a FTT-based own resource.

In our study, we considered the following formula to determine the potential revenue from a FTT in the EU:

$$R = 2 * \tau * V * (1 - E) * \left(1 + \frac{2 * \tau}{c}\right)^{\varepsilon} \quad (1)$$

Where

R – represents the annual revenue,

τ – represents the tax rate, which is doubled as both side of transactions are taxed,

V – represents the annual transaction volume,

E – represents fiscal evasion and relocation,

c – represents transaction costs in per cent of the transaction volume and

ε – represents elasticity, which describes the effect of a tax increase on the transaction volume, i.e., the tax base.

As a dataset was applied the World Federation Exchange (WFE), which includes annual transaction values of trades performed around the world. However, only the transactions performed through EU financial markets in 2015 were considered for the purpose of our research, namely the value of share trading, value of bond trading, ETFs and investment funds in the case of equity transactions and currency options and futures, and commodities options and futures in the case of derivative transactions. Based on it, the tax base covers securities and exchange derivatives trades performed in the EU financial markets. Further, tax base was identified using a source principle. Under the source principle, the EU would have the right to tax all the financial transactions that are deemed to have occurred in the EU, regardless of the tax residence of the parties involved in the transactions – i.e., only the transactions taking place on EU territory

would be taxable events. Furthermore, we assumed that the transaction should be taxed on both legs in the trade (i.e. the buyer and the seller).

Further, table 1 below presents the variables that were taken into account for the prediction of FTT revenues. The first - *the tax rate* - was applied both in accordance with the proposal of FTT directive and various tax rates were considered. The second – *relocation and evasion rates* – FTT revenues are estimated with relocation and tax evasion effects in the range of 60 – 95% in case of derivatives and in the range of 5-25% in case of securities. The assumptions in the paper are based on the impact assessment of the European Commission (2010, 2011e, 2013a,b) and on the research of Coelho (2014), which assumed large avoidance responses of the market participants after the introduction of FTT. Moreover, we also utilize zero fiscal evasion. The third – *transaction costs* – we applied the transaction costs in accordance with the last surveys performed by Burman et al. (2016), Collins (2016), Pollin, Heintz and Herndon (2016), Schäfer (2015), Naess-Schmidt, Hansen and Ringsted (2014), the European Commission (2011e, 2013a,b), Nerudová and Dvořáková (2014), Schulmeister, Schratzenstaller and Picek (2008) and Bivens and Blair (2016). The last one – *elasticity* – which is defined as the relative change in the transaction volume to a relative change in the tax rate was applied according to the European Commission (2011e).

Table 1 Variables and their values used for the determination of a FTT estimates

Financial instruments / **Variant**	**Tax rates**				
	A*	**B**	**C**	**D**	**E**
Securities**	0.1 %	0.01 %	0.05 %	0.1 %	0.01 %
Derivatives	0.01 %	0.0025 %	0.005 %		
	Relocation and evasion rates				
Securities	0 %, 5 %, 10 %, 15 %, 20 %, 25 %				
Derivatives	95 %, 90 %, 85 %, 80 %, 75 %, 70 %, 65 %, 60 %, 0 %				
	Transaction costs				
Securities	0.6, 0.12, 0.1, 0.2, 0.98, 0.032, 0.32, 0.2, 0.3, 0.14, 0.08				
Derivatives	0.3, 0.024, 0.7, 0.005, 0.003, 0.01, 0.013, 0.042, 0.56, 0.002				
	Elasticity				
Securities and Derivatives	-2, -1.5, -1, -0.5, 0, 0.5, 1, 1.5, 2				

* Based on the proposal of FTT directive. ** bonds and stocks

Source: own compilation

All of the aforementioned variables and their values were separately used in the various combinations for the estimations of FTT revenues. The results are presented as a range between first and third quartiles, i.e., 25p and 75p, when the extreme estimations were omitted. Moreover, our study considered three different scenarios. The first scenario, the "static scenario", neglects all potential market reactions initiated by implementing FTT, in that elasticity, evasion and relocation effects are not considered. The second, the "maximum evasion scenario", assumes a 60-95% range of evasion for derivatives and 5-25% for securities and considers other variables explained above. The third scenario, the "no-evasion scenario", assumes no evasion in the markets at all (i.e., evasion is expected to be 0%) and assumed only transaction costs and elasticities.

3 Results and Discussion

Revenues potential of a FTT

Based on the methodology mentioned above, the estimates of FTT revenues were performed for five variants depending on different tax rates (variants A-E) and three

different scenarios, such as the static scenario, maximum evasion scenario and no-evasion scenario.

In the static scenario which neglects all potential market reactions initiated by introducing FTT, the highest FTT revenues could accrue to the EU from variant D, which includes the highest assumed tax rate for derivatives and securities in the amount of 0.1%. The estimated range of the volume for the entire EU is USD 433 bn.-5,884 bn. The lowest FTT revenues could accrue in variant B (i.e., 0.01% tax rate for securities and 0.0025% tax rate for derivatives) with the estimation in the amount of USD 7-11 bn.

Under other scenarios (i.e. max evasion or no evasion), estimates of FTT revenues are in the range of USD 2-251 bn. (max evasion scenario) and USD 5-1,058 bn. (no evasion scenario), for more details, see table 2.

Table 2 Summary of the estimates of the FTT revenue for EU

Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants in mil USD	**Variant A (0.1 % and 0.01 %)**					
Derivatives	32 370.22	96 296.41	1 444.388	6 864.745	10 043.21	29 331.52
Equity	22 563.38	43 146.71	15 647.96	33 774.69	15 806.17	35 552.00
Total	54 933.6	139 443.1	17 092.35	40 639.43	25 849.38	64 883.53
	Variant B (0.01 % and 0.0025 %)					
Derivatives	5 510.627	9 066.407	446.7758	1 492.534	3 648.166	5 046.787
Equity	2 423.232	2 651.237	2 203.68	2 425.594	2 257.627	2 488.934
Total	7 933.859	11 717.64	2 650.455	3 918.128	5 905.793	7 535.721
	Variant C (0.05 % and 0.005 %)					
Derivatives	15 140.87	31 197.23	851.519	3 050.998	6 328.831	11 639.46
Equity	11 589.08	16 952.7	9 340.492	14 297.19	9 482.793	14 814.15
Total	26 729.95	48 149.93	10 192.01	17 348.18	15 811.62	26 453.61
	Variant D (0.1 %)					
Derivatives	410 707.78	5 841 691	13 025.61	218 116.3	36 842.92	1 022 589
Equity	22 563.38	43 146.71	15 647.96	33 774.69	15 806.17	35 552
Total	433 271.16	5 884 838	28 673.58	251 890.9	52 649.09	1 058 141
	Variant E (0.01 %)					
Derivatives	20 303.04	74 881.39	1 444.388	6 864.745	10 043.21	29 331.52
Equity	2 423.232	2 651.237	2 203.68	2 425.594	2 257.627	2 488.934
Total	22 726.27	77 532.63	3 648.068	9 290.339	12 300.84	31 820.46

Source: WFE, author´s calculation.

Replacement of VAT and GNI own resources

This paper considers the design of FTT-based own resources, which is based on a remittance system (the system expects the replacement of VAT- and GNI-based own resource by the transfer of tax revenues from FTT raised on national level to the EU budget). In the case of EU28, the VAT-based own resource generates EUR 17.6 bn. (USD 15.91 bn.) and GNI-based own resources generates EUR 99.07 bn. (USD 89.25 bn.). A FTT is able to generate substantial tax revenues for EU28 depending on the set tax rates and the reaction of the financial markets (i.e., the elasticity, transaction costs or the relocation effects). Globally, based on our estimates, a FTT could generate tax revenues between USD 2.65 bn. – 5 884.8 bn. Therefore, the replacement of VAT- or GNI-based

national contributions to the EU budget by new FTT-based own resource can be considered.

The replacement of VAT- and GNI-based own resources with FTT is presented in tables below. As is obvious, in the case of VAT-based own resources (shown in table 3 below), a FTT would not be able to fully replace the overall contribution of the EU member states to the EU budget in the amount of USD 15,916 mil if the variant B or variant E max evasion scenario is considered. It would be achieved only partial replacement, which varies from 2.81% to 73.62%, depending on the selected scenario. In the respect of other variants and scenarios the full replacement is possible, specifically in all scenarios in variants A and D.

Table 3 FTT revenue potential in the case of VAT-based own resource replacement

VAT replacement in % Total VAT for EU28 - USD 15 916.56 mil						
Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants			**Variant A**			
Derivatives	**100.00**	**100.00**	9.07	43.13	63.10	**100.00**
Equity	**100.00**	**100.00**	98.31	**100.00**	99.31	**100.00**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
			Variant B			
Derivatives	34.62	56.96	2.81	9.38	22.92	31.71
Equity	15.22	16.66	13.85	15.24	14.18	15.64
Total	49.85	73.62	16.65	24.62	37.10	47.35
			Variant C			
Derivatives	95.13	**100.00**	5.35	19.17	39.76	73.13
Equity	72.81	**100.00**	58.68	89.83	59.58	93.07
Total	**100.00**	**100.00**	64.03	**100.00**	99.34	**100.00**
			Variant D			
Derivatives	**100.00**	**100.00**	81.84	**100.00**	**100.00**	**100.00**
Equity	**100.00**	**100.00**	98.31	**100.00**	99.31	**100.00**
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
			Variant E			
Derivatives	**100.00**	**100.00**	9.07	43.13	63.10	**100.00**
Equity	15.22	16.66	13.85	15.24	14.18	15.64
Total	**100.00**	**100.00**	22.92	58.37	77.28	**100.00**

Source: WFE and own calculations.

With regard to the replacement of GNI-based own resources with FTT revenues, the full replacement would not be reached in the majority of variants, namely by variant A (except the static scenario – 75p), B, C and E. The full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved between 0.50% and 86.87% (for more details, see table 4 below).

Table 4 FTT revenue potential in the case of GNI-based own resource replacement

GNI replacement in % Total GNI for EU28 - USD 89 244.32 mil						
Financial instruments	**Static scenario (without E and ε)**		**Max evasion scenario**		**No evasion scenario**	
Percentiles	**25p**	**75p**	**25p**	**75p**	**25p**	**75p**
Variants			**Variant A**			
Derivatives	36.27	**100.00**	1.62	7.69	11.25	32.86
Equity	25.28	48.34	17.53	37.84	17.71	39.83
Total	61.55	**100.00**	19.15	45.53	28.96	72.69
			Variant B			
Derivatives	6.17	10.16	0.50	1.67	4.09	5.65
Equity	2.71	2.97	2.47	2.72	2.53	2.79
Total	8.89	13.13	2.97	4.39	6.62	8.44
			Variant C			
Derivatives	16.96	34.95	0.95	3.42	7.09	13.04
Equity	12.98	18.99	10.46	16.02	10.62	16.60
Total	29.95	53.95	11.42	19.44	17.72	29.64
			Variant D			
Derivatives	**100.00**	**100.00**	14.59	**100.00**	41.28	**100.00**
Equity	25.28	48.34	17.53	37.84	17.71	39.83
Total	**100.00**	**100.00**	32.13	**100.00**	58.99	**100.00**
			Variant E			
Derivatives	22.75	83.90	1.62	7.69	11.25	32.86
Equity	2.71	2.97	2.47	2.72	2.53	2.79
Total	25.46	86.87	4.09	10.41	13.78	35.65

Source: WFE and own calculations.

4 Conclusions

To determine the revenue potential of the FTT, we identified and analyze dataset from WFE database through three different scenarios (the estimates of the FTT in the case of static, max evasion and no-evasion scenarios) and variants depending on the tax rates. Furthermore, we considered the source principle for the determination of FTT revenues. Our model of FTT estimates revealed that a FTT is able to generate substantial tax revenues depending on the level of tax rates and the reaction of financial markets. Globally, based on our estimates, a FTT could generate tax revenues between USD 2.65 bn. – 5 884.8 bn., depending on the simulated variant.

Further, for the purpose of replacement of VAT- and GNI-based own resources, this paper considered the design of FTT-based own resources, which is based on a remittance system. Accordingly, we suggest the replacement of VAT- and GNI-based own resources by the transfer of tax revenues from a FTT raised on a national level to the EU budget. Our research revealed that the introduction of a FTT would not be able to fully replace VAT-based own resources if variant B or variant E (max evasion scenario) is considered. In the case of GNI-based own resources the full replacement of GNI-based own resources in the amount of USD 89,255 mil would only be reached by variant D. In the remainder of the cases, partial replacement would be achieved.

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The Government Expenditure Efficiency in OECD Countries with DEA Approach

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Abstract: *Data Envelopment Analysis (DEA) is one of the methods to measure efficiency in the service sector. DEA searches individual scales for each production unit. In the presence of different input and output factors, efficiency is perceived as the ratio of the weighted sum of outputs to the weighted sum of inputs. The aim of our paper is to analyze efficiency in the health care sector using DEA models. In several OECD countries, it is possible to point to the ineffectiveness of public spending on health care. We use the basic health characteristics of the population as well as the basic macro indicators from the point of view of health financing in OECD countries. The paper shows on the impact of individual indicators on the level of efficiency in the health sector.*

Keywords: health expenditure, life expectancy, infant survival rate, physicians´ density, impatient bed density, Data Envelopment Analysis

JEL codes: I15, H51, C61

1 Introduction

In recent years, we follow the growing trend of investment and innovation in the service sector (Obradović et al. 2016). An essential part of this trend should also be an analysis of the effectiveness of the invested funds (Djogo and Stanisic, 2016; Khalid et al. 2016). The health sector today can be seen as leading in terms of investment (Bartak et al. 2016). In recent years, we often encounter many analyzes by authors who point to the shortcomings and difficulties of this sector (Soltes and Gavurova, 2015). In many cases, the non-parametric method – Data Envelopment Analysis (DEA) is also used to analyze efficiency of the used resources in the production of outputs. Health sector is mostly financed by government expenditures. Governments of OECD countries are under high pressure to improve public sector performance and at the same time to reduce the government expenditure (Popesko et al. 2015a; Rogalewicz et al. 2016). Therefore, in the process of improvement public sector performance, it is necessary to ensure the efficiency in the provision of health care services, at the same time, the countries are required to provide their health care services by minimizing the value of public expenditures directed to them (Popesko et al. 2015b). This prompted us to implement the comparative study to evaluate the efficiency of health expenditure in selected European countries, which are member of OECD, during the years 2005-2014. In first step we try to analyze the development of all variables used in DEA, as average in all analyzed countries. Then we try to analyze the relation between health expenditure and life expectancy and infant survival rate using scarlet plots. We assume, that countries with the high level of expenditures should have higher level of life expectancy and infant survival rate. In the next part of our paper we try to analyze, if countries used health

expenditures in maximal possible way, considering other characteristics which influence the individual's health indicators. According to the aim, the paper is organized as follow. In the section 2 a review of relevant literature is provided. In the section 3, applied methodology and data are described. The section 4 presents the results and key findings. The paper concludes main findings and suggestions for future research.

2 Literature preview

DEA is considered as a suitable methodology for evaluation of efficiency in the service sector. It is often used to study the efficiency of health care system from different point of view. In some papers we can see an application of this method to evaluate the efficiency of hospitals in one country, or it can be also used for international comparison of health care systems within the group of selected countries. Grosskopf et al. (2006) analyzed the efficiency of spending on health care in 143 countries. They used the DEA method and the Malmquist productivity index to estimate technical efficiency. Inputs included private and public health expenditures as percentage of per capita GDP, gross capital formation per capita, per capita labor force and enrollment rate in primary education. In model the life expectancy, infant survival rate and per capita GDP were considered as outputs. They used two multilateral health sector quantity indexes and the improvement index. They divided countries to three groups: developed, less developed and middle-incomes countries based on cumulative health index. The analysis showed that the public sector has a greater importance in health care financing in developed and middle income countries than in less developed countries. While the developed countries show signs of having better health, as measured, it does not necessarily imply that this is a result of reliance on a larger share of publicly funded healthcare. Better signs of health indicators in the context of developed countries may not be the result of higher spending on health care in countries.

The efficiency within the OECD countries were analyzed in study of Hadad et al. (2013). They used two models: one incorporating mostly inputs that were considered to be within the discretionary control of the health care system (i.e. physician's density, inpatient bed density, health expenditure), and another, including mostly inputs beyond health care system control (i.e. GDP, fruit and vegetable consumption, health expenditure). In both models the life expectancy and infant survival rate were considered as outputs. They found that nine countries (Australia, Canada, Israel, Italy, Luxembourg, Spain, Sweden, Switzerland, and the United Kingdom) with large and stable economies were defined as efficient in model 1, but were found to be inefficient in model 2.

In our conditions, the DEA was applied in the paper presented by Grausová et al. (2014). In their study they evaluated efficiency in four countries of the Visegrád group during the period 2004-2010. They applied the Data Envelopment Analysis, namely Super SBM model. The number of physicians per 100 000 inhabitants, the number of hospital beds per 100 000 inhabitants and the share of health expenditures to GDP were considered as inputs, and infant mortality and life expectancy at birth were considered as outputs. They concluded that the best ranked was the health system of Poland, and Hungary together with the Slovakia ranked at the lowest positions. They also suggested measures that could improve the efficiency. Czech Republic, according to the results should reduce the number of doctors and the number of beds and slightly reduce the share of health expenditure to GDP. Hungary together with Slovakia may also reduce the number of doctors and beds. However, the problem in these countries were performance indicators, child mortality and life expectancy, which did not correspond to the level of health care system inputs.

Medeiros and Schwierz (2015) estimated the relative efficiency of health care systems across all European Union countries using three models with different combinations of inputs and outputs. Outputs were commonly reported health outcome indicators (i.e. life expectancy, healthy life expectancy, amenable mortality rate). Inputs included

expenditure on health care, physical inputs and environmental variables. They found, that on average in the EU, life expectancy could be increased by 2.3%, by moving from current positions to the efficiency frontier. Specifically, Czech Republic, Lithuania and Slovakia had the lowest efficiencies in most of the models that were used. Hungary, Latvia, Poland and Estonia, although were scoring marginally better than the previous group, but were also underperformers. Belgium, Cyprus, Spain, France, Italy, Sweden and the Netherlands consistently score among the top seven performers in most of the models.

Comparison in the area of health is offered by Van den Heuvel and Olariou (2016). They compared data for 31 countries in Europe. They used life expectancy at birth as the output and health care expenditures, expenditures on social production and education. They showed, that countries with more curative beds, fewer nurses and caring personnel has lower score of life expectancy. It has already been confirmed in the above-mentioned papers, it is important that health and investment policies have a direct focus on social protection, the quality of care provision and the healthy lifestyle.

3 Methodology and Data

In the literature, several authors emphasize the need to measure efficiency in economics. Koopmans (1951) defines technical efficiency as an input/output vector. Debreau (1951) and Farell (1957) derived input-oriented indices. These authors gave the basis for the development of Data Envelopment Analysis. DEA was later developed in papers by Charnes et al. (1978), Banker et al. (1984)). The purpose of DEA is to compare organizational unit productivity (DMU). DEA compares individual organizational units with respect to the entire set of units. DEA and Free Disposal Hull (FDH) are the nonparametric methods. The main output is technical efficiency. Parametric methods include Distribution Free Approach (DFA), Thick Frontier Approach (TFA) and Stochastic Frontier Approach (SFA). The main output is economic efficiency. DEA through the optimization process calculates the weight of inputs and outputs. We can divide the results into efficient and inefficient units. In inefficient units, DEA analyzes the size of inputs and outputs that would lead to efficiency. Charnes et al. (1978) developed a model called the CCR model. The CCR model is the output-oriented model that uses constant returns on a scale. Variable returns on scale (VRS) uses the BCC model developed by Banker et al. (1984).

In our paper will be used input oriented super SBM model under the condition of variable return to scale. The SBM models (Slack Based Measures) are non-radial models. SBM models are invariant to the units and alternative to the additive models. According to Cooper et al. (2007) the properties of SBM models are: invariant to the units (SBM is invariant to each input and output item) and monotone (SBM is monotone decreasing in each input and output slack). Cooper et al. (2007) defined the input oriented super-efficiency under the condition of VRS as the optimal function value δ^* from:

$$\text{Super SBM} \qquad \delta^* = \min_{\bar{x},\bar{y},\lambda} \frac{\frac{1}{m}\sum_{i=1}^{m} \bar{x}_i / x_{io}}{\frac{1}{s}\sum_{r=1}^{s} \bar{y}_r / y_{ro}} \tag{1}$$

$$\text{Subject to} \qquad \bar{x} \geq \sum_{j=1,\neq 0}^{n} \lambda_j x_j \tag{2}$$

$$\bar{y} \leq \sum_{j=1,\neq 0}^{n} \lambda_j y_j \tag{3}$$

$$\bar{x} \geq x_0 \ and \ \bar{y} \leq y_0 \tag{4}$$

$$\bar{y} \geq 0, \quad \lambda \geq 0 \tag{5}$$

$$\sum_{j=1}^{n} \lambda_j = 1, \lambda_j \geq 0, \forall j. \quad (6)$$

Models of super-efficiency can be used to find efficient units. In the models of super - efficiency it is possible to evaluate the effectiveness of already effective units. The super SBM model is derived from the SBM model (in detail defined e.g. in Cooper et al. 2007). The resulting super SBM purpose function is greater or equal to one. The resulting value is more effective as the function value is higher.

Based on the previous studies, there was set up that we use in our paper and set the following input and output variables, which have impact on the efficiency of each health care system. In our analysis were used three inputs and two outputs. All variables, their definitions and data sources are presented in Table 1.

Table 2 Definition and source of variables included in the DEA model

Variable	*Role*	*Definition*	*Data source*
Life expectancy at a birth	*Output*	*The average number of years that a person could expect to live if he or she experienced the age-specific mortality rates relevant in a given country in a particular year.*	*OECD*
Infant survival rate	*Output*	*Infant survival rate is calculated as difference between 1000 and infant mortality rate. Infant mortality rate is the number of deaths of children under one year of age expressed per 1000 live births.*	*OECD*
Physicians´ density	*Input*	*The number of physicians, general practitioners and specialists, actively practicing medicine in a region during the year, in both public and private institutions.*	*OECD*
Inpatient bed density	*Input*	*Number of hospital beds (occupied or unoccupied) immediately available for use by patients admitted to all types of hospitals (general hospitals, mental health hospitals and other specialist hospitals) in all sectors (public and private).*	*OECD*
Health expenditure as a percentage of GDP	*Input*	*Total expenditure on health include the final consumption of health goods and services plus capital investment in health care infrastructure. It includes both public and private spending on personal health care services.*	*OECD*

Source: prepared by authors

As the output variables were chosen life expectancy (LE) at birth and infant survival rate (ISR). Life expectancy is a robust measure widely used in studies of health production efficiency (e.g. Grosskopf et al. 2006; Hadad et al. 2013) and is the most general and best known measure of the health status of the population (OECD, 2012). The second input, the infant survival rate is just mathematical transformation of the infant mortality rate (IMR). The reason why we did not use the infant mortality rate is, that according to DEA the outputs should be considered in such a way that "more is better". The infant survival rate was calculated as ISR = 1000 – IMR. The inputs included in our analysis were as follow: physicians' density, inpatient bed density and health expenditure as a percentage of GDP. All these variables were chosen according to the accepted conceptual model that recognizes that the following determinants have significant impact on individuals´ health: available medical care services and environment. Density of physicians is frequently used as an indicator of health-care provision. An adequate number of qualified practicing physicians, located according to need, helps to ensure the delivery of safe, high-quality medical services (OECD, 2012). The number of hospital beds usually provides a measure of the resources available for delivering health services in hospitals.

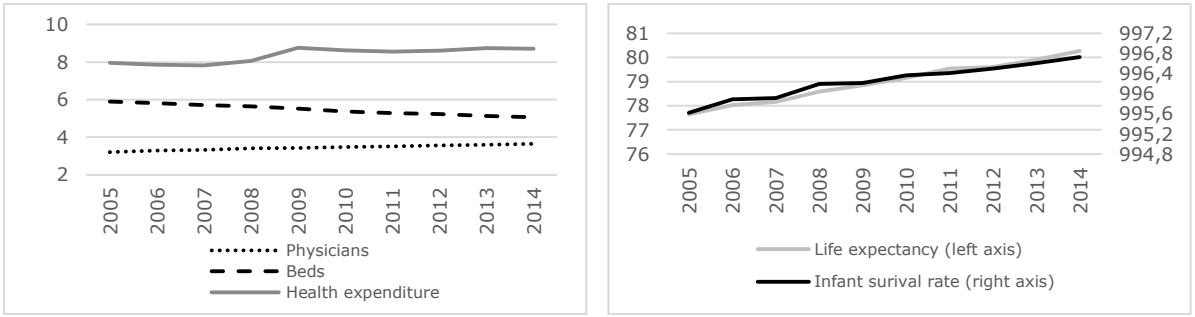
4 Results and Discussion

We try to analyze the relative efficiency of 20 European countries, which are members of OECD. The analysis is done during the period from 2005 to 2014. The year 2015 was not involved, as all data were not available. In order to eliminate the impact of the size of

individual countries, all variables were adjusted and calculated per 1000 inhabitants, per 1000 of live births, or in a case of health expenditure as a percentage of gross domestic product (GDP). In this study, an input oriented model is used with consideration that life expectancy and infant survival rate for a single country are basically given, and the objective of the health care system is to minimize the level of inputs (physicians, beds and expenditure on health). If the country is able to use minimal level of inputs to produce given level of outputs, it could be considered as efficient. This analysis provides inefficient countries with useful information regarding the ability to improve their efficiency by utilizing inputs in a more efficient manner.

The aim of the paper is to analyses and compare the relative efficiency of the countries´ health care systems. In first step we try to analyze the development of all variables used in DEA, as average in all analyzed countries. Then we try to analyze the relation between health expenditure and life expectancy and infant survival rate using scarlet plots. We assume, that countries with the high level of expenditures should have higher level of LE and ISR. In the next part of our paper we try to analyze, whether countries used these expenditures in maximal possible way, taking into consideration other characteristics which influence the individuals´ health indicators. In this part of our analysis the data were analyzed using DEA Solver software.

Figure 1 The development of average values of inputs (a) and outputs (b)

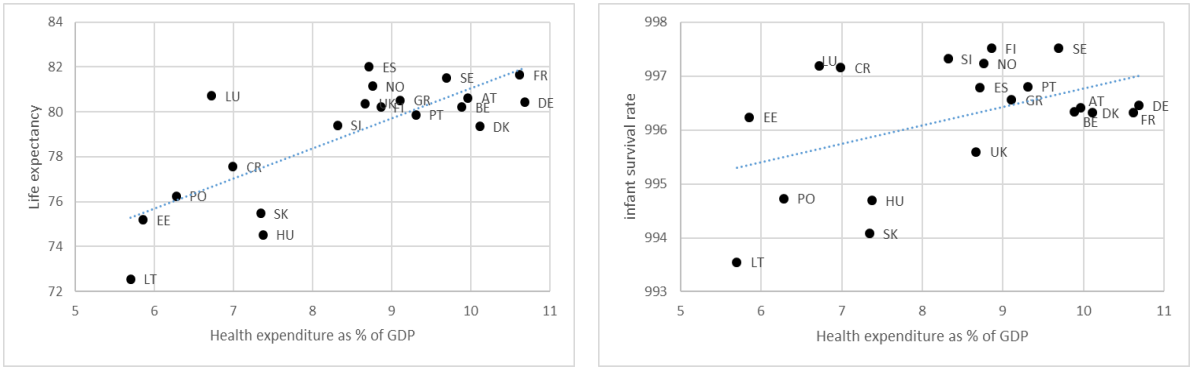


a) Average values of input variables b) Average values of output variables

Source: Prepared by authors

The tendency of development of all variables used in the analysis is presented in Figure 1. There can be seen a trend to reduce the number of hospital beds density. This fact is often a factor in transfer of hospital care to ambulatory care. There can be seen decrease by 14.2% between 2005 and 2014 in average. There is also a very slow rise in share of resources that is being devoted to health. Between 2005 and 2014, average analyzed countries health expenditure as percentage of GDP has grown by around 9.5%. Life expectancy during the analyzed period increased. It could be affected by several factors: e.g. rising living standards, better nutrition, less smoking and drinking, better education, greater access to quality health services, reduction in cross-country differences, longer live of old people thanks to improve access to health services and medical progress, especially in the treatment of cardiovascular diseases. Also the infant survival rate has the increasing tendency. It could be positively affected with new medical technology and improved prenatal care which increase survival of smaller infants.

Figure 2 The health expenditure versus life expectancy and infant survival rate



Source: Prepared by authors

In the next part of our paper we try to analyze the relation between health expenditure and life expectancy and infant survival rate. For this analysis was used the average values of indicators for each country. The scarlet plots are presented in next figure (Figure 2). The results of the analysis pointed to the fact, that the countries should be divided into three main groups:

- Countries with good results of individuals´ health indicators and higher health expenditures (e.g. Germany, France, Denmark, Austria, Belgium, Portugal, Sweden, Greece, Finland, Spain, Norway, United Kingdom, and Slovenia).
- Countries with good results of individuals´ health indicators and lower health expenditures (e.g. Luxembourg, Estonia and Czech Republic).
- Countries with lower results of individuals´ health indicators and lower health expenditures (e.g. Latvia, Poland, Slovakia, and Hungary).

In the last part of our paper we used DEA model to evaluate relative efficiency of healthcare in each country. Assuming that life expectancy and infant survival rate for a single country are basically given, then the objective of the healthcare system is to minimize the level of inputs (physicians, beds and expenditure on health). Table 2 compares the results of Super SBM input oriented model under the assumption of variable return to scale.

Table 3 Results of Super SBM input-oriented model

	2005	***2006***	***2007***	***2008***	***2009***	***2010***	***2011***	***2012***	***2013***	***2014***	***2005-2014***	***Average Rank***
Austria	*0.6313*	*0.6359*	*0.6347*	*0.6394*	*0.6511*	*0.6425*	*0.6474*	*0.6469*	*0.6605*	*0.6531*	*0.6443*	*20*
Belgium	*0.7775*	*0.7727*	*0.7628*	*0.7625*	*0.7710*	*0.7663*	*0.7449*	*0.7506*	*0.7619*	*0.7575*	*0.7628*	*16*
Czech Republic	*0.8413*	*0.8390*	*0.8329*	*0.8370*	*0.8255*	*0.8331*	*0.7899*	*0.8018*	*0.7703*	*0.7688*	*0.8140*	*14*
Denmark	*0.8540*	*0.8540*	*0.8507*	*0.8528*	*0.8453*	*0.8440*	*0.8676*	*0.8700*	*0.9046*	*0.8962*	*0.8639*	*10*
Estonia	*1.1234*	*1.1265*	*1.1154*	*1.0739*	*1.0517*	*1.0517*	*1.0765*	*1.0879*	*1.0654*	*1.0449*	*1.0817*	*5*
Finland	*0.8807*	*0.8651*	*0.8550*	*0.8587*	*0.8658*	*0.8542*	*0.8236*	*0.8272*	*0.8223*	*0.8173*	*0.8470*	*12*
France	*0.7298*	*0.7314*	*0.7319*	*0.7365*	*0.7397*	*0.7299*	*0.7800*	*0.7835*	*0.7872*	*0.7834*	*0.7533*	*17*
Germany	*0.6666*	*0.6656*	*0.6634*	*0.6676*	*0.6709*	*0.6656*	*0.6628*	*0.6683*	*0.6748*	*0.6686*	*0.6674*	*19*
Greece	*0.7164*	*0.7178*	*0.7148*	*0.7022*	*0.7268*	*0.7129*	*0.7586*	*0.7833*	*0.8076*	*0.8249*	*0.7465*	*18*
Hungary	*0.7512*	*0.7641*	*0.7953*	*0.8205*	*0.8354*	*0.8144*	*0.8062*	*0.8088*	*0.8268*	*0.8311*	*0.8054*	*15*
Latvia	*0.8479*	*0.8551*	*0.8570*	*1.0965*	*1.0787*	*1.0863*	*1.1288*	*1.1387*	*1.1401*	*1.1254*	*1.0354*	*6*
Luxembourg	*1.0847*	*1.1087*	*1.1312*	*1.1238*	*1.1094*	*1.1213*	*1.2187*	*1.2036*	*1.2274*	*1.2412*	*1.1570*	*2*
Norway	*0.8219*	*0.8454*	*0.8292*	*0.8561*	*0.8257*	*0.8169*	*0.8849*	*0.8845*	*0.8775*	*0.8770*	*0.8519*	*11*
Poland	*1.1329*	*1.1184*	*1.0999*	*1.0834*	*1.1055*	*1.1059*	*1.0829*	*1.0876*	*1.0807*	*1.0793*	*1.0976*	*4*
Portugal	*0.8881*	*0.8967*	*0.8983*	*0.8978*	*0.9060*	*0.8958*	*0.9510*	*0.9737*	*1.0004*	*1.0064*	*0.9314*	*9*
Slovak Republic	*0.8315*	*0.8198*	*0.8046*	*0.8450*	*0.8150*	*0.8125*	*0.8280*	*0.8180*	*0.8391*	*0.8629*	*0.8276*	*13*
Slovenia	*1.0409*	*1.0332*	*1.0233*	*1.0273*	*1.0240*	*1.0309*	*1.0275*	*1.0277*	*1.0162*	*1.0155*	*1.0267*	*7*
Spain	*1.0199*	*1.0111*	*0.9672*	*0.9452*	*0.9450*	*0.9293*	*1.0375*	*1.0418*	*1.0520*	*1.0484*	*0.9997*	*8*

Sweden	*1.2654*	*1.2870*	*1.2655*	*1.2969*	*1.2679*	*1.2798*	*1.4590*	*1.4979*	*1.4979*	*1.4979*	*1.3615*	*1*
United Kingdom	*1.1223*	*1.1099*	*1.0978*	*1.1001*	*1.0941*	*1.0920*	*1.1296*	*1.1324*	*1.0925*	*1.0925*	*1.1063*	*3*
Minimum	*0.6313*	*0.6359*	*0.6347*	*0.6394*	*0.6511*	*0.6425*	*0.6474*	*0.6469*	*0.6605*	*0.6531*	*0.6443*	
Maximum	*1.2654*	*1.2870*	*1.2655*	*1.2969*	*1.2679*	*1.2798*	*1.4590*	*1.4979*	*1.4979*	*1.4979*	*1.3615*	
Average	*0.9014*	*0.9029*	*0.8965*	*0.9112*	*0.9077*	*0.9043*	*0.9353*	*0.9417*	*0.9453*	*0.9446*	*0.9191*	

Source: prepared by authors

As can be seen the average efficiency during the analyzed period was relatively stable. Also the position of the most and less efficient countries was relatively stable. The outcomes from the analysis point to the following findings:

- The less efficient country was during the whole analyzed period Austria. Therefore, we can say that the health care system can be considered as the most inefficient in evaluated group of countries under the used criteria. On the other hand, as the most efficient was marked health care system in Sweden. This country can be considered as efficient in term of the effective usage of health expenditure, physicians and beds to reach the best results of individuals´ health indicators (life expectancy, and infant survival rate). At the given level of individuals´ health indicators the Sweden was able to use the minimal level of inputs, compared to other countries within the sample.
- In average, nine countries have efficiency score higher than the average value (0.9191). Seven of them could be considered as efficient, where the score is higher than 1 (e.g. Estonia, Latvia, Luxembourg, Poland, Slovenia, United Kingdom and Sweden). The others (Spain and Portugal) could not be marked as efficient, as the score is above the 1. In average, eleven countries have efficiency score under the total average: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Norway and Slovak Republic).

When we look at the data in 2014, it is possible to observe that nine countries were labelled as efficient (Estonia, Latvia, Luxembourg, Poland, Portugal, Slovenia, Spain, Sweden and United Kingdom). These countries created benchmark for inefficient ones. We could see that Luxembourg, Sweden, Slovenia and Spain were located in the efficient frontier because it performed well in individuals´ health indicators (life expectancy, and infant survival rate), getting the first four position in the case of both indicators. At the same time, they were able to have the first four position in one of the input variable. Estonia and Latvia could be located in the efficient frontier because they had the lowest levels of expenditures which were able to use in maximal possible way in form of good results in health indicators compared to other countries. For example, Latvia reached the similar level of infant survival rate as Greece using health expenditures lower by 34%, and the similar level of life expectancy like Hungary using expenditures lower by 23%. The same tendency could be also seen in a case of Estonia. Poland could be considered as efficient because it had the lowest level of physicians' density and was able to use this variable to reach outputs comparable with Czech Republic (physicians´ density higher by 60%) or Hungary (physicians´ density higher by 44%). Also the United Kingdom had the lowest levels of physicians´ density and beds´ density which was able to use to reach outputs comparable with Greece. We can see that Greece must use inputs higher by 127% respectively by 55% to get the similar level of outputs, therefore it was not able to get mark as efficient. Portugal was able to reach the outputs similar to Germany using beds´ density lower by 60% and health expenditures lower by 19%.

However, it is hard to estimate the minimum number of physicians required to guarantee adequate provision. Also the adequate bed density depends on many factors. In fact, a country may have an optimal number of beds but accessibility may be low if the hospital is located far from the population. That's why we can talk only about the relative efficiency, within the selected group of countries and under the used criteria. When we take into consideration different criteria or wider set of countries, the results should be

different. It is also necessary to search external factors (e.g. macroeconomic environment and social status of population) which have significant impact on the health care efficiency in individual countries.

5 Conclusions

The countries are required to provide their health care services by minimizing the value of public expenditures directed to them. This prompted us to implement the comparative study to evaluate the efficiency of health spending in selected 20 European countries, which are members of OECD, during the years 2005-2014. The aim of this paper was to compare the development of all variables used in our analyses and compared the results of Super SBM input oriented model under assumption of variable return on scale. In first step of our analyses we can see decrease of number of hospital beds density by 14,2% between 2005 and 2014 in average. Health spending as percentage of GDP has grown on average by around 9,5%. Life expectancy and infant survival rate has the increasing tendency during the analyzed period. We think, it could be positively affected with new medical technology and improved prenatal care which increase survival of smaller infants. In the next part of our paper we tried to analyze the relation between health expenditures and life expectancy and infant survival rate. We divided the countries into three groups, with good results of health indicators and higher health expenditures, with good results of health indicators and lower health expenditures and lower results of health indicators and lower health expenditures. The outcomes from the Super SBM analysis pointed to the findings that, Austria was the less efficient country during the whole period. The most efficient was marked health system in Sweden. The average value was 0.9191 and nine countries have efficiency score higher than the average and eleven countries have efficiency score under the average. We can talk only about the relative efficiency and an open question remains when we take into consideration different criteria or the wider set of countries, the results should be different.

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Efficiency of humanitarian nonprofit organizations – a case of the Red Cross in the Europe and Central Asia

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Abstract: *The efficiency of nonprofit organizations has been a key issue since the donors are interested in efficient and effective utilization of donations. The aim of the article is to compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network. Moreover, the relationship between financial efficiency and super-efficiency score based was investigated. Super-efficiency score is defined as the number of clients to the number of paid staff and volunteers. The Data Envelopment Analysis (DEA) in its super-efficiency modification was used as an indicator of efficiency of the RCNSs from 49 European and Central Asian countries in the average of 2013 - 2015. Nonparametric DEA method has been more frequently used than parametric methods in the nonprofit sector so far. Super-efficiency modification emerged as a good method for efficiency evaluation of humanitarian nonprofit organizations. The results show significant variance in the efficiency scores between countries. Our findings suggest distinct clusters of Red Cross national societies as they were identified by combination of financial efficiency and super-efficiency scores. Authors revealed negative relationship between financial efficiency and technical super-efficiency in all clusters.*

Keywords: humanitarian network, super-efficiency score, Europe, Central Asia, expenditures

JEL codes: L30, G30

1 Introduction

The nonprofit organizations are an essential part of most economies. John Hopkins' Institute defined five key characteristics which nonprofit organizations must share (Salamon and Anheier, 1997). Nonprofit organizations must be organized, institutionally separate from government, nonprofit-distributing, self-governing and voluntary. The mission accomplishment of the nonprofit organization is fundamental for efficiency evaluation of nonprofit organizations because the nonprofit organizations do not have financial indicators as a key indicator of success. The mission accomplishment like any other soft determinants is hard to measure.

There are many types of nonprofit organizations, ranging from small clubs to big societies. Their focus is also diverse. It is not possible to evaluate efficiency of nonprofit organizations through one universal method. So, we focus on the humanitarian organizations which are an important part of the nonprofit sector. They are human-centered organizations providing humanitarian assistance. Their mission intends to save lives, alleviate suffering and maintain human dignity during and after man-made crises and disasters caused by natural hazards, as well as to prevent and strengthen preparedness for when such situations occur. The article evaluates the efficiency of the world's largest nonprofit humanitarian network – The International Federation of Red Cross and Red Crescent Societies (IFRC). It reaches 150 million people in 190 National Societies through the work of over 17 million volunteers. The aim of the article is to

compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network across the countries in Europe and Central Asia. The two regions are considered as one region in the statistics of the IFRC.

The literature agrees that it is not possible to fully apply the methods of evaluating the performance of profit-oriented sector to the nonprofit sector (Cheverton, 2007; Speckbacher, 2003). Methods of evaluating the performance of the for-profit sector are based on certain assumptions that would have to be fulfilled in the nonprofit sector, if they were used. To evaluate the success of an organization, it is necessary to define the success of the organization and to define success criteria and stakeholders towards which success is evaluated.

The comprehensive literature review identified financial performance indicators as dominant success indicators whereas studies using proxies for mission accomplishment were relatively rare (Helmig, Ingerfurth and Pinz, 2014). However, efficiency is more general term than financial performance. Generally, efficiency states the right use of resources to accomplish tasks. Efficiency can be measured as technical or allocative (Coelli et al., 2005). Let's consider that production frontier represents the maximum output attainable from each input level. Hence it reflects the current state of technology in the industry. Organizations operate either on that frontier, if they are technically efficient, or beneath the frontier if they are not technically efficient.

Helmig et al. (2014) presents systems approach to organizational success. In this view, the accomplishment of organizational objectives is only a partial measure of organizational success. Goals are important, but organizations should also be judged on their ability to acquire inputs, conduct efficient transformation processes to produce valuable outputs, and maintain stable relationships with their environment.

In the humanitarian nonprofit organization, the labour productivity is important indicator of success because people (staff and volunteers) provide benefits to people in need. In order to minimize the cumulative unmet demand and maximize volunteers' preference, the allocation of volunteers need to be optimized. It is important to emphasize that the maximization of the number volunteers as a workforce that can immediately serve a community's needs is not appropriate solution. Using robust optimization approach, authors showed that the volunteer managers should consider matching volunteers to their task assignment preferences up to a critical percentage, above which needs fulfilment decrease quickly due to overly strict adherence to volunteer task assignment preferences (Lassiter, Khademi and Taaffe, 2015).

From the methodical point of view, efficiency can be measured through parametric or nonparametric methods. The nonparametric frontier approach, based on envelopment techniques like the Data Envelopment Analysis (DEA) or the Free Disposal Hull (FDH), has been extensively used for estimating efficiency of firms as it relays only on very few assumptions for the set of decision-making units (DMUs). On the contrary, the stochastic frontier approach (SFA) allows the presence of noise but it demands parametric restrictions on the shape of the frontier and on the Data Generating Process (DGP) in order to permit the identification of noise from inefficiency and the estimation of the frontier. In the nonprofit sector, nonparametric methods of efficiency evaluation are more widespread (Lee, Yang and Choi, 2009; Medina-Borja and Triantis, 2014; Motwani et al., 2006; Roh, Moon and Jung, 2013) than parametric methods (Kuo and Ho, 2008). The DEA does not assume any type of the production function and distribution of variables. It is an advantage in nonprofit sector where some axioms of neoclassical production function are not a prerequisite, such as profit maximization. Moreover, the DEA creates frontier curve that serves as benchmark for measuring DMUs comparative efficiency.

2 Methodology and Data

In the paper, the efficiency of the national Red Cross national societies (RCNSs) was examined through nonparametric input-output analysis as it was justified earlier. For our purposes, the problem of the DEA is the limitation of the fully efficient units by 100 percent, so it is not possible to rank efficient units and abide by the conditions of subsequent parametric statistical tests. Andersen and Petersen (1993) allowed the efficient units to receive an efficiency score greater than 100 percent by dropping the constraint that bounds the score of the evaluated unit. Such feature enables better perform the regression analysis or statistical comparison of efficiency between regions because it ranks the efficient units. Alternatively, there are some troubles with the super-efficiency approach. They can range from a lack of units invariance for these measures and extend to non-solution possibilities when convexity constraints are to be dealt with – as in the BCC (Banker, Charnes and Cooper) model (Cooper, Seiford and Tone, 2006). So, authors used CCR model (Charnes, Cooper and Rhodes) to evaluate the efficiency of the RCNSs. The output-oriented modification was selected because the nonprofit sector has usually been resource-oriented and the nonprofit organizations try to maximize output with given amount of finance and labour-input.

Let's assume *n* units (RCNSs). Each $RCNS_j$ (j = 1, 2,…,n) consumes a vector of inputs, x_j, to produce a vector of outputs, y_j. Then, the super-efficiency output-oriented DEA model can be expressed as

$$\max \varphi$$

$$s.t. \sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j x_j \leq x_0; \tag{1}$$

$$\sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j y_j \geq \varphi y_0; \tag{2}$$

$$\varphi, \lambda_j \geq 0, j \neq 0 \tag{3}$$

where x_0 and y_0 represents RCNS. The CCR model assumes constant returns to scale.

Critics of the super-efficiency models (Seiford and Zhu, 2016) concluded that the ranking of the total set of efficient units is impossible because of the infeasibility of super-efficiency DEA models. Nevertheless, the use of the super-efficiency DEA models in the sensitivity analysis of efficiency classifications can be generalized from the CCR model to the situation of non-constant returns to scale.

The dataset on the RCNSs were gained from The International Federation of Red Cross and Red Crescent Societies (IFRC). The dataset contains countries in Europe and Central Asia region. Original dataset of 53 countries was reduced to 49 countries due to the unavailable or extreme data in some countries. The three-year average (2013 – 2015) was calculated to avoid exceptional year. Based on the previous research (Špička and Boukal, 2017), authors suggest possible set of inputs and outputs which should be used in the DEA model for efficiency evaluation. There is no multicollinearity in the set of variables.

- Input I_1 – Number of people volunteering. People that have volunteered at least four hours during the annual reporting period.
- Input I_2 – Number of paid staff. People who work with a National Society or the Secretariat for a minimum of three months and are remunerated.
- Output Y – Number of people reached by disaster response and early recovery, number of people reached by long-term services and development programmes, number of people covered by disaster preparedness.

So, the *super-efficiency score* ("Score") measures a relationship between output Y and the two inputs I_1, I_2.

The average expenditures in CHF per one labor unit (volunteers and staff) is a proxy for the *financial efficiency* ("Fin"). Authors verify the hypothesis that there is a significant positive relationship between financial efficiency ("Fin") and super-efficiency score ("Score") between countries in the European and Central Asian Region.

National societies are clustered according the two variables "Fin" and "Score". The medoid partitioning algorithms used here attempt to accomplish this by finding a set of representative objects called medoids. The medoid of a cluster is defined as that object for which the average dissimilarity to all other objects in the cluster is minimal. The medoid algorithm by Kaufman and Rousseeuw (1990) is applied. Two of the most difficult tasks in cluster analysis are deciding on the appropriate number of clusters and deciding how to tell a bad cluster from a good one. Kaufman and Rousseeuw define a set of values called silhouettes (*s*) that provide key information about both tasks. The silhouette measures how well an object has been classified by comparing its dissimilarity within its cluster to its dissimilarity with its nearest neighbor. When *s* is close to 1, the object is well classified. When *s* is near 0, the object was just between clusters A and B. When *s* is close to negative one, the object is poorly classified. Kaufman and Rousseeuw interpret the average silhouette SC. When SC exceeds 0.5, a reasonable structure has been found. Otherwise the structure is weak and could be artificial. The Manhattan distance method for place similar objects in one cluster is applied (Ciaschini, Pretaroli and Socci, 2011).

3 Results

Table 1 provides descriptive statistics of financial efficiency and super-efficiency scores. It shows high diversity in financial productivity and super-efficiency score between national societies. Countries with the highest expenditures per one labor unit include French Red Cross, Turkish Red Crescent Society and German Red Cross. Alternatively, there is the lowest financial efficiency in the Red Cross of Serbia, Cyprus Red Cross Society and in the Red Cross Society of Bosnia and Herzegovina. The Czech Republic ranked 15th place.

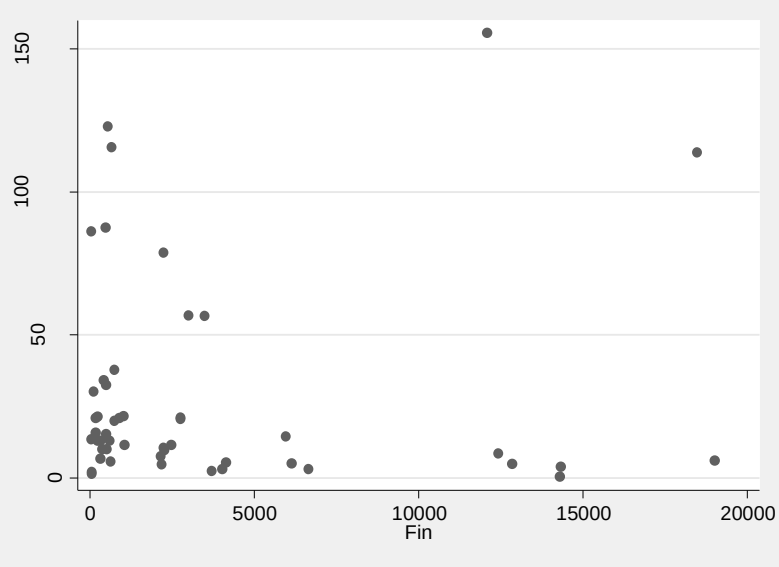
Table 1 Descriptive statistics of variables

Variable	Obs	Mean	St.Dev.	Min	Max
Fin (CHF/unit)	49	3491.14	5042.92	46.31	19019.1
Score	49	28.365	36.549	0.5	155.6

Source: author

Concerning the super-efficiency score, the highest values were reached in the Belgian Red Cross, Slovenian Red Cross and Turkish Red Cross Society. On the contrary, the lowest efficiency recorded the Red Crescent Society of Uzbekistan, the Red Cross of Serbia and the Luxembourg Red Cross. The Czech Republic ranked 8th place. The scatterplot in the figure 1 shows values for the two variables. It enables to see the groups of countries with similar values of variables.

Figure 1 Scatterplot of financial efficiency and super-efficiency score



Source: author

In the top right corner, there are two countries with high financial efficiency and high super-efficiency score – Belgium (SC = 0.3960) and Turkey (SC = 0.3647). These countries can be considered as most effective from the nonfinancial and financial point of view. However, the cluster 1 has no reasonable structure (SC = 0.3803).

There are the most values in the left bottom corner of the scatterplot. There are 35 countries[23] which together create cluster 2 with reasonable structure (SC = 0.6730). This is the biggest cluster with no extremes in the score and financial efficiency.

In the right bottom part of the figure, there are five countries with high financial efficiency and relatively low super-efficiency score – the Red Cross of Monaco, British Red Cross, German Red Cross, Luxembourg Red Cross and French Red Cross. The cluster 3 has reasonable structure because of high SC value (table 2).

Table 2 Statistics of cluster 3

RCNS	Average Distance Within	Average Distance Neighbor	SC
Germany	6.99	40.93	0.8293
Luxembourg	7.97	42.01	0.8102
Great Britain	7.89	36.33	0.7828
Monaco	9.63	34.47	0.7206
France	17.14	53.91	0.6821
Cluster average	9.92	41.53	0.7650

Source: author

The left upper part of the figure shows the group of societies with low financial efficiency and relatively high super-efficiency score - Slovenian Red Cross, Armenian Red Cross Society, Albanian Red Cross, Cyprus Red Cross Society, Estonia Red Cross. Table 3 shows that the five countries have SC value higher than 0.5. The algorithm added other two

[23] Andorra, Austria, Belarus, Bulgaria, Croatia, Denmark, Finland, Hungary, Ireland, Italy, Kazakhstan, Latvia, Lithuania, Malta, Norway, Poland, Portugal, Azerbaijan, Kyrgyzstan, Tajikistan, Turkmenistan, Uzbekistan, Montenegro, Georgia, Moldova, Romania, Slovakia, Spain, Sweden, Switzerland, Serbia, Former Yugoslav Republic, Bosnia and Herzegovina, Russia, Ukraine.

countries in this cluster – Czech Republic and Iceland. But their SC values are much lower.

Table 3 Statistics of cluster 4

RCNS	Average Distance Within	Average Distance Neighbor	SC
Albania	12.81	33.21	0.6143
Armenia	18.25	44.30	0.5881
Cyprus	13.76	33.40	0.5880
Slovenia	20.73	47.25	0.5613
Estonia	13.83	30.67	0.5491
Czech Republic	19.34	23.08	0.1623
Iceland	20.54	23.97	0.1429
Cluster average	17.04	33.70	0.4580

Source: author

The figure 1 shows negative and nonlinear relationship between financial efficiency and super-efficiency score. However, it is valuable to make partial correlation analysis within each cluster. It makes no sense to analyze cluster 1 because there are just 2 Red Cross societies. There are Pearson correlation coefficients in the table 4.

Table 4 Correlation between Score and Fin

Cluster	Pearson correlation	p-value
Cluster 2 (n = 35)	-0.371345	0.028068
Cluster 3 (n = 5)	-0.035062	0.955367
Cluster 4 (n = 7)	-0.790090	0.034504

Source: author

The correlation is significant only in the clusters 2 and 4. All correlations are negative. It means the higher financial efficiency is associated with lower super-efficiency score.

The results can be interpreted in terms of volunteers' engagement and aid standards. The cluster analysis revealed two extreme clusters – No. 3 and No. 4. Volunteers' engagement and aid standard seem to be determinants of financial efficiency and super-efficiency score. In the cluster 3, there are five highly developed countries which provide higher aid standard for clients than less developed countries in the cluster 4. Red Cross ambulance or more individual long-term care for the elderly are examples of higher standard of services. Red Cross societies in the cluster 3 engage significantly less volunteers than societies in the cluster 4 as it was measured by the share of volunteers per one paid staff (table 5). Lower standard of services and high engagement of volunteers are good reasons for low financial efficiency and relatively high super-efficiency score in the cluster 4.

Table 5 Descriptive statistics of volunteers' engagement

Variable	Obs	Mean	St.Dev.	Min	Max
Cluster 2	35	36.18	26.94	1.20	97.93
Cluster 3	5	5.19	3.32	2.64	10.43
Cluster 4	7	83.20	86.50	5.79	207.15

Source: author

4 Discussion

The results could have some limitations from the methodical point of view. Authors chose DEA method as potentially suitable for assessing non-profit organizations. DEA has its limitations and cannot pretend to be a universal and fully objective method. The

possibility to measure and compare values expressed in different units is an important advantage of the DEA method. Selection of variables is the primary and often the most difficult aspect of DEA application in the comparative analysis of DMUs (Nazarko and Šaparauskas, 2014). Kuo and Lin (2011) emphasized two limitations of DEA method: (i) results are based on data integrity and (ii) the number of DMUs must be larger than the sum of the number of inputs and outputs. They pointed out that if the number of inputs and outputs is much larger than the number of DMUs, the discriminating power of DEA is affected. As the number of inputs and outputs increase, there are DMUs that get an efficiency rating of 1, as they become too specialised to be evaluated with respect to other units. They recommend that the number of DMUs is expected to be at least two or three times larger than the sum of the number of inputs and outputs. In this paper, there are two inputs, one output and 49 observations. So, the paper meets the requirement.

5 Conclusions

The aim of the article was to compare the efficiency of the Red Cross and Red Crescent national societies (RCNSs) as the world's largest nonprofit humanitarian network. Moreover, the relationship between financial efficiency and super-efficiency score was investigated. Based on the calculation of efficiency through nonparametric DEA method and cluster analysis, authors revealed distinct clusters with reasonable structure in the group of 49 RCNSs in Europe and Central Asia. The variability of super-efficiency score is high across national societies.

The hypothesis about positive relationship between technical super-efficiency score and financial efficiency was rejected. There is negative relationship between super-efficiency score and financial efficiency. So, the higher financial expenditures per one labor unit (staff and volunteers) the lower number of peoples reached by RCNSs' services per one labor unit. The negative relationship can be explained by volunteers' engagement and aid standards. In the developed countries, there are higher standards of services and lower engagement of volunteers than in less developed countries. It explains relatively high financial efficiency in the developed countries (Germany, Luxembourg, Great Britain, Monaco, France). More individual services caused relatively low super-efficiency scores in these countries. Relatively high super-efficiency score in the cluster of Albania, Armenia, Cyprus, Slovenia, Estonia, Czech Republic and Iceland could be associated with higher volunteers' engagement.

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The analysis of the efficiency of on-line auctions in Poland based on data coming from service Allegro.pl

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Abstract: *Nowadays online auctions become more and more popular. There are many participants, who buy different kinds of products every day. They have information of products and historical prices thanks to new technology and wide access to Internet. The main aim of this work is to check if on-line auction markets are still inefficient (like traditional auctions characterized by geographical fragmentation and limited access to information) and it is possible to gain abnormal profit. Data used in the researches come from one of the Polish biggest and oldest online auction market – Allegro.pl. The category Mobile Phones in Electronics was chosen for the researches. The on-line auction market efficiency was checked by two tests: a unit roots test and variance ratio test. Both tests showed that auctions during the examined period were inefficient. It could mean that it is possible to gain abnormal return with on–line auctions in Poland. Of course, individually participants of on–line auctions usually do not possess a significant amount of money but commonly pose very important market, that's why it seems to be the important problem.*

Keywords: online auctions, efficiency, collectible market, Allegro.pl, stationary process

JEL codes: G14, G19, C19

1 Introduction

The traditional auctions used to be characterized by the inefficiency. The main problems were the following: geographical fragmentation of market and poor information. There was sometimes no possibility to come to the auction or even to know about it. What is also important – people used to pay more money for some goods without the knowledge about the same products in other parts of the country. The development of new technologies in 20th century made it possible to disseminate information all over the world and even to conduct auctions all over the world. There is no problem to buy any products hundred kilometers away without expensive travel costs thanks to IT technologies. One can also observe a great information flow. It is estimated that more than 3,4mld people use Internet (data from researches conducted by agency "We are Social" in 2016). It is 332mln people users more than one year earlier and when one compares it with only 394mln users in 2000, the incredible increase will be visible. Of course, the development of mobile technologies in the last few years make it faster. To understand how important is e–market with on–line auctions helps the statistics that for example Brazilian and Filipino spend 5,2 hours per day on Internet (access through laptop or desktop) and Thaiman 3,9 hours (access through mobile device). These nationalities are the top ones but the rest of the world is not far away. In Poland, people spend usually 4,4 hours on Internet with the use of computer and 1,3 hours with the use of mobile phones. In this way, on-line auctions become bigger and more important market from one year to another.

Nowadays, the problem of the inefficiency is coming back. The problem of poor access to information and geographical distance connected with traditional auctions seems to disappear. So the question is if the on–line auctions are still inefficient? They are conducted under different conditions in comparison to traditional ones. During the traditional auctions, there was always possibility that uninformed bidder would pay too much (Thaler, 1992). The problem of the efficiency of on-line auctions was examined by Song (2007), Vragov (2005) and Kuśmierczyk in Poland (2011) but in operational meaning. The inefficiency

interpreted as the possibility to obtain abnormal returns from on-line auctions was examined by Kauffman on on–line auctions of old stamps and coins (2009). He conducted his research with the use of data coming out from the biggest on-line auctions service in the world – Ebay.com. The problem is worth to be examined always on much smaller and national markets generally without international reach. In Poland, service Allegro.pl is one of the most popular ones. In previous works preliminary researches were conducted on on-line auctions of children clothes (Sroczynska-Baron, 2015) and old coins (Sroczynska-Baron, 2015, 2016). The examination shows that the inefficiency may still exist. However, these products are specific. Both categories are emotional. Mothers are often ready to pay irrational money for particular clothes from one collection, which they want for children. The subjects are relatively cheap so it is easier to bid and raise the price because something took fancy. Nobody is afraid of a potential fraud. Mothers of young children have often similar plans for a day so maybe that's why some calendar effects were observed. Second category - old coins is also specific. Sometimes the collector is ready to pay much more for the item if it is only one he misses to end the whole collection. Of course sometimes bidders could be uninformed properly, for example have small knowledge about the collectible in the world or are the beginning collectors. Both examined earlier categories are also characterized by great liquidity, many auctions are finished with the sale, there are nearly 5 bids per one auction of an old coin. The third feature common for both categories is no established limit of the price, only common sense of bidders. In this work the examination of totally different category will be conducted.

The main aim of this work is to examine the efficiency of on-line auction market with the example of chosen category of mobile phones in Poland. It will be done similarly to verification of hypothesis of the efficiency of stock exchange market. The examined problem is whether prices of on–line auctions are based on all available information. So, in other words, the aim of the work is the attempt to answer the question: is it possible to obtain abnormal returns from on–line auction market. It will be examined with the use of similar tools practised during stock market prices analysis (Wood, 2008, Ashenfelter, 2003). The hypothesis of random walk will be verified. Data coming from the biggest Polish on-line auction service – Allegro.pl are used during the examination.

2 Methodology and Data

The efficiency of on–line auction market

The efficiency of market means that the market price is based on all information available in the market. There are three levels of the efficiency at the stock exchange (Haugen, 1996):

- The week–form efficiency – share prices should contain all information representing by historical prices
- The semi strong-form efficiency - share prices should contain all public information (not only historical prices but for example financial reports of companies)
- The strong-form efficiency - share prices should contain all public and secret information

There are a lot of science works verifying hypothesis of the efficiency of stock exchange, for example works of Fama (1970) and many other. In this work the hypothesis about on–line auction market will be discussed in Poland. The problem is whether the price during on–line auction represents all historical information and is it possible to estimate future price based on historical information? So, in other words, is it possible to gain abnormal return with on–line auctions in Poland? In this way, the week–form efficiency will be examined. If the market is efficient there is no chance for a single participant to gain abnormal profits.

Methodology

The on-line auction market will be checked by two tests. First one is a unit roots test with the use of methodology shown by Kauffman (Kauffman, 2009). Let $P_{i,t}$ be the indexed price for the item *i* at the moment *t.* Then it will be calculated with the following formula

$$P_{i,t} = \frac{price_{i,t}}{price_{i,1}} \tag{1}$$

where

$price_{i,t}$ – the final selling price for the item *i* at the moment *t*

$price_{i,1}$ – the average price for the item *i* at the first moment

Next, let $R_{i,t}$ be the percentage return on item *i* at the moment *t*. Then it will be calculated with the following formula

$$R_{i,t} = \frac{P_{i,t}}{P_{i,t-1}} - 1 \tag{2}$$

Prices in efficient market should follow a random walk (Malkiel, 2003) so next step is to consider the following autoregression function

$$R_{i,t} = \alpha_i + \beta_i R_{i,t-1} + \varepsilon_{i,t}\,. \tag{3}$$

where β_i can be calculated as

$$\beta_i = \frac{\operatorname{cov}\left(R_{i,t}, R_{i,t-1}\right)}{\sigma^2\left(R_{i,t-1}\right)}. \tag{4}$$

The parameter β_i gives the information whether the returns of the item *i* are predictable with the use of previous returns. Random walk occurs when β_i equals 1. In this situation, the estimate of $R_{i,t}$ is drift parameter and the return in the previous period. There is no chance to say if the return of this period will outperform or underperform the expectation. The statistics of Dickey – Fuller test (Dickey, Fuller, 1979)

$$d_i = \frac{\delta_i}{S\left(\delta_i\right)} \tag{5}$$

where $\delta_i = \beta_i - 1$, will be used to verify hypothesis.

Second test used during the researches is variance ratio test. Let $r_{i,t}$ be the logarithmic return calculated with the following formula

$$r_{i,t} = \ln \frac{price_{i,t}}{price_{i,t-1}} \tag{6}$$

Next, Lo and MacKinlay (1988) suggest to calculate the mean and variance of logarithmic prices as

$$\mu = \frac{1}{n}\sum_{t=2}^{n} r_{i,t} \tag{7}$$

$$\sigma^2 = \frac{1}{n-1}\sum_{t=2}^{n}\left(r_{i,t} - \mu\right)^2 \tag{8}$$

The set of data can be segmented based on returns across different period of time. Let $r_{i,t,q}$ be the logarithmic return calculated with the following formula

$$r_{i,t,q} = \ln \frac{price_{i,t}}{price_{i,t-q}} \tag{9}$$

If there is a random walk, the variances should not be changed regardless to the construction of segmentation (it means to *q*). The subsample variance could be calculated with the following formula

$$\sigma_q^2 = \frac{1}{m}\sum_{t=q}^{n}\left(r_{i,t,q} - q\mu\right)^2 \tag{10}$$

where

$$m = q(n-q+1)\left(1-\frac{q}{n}\right) \tag{11}$$

The statistics of variance ratio test

$$v(q) = \frac{\sigma_q^2}{\sigma^2} \tag{12}$$

will be used to verify hypothesis.
In this work the test for random walk will be used to test the efficiency of on–line auction market and both unit root test and variance ratio test will be implemented.

Service Allegro.pl

In Poland more and more people use Internet to buy different products. It is estimated that 20% of people regularly do it. 78% young people (to 34 years old) buy at least one subject per quarter by Internet and 64% older people do it. They do not spend much money – it is no more than 250zł for nearly 79% buyers, but what is significant – only 7% people in Poland never use this form for shopping (SW Research for Nesweek 2015). The most recognizable shopping service is on-line auction service Allegro.pl (report „E-commerce in Poland 2016. Gemius for e-Commerce Polska"). It was established in 1999 by Arjan Bakker and Tomasz Dudziak (Ocetkiewicz, 2012) and one year later became the biggest on-line auction service in Poland. There was first million of users in 2003. Nowadays, more than 50% of internet users visit the service at least once a month and 40 millions of subjects are sold per year. This is peremptory leader among auction services in Poland. The second one – actually service Lekki koszyk has got 3 939 502 auctions (29.05.2017), Allegro.pl has got 55 765 401 auctions at the same time, what is 86% of market. The first subject sold by Allegro.pl was an Internet camera for 320zł, one of very expensive subjects was the car - Porsche 918 Spyder Carbon for 4 500 000 zł. Sometimes You can buy very strange subjects or funny – there was even observed auction of the bottle with water signed as "melted snowman". Generally, it is possible to buy nearly everything. Products are divided into nine main categories, among others there are: Child and Collections and Art examined earlier and Electronics, which is the subject of actual researches.

Data

Data coming from service Allegro.pl was examined in the research. The category Mobile Phones in Electronics was chosen. New product of Apple was observed – Iphone 7 32GB. It is a new product (less than one year old) – its sale started on 23th September 2016 in Poland, 5 days earlier in USA. The official price in September was 3349zl. Of course, the price was quickly falling down. Nowadays one can buy new phone at the price of 2300zł on service Allegro.pl or 2799zł in a shop (ranking ceneo.pl). There are 5 colours of this phone but there is no difference in a price. There were collected data of used phones from 03.2017 till 05.2017. It was 480 observations of used phones. The time of observations seems to be good – there is still a lot of auctions (the number is gradually falling down) of used phones but most of them are in similar condition. They are like new one without any traces of using or with very little traces. They have the guarantee and were used generally no more than three months. All damaged or blocked items were rejected. It allowed to gain uniformity necessary for examinations. The category seems to be interesting because the value of the items is commonly known and they are not unique. There is no problem to buy this phone at once everywhere in Poland and the

range of prices is well known. So it is opposite situation to collectible market or even the market of clothes for children examined before.

3 Results and Discussion

The new kind of Iphone – 7 32GB was the object of the researches. It was rather popular phone and there were a lot of auctions of this item during the observed period. Chosen time of observation guaranteed that items were similar. They were generally like new. The auctions were characterized by low realization. Only 18% of auctions were ended with sale. It is very low result if one compares it with 70% for old coins (Sroczynska-Baron, 2016). There is 3,16 bids per auction. In the middle of the observed period there is a change in behavior of bidders. Lower number of auction is noticed, much more auctions are ended with sale, smaller number of bids is visible, the average price is similar (table 1)

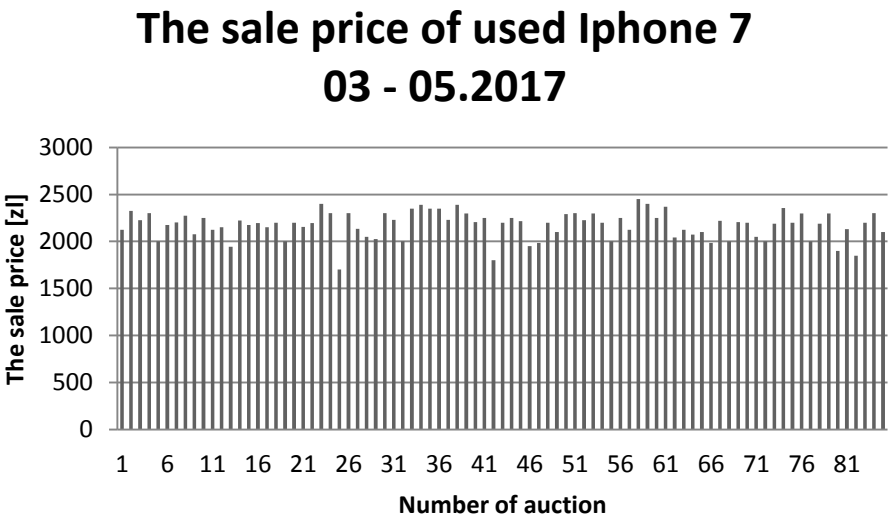
Table 1 Prices of used Iphone 7 32GB on service Allegro.pl 03 – 05.2017 divided into two parts

	I half of period	**II half of period**
Number of auctions	249	231
Percentage of auctions ended with sale	0,068	0,294
Average number of bids	7,82	2,01
Average price of the item	2172	2174

Source: own computation

The data coming from the auctions in period 03 – 05. 2017 are presented on figure 1.

Figure 1 Prices of used Iphone 7 32GB on service Allegro.pl 03 – 05.2017



Source: please own computation

Let us check if auctions in examined period are efficient. First the unit roots test will be used. The parameter β of autoregression function equals -0,51. The statistical analysis is conducted with the use of Dickey-Fuller test. The following hypothesis were verified connected with the equation:

$$R_{i,t} = \beta_i R_{i,t-1} + \varepsilon_t \quad (13)$$

H_0: $\beta_i = 1$ (variable is not stationary)
H_1: $\beta_i < 1$(variable is stationary)

It is equivalent with the process of analyzing the following hypothesis connected with the equation:

$$\Delta R_{i,t} = \delta_i R_{i,t} + \varepsilon_t \quad (14)$$

H_0: $\delta_i = 0$ (variable is not stationary)
H_1: $\delta_i < 0$ (variable is stationary)
The statistics is calculated as δ/S_δ and equals -15,47. It has got asymmetric distribution with an expected value below zero. Critical value (reading from the Dickey-Fuller tables) equals -2,57 (at the level of significance 0,01). The statistics is less than critical value so hypothesis H_0 should be rejected. It means that auctions during the period 03-05. 2017 were inefficient according to unit roots test.
Second, the variance ratios test will be used with the following segmentation: q = 2, 3, 4. The mean and variance of logarithmic prices are $\mu = -0{,}00014$, $\sigma^2 = 0{,}0094$. The estimated subsample variances are the following $\sigma_2^2 = 0{,}0046$, $\sigma_3^2 = 0{,}0032$, $\sigma_4^2 = 0{,}0024$. The expressions $v(2) = 0{,}49$, $v(3) = 0{,}34$ and $v(4) = 0{,}25$ were analyzed. The following hypothesis were verified:
H_0: $v(q) = 1$ (there is random walk)
H_1: $v(q) \neq 1$ (there is not a random walk)
Statistics $\tilde{v}(q)$ calculated, as

$$\tilde{v}(q) = \frac{v(q) - 1}{\sqrt{\frac{2(2q-1)(q-1)}{3qn}}} \quad (15)$$

has got normal distribution $N(0,1)$. If $|\tilde{v}(q)| > z_\alpha$ hypothesis H_0 should be rejected for given significance level α. Critical value for $\alpha = 0{,}01$ equals 2,58. The values of statistics are the following $\tilde{v}(2) = -4{,}75$, $\tilde{v}(3) = -4{,}09$ and $\tilde{v}(4) = -3{,}20$. It means that hypothesis H_0 should be rejected for all three values of parameter q. It means that the various ratios test also showed that auctions during the examined period were inefficient.

It is said that liquidity has got opposite effect to the efficiency on auctions in comparison to the stock exchange (Kauffman, 2009). If there is high liquidity, there could be the inefficiency because there is bigger probability that two bidders will raise the price. During second half of observed time the ratio bids to number of auctions is much smaller so the efficiency will be checked separately for this period.

First the unit root test will be implemented. The parameter β of autoregression function equals -0,49. The following hypothesis were verified connected with the equation (13):
H_0: $\beta_i = 1$ (variable is not stationary)
H_1: $\beta_i < 1$(variable is stationary)
It is equivalent with the process of analyzing the following hypothesis connected with the equation (14):
H_0: $\delta_i = 0$ (variable is not stationary)
H_1: $\delta_i < 0$ (variable is stationary)
The statistics is calculated as δ/S_δ and equals -13,88. It has got asymmetric distribution with expected value below zero. Critical value (reading from the Dickey-Fuller tables) equals -2,59 (at the level of significance 0,01). The statistics is less than critical value so hypothesis H_0 should be rejected. It means that auctions during the second half of the period 03-05. 2017 were inefficient according to unit roots test.
Second, the variance ratios test will be used with the following segmentation: q = 2, 3, 4. The mean and variance of logarithmic prices are $\mu = -0{,}00069$, $\sigma^2 = 0{,}0104$. The

estimated subsample variances are the following $\sigma_2^2 = 0{,}0053$, $\sigma_3^2 = 0{,}0035$, $\sigma_4^2 = 0{,}0029$. The expressions $v(2) = 0{,}51$, $v(3) = 0{,}34$ and $v(4) = 0{,}25$ were analyzed. The following hypothesis were verified:

H_0: $v(q) = 1$ (there is random walk)

H_1: $v(q) \neq 1$ (there is not a random walk)

The values of statistics $\tilde{v}(q)$ (15) are the following: $\tilde{v}(2) = -4{,}04$, $\tilde{v}(3) = -3{,}67$ and $\tilde{v}(4) = -3{,}19$. It means that hypothesis H_0 should be rejected for all three values of parameter q. It means that the various ratios test also showed that auctions during the second part of examined period were inefficient.

4 Conclusions

In this work the auctions of chosen model of mobile phone were analyzed. There were 480 observations which were used for researches. It was a new model so there was no problem to gather the items in similar condition (all of them were in perfect condition as used only 2 or 3 months). The problem was if the on–line auctions were still inefficient? Traditional auctions were considered as inefficient because of most of all the problem of lack of information and geographical limit. When on–line auctions are analyzed these problems disappear. However, the researches show that on-line auctions seems to be still inefficient. Both unit roots test and variance ratios test pointed the inefficiency. Next the analysing period of time was divided because in second half the number of bidders were evidently smaller. It is said that the ratio: number of auctions to number of bidders influences the level of the efficiency. Its influence is opposite to stock exchange where higher liquidity could allow to gain the efficiency. When on-line auctions are considered the higher value of this ratio the higher probability of the inefficiency. There is bigger probability that one bidder will for example raise the price too much (maybe because of sentimental reasons – he had something like this when he was a child or it is the last item for his collection). The second part of analyzed period showed decrease in number of bidders so it could stand for the efficiency for these observations. However, the research showed also the inefficiency. Maybe the ratio was smaller but not small enough. Of course, it is preliminary examination but seems to start an interesting problem.

The similar researches were conducted for different categories. When objects with unfixed price like collectible market is analyzed it seems more obvious to observe the inefficiency. But when the new kind of phone is examined its value is commonly known and it seems to be harder to obtain abnormal returns. That is why this category was examined. However, the researches confirmed the inefficiency like previous examinations for different items.

The researches were conducted on the biggest Polish on-line auction service Allegro.pl. There is no doubt that it is a powerful market but one must say that a little bit different to Ebay.com where big researches were conducted earlier. It is generally local service (only for Poland with some small exceptions), a little bit younger and guided in different economic conditions of potential customers and poorer access to Internet by potential customers for most years of existing from the beginning in comparison to Ebay.com. That is why it seems to be important to analyse it separately.

The on–line auction market is more and more popular in Poland. The institute Homo Homini says that every third user of Internet would sell his objects by on–line auction. What is more people have got unnecessary things worth about 3000zl. Of course, small users of Internet do not possess individually big amount of money but together form very important market. In that way, it seems to be important to learn mechanisms which create on–line auction market and all kinds of anomalies one can meet. Furthermore, even banks introduce auctions to their offers. In Poland for example bank Millennium uses it to create

the term deposit. Public Procurement Authority (in Poland UZP) also carries out on-line auctions in some cases. Of course, the mechanism is different from auctions on service Allegro.pl but it shows how popular become this form of auctions nowadays so it is important to examine it thoroughly and discover all mechanism.

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Development of Patent Activity in Czech Republic

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***Abstract**: Intangible assets play an important role in business activities and represent a significant source of competitive advantage. Firms usually tend to protect their assets regardless of whether they are tangible or intangible. This study focuses on patents and patent activity in the Czech Republic. The aim of our research is to discuss factors affecting the value of a patent and factors affecting its vulnerability. Research in this field also revealed why firms tend to patent their technology. In this paper we analyse the historical development of patent activity, focusing on the engineering sector (classes F16-F17 according to the International Patent Classification), and factors influencing the development. Data were obtained from the annual reports of the Industrial Property Office and the Czech Statistical Office. The analysis showed that the number of national patent applications has been rapidly decreasing since 2002, when the Industrial Property Office became a recipient of European patent applications. Nevertheless, the number of nationally granted patents and European patents validated in the Czech Republic has a rising tendency, suggesting that the Czech market is competitive and worth securing protection of new technology.*

Key words: intangible assets, patent, patent activity, engineering sector

JEL codes: O34

1 Introduction

Intangible assets play an important role in business activities and represent a significant source of competitive advantage. Firms usually tend to protect their assets regardless of whether they are tangible or intangible. This paper focuses on the legal protection of inventions – patents.

Patent represents a legally protected exclusive right to a new invention for a given period of time. Patents, by definition, are granted for inventions which result from inventive actions and also meet several other criteria, especially novelty and industrial applicability. Patents can be granted to an individual, a firm, or a public body. Patents are territorial in nature. Some authors describe patents as a monopoly right (Hall and MacGarvie, 2010; Pérez-Cano and Villén-Altamirano, 2013). Wanetick (2010) objects that a patent certainly is not a right to a monopoly. He argues that competitors are free to design around a patent by producing another technology which yields the same effects. He defines patent as a license to exclude anyone else from reproducing the same effect by applying a specified process during the time in which the patent remains in force, and to grant its holders the right to sue alleged infringers. A patent enables the holder to prevent competitors from using their innovation even if the competitors' products are developed independently (Stahl and Fisher, 2010). Another specific feature of a patent is that it doesn't need to cover the entire product, it can cover only smaller technical advances found in the new product. According to Stahl and Fisher (2010) it is common for companies to develop and produce a single product covered by a number of patents. The holder of a patent is not obliged to use their patented inventions, yet it is generally permissible for the holder to bring infringement lawsuits against competitors who use them.

Andries and Faems (2013) state that firms launching a new product or a new method of production are likely to gain competitive advantage and to realize higher margins in that particular market. Their conclusions correspond with that of Ernst (2001), who suggested

that patents have a positive impact on the firm's sales, and of Helmers and Rogers (2011), who examined high-tech start-ups and concluded that firms which patented their inventions are less likely to fail and achieve higher asset growth within the their first five years of existence compared to similar firms which did not patent. Maresch et al. (2015) also examined the impact of patenting on the firm's performance in relation to the economic value of the patent. They consider patenting an attractive way to turn inventions into economic success, and confirm a positive impact of patenting on the firm's performance and, consequently, on the value of the patent. They emphasize that patents lose their value over time, and they limit the time span of the competitive advantage gained by legal protection of the invention by the time it takes the competitors to enter the market with imitations that circumvent the patent rather than by the patent's expiry date. Hall et al. (2005) label intangible assets as a knowledge stock and believe that these assets positively contribute to the firm's future cash flows, and therefore should be reflected in the firm's market value. Their results showed that the firm's value determinant is given not only by patent counts, but also by patent citations. Nevertheless, they emphasize that citation-based analysis is limited by the fact that, considering forward citation, it is not usable for evaluating current or very recent innovations.

Patent Value Determinants and Patent Vulnerability

Wanetick (2010) emphasizes that a person who attempts to commercialize their patent does not receive the value that the technology deserves, but the value that they negotiate. Nevertheless, he determines several patent value factors. First are the remaining years of the term of the patent. From a potential buyer's point of view it is better to acquire a patent after it has been proven valid during litigation or at least has passed the period when its validity is likely to be challenged. He calculates this period according to the average duration of patents when they are litigated; he estimates it to be three years. The second factor he defines is the number of inventors listed on the patent. Patent quality is supposed to increase proportionally to the number of listed inventors because it means that more engineers or scientists believed in the technology behind the patent as well as in its patentability.

Grönqvist (2009) studied how patent characteristics influence its value. Her results showed that patents held by firms are approximately 1.5 times more valuable than patents held by private persons. She also states that renewing a patent for one more year signals its value is 1.5 times higher compared to if it was not renewed.

Hu et al. (2008) consider oppositions against patents, the number of claims, and the number of backward citations as value determinants. After the date of grant, there is a nine month legal period within which anybody can oppose patents. It is considered to be an important mechanism by which the validity of the patent is challenged. The idea beyond opposition as a value determinant is that no one would oppose a patent which has a value lower that opposition costs. Their results correspond with those of Harhoff and Reitzig (2004), who showed that valuable patents are more likely to be opposed against and that opposition is more frequent in areas with strong patenting activity. Sterlacchini (2016) came to the conclusion that leading European companies intensified their patenting activities as well as the usage of oppositions against the patents of competitors. However, he says the probability of an opposition attack from direct competitors does not depend on the patent value but can be associated with idiosyncratic corporate strategies.

Harhoff and Wagner (2009) note that a patenting firm may benefit from delaying the grant of a patent. During patent examination the applicant is not obliged to pay renewal fees or other associated costs; this positively impacts future cash flows. Moreover, pending applications create uncertainty for competitors, and thus may strengthen the competitive position of the applicant.

On the other side of patent value stands its vulnerability. According to Wanetick (2010) the granting of a patent does not ensure it will be ruled valid in litigation, and he estimates the probability of it being ruled invalid to be roughly 50% (in the United States). Moreover, due to high litigation costs, patentees can rarely afford to assert their rights.

According to Basberg (1987) there are, in general, three reasons not to patent an invention. The first reason is that the invention is not suitable for a patent (there might be a different form of legal protection). The second reason is that the inventor themselves does not believe that their invention can be patented, even if it satisfies all the necessary criteria. The last one, and the most interesting one from the economic point of view, is that the inventor decides to protect their invention by secrecy instead.

Suchý (2015) studied patent propensity of Czech firms, and his results showed several significant motivating factors, especially profit from the direct use of the patent or from licensing, protection against imitation and blocking of competitors, prevention of future litigation, improvement of reputation, or establishing new relationships with other entities. His research also revealed factors discouraging firms from patenting. The most common ones are costs associated with the registration of a patent and its maintenance or a fast innovation cycle not consistent with the duration of patent application examination. Holgersson (2013) along with Stahl and Fisher (2010) state that patents send a positive signal to potential investors, who might consider such investments to be less risky compared to investments in intangibles which lack formal protection.

2 Methodology and Data

In this paper we analyse the historical development of patent activity, focusing on the engineering sector (classes F16-F17 according to the International Patent Classification), and the factors influencing the development. The data were obtained from annual reports of the Industrial Property Office and the Czech Statistical Office. The development of patent activity was analysed for the period from 1998 to 2016. Patent activity was studied by the number of applications filed, by the number of patents granted, and marginally by the number of patents valid in the Czech Republic as of December 31, 2016.

Patent applications were examined by the sector to which their applicants belong. The Czech Statistical Office's classification was used to categorize the sectors; it was then simplified into four sectors:

- firms,
- universities,
- individuals, including enterprising and non-enterprising ones,
- and others, including public research institutions and other government and public organizations, hospitals, unions and non-profit organizations.

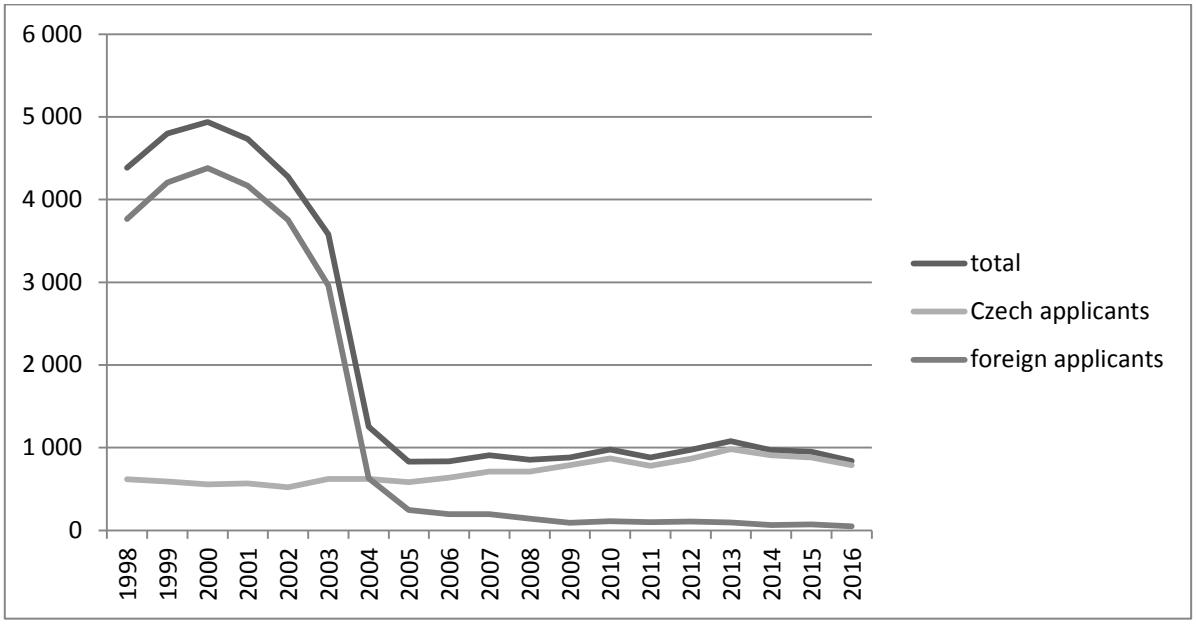
The data were analyzed via descriptive statistics. The studied time period was divided into two sections, from 1998 to 2004 and from 2005 to 2016, because of the fact that the Czech Republic became a member of the European Patent Organization, which affected the development of national patent application filing dramatically. The Czech Statistical Office does not provide detailed information and data related to European patent applications.

3 Results and Discussion

In 2002 the Czech Republic became a member of the European Patent Organization, which is an intergovernmental organization set up on the basis of the European Patent Convention. The Industrial Property Office became a recipient of European patent applications, which resulted in a significant decrease of national patent applications. The

development of the national patent application filing in the Czech Republic has been relatively stable since 2005, as is shown in Figure 1.

Figure 3 Number of patent applications filed in the Czech Republic



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Since 2005, the average number of national applications filed in the Czech Republic has been approximately 915 per year, and nearly 87% are accounted for by domestic applicants. Between the years 1998 and 2004 the situation was opposite; only 15% of applications were filed by Czech applicants and the average number of applications filed was 3995 per year. The percentages of national applications filed by foreign applicants since 2005 are as follows: 28.5% from the USA, 18.1% from Germany, 9.2% from Japan, 7.5% from Slovakia, and 5.6% from Switzerland. These results confirm those of Kučera and Vondrák (2016), who characterise the Czech Republic as a country with a low level of patent activity.

Further analysis focused on patent applications filed by Czech applicants. This analysis showed that approximately 41.7% of the defined subset of applications were filed by firms and 36.1 % by individuals in the years 1998 to 2016. Detailed results are shown in Table 1.

Table 4 Patent applications filed by applicants from the Czech Republic according to the type of applicant and year of filing – expressed relatively

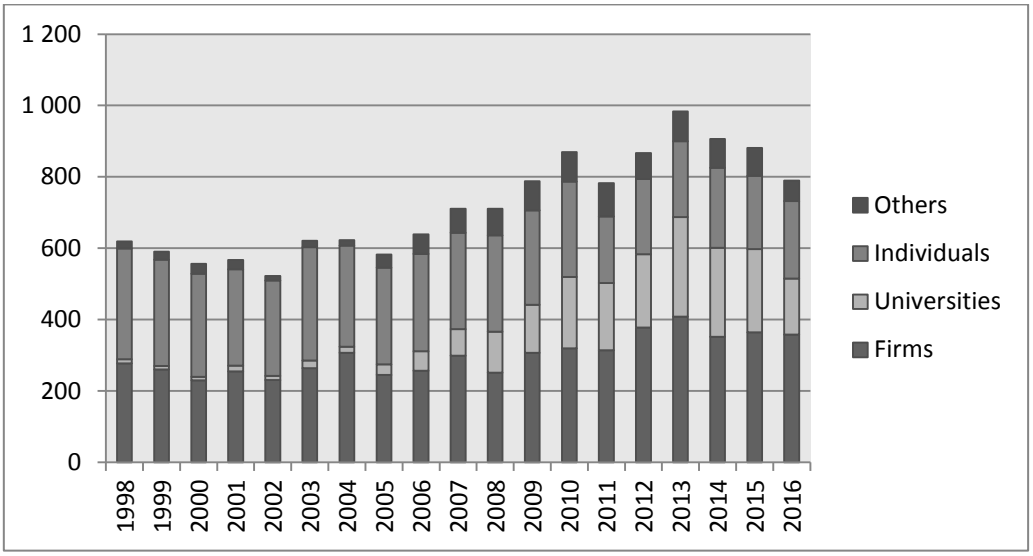
	1998 - 2004	**2005 - 2016**	**1998 - 2016**
Firms	44.50%	40.51%	41.71%
Universities	2.39%	20.21%	14.84%
Individuals	49.67%	30.22%	36.08%
Others	3.43%	9.07%	7.37%

Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 2 shows the patent activity of Czech applicants broken down by type of entity. Their patent activity had a rising tendency until 2013. The patent activity of universities during the years 1998 to 2004 was almost negligible. However, since 2005, there has been a noticeable increase in their patent activity. Kučera and Vondrák (2016) attribute

this increase to the implementation of new methodology for evaluation of R & D organizations.

Figure 4 Development of patent application filing by Czech applicants

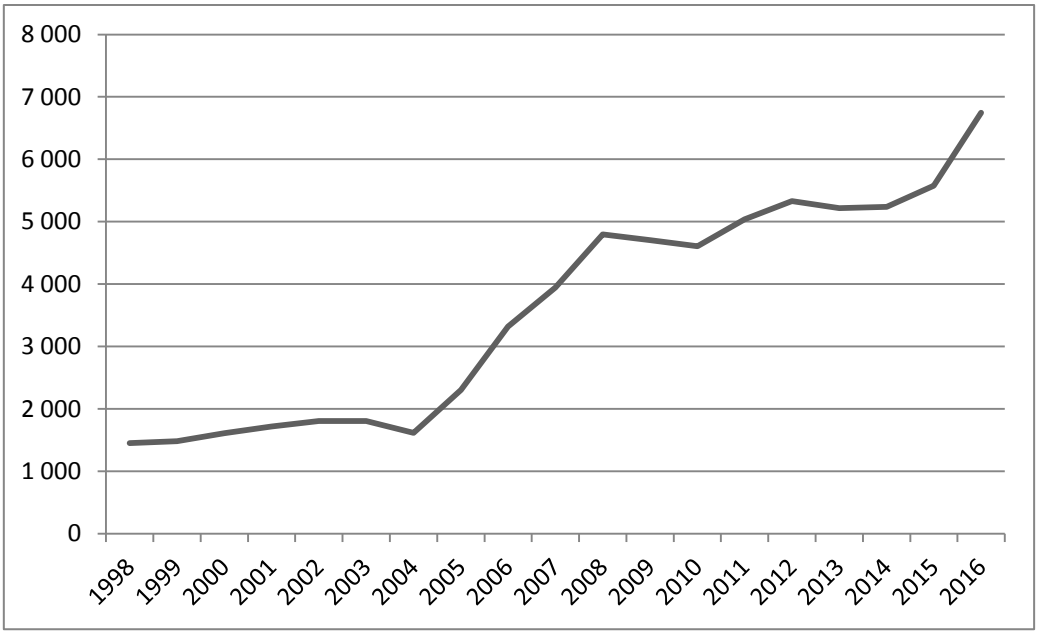


Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

The number of granted national patents and European patents validated in the Czech Republic has a rising tendency, suggesting that the Czech market is competitive and worth securing protection of new technology, as shown in Figure 3.

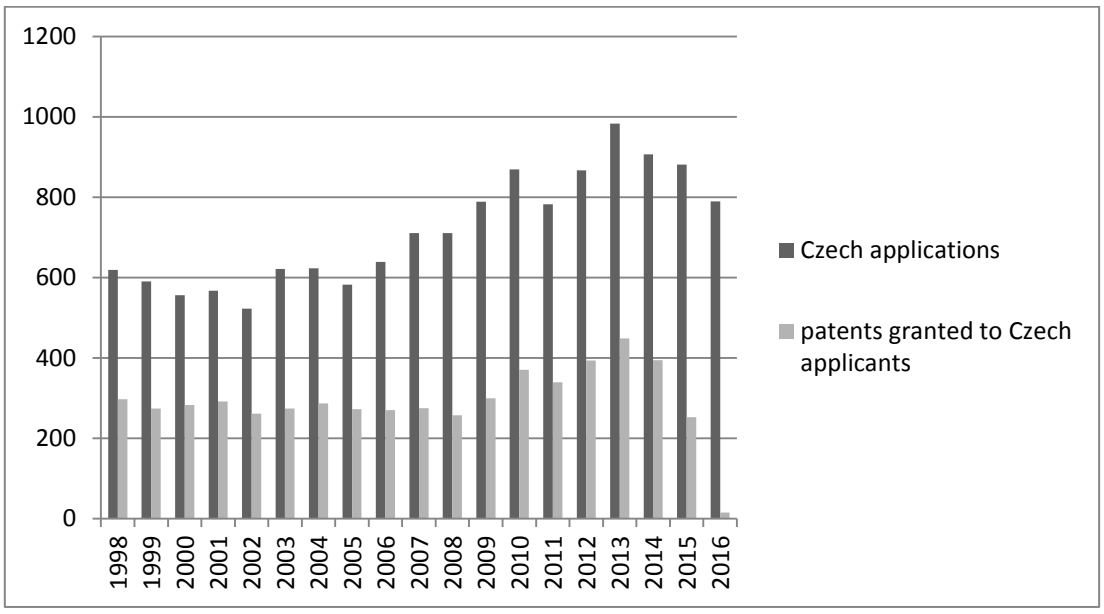
Figure 4 shows the number of patents granted to Czech applicants compared to the number of Czech applications in the given year. Between 1998 and 2013 the Industrial Property Office granted the patent in 44.7% of cases on average. The collected data did not contain detailed information about the number of rejected or pending applications. The duration of application examination is approximately 2.9 years, therefore the analysed time period was intentionally shortened.

Figure 5 Granted national patents and European patents validated in the Czech Republic according to the year of grant / validation



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 6 Patents granted to Czech applicants

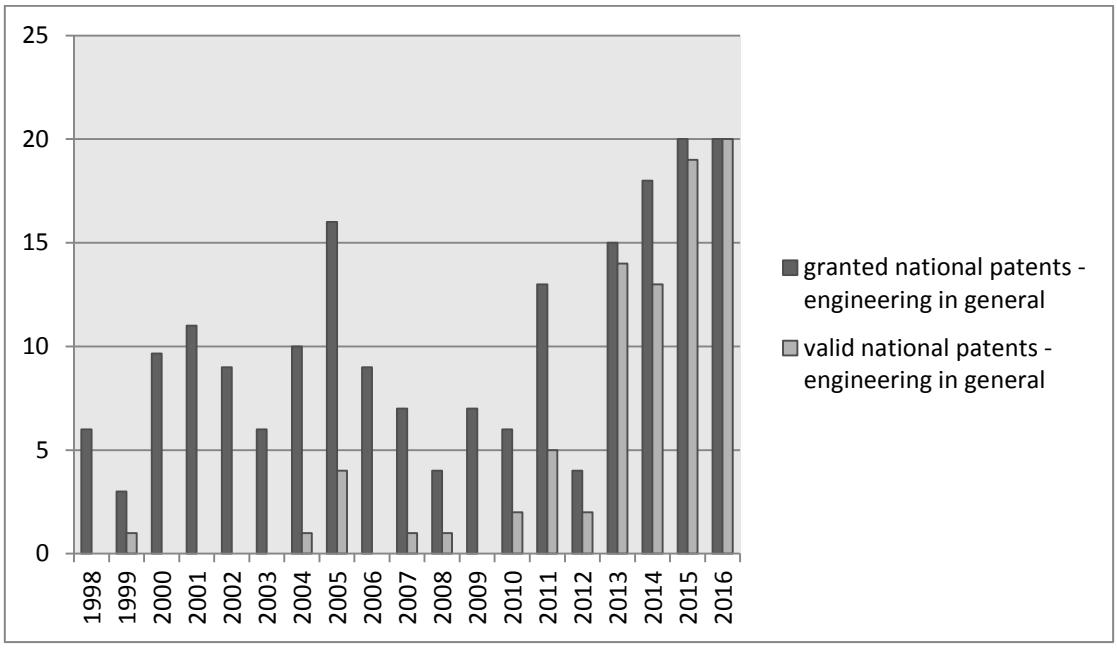


Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

Figure 5 shows the number of granted national patents in the engineering sector compared to the number of valid patents as of December 31, 2016. There are only six valid patents in this sector older than ten years out of a total of 83 valid patents; 63.8% of them are held by firms. The average age of national patents in the engineering sector is a little less than 3 years. Considering only patents held by firms, the average patent

age is approximately 3.3 years, pointing to a fast innovation cycle in the engineering sector.

Figure 7 Granted and valid patents in the engineering sector as of December 31, 2016 according to the year of grant



Source: The patent data are obtained from the Czech Statistical Office and the Czech Industrial Property Office.

According to Suchý (2015) firms in the engineering sector prefer patenting over secrecy. He also found out that larger firms are more active in patenting than small ones. This claim can by confirmed by the results of our research. The analysis showed that 1/3 of all patent applications filed by Czech firms in 2016 were filed by 10 Czech firms. In addition, 15% of all patents granted to Czech residents belong to 20 firms.

4 Conclusions

The aim of this paper was to discuss factors affecting the value of a patent and factors which affect its vulnerability. The literature review showed that patenting is a common way of gaining competitive advantage, that it positively affects the firm's performance, and consequently affects the value of the firm holding the patent. Some previous research (Grönqvist, 2009) showed that patents held by firms are more valuable than those held by private persons. The reason may be that firms usually have larger resources (in case of potential litigation) and a better negotiating position. Also because firms have more means to innovate and use the patents. The patent value can by affected by the number of inventors listed on a patent: the higher the number, the more experts believed in its quality. The crucial factor is the remaining life of the patent, because patents which are too young are under the risk of potential infringement litigation. On the other hand, the older the patent is, the shorter the remaining time of legal protection, causing higher uncertainty about future cash flows. Patent oppositions also indicate patent value; nevertheless, Sterlacchini (2016) objects that direct competitors can attack patents in line with their corporate strategy, regardless of the patent value.

Research in this field also revealed why firms tend to patent their technology. Suchý (2015) in his survey identified motivating factors, corresponding with other authors (Wanetick, 2010; Hall and MacGarvie, 2010; Basberg, 1987), for instance profit from the

direct use of the patent or from licensing, protection against imitation and blocking of competitors, prevention of future litigation or improvement of reputation. However, firms might be discouraged by the registration and maintenance costs or the fast innovation cycle not consistent with the duration of patent application examination.

The number of national patent applications filed in the Czech Republic since 2005 is on average 915 per year. The most active in patenting are Czech firms or individuals. Approximately 45% of applications are considered to be justified, and the Industrial Patent Office grants the patent to its applicants. The average duration of application examination is almost three years. Focusing on the engineering sector, the average age of a national patent granted to Czech applicants is approximately three years, in contrast with the average age of all valid patents granted to Czech applicants, which is 3.7 years.

The analysis confirmed the assumption of a current fast innovation cycle in the Czech Republic. On the other hand, it suggests a lower value of Czech patents, because valid patents are too young, and not renewing them means that even their holders do not consider their patents to be worth the renewal fees. Nevertheless, the number of national granted patents and European patents validated in the Czech Republic has a rising tendency, implying that the Czech market is competitive and worth securing protection of new technology, even if for a much shorter period of time than the theoretical 20 years.

Acknowledgments

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Difficulties in Terminology of Private Equity

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Abstract: *This article is focused on the theoretical definition of private equity capital, which, despite a relatively long history, is not precisely defined. Different entities often use different definitions in this area, which ultimately increases the disharmony of private equity, makes entry of new investors more difficult, and limits the demand for this asset. Even within the European Union, there is an inconsistent definition of private equity capital. We can see differences when comparing the institutional view of the European Union and some companies providing private equity capital. Therefore, we have focused on comparing several views of private equity to create clear definition of this category. Our new view on definition of private equity should adequately reflect the needs of our rapidly changing world and clearly distinguish private equity strategies. The effort to unify terminology is accompanied by highlighting the differences between types of private equity capital.*

Keywords: private equity, venture capital, growth capital, definition

JEL codes: G24, G23

1 Introduction

Private equity transactions represent form of financing business activity. They belong to the group of alternative sources characterized as a distinctive type of asset developed outside of traditional financial system formed by banks and stock markets. Its goal is not only to support financial operations in a company, but also to provide know-how and investors experiences. Companies often do not have detailed information how private equity works. The Slovak Republic is a good example of the lack of information about alternative sources. Nevertheless, this form also exists in Slovakia. According to Mura & Buleca (2012), Czech republic has more developed market of alternative sources, where we can include leasing, factoring, forfeiting, crowdfunding and project financing. (Bánciová & Raisová, 2012; Maresova, 2010)

As part of the private equity investment, we must also mention the second perspective on these assets, namely the investor's point of view. Private equity investments are a part of a broad pool of assets called private capital, defined as private with character of equity and debt in different assets, formed by:

- Private Equity,
- Private Debt,
- Real Estate Financing,
- Infrastructure Financing,
- Funding of Natural Resources. (O'Hare, 2015)

We focus on core private capital transactions marked as private equity. Due to the inconsistency in terminology in this area, we have used several definitions and insights into private equity investments. The result should be the comparison of different definitions according to different perspectives, as well as the consolidation of one conceptual framework for defining private equity.

Definition of private equity investment

The term private equity suggests that it is an investment in the company's equity. This private capital is directed to non-listed companies on the market. The simplest definition speaks about "any investment in a non-listed company on a fixed-term equity market". Because of the simplicity, it does not explain the nature of private equity investments. (Šoltés, Šoltés, Gazda, & Sípko, 2013)

Invest Europe, association representing Europe's private equity, defines private equity as the capital provided to non-listed companies in investment phases: venture capital, growth capital, debt refinancing capital, rescue capital and buyouts. These investments are closed with a fixed life cycle, i.e. exit from investment from company is precisely planned. (Invest Europe, 2016) Slovak Venture Capital & Private Equity Association, member of Invest Europe, define private equity as capital provided to non-listed companies for creating new products and technology, expanding working capital, financing acquisitions or improving the capital structure of an enterprise. (SLOVCA, 2016)

Fenn et al. (1995) use a definition of financial sponsorship activities, where the acquisition of a large equity stake takes the investor into a position with active involvement in the strategic affairs of the company. Using this definition, he includes business angels, providing angel capital to start new companies.

Private equity investments are therefore a temporary investment of private capital into a non-publicly-traded company, with an active involvement of the investor to optimize its growth. This type of investment is typically characterized by a higher risk balanced by higher returns. Such an investment represents a relatively illiquid form of capital by which the investor participates in the company's own capital. End of the investment, also known as exit route, is done by selling investors stake in a company. In summary, Private equity investments have the following characteristics:

- medium to long-term fixed investment life cycle provided as capital injection,
- a contractual relationship between the provider and the recipient of the capital,
- active participation of the investor,
- making profits at the end of the investment,
- it's an illiquid and risky asset,
- investing in a non-publicly traded company.

The last characteristic is criticized by Gilligan & Wright (2010), who say that this condition can be broken. As an example, we can mention private equity investments in publicly traded companies known as PIPE, but because of tradability of stocks during investment we do not include this investments to private equity.

These investments help to support business and innovation on the regional level. As an example, we can mention resources of European Investment Fund flowing into private equity industry. Companies look for resources for innovation, rapid growth and acquisitions. Using private equity this can be achieved in situations, when other forms of capital are not available due to higher risk. On the other side, investors are motivated by higher profits, innovation efforts and ability to provide their know-how to younger generations. Private equity investments are used in all industries, but one private equity company specialize mostly in one industry. (Sipikal, Pisar, & Uramova, 2010)

With these investments risk comes in many forms. Standard risk management tools are not sufficient for investors to handle specific risk of private equity, namely, market risk, liquidity risk, funding risk and capital risk. On the other side, original owners run the risk of losing leading position or even their company because of low business performance.

Private equity industry

Within the private equity market, we recognize several investment strategies. They have developed relatively independently, and over time they have gained unique

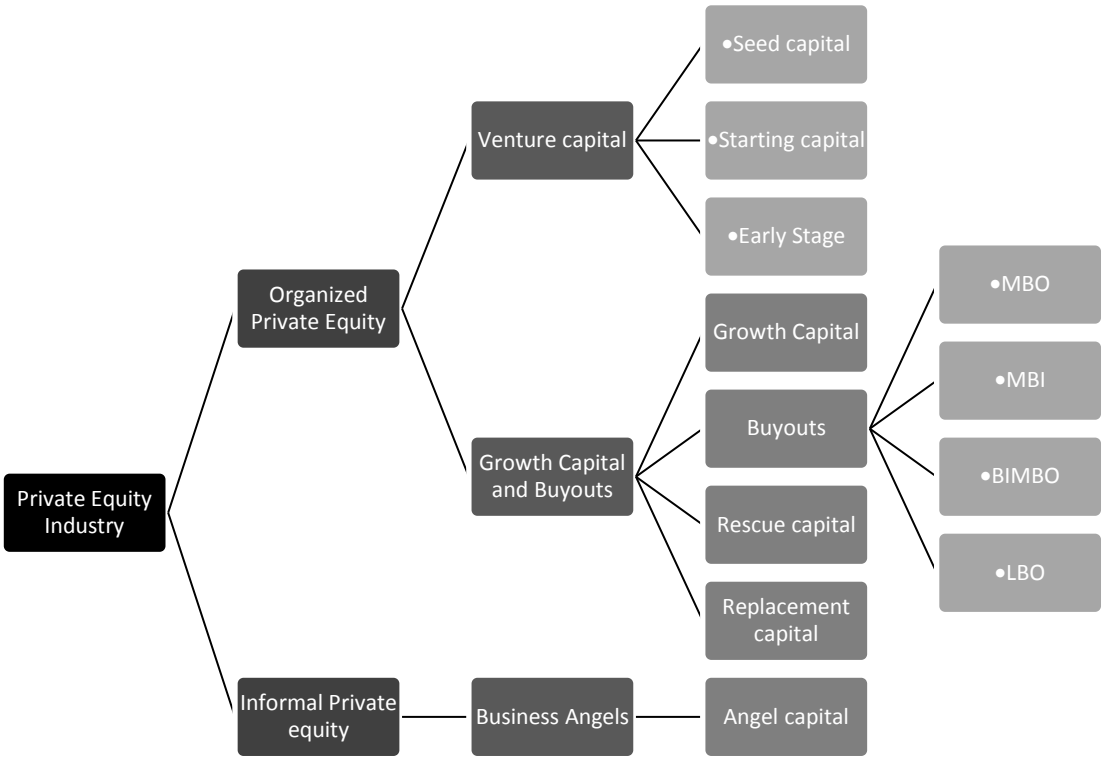
characteristics representing the most important differences of strategies. These differences are very important investors because investors can adjust their portfolio to achieve the optimal investment triangle. To precisely define private equity, we must point to all existing strategies and show their uniqueness. But first we should present organized and informal market. The organized market is professionally managed by intermediaries, who mainly work with sources in the form of funds in cooperation with national and international entities. This category is understood as the main research topic of private equity capital. (Kumpf, 2013) Informal market is formed by business angels. These investors provide funding and know-how with active ownership. According to estimates, the informal is several times larger than the organized market, but it lacks the institutional structure and hence performance data, which prevents to effectively invest on this market. (Fenn et al., 1995)

Private equity companies often do not respect their specific focus and therefore the risk profile of the investment may increase. For example, some buyout funds provide resources meeting the conditions of growth capital, which is linked with higher risk. The main differences between strategies are represented by:

- the stage of business life cycle,
- the size of the investment,
- acquired part of the company,
- structure of resources provided,
- the sector of the funded company,
- the underlying risk and the associated required rate of return,
- exit route of investor from company. (Freňáková, 2011)

Considering all the differences, simple division is not suitable for current market statistics. Private equity industry has grown and diversity of strategies require a more detailed division. Therefore, reporting services as Invest Europe is based on the division of the organized market into five categories, including venture capital, growth capital, buyouts, replacement and rescue capital. Such allocation is also used by the European Union's organizations, namely the Statistical Office and the European Investment Fund. In the Fig. 1 we have created multi-stage division with respect to all mentioned facts.

Figure 1 Private equity industry division



Source: Own elaboration

In one enterprise, multiple private equity strategies may occur. Any new use of private equity may be the exit point of previous investment, and so private equity can stay in a company for a long time. (Robinson & Sensoy, 2016)

Venture capital

In our perception, venture capital is a form of private equity investment focused on new and potentially fast growing companies, mostly in the high-growth sectors. The size of this investment is usually less than the industry average and is provided within several stages of the company's development. This amount is used for product development and market mapping. The investor usually acquires the minority share of the company to motivate the original owners, but every capital injection reduces their share. Nevertheless, venture capital providers maintain a certain level of control over the entity throughout the investment period. Due to the risk profile of investments and relatively low investment size, investors rely on their own capital.

The main goal of these companies is to increase their revenues, market share and brand awareness. These intangible assets are very important for increasing the value of the company. (Drabiková, 2016) Making profits is almost not possible when achieving high growth rate, because of high costs. Dvořák & Procházka (1998) state that venture capital has three stages seed capital, start capital and early stage capital, that differs by the amount of the investment, duration, risk and profitability.

Growth Capital

In this work, we define growth capital as resources provided for established companies to support their growth. They have characteristics of venture capital and buyouts, therefore their unequivocal inclusion into one of these categories is not possible. Their objective is similar to buyouts and so we prefer inclusion to this category.

Like venture capital, they usually earn a minority stake in the company. A minority share is associated with certain rights, pre-determined in a contract. Investors use almost exclusively their own capital. Growth capital, due to the existence of company's assets, brings less risk compared to venture capital. Parallel with buyouts can be seen in the support of mature companies, offering own products with potential to expand domestic and foreign markets. Several forms of investment can be used, but private equity, while accepting higher risk, makes faster growth of the company possible. Growth capital, unlike venture capital, has a form of one financial injection. (European Commision, 2006)

Buyouts

Buyouts are the part of the private equity investment used to buy a mature company to expand its portfolio and market. Due to the presence of tangible and intangible assets, the level of risk is relative small, because failures would be at least partially covered by these assets. Unlike venture capital, buyout are not associated with technological risk, because of existing product portfolio. (Kaplan & Strömberg, 2009)

The goal of the buyout is to maximize the value of the company, which is usually associated with the change of existing management. Through optimization, the company tries to increase its value. There is a negotiation between the current owners of the company and the investor. Given that this sale may become violent takeover, typical for 1980s. Nowadays, investors offer better conditions and proposals, and therefore takeovers are not so widespread. Buyouts often help current or external management to buy a company from owners. In this case we speak about Management Buyouts, respectively about Management Buy-in or Buy-In Management Buyout. (BVCA, 2010; Freňáková, 2011; Jurkasova, Cehlar, & Khouri, 2016)

Such a transaction requires a large amount of funds, the portion of which is borrowed. In this case, we are talking about leveraged buyouts. According to Metrick & Yasuda (2010) these transactions allow to make higher profits, but also to invest in larger companies. Because the average annual return is higher than the cost of borrowed capital, the profitability of the investment increases. Engel, Braun, & Achleitner (2012) talk about the positive effects of the debt on return on investment only to a certain debt level. With a debt ratio over 90% to total capital, the debt becomes too high, which outweighs the positive effects of the leverage. Higher risk is reflected in higher interest, causing reduced profits or raising losses.

Rescue capital

Invest Europe defines rescue capital as a source for mature companies with business difficulties. Investor can provide required capital and experiences to overcome the company crisis. Rescue capital is therefore special use of private equity capital with higher risk profile. (Invest Europe, 2016)

The aim of this capital is to avert the bankruptcy, to direct the company the right way and to restore profits. As part of the restructuring plan, the development program plays an important role. It can involve radical steps such a sale of some divisions or layoffs. Given the nature of supported businesses, rescue capital is associated with a higher risk than the average private equity industry.

Replacement capital

According to Invest Europe, replacement capital is defined as the acquisition of a minority stake from another private equity firm or other shareholder. This capital may also include elements of rescue capital, because, in the case of refinancing debt, the aim is to avert the negative effects caused by high debt. Debt affects the company adversely by credit payments that could lead to a cash-flow collapse. Decreasing debt/equity ratio can improve business predictions, therefore private equity capital can be very helpful. Such form of investment is associated with a higher risk, as an investor enters a business that is in danger of producing a loss. In addition to this use, replacement capital is

invested to compensate new capital requirements, e.g. replacement of another private equity investor. (Invest Europe, 2016)

Angel capital

Angel capital is provided by investors known as business angels. As mentioned previously, they create informal private equity market, widespread in the USA. Business angels are wealthy people investing alone or as a group with several objectives. Profit is one of them, but they are primarily driven by desire to mentor future generations and to transfer their knowhow. Angel capital is mainly flowing into new companies. As part of their activities, they seek to provide insights and gained experience, while the start of the business is the task of the owner.

Other views on private equity

In this section, we tried to analyse other views on private equity capital, including American and European understanding with emphasis on Slovak private equity market. These views should point to inconsistency of terminology. Metrick & Yasuda (2010) highlight the differences between the strategies of private equity, because investors make different decisions in company management. Companies often distinguish only venture capital and buyouts and that cannot provide all necessary information for individual investors. Fraser-Sampson (2011) expects that if there are more investors in the market, the differences between the different categories would be more visible, which would result in changes of present nomenclature.

Given that terminology is not firmly integrated, there is a different understanding of this capital in Europe and the US as well as between individual private equity organizations. Some inconsistencies in terminology are also found in the European market, as we can see in the former name of the Invest Europe association, which was called the European Venture Capital Association. Later, its name was adjusted to European Private Equity & Venture Capital Association to suit the fit focus on the private equity industry.

In Tab. 1 we show the relationship between the US and European definition of private equity. This comparison considers the basic division of the private equity industry shown in the Fig. 1, where replacement and rescue capital is perceived as a form of buyouts.

Table 1 Comparing the understanding of the term private equity in Europe and the US

	Informal market	Organized market		
Europe	Angel capital	Venture capital	Growth capital and buyouts	
			Growth capital	Buyouts
USA	Angel capital	Venture capital		Private equity

Source: own elaboration based on European Comission (European Commision, 2006)

The biggest difference between these definitions is the fact that in American definition venture capital and private equity represent different forms of investment. The term private equity is in the US used to identify transactions that are a part of the growth and buyout category in Europe. Growth capital is a category standing on the dividing line of venture capital and buyouts. In the US, it is understood as part of a venture capital, but in Europe it is considered as a part of wider category of growth capital and buyouts. Growth capital is often represented as expansion capital. We consider expansion capital as part of early stage capital, to support growth of new companies and growth capital as independent category providing support for mature companies American authors like Bance (2004) and Gompers & Lerner (2001) use division of this investment into categories venture capital and private equity. On the other side, Fraser-Sampson (2011) states that the term venture capital can even mark the entire US private equity market. Slovak authors Hečková & Hrabovská (2016) refer to this industry like venture capital,

too, which does not correspondent with Invest Europe, where venture capital is a part of private equity.

In Slovakia and Czech Republic terms private equity and venture capital are often replaced by terms risk and development capital. Freňáková (2011) understands risk capital as the part of private equity that deals with investing in new companies, in our understanding as a synonym for venture capital. The private equity industry may be labelled as "risk and development capital". Even according to the document of Ministry of Economy of the Slovak Republic venture capital can be sufficiently replaced by the synonym risk capital. (MH SR, 2005) On the other hand, Dvořák & Procházka (1998) refer only to venture capital as to risk and development capital. Venture capital is relative broad category including seed, start, early stage, rescue, debt replacement and acquisition capital. Private equity is understood as a wider concept including venture capital investments, as well as buyouts, mezzanine financing and other strategies. We can find this view in some companies too, e.g. Arca Capital.

We have analysed 15 companies providing private equity investments in Slovakia using data obtained from official freely available websites and prospects of this companies. By understanding their active and finished projects, we have created analysis of their products according to statistics of Dvořák & Procházka (1998). Most of these companies are relatively small and therefore, some companies have experiences with only a few investments. They rarely focus on one type of private equity, they even try to provide other forms of investments as real estate or mezzanine finance. We can observe support from the state and the European Union, where Neulogy Ventures and Limerock Fund Managers provide capital support from private sources and European Investment Fund.

Table 2 List of private equity firms in Slovakia

	Venture Capital	Growth Capital	Buyouts	Other financing form	Public portfolio details	Invest Region
Across Private Investments	x	x	x	x		SK
Arca Capital	x	x	x	x	x	CZ&SK
BENSON OAK		x	x		x	CZ&SK
Enterprise Investors		x	x	x	x	EU
Equity Solutions	x	x		x		CEE
Genesis Capital	x	x	x		x	CZ&SK
InfraPartners Management		x	x			World
J&T Private Equity Group		x	x			World
Limerock Fund Manager		x				SK
Neulogy Ventures	x				x	SK
Pro Partners Holding	x	x	x	x	x	CEE
SANDBERG CAPITAL	x	x				CZ&SK
Slavia Capital	x	x	x		x	World
VenCorp group	x			x		SK
WOOD & Company			x	x		EU

Source: own elaboration

Only seven companies precisely define their investment focus, which companies can seek investments. Eight companies do not offer public data about their company and portfolio. Five of them refer to their activities as only private equity investments, which indicate American meaning of private equity investments. The most popular investment strategy is providing growth capital. Although there are companies providing this capital, demand

is not high. Nine companies register together 177 active and finished investments during their existence in our region.

2 Conclusions

In the world, different definitions are used to define private equity, which, despite many similarities, often refer to broader or narrower groups of investments. This situation is observable not only at the level of continents but even countries or individual organizations dealing with this financial asset have chaotic labelling. The aim of this article was to describe and unify the terminology used in this area, along with a basic explanation of each type of capital.

Private equity companies have relatively short history in CEE, but the main problem is information support for enterprises looking for capital. Only few companies described what type of capital they provide. On the other side venture capital becomes relatively well-known through start-up centres and conferences.

Due to the inconsistency of nomenclature, we assume there is a lower demand and supply of this capital. Private equity itself involves a significant part of the risk, therefore any other risk factor discourages new and small investors.

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Disparities in capital markets of the EU and the US

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Abstract: *The aim of the paper is to give strong preview of the EU and US position in global trade by comparing capital/stock markets in the EU and US. For this purpose we used trading volumes on several instruments. After presenting dependence between trading volumes and market capitalization for both sides of pacific, we gradually show major differences in overall trades/volumes and specific areas such as interest rates trading, ETFs, stock options, investment funds etc., using data collected from 70 biggest exchanges, covering more than 90% of total stock market capitalization, In line with expectations, our findings prove that US market is definitely significantly bigger and more dynamic than EU market with almost doubled market capitalization and more than tripled number of trades. Findings in this paper show that Capital Markets Union concept brought by the European Commission could lead to increase in those numbers subsequently make EU market more flexible and dynamic. Improving redistribution and transmission of assets and capital in the EU market supported by CMU could lead to better economic growth and better overall performance.*

Keywords: Capital Market Union, stock markets, capital market, stock exchange

JEL codes: F21, G15, O16

1 Introduction

Stock market is undoubtedly an integral part of the European and American economy. Activity on stock markets could be simple and good indicator about state of economy, if we take into consideration, that investors and traders are rational and are aware of all information. In this paper we focused on concept of Capital Market Union presented by the European Commission in 2015 (see EC–European Commission, 2015). This document presents vision of better trading and investment environment in the EU, better economic performance and also easier access to capital market for businesses, with easier way for investors and mainly improvement of stock markets performance in the EU with aim of stronger economic growth. We decided to compare the EU data from stock markets with the United States in order to achieve clear view how important CMU concept is.

Considering uni-directional linkage from stocks performance to economic growth, positively related results could be found in many papers with variety of approaches, data sets and empirical methodologies (Tsouma, 2009). In terms of the US, studies suggest that stocks return (stock market performance) granger causes economic activity or can be used as a leading indicator of economic activity (Bosworth, 1975; Balvers, Cosimano, and McDonald, 1990; Schwert, 1990; Fama 1990). Asprem (1989) reached similar conclusions for 10 European countries and for G-7 countries Choi, Hauser, and Kopecky (1999). However, across the literature we can find also results with negligible impact of stock market performance on real economic growth and activity (Canova and De Nicolo, 2000).

The majority of empirical results among several studies investigating bi-directional interdependencies show us also positive linkage from stock returns to economic activity.

Stock market performance seems to explain a significant variability in economic activity in the US according to Lee (1992), G-7 countries (Hassapis and Kalyvitis, 2002) or in Canada (Hassapis, 2002). Caporale et al. (2004) comes with more complex conclusions. Besides suggestions, that especially in the long run, economic growth could be fostered by developed stock market, his work also supports theories according to which economic growth bolsters faster capital accumulation and allocation throughout well-functioning stock markets. We assume that CMU has similar complex goals – to encourage activity on stock markets throughout simplifying access to stock and capital markets and achieve faster and more effective capital allocation. There are legislation differences between US and EU undoubtedly too.

Considering a fact, that stock market development implies economic growth, we decided to focus on and compare activity on stock markets in the EU and the US. We use trading volumes as an indicator of activity and accessibility to stock markets. For instance, Gervais, Kaniel and Mingelgrin (2001), Zhou (2010) or Kurniasari (2008) uses trading volumes as an instrument to predict stocks returns, resulting causality where higher returns are caused by higher volumes on particular asset. Kaniel, Ozoguz and Starks (2012) states that higher trade volume on particular stock bring some visibility to it, and increases its interestingness and vice versa. Some literature strands refute this interconnection (f.i. see Huang, Heian and Zhang, 2011). Nevertheless, we put traded volumes not only of particular asset, but whole basket of instruments in context with market capitalization that will represent returns of all stocks. After defining what will imply market capitalization mostly, we analyse these volumes.

Paper is structured as follows; we show panel regression model for US and EU using volumes of trades in order to discover their effects on market capitalization, in line with positive relationship between stock returns and market capitalization, consequently we present results of our model. After that we compare EU and US market in the field of volumes traded on various instruments. Then we conclude our findings.

2 Methodology and Data

To prove some significant disparities between the EU and the US, in this paper we use mainly volumes traded on both futures and options on commodities, currencies, indices, single stocks, long and short term interest rates. For other derivatives there is volume as sum, and for ETF´s we state only options. Data were gathered from world federation of exchanges. Next we adjusted data with respect to our needs, in other words, we gathered volumes of trades only from major US and EU stock exchanges, covering together more than 90% of market capitalization both in the US and the EU. Subsequently, we used panel regression model to estimate influence of volumes traded on particular instruments on market capitalization. Reason for searching this dependence is, that with increasing market capitalization companies are facing capital inflows, and consequently reinvests, while volumes traded present activity of market participants. We used first differences of annual data from 2009 to 2016. It is undoubtedly short time period, nevertheless, we consider our data solid because of large amount of major stock exchanges included. The general linear relationship is defined as follows:

$$MC_{it} = \alpha_i + X_{it}\beta + u_{it} \tag{1}$$

For t = 1,…,T and i = 1,…,N, where MC_{it} is the dependent variable used as proxy variable for market capitalization, observed for US or EU at time t. X_{it} is the time variant matrix of explanatory variables – volumes of trades in our case, αI is the unobserved time-invariant individual effect and u_{it} is the error term, Bai (2009).

We excluded other derivatives and single stock futures from our model, because of missing data, subsequently we were removing variables that were insignificant for our model with respect to their p-value. Main objective here was to determine statistically significant effect of volumes of trades on market capitalization in the EU and the US.

In Table 1 and Table 2 we present trading volumes of tracked instruments in millions of trades and total market capitalization in millions of dollars.

Table 5 US Financial Market Indicators

Year	2009	2010	2011	2012	2013	2014	2015	2016
MC	15 077 285.74	17 283 451.68	15 640 707.04	18 668 333.21	24 034 853.52	26 330 589.19	25 067 539.60	27 352 200.72
SSO	1 392.41	1 110.85	2 370.70	2 284.74	1 689.37	2 342.93	2 179.59	1 975.56
SSF	2.62	4.76	3.60	5.15	6.74	6.16	-	-
SIO	242.34	265.84	300.47	270.49	334.03	390.96	408.10	597.00
SIF	749.58	742.49	800.99	623.16	603.73	608.77	612.92	668.30
ETFO	1 063.48	1 237.33	1 705.56	1 374.56	1 452.09	1 502.14	1 399.47	1 650.90
STIRO	161.03	183.58	196.62	140.54	150.04	216.66	243.99	308.88
STIRF	438.10	511.37	588.35	441.18	524.76	672.35	607.23	688.27
LTIRO	62.90	85.15	77.39	87.30	135.88	148.28	144.16	145.44
LTIRF	411.53	598.49	672.47	565.87	680.55	727.35	703.12	751.61
CURO	6.15	11.89	10.51	10.74	15.39	17.33	21.06	18.16
CURF	156.31	229.09	231.57	210.70	216.95	193.11	212.01	205.41
COMO	113.40	182.90	154.55	166.22	194.35	184.17	200.32	208.52
COMF	555.32	719.93	721.69	806.98	975.71	901.35	1 010.35	1 157.08
OD	33.63	62.77	-	-	40.19	50.62	196.14	208.43

Note: MC: market capitalization (in millions $); SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options; LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE and World Bank data

From Table 1 we would like to point out very strong increasing trend in market capitalization in the US, which indicates strong money inflows. On the other hand, as it could be seen in Table 2 below, market capitalization in the EU does not indicate any trend, or it is stagnating, while in 2009, market capitalization in the US was more than twice as high as in the EU, in 2016, the US market capitalization was even four times higher than in the EU. We show more comprehensive analysis in Section 3.

Table 6 EU Financial Market Indicators

Year	2009	2010	2011	2012	2013	2014	2015	2016
MC	6 900 113.24	6 705 066.62	5 601 539.01	6 332 388.72	7 932 211.38	7 184 713.37	6 276 080.00	6 379 057.69
SSO	563.28	578.61	549.22	443.82	394.50	361.94	326.48	318.89
SSF	385.96	534.04	479.36	487.73	331.47	256.03	215.86	175.88
SIO	488.37	448.34	540.20	440.03	377.48	397.98	437.88	428.54
SIF	563.96	611.55	665.28	533.34	473.82	516.85	570.57	646.88
ETFO	0.01	0.14	0.06	0.07	0.00	0.01	0.04	0.30
STIRO	191.31	191.02	178.18	112.43	143.03	85.40	58.27	63.64
STIRF	316.31	386.96	391.13	326.39	410.73	307.07	290.02	302.76
LTIRO	51.95	65.00	80.89	71.91	66.42	51.01	79.35	59.28
LTIRF	444.28	546.59	591.40	443.60	492.50	450.88	467.39	524.59
CURO	0.66	0.33	0.22	0.24	0.22	0.16	0.15	0.06
CURF	7.69	7.25	6.06	5.37	9.34	8.77	10.23	3.53
COMO	7.38	3.23	14.88	21.62	28.65	37.11	34.36	37.88
COMF	277.30	328.97	417.86	441.92	484.25	492.48	541.85	587.86

OD	-	-	14.37	18.55	3.64	5.36	28.64	32.36

Note: MC: market capitalization; SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options; LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE and World Bank data

In second part we present graphs with comparison of development of these traded volumes with theoretical context.

3 Results and Discussion

After removing stock index futures (SSF) and other derivatives (OD) because of missing data for those instruments, we gradually removed single stock futures (SSF), exchange traded funds options (ETFO), short term interest rate options (STIRO), short term interest rate futures (STIRF), long term interest rate options (LTIRO), currency futures (CURF) and commodity options (COMO), because of their p-value signalling insignificance, in order to achieve model where only statistically significant variables will remain. In Table 3 we present only statistically significant variables that remained in our model.

Table 7 Estimated coefficients from panel data

Coefficients	Estimate
COMF	0,077841 (**)
CURO	-0,892964 (*)
LTIRF	-0,862663 (***)
SIF	-1,818970 (***)
SIO	0,422963 (**)
SSO	-0,212954 (***)

Note: ***, **, * denote significance levels on 1, 5 and 10 per cent respectively. R-Squared is 0.92. According to White´s test, there is not heteroscedasticity presented in the model, LM statistic=9,85. Residuals are normally distributed, Chi-square = 0.428. There is no autocorrelation according to Durbin-Watson test.

So the final model is:

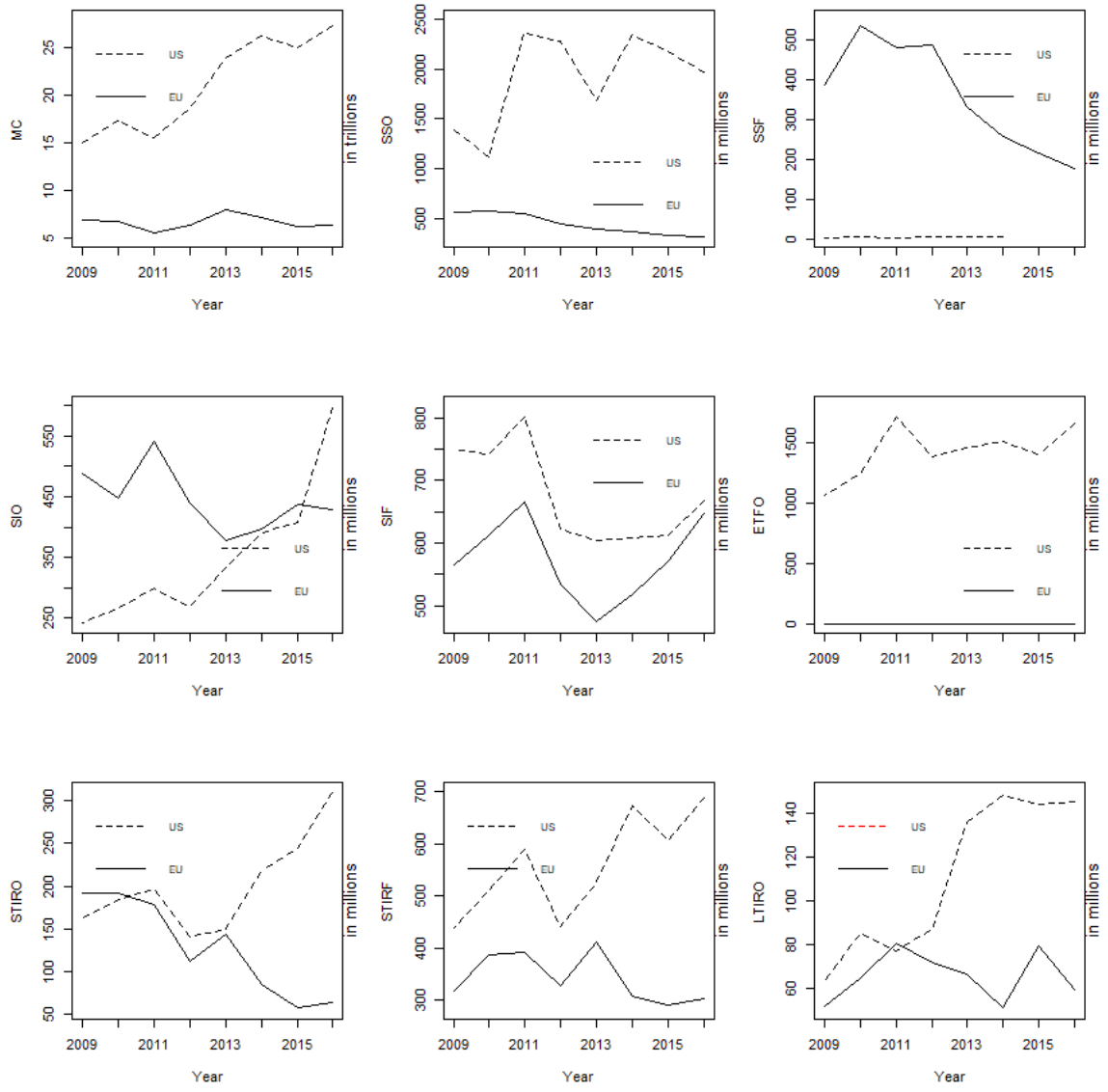
$$\begin{aligned} MC &= 0{,}077841 - 0{,}892964 * COMF - 0{,}149472 * CURO \\ &+ 0{,}862663 * LTIRF - 1{,}818970 * SIF + 0{,}422963 * SIO \\ &- 0{,}212954 * SSO + u_t \end{aligned} \tag{2}$$

These results suggest which trading volumes mostly are significant for market capitalization on both sides of pacific. From our model we can see, that market capitalization is positively implied by changes in traded volumes on commodity futures and stock index options, while changes in volumes traded on currency options, long term interest rates futures, stock index futures and single stock options have negative estimated coefficients.

We consider these results very interesting, because of negative coefficients estimated, and we suggests this interpretation: if we consider options and futures mainly as instruments intended to hedge against future turmoil (especially for currencies, commodities and interest rates), than decrease of those trades could indicate calm and steady environment, so investment flows could be directed to stocks directly and consequently increase market capitalization, while increase could indicate some concerns about future economic development. Nevertheless, market capitalization is significantly implied by volumes of trades of instruments stated above in the US and also in the EU according to our findings.

In next part we focused on volumes traded in nominal values, but separately for the US and the EU. In Figures 1 and 2 we show several graphs of volumes traded on major stock exchanges in the EU and the US. With data processing, we strongly believe that results give us simple but solid preview of where trading activity is in the US and the EU.

Figure 1 Traded volumes comparison 1



Note: MC: market capitalization; SSO: single stock options; SSF: single stock futures; SIO: stock index options; SIF: stock index futures; ETFO: exchange-traded fund options; STIRO: short term interest rate trading options; STIRF: short term interest rate futures; LTIRO: long term interest rate options

Source: own elaboration according to WFE data

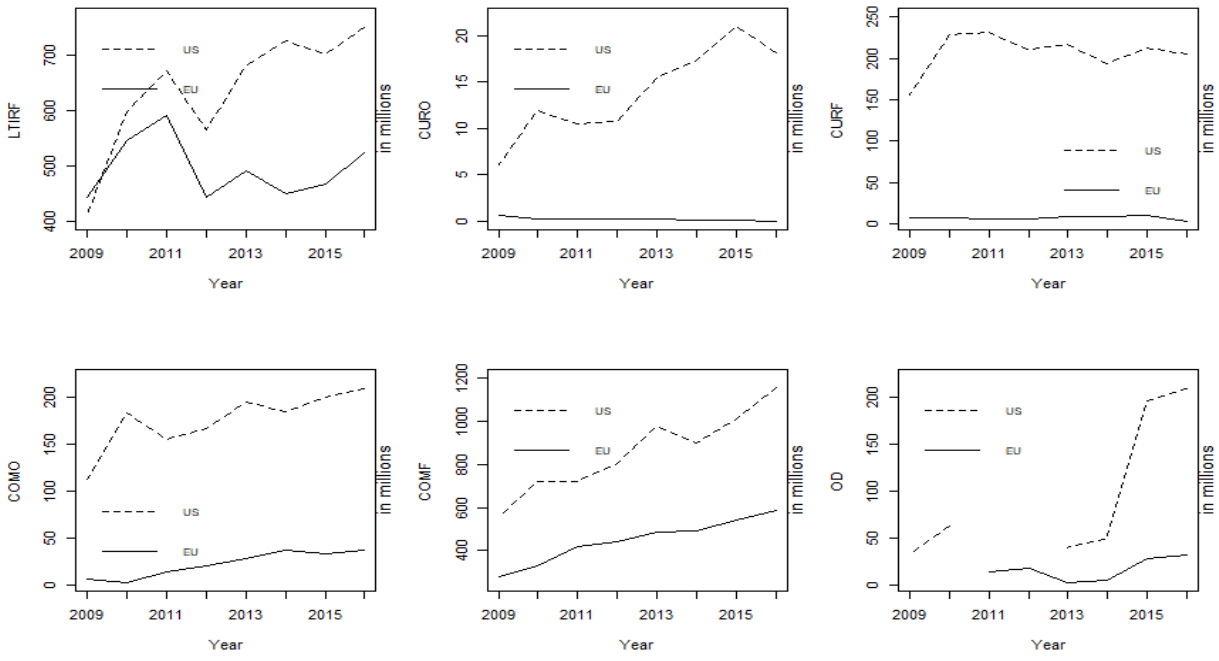
As stated before, in first graph we can see strong increasing trend in market capitalization in the US and also divergence with the EU market capitalization. Next we see that Single Stock Options (SSO) and Single Stock Futures (SSF) have different "popularity" in these regions. Although, SSO, which represents and alternative way how to increase capital, have almost tripled trading volumes in the US than in the EU, even if SSO and SSF in the EU were put together, it would be only somewhere near 50% of volumes traded on SSO in the US. Indexed trading volumes, tracked by Stock Index Options (SIO) and Stock Index Futures (SIF) suggests that volumes on trading index futures are converging in the EU and US, also that SIO have strong uptrend in the US,

and already overcame number of trades in the EU in 2015. That could sign some more investor´s activity, even in less risky investing. Another sign of different activity on markets could be volumes traded on ETF´s (ETF Options-ETFO, Figure 2). ETF´s are very popular and are still getting more attention. In our graph we see volumes on ETF options in the EU are at zero level, while in the US it reaches levels of volumes traded in SSO, SSF, SIO and SIF in the EU together.

Also last graph in Figure 2 – Other Derivatives (OD) shows some different attitude of investors, again in favour for US. This category includes commodity index derivatives, intellectual property futures, single stock dividend futures, equity index dividend futures and dividend options and shows stagnating trend of volumes traded in the EU, while volumes traded in the US have –in line with other showed instruments – strong uptrend.

Following graphs are showing volumes traded on short and long term interest rates futures and options (STIRO, STIRF, LTIRO – Figure 1, LTIRF – Figure 2). In general, every interest rates trading volumes are significantly higher in the US than in the EU for at least few years, but we assume, that this trading activity is caused by FED and ECB policies, that are diverging especially last year, in other words, FED is ready to tighten its monetary policy, which means rate hikes (already hiked three times since 2006, firstly in December of 2015), while even these days' rhetoric of ECB is not changing about interest rates. No matter that fact, in LTIRO we can see some correlation of volumes traded in the EU and US, also from 2009 till 2013 in STIRF, but since 2012 there is again strong uptrend in volumes traded in the US in every stated instrument, while EU volumes are stagnating or decreasing, with increasing volumes only in LTIRF. In line with different monetary policies on both sides of Atlantic, we consider interest rates trading as a part of a hedging for companies. With hedged interest rates that are connected to debt management and risk we assume that company could perform more stable.

Figure 2 Traded volumes comparison 2



NOTE: LTIRF: long term interest rate futures; CURO: currency options; CURF: currency futures; COMO: commodity options; COMF: commodity futures; OD: other derivatives.

Source: own elaboration according to WFE data

Another great disparity could be seen in volumes of traded Currency Options (CURO) and Currency Futures (CURF) shown in Figure 2. It is hard to say what type of contract whether option or future contract is more speculative, but both the EU and the US companies have their business counterparts in countries with different currencies. We assume that especially currency futures could help companies to hedge against negative foreign exchange scenarios in their view. But while in the US we see over 200 million trades almost every year since 2010, volumes traded on currency futures in the EU are fluctuating around 8 million, while in 2016 we faced on 3.53 million of trades.

Figure 3 also shows volumes traded on Commodity Futures (COMF) and Commodity Options (COMO). In general, for manufacturing companies (car industry, steel industry etc. in both the US and the EU) commodities presents necessary inputs, therefore hedging against price instability on commodity markets will logically lead to more stable and sustainable performance of these companies. In both COMF and COMO we can see uptrend in trading volumes in last 6 years in both the EU and the US. Despite stated facts, volumes traded on Commodity futures are double sized in the US than in the EU, while Commodity options volumes are almost 5 times higher than in the EU.

We would also like to put in contrast GDP and population of the US and the EU with those findings. Population (as for 2016) in the EU was 510 mil and in the US 325 mil, while overall GDP (as for 2016) in the US was 18 trillion USD and in the EU 16 trillion USD. Those numbers indicate that economies in the US and the EU are more likely similar than significantly different. This brings us to question why stock markets in the US are much more active than in the EU. One of explanation could be heterogeneity in the EU that causes disinclination of investors in one country to move their capital to other also European country. Another part of explanation could be better unified environment for investors in the US that is missing in the EU.

4 Conclusions

In this study, we mainly focused on disparities between the EU and the US considering trading volumes. Firstly, our panel regression showed that statistically significant dependence between changes of volumes traded and market capitalization exists on both sides of pacific, while we believe that market capitalization could be positive indicator for future economic development. After proving this assumption, we compared trading activity (using trading volumes) in the EU and US in order to achieve solid preview which "region" is more dynamic. According to our findings, US market has significantly bigger volumes of trades on almost every investigated instrument than the EU, in some occasions (single stock options) total number of trades are almost five times higher in the US than in the EU. Especially strong uptrend in market capitalization in the US points to significant amount of money inflows to companies via markets, while trend in the EU suggests stagnation, while we assume that higher trading volumes indicate more participants in the market and could lead to better shock absorptions, also to faster equilibrium pricing and especially more money inflows where needed, with lower effective spreads for investors/traders. In line with Green Book presented by European Commission, we agree upon that EU stock markets need a better and unified environment, that could help to relocate capital more effectively, also could lead to better shock absorptions on markets and gain easier access on markets both for investors and companies. We assume that concept of Capital Market Union could increase number of participants, even volumes of trades and value of those trades in the EU and consequently lead to better economic activity and growth. Therefore, we think individual parts of CMU, and also ability of trading volumes to predict economic and stock market development deserve further research in order to set most effective approach during introducing them.

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IFRS valuation models vs. business entities' practice – a case of Polish publicly traded enterprises

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Abstract: *Disclosure of information about the economic situation including description of assets, liabilities, and equity structure, as well as results of financial performance compose an inherent part of the obligations imposed on contemporary enterprises, especially those whose shares are publicly traded. In order to fulfill the duties, entities must organize bookkeeping procedures; inter alia make decisions regarding valuation models and techniques. From the point of view of stakeholders (investors among them), the above is of crucial importance as faithfulness and relevance of financial reporting depend on the proper decisions in the field of valuation techniques reflecting the results of economic phenomena that it purports to represent. The main aim of the paper is to compare valuation models and techniques encompassed into International Financial Reporting Standards with Polish local accounting norms in the scope of measurement regulations. The meta-analysis of previous studies was conducted in order to present differences between valuation models as well as problems already stated by researchers. Furthermore, the objective of the study conducted is to analyze Polish enterprises' preferences in the domain of assets and liabilities valuation models. The material for the study comprises of financial reports of the biggest Polish publicly traded companies that are incorporated into WIG 30 index. The authors compare International Financial Reporting Standards regulations with Polish norms and find discrepancies, although in Poland the convergence process was finished more than ten years ago. The study conducted among Polish entities shows that the historical cost model prevails among the biggest Polish entities while measurement based on fair value is mainly used for financial assets valuations. The authors conclude that although Polish entities prepare their financial reports in accordance with the International Financial Reporting Standards, the disclosures they make are still under a strong influence of historical implications derived from previous system of accountancy in Poland.*

Keywords: financial reports' valuation, accounting models for measurement, earnings management, Polish accounting practice

JEL codes: M41

1 Introduction

Valuation is one of the most important issues of contemporary accounting. For years, the solutions adopted in IAS/IFRS relating to the preparation of financial reports have focused on assigning properly value to assets, capital and components of total income of an enterprise as well as capital group. By contrast, the form adopted for financial reports is much less important. Amendments to IAS/IFRS generally relate to mandatory or

optional valuation principles and methods. Introduced changes are often accompanied by discussion of theorists and accountants about the effects of their use (e.g. Ijiri, 1967; Hendriksen, Van Breda, 2002; Sapra, 2008; Hellman, 2008). It is important to highlight the controversy surrounding the fair value parameter used on an ever-increasing scale. At the EAA congress, 23-26% of the research presentations were devoted to valuation issues in financial reporting for 2010-2012 (EAA, Program and Collected Abstracts 2010-2012, Cite by Dobroszek, Michalak, 2013).

The solutions adopted in the Polish law governing the accounting process include the process of its harmonization and, in part, also the standardization. However, there are some areas in which the Polish authorities have quite consistently maintained a different, separate approach. This area is primarily the valuation as well as scope and structure of financial reports. In Poland, the dominant approach in the balance sheet valuation is the historical cost model.

The authors of the paper posed a question whether it is possible to indicate the correctness between the scale and form of conducting economic activity of Polish enterprises and preferred models and methods of balance sheet valuation.

Two objectives of the study were formulated:

- comparison of solutions adopted in Polish and international accounting standards,
- examination of preferences for valuation methods in entities using IAS/IFRS on the example of enterprises listed on the Warsaw Stock Exchange, compiled in the WIG 30 index.

The paper analyzes the literature on valuation issues in accounting. A comparative analysis of the IAS/IFRS and Polish standards for valuation of reporting items has also been performed. The qualitative analysis of financial reports was used in the research section of Polish enterprises.

2 Models and concepts of valuation in accounting theory

Valuation is a complex process that assigns value to a particular object. Karmańska (2007) points out that simultaneous attributes of a value are 'present' and 'future'. The change of the 'present' determines future actions and states. From the point of view of processes occurring in economic entities it is particularly important to determine the economic value of the resource. The economic value of a resource, as long as it performs assigned functions, is always an estimate, both mentally and in monetary measurement (Karmańska, 2007; Sawicki, 2009). Generally, in the accounting system it is related to the measurement of a phenomenon or event. The Conceptual Framework for Financial Reporting refers to the valuation process from the point of view of financial reporting. Measurement involves assigning monetary amounts at which the elements of the financial reports are to be recognized and reported (F4.54).

The valuation process involves appropriately selected elements such as:

- correctly identified valuation object,
- adopted valuation concept,
- method used and the associated valuation parameter,
- valuation moment,
- size of the entity (e.g. valuation in micro entities is based on historical cost).

In accounting, the valuation includes all possible assets disclosed and not disclosed in the financial reports, components of equity and liabilities, revenues, expenses and other comprehensive income. The specificity of a particular asset often affects valuation solutions. Examples may be intangible assets, which by their nature are much more difficult to value, with particular emphasis on goodwill.

From the point of view of the moment of carrying out the valuation in accounting, the most important is the current valuation related to the introduction of the asset or capital

component into the accounting ledgers and the balance sheet valuation. The balance sheet valuation consists in determining the value at the so-called balance sheet moment, i.e. the value determined for presentation in the financial reports. It is also possible to indicate the moment of liquidation of an entity and the resulting liquidation value.

Also entity's size is important for valuation. Various types of simplifications in valuation are permitted or even imposed in small and micro entities (Directive, 2013).

The prudence principle in preparing financial reports for this type of entities is a priority.

The choice of the valuation method can be influenced by factors such as the insolvency, liquidation, takeover.

In general, two main valuation models can be identified: historical cost model and fair value model. There are also mixed models in legal solutions. Each of the indicated models has its advantages and disadvantages. The historical cost model is a traditional, conservative approach, based primarily on the prudence principle (N. Hellman, 2008, p. 72). The fair value model is the result of exposing the needs of capital providers, especially investors. The principles for fair value measurement are included in SFAS 157 'Fair Value Measurement' (US GAAP) and IFRS 13 'Fair Value Measurement'.

Some authors in the publications express doubts as to whether one group of users of the financial reports is rightly privileged (eg. Suryaningrum, Anwar, 2012; Whittington, 2008). The problem with determining fair value in the absence of an active market was raised (e.g. Gullette, 2009; Mazur, 2011). It is worth pointing out that fair value is a hypothetical value because the real transaction did not occur at the moment of valuation. Also, the market value is not unequivocal as a valuation parameter, even in the case of an active market for a valuated asset. For the market value from the buyer's point of view is different (according to IFRS 13 the so-called entry price) and so from the seller's point of view (in accordance with IFRS 13 the so-called exit price) (Strojek-Filus, Kumor, 2015). The advantages and disadvantages of these models are summarized in Table 1.

Table 1 Advantages and disadvantages of historical cost model and fair value model in valuation

Valuation model	Advantages	Disadvantages
Historical cost model	• predictability of results • ease of verification of the valuation result, • ease of measurement, • low cost of obtaining information for valuation, • convergence with tax regulations.	• loss of information on current market value, • threat of large discrepancies between book value and fair value under inflation conditions, • creation of unrealized capital gains, • lack of information abort real operating costs.
Fair value model	• reflecting the current market value, • cost realignment, • creating the basis for investor decisions.	• risk of error in estimating the value in the absence of an active market, • difficulty in verifying valuation, • high costs of obtaining information for valuation, • ease of manipulation of reporting data.

Source: own elaboration based on Gierusz (2011), Kaczmarczyk (2015) , Liang and Wen (2007).

Based on two main valuation models, four valuation concepts have been derived. In the IFRS Framework the following basic valuation concepts are listed (F 4.55):

- historical cost,
- current cost,

- net realizable (settlement) value,
- present value.

In order to properly measure the asset components at the balance sheet date, the effects of the change in their value should be taken into account. Value adjustments are made using revaluation write-downs. With appropriate write-downs, the right value will be – from this point of view of adopted valuation concepts – recovered. In addition to the current value and balance sheet value, the recoverable amount, the useful value is also used.

Selection of valuation methods has long been an instrument of accounting policy, considered one of the most effective. By the means of appropriately selected, permitted by law, valuation methods the items in the financial reports and, consequently, the financial position of an enterprise can be influenced. It is worth emphasizing that the solutions adopted by the entity in the field of balance sheet valuation, in general, directly affect the reported net financial result or components of other comprehensive income (Salvary, 1998, Sivakumar, Waymire, 2003). Valuation methods can also be used with particular intensity under certain conditions e.g. inflation. From the point of view of the possibility and magnitude of impact on the items of financial reports, the fair value model is much more effective. Historical cost in this respect gives relatively little opportunity. Accounting based on the fair value parameter is sometimes called the estimation era (Kim, Yoon, 2012).

3 Valuation methods adopted in IAS/IFRS and in Polish legal regulations – comparative analysis

The orientation of financial reports in line with investor's needs has been introduced in the international standards to a very large extent. In IAS/IFRS, fair value is used as a basis for valuation or as an option in the following areas (Gierusz, 2012; Dyląg, 2007; Michalczuk, 2009; Dyduch, 2010):

- intangible assets (IAS 38),
- property, plant and equipment (IAS 16),
- investment property (IAS 40),
- agricultural assets (IAS 41),
- financial assets and liabilities (IAS 39, 27),
- non-current assets available for sale (IFRS 5),
- employee benefits (IAS 19).

Additional areas of fair value application are:

- merger of entities in the form of acquisition,
- share-based payments.

The basic act regulating the accounting of economic entities in Poland is the Act of 29 September 1994 on Accounting (further referred AoA). The AoA contains the legal basis for the recognition, valuation, eligibility and disclosure of assets, liabilities and equity in accounting ledgers and in financial reports. In contrast to the IAS/IFSR, the AoA also contains templates of financial reports, according to which financial information about economic entities should be presented. The solutions included in the AoA are further specified in the Regulations. The Regulation which regulates methods of valuation of financial instruments is the Ordinance of the Minister of Finance of 12 December 2001 on detailed principles of recognition, valuation methods, scope of disclosure and presentation of financial instruments (Journal of Laws, No. 149). In the case of issues not explained in the AoA and in the regulations, the entity should follow the National Accounting Standards. In the absence of a suitable standard, accountants may use IAS/IFRS.

Some reporting entities in Poland are subject to IAS/IFRS. As of 1 January 2005, such obligations are borne by public companies and banks preparing consolidated financial reports (art. 4 of Regulation (EC) No. 1606/2002 of the European Parliament and of the

Council of 19 July 2002 on the application of international accounting standards (OJ of EU L 243, 11.09.2002, p.1; Polish special issue, Chapter 13, Vol. 29, page 609, as amended by the Regulation of the European Parliament).

Some entities have a choice of accounting law (AoA or IAS/IFRS). These are issuers of securities admitted, issuers intending to apply for or applying for admission to trading on one of the regulated markets of European Economic Area countries.

According to the AoA, fair value is allowed as an option alongside the historical cost model to the following statement of financial position items:

- financial investments,
- non-financial investments,
- financial liabilities.

The Regulation clarifies the principles for the valuation of financial instruments:

- financial assets – only fair value is allowed,
- loans granted and own receivables – fair value as an option alongside historical cost,
- financial assets held to maturity – fair value as an option alongside historical cost.

Fair value is also applied to the same extent as in the case of IAS/IFRS for consolidation of financial statements, business combinations and share-based payments.

4. Methodology – review of valuation methods adopted for selected groups of assets in WIG 30 enterprises listed on the Warsaw Stock Exchange

The largest Polish listed enterprises quoted on the WIG 30 index were surveyed. The WIG30 index has been published since 23 September 2013, based on the share portfolio value of the 30 largest and most liquid enterprises of the main stock market. The research is based on the qualitative analysis of consolidated financial reports of the capital groups for the years: 2014, 2015 and 2016. These are the entities that made IAS/IFRS obligatory for use to prepare financial statements. The research sample consists of 21 entities from sectors such as: energy, coal, fuel, gas, telecommunications, footwear, real estate, IT. The study examined the choice of valuation methods for assets and liabilities in areas where IAS/IFRS leaves the management with a choice in the valuation model.

For the purposes of the analysis, nine groups of components, subject to valuation, were identified: intangible assets, operating tangible assets, inventories, property investments, financial liabilities, financial assets available for sale, financial assets to maturity, loans granted and receivables, other financial assets valued at fair value through profit or loss.

5 Results

According to the accounting regulations, two valuation models, historical cost and fair value can be used for balance sheet valuation (IAS 39, 40). In the analyzed enterprises, with regard to the valuation of investments, especially non-financial ones, the variations in the models used can be noted.

The results of the analysis are shown in Table 2.

Table 2 Analysis of the reporting valuation models for selected WIG 30 capital groups

short name	operating intangible assets	operating tangible assets	inventories	non-financial investments/ property	financial liabilities	financial assets available for sale	financial assets to maturity	loans granted and receivables	other financial assets valued at fair value through profit or loss
ASSECO	HC	HC	HC	HC	AC	FV/HC	AC	AC	FV
BOGDANKA	HC	HC	LV	NDA	AC	NDA	NDA	AC	NDA
CCC	HC	HC	LV	NDA	NDA	FV	AC	AC	FV
CDPROJEKT	HC	HC	LV	FV/HC	NDA	NDA	NDA	HC	FV
CYFROWY POLSAT	HC	HC	LV	HC	AC/FV	NDA	NDA	AC	FV
ENEA	HC	HC	LV	HC	NDA	FV	AC	AC	FV
ENERGA	HC	HC	LV	HC	AC	FV	AC	AC	FV
EUROCASH	HC	HC	LV	HC	AC/FV	FV/HC	AC	AC	FV
GRUPA AZOTY	HC	HC	LV	FV/HC	AC/FV	FV	AC	AC	FV
GTC	HC	HC	LV	FV	AC	FV	NDA	AC	FV
JSW	HC	HC	LV	HC	AC	FV/HC	NDA	AC	FV
KGHM	HC	HC	LV	NDA	AC/FV	FV/HC	AC	AC	FV
LOTOS	HC	HC	LV	NDA	AC/FV	FV/HC	AC	AC	FV
LPP	HC	HC	LV	NDA	AC/FV	FV	AC	AC	FV
ORANGE	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV
PGE	HC	HC	LV	HC	AC/FV	FV	AC	AC	FV
PGNIG	HC	HC	LV	HC	AC/FV	FV	NDA	AC	FV
PKNORLEN	HC	HC	LV	FV	AC	NDA	NDA	AC	FV
PKPCARGO	HC	HC	LV	HC	AC/FV	FV/HC	AC	AC	FV
SYNTHOS	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV
TAURON	HC	HC	LV	NDA	AC/FV	FV/HC	NDA	AC	FV

FV - fair value
HC - historical cost (purchase price or manufacturing cost) with write-downs to sales market value or value in use
AC - amortized cost (adjusted purchase price)
LV - lower value (the lower of two values: cost of purchase or manufacturing cost and net realizable value)
NDA - no data available

Source: own elaboration based on consolidated financial reports for the period of 2014-2016

In the scope of operational tangible assets and intangible assets, the studied enterprises apply uniform principles of balance sheet valuation according to historical cost model. Operational tangible assets and intangible assets in all analyzed enterprises are valuated at purchase or manufacturing cost, less depreciation charges and impairment losses. In the analyzed reports, the enterprises present differently the procedure for valuation of impairment charges.

In essence, there are no discrepancies in the valuation of inventories that are measured at the balance-sheet date in accordance with the prudence principle, at the lower of the two values: purchase cost or net realizable value. The enterprise's reports do not always specify the valuation model. For example, the Asseco Poland report includes the principles for valuation of initial value and information that the group makes write-downs on the value of goods, depending on the date of the deposition of stock. Moreover, the report shows that annual analyzes are carried out whether the principles of making write-downs are consistent with the actual loss of value of inventories held. However, it is not

exactly clear how the valuation of the inventories is impaired and whether it is up to the price level of possible resale. It should be noted that the specific nature of the conducted economic activity influences the valuation model. For example, Orange identifies inventories sold in promotional offers (phones and subscriptions), which are shown at a lower value: purchase price and net recoverable value, taking into account expected future revenue from the subscription.

In the field of property investment 8 enterprises do not present valuation principles because of the absence of such assets. Among other capital groups, 9 of them value property investment according to the historical cost model, as operational tangible assets.

In terms of financial liabilities 3 groups do not present valuation principles in their consolidated reports. 12 capital groups identify the category of financial liabilities at fair value through profit or loss and other financial liabilities at amortized cost using the effective interest rate method. The remaining analyzed groups use only the amortized cost model, namely the adjusted purchase price. The amortized cost model is included in all analyzed reports with respect to valuation of loans and receivables.

The valuation of other financial assets of the studied groups depends on the qualification of particular groups of financial instruments. All analyzed groups, except for Bogdanka Group, identify financial assets at fair value through profit or loss.

As for financial assets available for sale, Bogdanka and Cyfrowy Polsat do not identify such asset category in their reports. In the reports of the CdProjekt Group and PKN Orlen, this category appears in the statement of financial position, but there are no valuation rules after initial recognition. 8 of the analyzed groups allow valuation of financial assets available for sale by the fair value model only. In the case of the remaining 9 capital groups for valuation of financial assets available for sale in the absence of an active market, valuation at purchase cost less impairment losses is applied.

The least information in the reports of the analyzed groups can be found in relation to assets held to maturity. In 10 capital groups, no such assets are identified at all. In other groups, the adopted valuation model is amortized cost.

6. Discussion and conclusions

The presented research results indicate gaps in the disclosures concerning entities and valuation methods adopted by them. Lack of detailed information in this regard hinders the proper interpretation of the data presented. At the same time, the dominant historical cost model used for operating assets can be observed. In the case of investment assets, there are variations in the methods used, but in this case, there can be noted a significant number of instances in which the historical cost model is used. This model also dominates in the case of valuation of loans and receivables. It should be emphasized that the examined groups of enterprises use IAS / IFRS as the legal basis for the preparation of consolidated financial statements. They are therefore able to use the fair value model on a much larger scale. The obtained results show that a dominant approach to valuation in the Polish capital groups in the WIG 30 index is a traditional method based on a historical cost. Polish legal solutions have introduced fair value to a much lesser extent than IAS/IFRS and relate almost exclusively to investment components. Fair value is not permitted for operating balance sheet items.

Such a state can be explained by the attachment to the traditional solutions which have been used in the Polish legal regulations for year and whose origins should be sought in German accounting.

The results also show that the selection of a valuation model is not considered a ‘strategic’ policy instrument by the managers of the surveyed enterprises. Fair value

significantly increases the potential for launching instruments that achieve the desired effect in the financial statements by management. Not using the opportunities that IAS/IFRS provide in this respect demonstrates the attachment to the prudent valuation principle in Poland.

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The future of value added tax in European Union in accordance with size criteria of business entities

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Abstract: *In current value added tax system applicable in the single market of European Union is cross border value added tax fraud expected to be responsible for fraud worth around 50 billion of euros and it bears significant administrative burdens with current fragmented rules (Ondrušová, 2015). The aim of the paper is to explore possible approaches to tackle current problems in the area of ongoing value added tax reform in European Union with focus on solutions comparable to already existing mini-one-stop-shop solution for certain e-commerce services and the impact of similar system used for goods delivered to consumers in the single market from one member state to other member state of European Union. Combination of mini-one-stop-shop approach with upholding of thresholds for intra-community value added tax registration in different member state for businesses established for purposes of delivery of goods on current levels would be a path worth of exploring further as minimizing of administrative burdens is vital part of aims stated in the documentation of VAT Expert Group assisting European Commission in the value added tax administration.*

Keywords: value added tax, size criteria, intra-community supply of goods and services

JEL codes: M40, M41, M48, M49, H25

1 Introduction

Each business entity operating in the area of European Union has to be registered for value added tax in domestic member state if total sales of goods and services which are not explicitly excluded from value added tax regulation reach certain value in 12 consecutive months. This value can be different in different member states of European Union. In some countries there is no stated threshold for value added tax registration and therefore any business entity has obligation to be registered for value added tax with no connection to its size criteria stated as an aggregate value of sales of goods and services in 12 consecutive months. Business entity can register as a value added tax payer also voluntarily in accordance with the regulation applicable in its domestic member state (Mateášová, 2016). Therefore we can recognize three basic types of business entities in accordance to the relation of its size criteria stated as an aggregate value of sales and obligation in accordance with value added tax system (Parajka, 2016). First type is a business entity not registered for value added tax even in its domestic member state, second type is a business entity registered for value added tax in its domestic member state voluntarily without reaching needed threshold to register and third and last type of a business entity is entity which reached domestic threshold for registration and has to be registered for value added tax in its domestic member state. There are also business entities which have higher value of sales of goods and services in 12 consecutive months as the threshold in their domestic member state, but goods and services provided by these companies are excluded from value added tax system in

accordance with the rules applicable in their domestic member state. Below in Table 1 is list of thresholds applicable in each member state of European Union and states of European economic area.

Table 1 Value added tax registration thresholds applicable in the year of 2017

STATE	Threshold	Currency
Austria	30000	EUR
Belgium	15000	EUR
Bulgaria	50000	BGN
Croatia	230000	HRK
Cyprus	15600	EUR
Czech Republic	1000000	CZK
Denmark	50000	DKK
Estonia	40000	EUR
Finland	10000	EUR
France	32600	EUR
Germany	17500	EUR
Greece	10000	EUR
Hungary	6000000	HUF
Ireland	37500	EUR
Italy	60000	EUR
Latvia	50000	EUR
Lithuania	45000	EUR
Luxembourg	30000	EUR
Malta	-	EUR
Netherlands	1345	EUR
Norway	150000	NOK
Poland	150000	PLN
Portugal	12500	EUR
Romania	220000	RON
Slovak Republic	49790	EUR
Slovenia	50000	EUR
Spain	-	EUR
Sweden	-	SEK
Switzerland	100000	CHF
United Kingdom	83000	GBP

Source: own elaboration

Value added tax rules and administration in European Union differ depending on the transaction partner, place of delivery and on the type of sold service or good. Business entity registered for value added tax selling goods or services to other business entity from the same member state will apply value added tax applicable in given member state. Business entity registered for value added tax selling goods or services to other business entity from different member state will not apply value added tax to value of sold goods or services. Business entity registered for value added tax selling goods or services to other business entity from different member state will apply its domestic value added tax rate if the consumption of goods or services happens in its domestic member state (for example accommodation services or services of restaurants). Of course according to legislature is possible to have also different approaches to tackling value added tax by business entities, the rules stated above are the most common in business practice in the cases of business to business transactions.

Business entity registered for value added tax selling goods (by mail order sales) to consumer from the same member state will apply value added tax applicable in given member state. Business entity registered for value added tax selling goods (by mail order

sales) to consumer from different member state will apply value added tax applicable in its domestic member state until it reaches certain threshold for registration for value added tax in member state of consumer. Business entity registered for value added tax selling services which are considered as telecommunication services, television and radio broadcasting services and electronically supplied services to consumer from different member state will apply value added tax rate applicable in the member state of consumer and therefore needs to either be registered as a value added tax payer in given member state or needs to use mini one-stop-shop scheme.

Mini one-stop-shop scheme was introduced into legislation in the year 2014 and possibility to register a business entity for this scheme opened up on October 1st 2014 (Mateášová, Vašeková, 2015). It allows business entity to sell specific services to consumers in different member states without need to register for value added tax in each member state where consumer of given services reside. In this case business entity applies value added tax applicable in the member state in which consumer resides or where consumption of services happens (Rafał, 2016). Business entity using mini one-stop-shop scheme therefore uses its value added registration number obtained from its domestic member state and does not need to register in all the member states where the consumption of its services happens. Business entity using mini one-stop-shop scheme therefore reports value added tax in value added tax return for its domestic member state and then within mini one-stop-shop scheme for value added tax collected by selling of specified services to consumers outside of its domestic member state. Below in the Table 2 is a list of standard value added tax rates in member states which are usually applied on services in mini one-stop-shop scheme.

Table 2 Standard value added tax rates applicable in the year of 2017

STATE	VAT rate
Austria	20%
Belgium	21%
Bulgaria	20%
Croatia	25%
Cyprus	19%
Czech Republic	21%
Denmark	25%
Estonia	20%
Finland	24%
France	20%
Germany	19%
Greece	24%
Hungary	27%
Ireland	23%
Italy	22%
Latvia	21%
Lithuania	21%
Luxembourg	17%
Malta	18%
Netherlands	21%
Poland	23%
Portugal	23%
Romania	19%
Slovak Republic	20%
Slovenia	22%
Spain	21%
Sweden	25%
United Kingdom	20%

Source: own elaboration

If a business entity sells goods (by mail order sales) to consumers in another member state and total value of sales to any given state reaches threshold set by that member state, it has obligation to register for value added tax in member state of consumption, charge and report value added tax in accordance with rules of given member state. If a business entity sells services to consumers in another member state and those services are not in the field of telecommunications, broadcasting and electronic services, applies value added tax rate applicable in domestic member state. As it is stated above there are different rules for different types of transactions between business entities and business entities and consumers or business which are not registered for value added tax, therefore are not considered as a taxable person in accordance with value added tax rules. Below in Table 3 is a list of thresholds of total sales in given member state by business entity selling goods (by mail order sales) for registration as a value added tax payer in that member state.

Table 3 Value added tax registration thresholds for distance selling of goods (by mail order sales) applicable in the year of 2017

STATE	Threshold	Currency
Austria	35000	EUR
Belgium	35000	EUR
Bulgaria	70000	BGN
Croatia	35000	EUR
Cyprus	35000	EUR

Czech Republic	1140000	CZK
Denmark	280000	DKK
Estonia	35000	EUR
Finland	35000	EUR
France	35000	EUR
Germany	100000	EUR
Greece	35000	EUR
Hungary	8800000	HUF
Ireland	35000	EUR
Italy	35000	EUR
Latvia	35000	EUR
Lithuania	35000	EUR
Luxembourg	100000	EUR
Malta	35000	EUR
Netherlands	100000	EUR
Norway	-	NOK
Poland	160000	PLN
Portugal	35000	EUR
Romania	118000	RON
Slovak Republic	35000	EUR
Slovenia	35000	EUR
Spain	35000	EUR
Sweden	320000	SEK
Switzerland	-	CHF
United Kingdom	70000	GBP

Source: own elaboration

As there are different rules of taxation for business entity operating with goods (by mail order sales) and operating with services and operating with specified electronical services, the administrative burden and costs of compliance with taxation rules should differ too. Value added tax in member states is not harmonized, so the obligations of business entity for each member state differ in the form of registration process, deadlines for reporting collected value added tax, periodicity or payment methods of value added tax by business entity which is registered in given member state.

2 Methodology and Data

The main method used in this paper is comparison based on the case study of two anonymized existing business entities, from which one sells electronic services and other one is selling goods by mail order sales. Both are established and operate in European Union and are selling their goods or services to consumers in more than 3 member states. Business entity selling services is already registered for mini one-stop-shop scheme since the beginning of the year 2015 and it is also registered for value added tax in domestic member state which is Slovak Republic. Consumers of this business entity are from member states as Slovak Republic, Czech Republic, Austria, Germany and Switzerland. Business entity selling goods is already registered as a value added tax payer in Slovak Republic, Czech Republic, Denmark and Sweden with need to register in Hungary, Poland and Romania, in the month of June 2017. Consumers of this business entity are from member state as Slovak Republic, Czech Republic, Austria, Germany, Belgium, Croatia, Cyprus, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden and United Kingdom. Both business entities from above use automated invoicing systems and operate theirs business with consumers mainly via internet. For comparison of costs of administrative burden of value added tax related with requirements of given business entity can be used simple formulas stated below:

$\sum C_r=(t+f+p)*m$ (1)

- C_r – costs of registration,
- t – time spend by the process of registration expressed in monetary units,
- f – fees paid to public institution or notaries for issuing of needed documents,
- p – payment to partner organizations registering the business entity in given member state,
- m – number of member states where registration is needed in given year.

$\sum C_a=(t+f+a)*p$ (2)

- C_a – costs of administration after registration in given year,
- t – time spend by the process of reporting data for value added tax institution expressed in monetary units,
- f – fees paid to bank for payment of value added tax in different currency than EUR,
- a – payment for accounting services of reporting value added tax,
- p – periodicity of reporting for given year or number of reports for given year.

3 Results and Discussion

First step to calculate costs of registration and costs of administration of value added tax reporting for given business entities is to estimate the value of variables from the formulas above. For estimation of the value of variables data from accounting of business entities were used and for estimation of payment to a partner organization registering the business entity in given member state three different possible partners gave their offer for the service. Estimates are stated in Table 4 and Table 5 below.

Table 4 Estimated value of variables from formula C_r

Variable	Value in EUR
t	150
f	63
p	300

Source: own elaboration

Table 5 Estimated value of variables from formula C_a

Variable	Value in EUR
t	150
f	20
a	50

Source: own elaboration

Number of member states where registration is needed is estimated to 3 for year 2017 for business entity selling goods and number of reports of value added tax is estimated to 16 for business entity selling services and to 44 for business entity selling goods. Business entity selling services does not need to register in any member state, so to calculate costs in formula C_r is not needed. In Table 6 are stated final results for both of case study business entities.

Table 6 Costs of registration and costs of administration of value added tax in given business entity

Business entity	C_r	C_a	Variables in formula C_r	Variables in formula C_a
Business entity selling services	N/A	3520 EUR	N/A	{t(150)+f(20)+a(50)}*16
Business entity selling goods	1539 EUR	9680 EUR	{t(150)+f(63)+p(300)}*3	{t(150)+f(20)+a(50)}*44

Source: own elaboration

In the case we would decrease the number of reports send by the business entity selling goods to level of the business entity selling services, the costs of administration would be the same at the level of 3520 EUR, but registration costs are missing for the business entity selling services completely and those can be significant in dependence of the registration system and requirements of any given member states. From qualitative research of process of registration is very important to note that registration process in member states as Denmark or Sweden was rather easy and doable without the need of partner organization or need to visit country in person and all the needed information was prepared also in English and documents did not need to be translated by official translators to Danish or Swedish language. In case of registration for Czech Republic and Hungary the process is much harder without needed information provided in English and with the need to translate documentation into Czech Republic and Hungarian language.

4 Conclusions

Comparison of mini one-stop-shop scheme and regular registration for value added tax after reaching the threshold for selling goods (by mail order sales) shows us that extension of mini one-stop-shop scheme to all intra-community selling of goods (by mail order sales) to consumers with preservation of thresholds after which the business entity is required to apply value added tax of the member state of consumption would possibly save significant amount of costs and probably also bring more clarity into the system which is fragmented with different requirements from different member states.

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The Importance of Financial Management in Small and Medium-sized Entrepreneurship

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Abstract: *Current practice and researches show that the decisive factor of long-term success is the prioritization of effective financial management. However, enterprises, especially small and medium-sized enterprises, often confuse the principles of financial management with functioning accounting. Underestimating the role of financial management may be the reason for the impossibility of developing small and medium-sized enterprises. The main objective of this paper is therefore to evaluate the importance of financial management that SMEs attribute to the financial management aspects on their long-term development. The partial objective of the paper is to identify whether SMEs evaluating financial management as more important are more financially successful than SMEs evaluating financial management as less important. The fulfilment of the main and partial objective of the paper is fulfilled through methods of personal polling, selected methods of financial analysis and selected methods of statistical induction. The research is carried out on a selected sample of small and medium-sized enterprises based on selected restrictive criteria. The research has shown that small and medium-sized enterprises are undermining the importance of financial management and do not attribute the same strategic importance of financial management on their business development. At the same time, it was confirmed that SMEs evaluating financial management as more important are more financially successful (higher volume of assets, ROE and EAT) than SMEs that do not do so.*

Keywords: small and medium-sized entrepreneurship, financial management, financial strategy, financial analysis, methods of statistical induction

JEL codes: M20, M21, M29, G30, G39

1 Introduction

The area of small and medium-sized entrepreneurship (hereinafter SME) is emerging and gaining popularity with its increasing importance in the whole business field and economy (Cravo et al., 2015). Small and medium-sized enterprises represent 99% of European enterprises, which generate about 70% of all jobs and 60% of EU GDP. SMEs represent 99.84% of the total number of enterprises in the Czech Republic (MPO ČR, 2015). SMEs secure 59.39% of employment, participate in the performance and value added of more than 53.11%, creating GDP more than 37% (Srpová and Řehoř et al., 2010; MPO ČR 2015). According to regulation of the European Commission No. 70/2001, small and medium-sized enterprise is considered to be that enterprise employing fewer than 250 employees and its annual turnover does not exceed EUR 50 million and its assets do not exceed EUR 43 million.

This paper is primarily oriented on the area of small and medium-sized entrepreneurship in agricultural sector. The main reason for focusing on agricultural companies is the fact that not many researches were provided in this area and the financing of these selected companies is specified due to subsidies, donations and other financial interventions, which regulates agricultural market. "The agricultural sector is included among the very sensitive areas of the economy, as it has its specifics that must be respected, such as the seasonal character of production, a high level of dependence on natural conditions, as well as the production structure" (Aulová and Hlavsa, 2013, p. 24).

2 Theoretical Framework

Financial management is one of the important business activities associated with its development and anticipating the need for funds and choosing the most appropriate ways to get them. Financial management can be defined as a subjective economic activity engaged in obtaining a needed quantity of funds from various sources of funding, allocation of funds to various forms of non-monetary assets and the distribution of profit in order to maximize the market value of the company (Valach et al., 1999, p. 14). Strategic financial management consists of "financial strategies which are goals, patterns or alternatives designed to improve and optimize financial management in order to achieve corporate results" where financial strategy "represents a path to achieve and maintain business competitiveness and position a company as a world-class organization" (Salazar et al., 2012). The main financial objectives are usually based on maximizing of market value, optimizing of the capital risk, maintaining the financial stability including the liquidity, solvency, profitability or cash flow (Kalouda, 2009; Valach, 2006). Two main perspectives on financial management have been occurred: 1) management of costs, revenues and profit (its minimizing and optimizing) and 2) management of financial resources (its obtaining and allocation). The main tasks of financial management are following (Živělová, 2014): ***raising capital*** *for the current and future needs of the company and deciding on its structure;* ***deciding on allocation of capital*** *to ensure the ordinary activities of the company, the development of new products, new technologies, investing in machinery, buildings, inventory, securities, etc.;* ***deciding on the distribution of profit****, i.e. to use it for investments, payment of dividends or profit shares of the company, etc.;* ***record, analyze, check and manage the economic activity*** *of the company in such a way as to ensure its financial stability, etc*.

According to Nývltová and Marinič (2010, p. 13), financial management involves the following principles: principle of respecting the time factor, principle of cash flows, principle of net present value, principle of consideration of risk or principle of optimizing the capital structure. Růčková and Roubíčková (2012, p. 141) report that one of the fundamental problems of financial management is to set the total optimal amount of capital as well as choosing the right mix of financing its activities, i.e. capital structure. Modern financial management is based on the assumption to meet the main objectives of the company. The basic pillars of financial management are following (Synek et al., 1999): active use of financial resources and opportunities, defining financial strategies, high autonomy of decision-making at lower levels, application of financial management at all level of corporate management, creating plans and budgets in a close cooperation of all departments, conducting high quality analyses and implementation of the necessary measures. **The main stages of financial management** are following (Calandro and 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. The practical applications of financial management can be distinguished into three main groups of decision-makings (Ogilvie, 2009, p.14): investment decisions, financing decisions and dividend decisions – which reflect the responsibilities of acquiring financial resources and managing those resources. **Tools of financial management** are following: *financial analysis, planning, optimizing the financial structure, financial criteria to evaluate the effectiveness of managerial decision-making, cash-flow management, management of receivables and liabilities, budgeting, controlling*. The general financial components of the financial management are the main **types of financial policies**: *investment policy focusing on the promotion of economic efficiency of investment projects; policy of financing (external and internal) business activities; policy of managing the assets and liabilities (credit policy); policy of inventory management; policy of cash flow and liquidity management; policy of operating result management; policy of cost control and profit*. (Máče, 2013; Petřík, 2007).

The main core of financial management is to set up and implement appropriate financial strategy. **Three steps to set up a successful financial strategy** are following (Mallete, 2006): Step 1 – *Establish appropriate financial capital structure, following which a determination would be made of the magnitude of its cash surplus;* Step 2 – *Understand whether a company is undervalued or overvalued in the market, by examining investors' expectations;* Step 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*. According net working capital, three basic financing strategies are then distinguished to (Režňáková, 2012, p. 107-108): **aggressive financial strategy** – net working capital was 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; **conservative financial strategy** –the long-term sources of financing are used 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; **balanced financial strategy** – consistency between the maturity of financial sources with a lifetime of assets in the company is ensured.

Literature review (2010-2016; Svatošová, 2015) about financial condition and performances of agricultural companies is not dedicated to this issue. Aulová and Hlavsa (2013) explored the positive or negative effect of selected determinants on the capital structure of businesses among the selected agricultural companies. Details about financing from EU funds have been recently provided among Czech agricultural companies (Homolka, Švecová, 2012). The research (Malá, 2011) has confirmed the less efficiency of organic agricultural companies that have to be subsidized. Čechura (2012) identifies the key factors determining the efficiency of input use and the total factor productivity development. Another research (Venclová, Salková, Koláčková, 2013) has confirmed that agricultural companies apply selected methods of employee appraisal. The research (Davidová, Latruffe, 2007) shows that corporate livestock farms are the most homogenous in terms of technical efficiency. Another research (Špička, 2014) is dedicated to the agricultural companies indirectly with the focus on the evaluation production efficiency and its determinants of mixed crop and livestock farming among the EU regions. The Slovakian research (Adamišin, Kotulič, 2013) found out business companies show a higher economic success evaluated through the selected economic indicators than cooperatives even with subsidies.

2 Methodology and Data

The main objective of this paper is to evaluate the importance of financial management that SMEs attribute to the financial management aspects on their long-term development. The partial objective of the paper is to identify whether SMEs evaluating financial management as more important are more financially successful than SMEs evaluating financial management as less important. The main research methods are: the method of personal polling in the form of quantitative research (i.e. questionnaire survey with the main managers or owners of the enterprises). The supplementary methods are selected methods of financial analysis based on the study of financial statements. Confirmation and rejection of the formulated hypotheses is performed by using selected methods of statistical induction (multiple regression analysis, Kruskal-Wallis test, Friedman test). Research was carried out between the selected SME sample from March to May 2017.

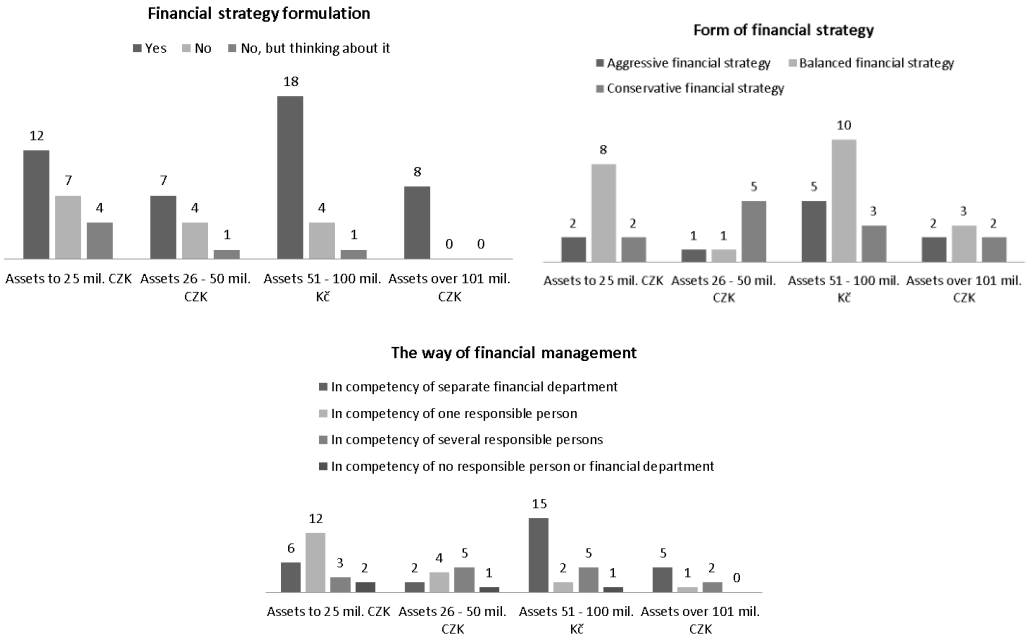
The survey of respondents included enterprises that meet the following criteria: enterprises belonging to SMEs (i.e. enterprises with 5 to 250 employees), headquarters in the Czech Republic, scope of business: CZ-NACE: 01 Plant and animal production, hunting and related service activities, legal form of enterprise: joint-stock company, existence of an enterprise on the market: minimum 5 years. Enterprises were selected with a help of the ARES database. The reason for selecting these restrictive criteria is the

presumption of the stability of these enterprises and the availability of information from annual reports and financial statements. Based on ARES database, a total of 92 enterprises were found, 11 of them were unwilling to participate, 5 of them were in liquidation. Finally based on these restrictive criteria, a survey consists of 66 enterprises.

3 Results and Discussion

The selected SME sample (N = 66 enterprises) has been divided according to volume of assets (23 SMEs to 25 million CZK, 12 SMEs 26 – 50 million CZK, 23 SMEs 51 – 100 million CZK and 8 SMEs over 101 million CZK). The results of questionnaire survey provided 68 % of selected SMEs have formulated financial strategy, where 22 % of them use aggressive financial strategy, 49 % of them use balanced financial strategy and 12 % of them use conservative strategy. In summary, 28 SMEs have financial management in competency of separate financial department, 19 SMEs in competency of one responsible person, 15 SMEs in competency of several responsible persons and only 4 SMEs have no responsible person or separate financial department for financial management or managing corporate finance. Details see in Figure 1, in which SME sample is divided according to volume of assets. Following Table 1 shows selected calculated variables from financial statement of SME sample using mean, median, modus, minimum, maximum, standard deviation. The average value of assets is over 58 million CZK, the average EAT is over 3 million CZK, net working capital 6,8 million CZK, ratio of equity and debts is 58:41, ratio of fixed assets and current assets is 54:46, current ratio is 6 (over a recommended value 1,5 – 2,5), ROE is on average 22 % and ROA on average 13 %.

Figure 1 Results of the survey (N = 66) – financial strategy formulation, form of financial strategy, the way of financial management according to volume of assets



Source: own work

Table 1 Descriptive statistics of SME sample

	Mean	Median	Modus	Frequency mode	Min.	Max.	Standard deviation
Assets	58412	47263.5	multiple	2	5632.0	265451	50349
Fixed Assets	32266	23555.0	multiple	2	2014.0	165741	31451
Current Assets	25923	17106.0	multiple	1	2850.0	99606	24139
Inventories	7974	5767.0	multiple	3	237.0	48265	9469

Receivables	12114	7206.0	multiple	2	369.0	71333	13421
Short-term financial assets	5835	2633.0	multiple	1	3.0	62596	9422
Equity	32710	24549.0	multiple	2	1299.0	120451	29370
Liabilities	25603	11121.5	multiple	1	798.0	255776	37428
Long-term bank loans	2120	523.5	0	25	0.0	50263	6564
Short-term bank loans	831	134.0	0	22	0.0	14521	2201
Short-terms liabilities	18194	7471.0	7410	2	47.0	152361	26662
Long-term liabilities	4152	1222.0	0	9	-52990.0	73563	13313
Reserves	307	0.0	0	42	0.0	5478	916
EAT (net profit)	3047	2073.0	multiple	2	-1024.0	10524	3288
E/A	58	61.6	multiple	1	3.6	97	24
L/A	41	37.9	multiple	1	3.3	96	24
FA/A	54	55.7	multiple	1	15.8	88	17
CA/A	46	44.2	multiple	1	11.3	84	17
Current Ratio	6	2.0	multiple	1	0.1	164	21
Quick Ratio	5	1.5	multiple	1	0.1	107	14
Cash Ratio	2	0.3	multiple	1	0.0	56	7
NWC	6899	4661.5	multiple	1	-57278.0	70890	21863
Level of Capitalization	1	0.8	multiple	1	-5.9	1	1
ROA	13	3.9	multiple	1	-6.3	97	21
ROE	22	8.3	multiple	1	-29.9	183	35

Source: own work based on financial statements (2015) of SME sample

The survey has also explored the order of importance of individual financial management tools (see Table 2). The monitored enterprises should rank from 1 to 9 individual financial management tools according to their importance for the business strategic development (1 - the most important, 8 - the least important). On average the most important tool is considered to be norms (material consumption; 5.24) and on average the least important tool is budgeting and financial analysis with a value 3.81. These results are then used for Shapiro Wilsk's test (see Figure 3).

Table 2 Mean of the order of individual financial management tools

	Mean of order of importance (in summary)	**Assets to 25 million CZK**	**Assets 26 – 50 million CZK**	**Assets 51 – 100 million CZK**	**Assets over 101 million CZK**
Break Event Point	4.56	4.69	4.83	4.52	3.88
Calculation	4.86	4.69	5.25	4.74	5.13
Budgeting	3.81	3.65	4.17	3.96	3.38
Financial Analysis	3.81	3.57	3.92	4.17	3.38
Optimizing Capital Structure	4.77	5	4.58	4.26	5.89
Tax shield effect	4.01	4.39	3.42	4.04	3.75
Financial Leverage effect	4.91	4.91	4.58	5	5.13
Norms (material consumption)	5.24	5.09	5.25	5.3	5.5

Source: own work in Statistica program

Table 3 shows the importance of individual components of financial management in the interval 1 - 5 (1 - the smallest importance, 5 - the greatest importance) that SMEs attribute to the financial management aspects on strategic development, again divided into the monitored categories. On average (3.19) the most important component of financial management is considered to be financial strategy formulation and

implementation and the least important component (2.89) is considered to be financial analysis and financial planning. When exploring SME sample according to volume of assets, the most important component (3) is considered to be financial planning followed by financial analysis (2.87) and the least important component (2.26) is considered to be financial controlling in category of SMEs with volume of assets to 25 million CZK. And for example in the category of SMEs with volume of assets over 101 million CZK, the most important component (4) is considered to financial controlling and the least important component (2.75) is considered to financial analysis and financial planning.

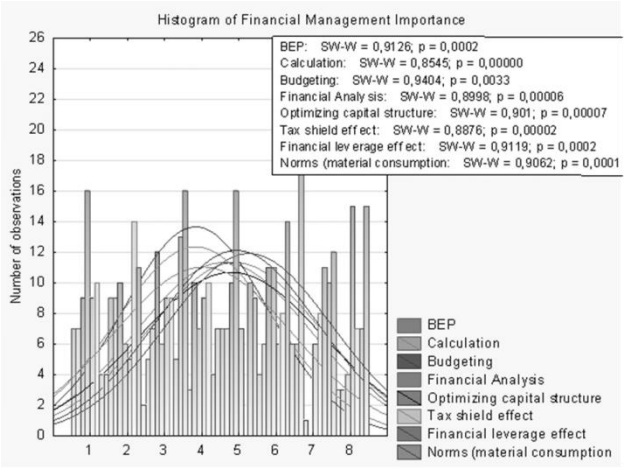
Table 3 Importance of individual components of financial management

	Mean of importance (in summary)	Assets to 25 million CZK	Assets 26 – 50 million CZK	Assets 51 – 100 million CZK	Assets over 101 million CZK
Financial analysis	2.89	2.87	3.5	2.83	2.25
Financial Planning	2.89	3	1.83	3.39	2.75
Financial strategy formulation and implementation	3.19	2.52	3.08	3.69	3.88
Financial Decision-makings	2.79	2.61	3.08	2.69	3.13
Financial Controlling	2.91	2.26	2.58	3.35	4

Source: own work in Statistica program

Subsequently, hypotheses are formulated and verified to support the main purpose of the whole survey (see Table 4). Verification of hypotheses is performed at the significance level α = 0.05. The confirmation or rejection of the hypotheses is decided on the basis of a comparison of the p-value, which is the minimum level of significance for which the zero hypothesis can be rejected. Figure 2 using Shapiro-Wilsk's test confirmed that the selection does not come from the normal probability distribution at a significance level α=0.05, since p ≤ α. Because the normality condition is not met, scatter analysis and correlation tests cannot be performed. For hypothesis testing, these nonparametric tests are selected: multiple regression analysis, Kruskal-Wallis test, and Friedman test. Verification of the hypotheses is carried out by using the Statistica program.

Figure 2 Box plot of selected variables (2015; N = 66)



Source: own work in Statistica program

Table 4 Hypotheses formulation and verification

Hypothesis	Hypothesis formulation	Method of hypothesis verification	Result of hypothesis verification
H1	There is a relationship between ROE and importance of individual components of financial management.	Multiple regression analysis	Not rejected
H2	There is a relationship between ROA and importance of individual components of financial management.	Multiple regression analysis	Rejected
H3	There is a relationship between volume of assets and importance of individual components of financial management.	Kruskall-Wallis ANOVA	Rejected
H4	All the financial management tools are equally important to businesses.	Friedman test	Rejected
H5	There is a relationship between volume of assets and the form of financial strategy.	Kruskall-Wallis ANOVA	Not rejected
H6	There is a relationship between volume of assets and the way of financial management.	Kruskall-Wallis ANOVA	Not rejected
H7	There is a relationship between volume of assets and form of financial strategy formulation.	Kruskall-Wallis ANOVA	Not rejected

Source: own work in Statistica program

A multiple regression analysis is used to verify the H1 and H2 hypothesis. The basis for ROE and ROA for all monitored enterprises was the annual report for 2015. The results for ROE are presented in Table 5. The hypothesis H1 has not been rejected. The aggregate p-value for ROE is 0.06870. It can be said that there is a relationship between the value of ROE and the importance of individual components of financial management. Hypothesis H2 was rejected, since p-value for ROA is 0.01308. We can conclude, there no relationship between the value of ROA and the importance of individual components of financial management

Table 5 Multiple regression analysis for ROE and ROA

	Regression Results with Dependent Variable: ROE R = 0.39175075 R2 =0.15346865 Modified R2 =, 08292437 F (5.60) = 2.1755 p <0.06870. Error estimate: 33.089					
	b*	**Standard error from b***	**b**	**Standard error from b***	**t(60)**	**p-value**
Financial analysis			-37.1202	25.63373	-1.44810	0.152795
Financial Planning	0.241684	0.122237	7.2492	3.66647	1.97717	0.052622
Financial strategy	0.338889	0.132518	10.1649	3.97483	2.55731	0.013094
Financial Decision-makings	0.028697	0.125411	0.9525	4.16266	0.22882	0.819784
Financial Controlling	0.078948	0.125840	2.6471	4.21930	0.62737	0.532797

Source: own work in Statistica program

The H3 hypothesis is tested by the Kruskal-Wallis test. Table 6 shows the test results for the financial analysis as an example. For the financial analysis p = 0.0598, for the financial planning p = 0.0017, for the financial strategy formulation and implementation p = 0.0005, for the financial decision-makings p = 0.5324 and for financial controlling is p = 0.0006. The H3 hypothesis has been rejected because for financial planning, financial strategy formulation and implementation and financial controlling $p \leq \alpha$. It can therefore be said that there is no relationship between volume of assets and importance of individual components of financial management.

Table 6 Kruskall-Wallis ANOVA (Assets and Importance of Financial Management)

	Kruskal-Wallis ANOVA based on order; Financial analysis (Assets and importance of FM) Independent (collation) variable: Assets Kruskal-Wallis test: H (3, N = 66) = 7.415543 p =0.0598		
Dependent variable: Financial Analysis	**Number of valid**	**Summary of order**	**Average order**
Assets to 25 million CZK	23	772.0000	33.56522
Assets 25 - 50 million CZK	12	529.0000	44.08333
Assets 51 - 100 million CZK	23	738.0000	32.08696
Assets over 101 million CZK	8	172.0000	21.50000

Source: own work in Statistica program

To verify the H4 hypothesis, Friedman's test is used, which is tested at a significance level of α = 0.05. After comparing the level of significance α with the p-value of 0.00168 (see Table 7), the zero hypothesis was rejected as $p \leq \alpha$. It can be argued that all the financial management tools are not equally important to businesses.

Table 7 Friedman test

	Friedman's ANOVA and Kendall Matching Coefficient (Importance of FM (order)) ANOVA chi-kv. (N = 66, sv = 7) = 23.03030 p =0.00168 Coefficient of Conformity =0.04985 Avg. R =0.03523			
	Average order	**Summary of order**	**Mean**	**Standard deviation**
Break Event Point	4.56	4.69	4.83	4.52
Calculation	4.86	4.69	5.25	4.74
Budgeting	3.81	3.65	4.17	3.96
Financial Analysis	3.81	3.57	3.92	4.17
Optimizing Capital Structure	4.77	5	4.58	4.26
Tax shield effect	4.01	4.39	3.42	4.04
Financial Leverage effect	4.91	4.91	4.58	5
Norms (material consumption)	5.24	5.09	5.25	5.3

Source: own work in Statistica program

The H5, H6, H7 hypothesis is tested by the Kruskal-Wallis test. For all tested hypotheses p = 0.3916. The H5, H6, H7 hypothesis has been not rejected because $p > \alpha$. It can be said that there is relationship between volume of assets and the form of financial strategy, after that there is relationship between volume of assets and the way of financial management and finally there is relationship between volume of assets and the financial strategy formulation.

4 Conclusions

The results of questionnaire survey provided 68 % of selected SMEs have formulated financial strategy, where 22 % of them use aggressive financial strategy, 49 % of them use balanced financial strategy and 12 % of them use conservative strategy. The average value of assets is over 58 million CZK, the average EAT is over 3 million CZK, net working capital 6,8 million CZK, ratio of equity and debts is 58:41, ratio of fixed assets and current assets is 54:46, current ratio is 6, ROE is on average 22 % and ROA on average 13 %. 94 % of SMEs have financial management in competency of financial department or responsible persons. It could be stated SME sample is in a good financial condition and most of them formulated financial strategy using at least basic principles of financial management. SMEs with volume of assets to 25 million CZK have EAT on average 3.871 million CZK, current ratio 3.96, ROE 47 % and ROA 29 %. This group of SMEs uses aggressive financial strategy. SMEs with volume of assets between 26 – 50 million CZK have on average EAT 2.468 million CZK, current ratio 17.75, ROA 5.92 % and ROE 9.13 %. This group of SMEs uses conservative financial strategy. SMEs with volume of assets between 51 – 100 million CZK have on average EAT 2.533 million CZK, current ratio 2.79, ROA 3.37 % and ROE 5.99 %. This group of SMEs uses balanced financial strategy. The SMEs with volume of assets over 101 million CZK have on average

EAT 3.024 million CZK, current ratio 6.24, ROA 2.14 and ROE 12.58 %. This group of SMEs uses balanced financial strategy. On average the most important tool is considered to be norms (material consumption; 5.24) and on average the least important tool is budgeting and financial analysis with a value 3.81. The survey confirmed that all the financial management tools are not equally important to businesses despite of the fact all the mentioned tools have the same priority of effective financial management (based on theory). The volume of assets has an impact of importance financial management components (on average SMEs with assets to 25 million CZK (2.65) evaluate these tools as the least important compared to SMEs with assets over 101 million CZK (3.2)). It could be stated higher volume of assets among SMEs, the higher importance is given for financial management activities (financial analysis, planning, strategy, decision-making, controlling). The survey also confirmed there is a relationship between ROE and importance of individual components of financial management. The survey also found out There is a relationship between volume of assets and the form of financial strategy, the way of financial management and the form of financial strategy formulation. The higher volume of assets, the higher probability of financial strategy formulation and implementation and comprehensive approach to the financial management (i.e. financial management is in competency on financial department or responsible persons). The research has shown that small and medium-sized enterprises are undermining the importance of financial management and do not attribute the same strategic importance of financial management on their business development. At the same time, it was confirmed that SMEs evaluating financial management as more important are more financially successful (higher volume of assets, ROE and EAT) than SMEs that do not do so.

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Comparison of banking rating systems

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Abstract: *The aim of the article is to compare several rating systems used by banks and their affiliates, especially in German-speaking countries and Central European countries. The research is focused on the rating of business entities, more precisely the corporate, (especially limited liability companies or joint-stock companies). In particular, two aspects of the rating of the corporate are highlighted in the rating system comparison, namely: (i) which quantitative indicators are used for the calculation of the hard-facts (quantitative analysis based on data from reports, especially balance sheets and profit and loss accounts); and (ii) how the soft-facts are included in the rating system (qualitative indicators usually based on a questionnaire). In addition, the hard- and soft-facts weights used to calculate the overall rating result are mentioned and whether these scales are always constant, or vary with a change in a certain quantity of the rated enterprise (usually the size). Also some other characteristics of individual rating systems are briefly mentioned, like the resulting rating scale used. The procedure of collecting empirical data, their assessment according to the criteria of verifiability and relevance and the application of the induction method was used and a generalization of conclusions was subsequently made. The result of the research shows, that concerning the quantitative indicators (i), the highest emphasis is put on the capital structure of an enterprise (whether in the form of Equity to Liabilities or Equity to Total assets) in all compared rating systems. Concerning the other indicators used for the calculation, the monitored rating systems are different, and the total number of indicators also differs (from 6 to 9). For soft-facts (ii) all rating systems agree on some of the queries (e.g. the sensitivity of the rated entity to market fluctuations), but otherwise the number and the topics of the queries overlap only partially.*

Keywords: Rating, Risk Management, Hard-Facts, Soft-Facts

JEL codes: G24

1 Introduction

Internal rating systems are currently an integral part of the risk management system of banks and non-banking financial institutions. In addition to the original purpose, which is the assessment of clients' creditworthiness, they also play an irreplaceable role in determining the capital adequacy of banks in compliance with the Basel II accord and the emerging Basel III accord respectively.

This article deals with the comparison of the internal rating systems used currently and / or in the recent past by three banks or banking groups originating from the German-speaking economic environment and regions. All the banks mentioned apply the IRB Approach for Basel II and use their rating tools for estimate the credit risk of their clients, expressed in the PD (probability of Default).

As the issue of rating systems is quite extensive, I focus only on selected matters of the rating systems mentioned here, namely: (i) which quantitative indicators are used for the calculation of the hard-facts (quantitative analysis based on data from reports, especially balance sheets and profit and loss accounts); and (ii) how the soft-facts are included in the rating system (qualitative indicators usually based on a questionnaire or interview).

Similar topic, but from different point of view studied Bakhtiari (2017). His paper focuses on the Standard and Poor's (S & P) credit rating of firms in the USA. Bakhtiari tried to find positive or negative correlation between the credit rating and productivity of companies. The findings of the paper point to size as to one major balancing factor for a

good rating result. With a focus on manufacturing, the evidence points to two types of companies getting an investment grade rating: (i) medium-sized productive firms (firms "driving the creative destruction" according to Bakhtiari) and (ii) very large but not so productive firms (too-big-to-fail and "resisting the creative destruction"). The Bakhtiari's results suggest that the substitutability of size and productivity in the ratings system is not recent and has been around for a long time. In this context, the effort to find the most important factors for the rating results and the potential change of the weights of these factors with size of the rated company make sense.

Berg and Koziol (2017) in their paper, covering 40 banks and 17,000 corporate borrowers from 2008–2012 in Germany, found three main results, related to banks' rating systems and their results. (i) First, the variability of PD estimates for the same borrower across banks is large. (ii) Second, bank fixed effects explain 5% of the variation in PD estimates across banks, while 95% of the variation is idiosyncratic (non-systematic and thus not affecting capital requirements). (iii) Third, there are various bank characteristics that explain the size of bank fixed effects, like that weaker-capitalized banks on average report lower PD estimates and that banks' reported PD estimates increase after significant capital increases. But as the authors emphasize, their results should be interpreted with care.

For the basic overview and historical background about credit rating agencies (I mention the agencies as source for external ratings in point 3.1 and use the Moody's scale for comparison in point 3.4) the paper of Jeon and Lovo (2013) can be recommended.

Danielsson (2002) and Danielsson, Song Shin and Zigrand (2004) show on the example of market risk and value-at-risk models (VaR), that if many players on the same market use the same or similar risk models, it could have very negative consequences. If many market participants apply the same or very similar strategy at the same time, it can make the fluctuation bigger and the situation worse. Although this study covers market risk and value-at-risk models, the degree of similarity can be an interesting question in different types of models too.

The most authors mentioned above use more statistical point of view, thus they usually do not analyze the internal structure of the rating systems / tools. I try to answer the question, how far the credit risk models (banks' internal rating models) are similar and what are the most important factors of rating results, with awareness of limits of available data (regarding the region, the number of monitored banks etc).

Fracassi, Petry and Tate (2016) were concerned with interesting question of how rating analyst subjectivity affects corporate debt pricing. In my paper, I can only briefly mention the soft-facts part of the rating systems (where there is the only potential space for rating analyst subjectivity), but I see this topic as possible direction for future studies.

2 Data and methodology

For comparison, documentation to the three rating systems used by three different banks (banking groups) from the German-speaking environment was available. Since some of these documents are confidential and have not been granted full disclosure, the results of the investigations are limited in some respects. It is also not possible to publish the names of the mentioned banks (banking groups). The data are anonymized accordingly, however, in order not to affect their value for the research. These three banking institutions and their rating systems are listed under A, B and C.

In all cases, the rating tool is used in a form of a software tool for Microsoft Windows OS.

The research is focused on the rating of business entities, more precisely corporate, (especially limited liability companies or joint-stock companies). It does not take into account the rating of natural persons or non-profit organizations, municipalities etc.

Excluded are also the banks, insurance companies, leasing companies etc. For all these entities the examined banks have special different modules in their rating systems.

The procedure of collecting empirical data, their assessment according to the criteria of verifiability and relevance and the application of the induction method was used and a generalization of conclusions was subsequently made.

3 Results and Discussion

The basic structure of the rating systems

The basic structure of all the three rating systems mentioned is very similar, as the Figure 1 show, just the names used for particular steps are different.

All three compared rating tools first produce the part of the rating, based on clients' financial statements (financial data). After possible other inputs like sector data, budgets etc., the financial statement rating becomes **quantitative or hard-facts (HF) rating**, as one of the two main sources for the final result. The second source is the **qualitative or soft-facts (SF) rating**, based on qualitative criteria, where usually the key account manager provides most of the information used (for details of the quantitative and qualitative indicators used see below - points 3.2 and 3.3).

In the next stage, the hard-facts rating and the soft-facts rating are integrated together, according to a given weighting formula. This formula differs slightly at the compared rating tools, reaching from 66 : 34 (HF : SF) up to 50 : 50. Two rating systems use fix weights for all their corporate client, the third system is more complex, with the weights varying with a change of the size of the rated company. The more turnover the rated company makes, the more weight the hard-facts have in counting the final rating. This is a logical solution: smaller companies are more endangered by one person's mistakes or loss (like death of the owner / CEO in one person), their processes (like accounting etc.) are usually less intensively checked by internal and external audits etc.

Using the weights, the hard-facts rating and the soft-facts rating result together in a **basic or automated rating**. Such credit rating is then manually reviewed for possible down- or (in some cases) upgrading, usually executed by the risk managers. Manual down- or upgrade can be made either by any person of the risk management team with the following supervision of team head or can be made by chosen person(s) only. Always the four eye principle (maker - checker) is kept. The possible reasons for downgrade can be for example the age of the financial statement (more than 18 or 24 months), high amount of doubtful receivables (not noticed in the financial statements, but known to the bank), qualified opinion report given by the auditor, non-trustworthy financial statements etc. The possible reasons for upgrade are more rare (e.g. a major new business contract, unique new technology...) and the possible upgrade is limited by maximal one or two points of the scale (see below). The possible downgrade is usually not limited, or it can downgrade the client directly to the worst non-default category of the rating scale.

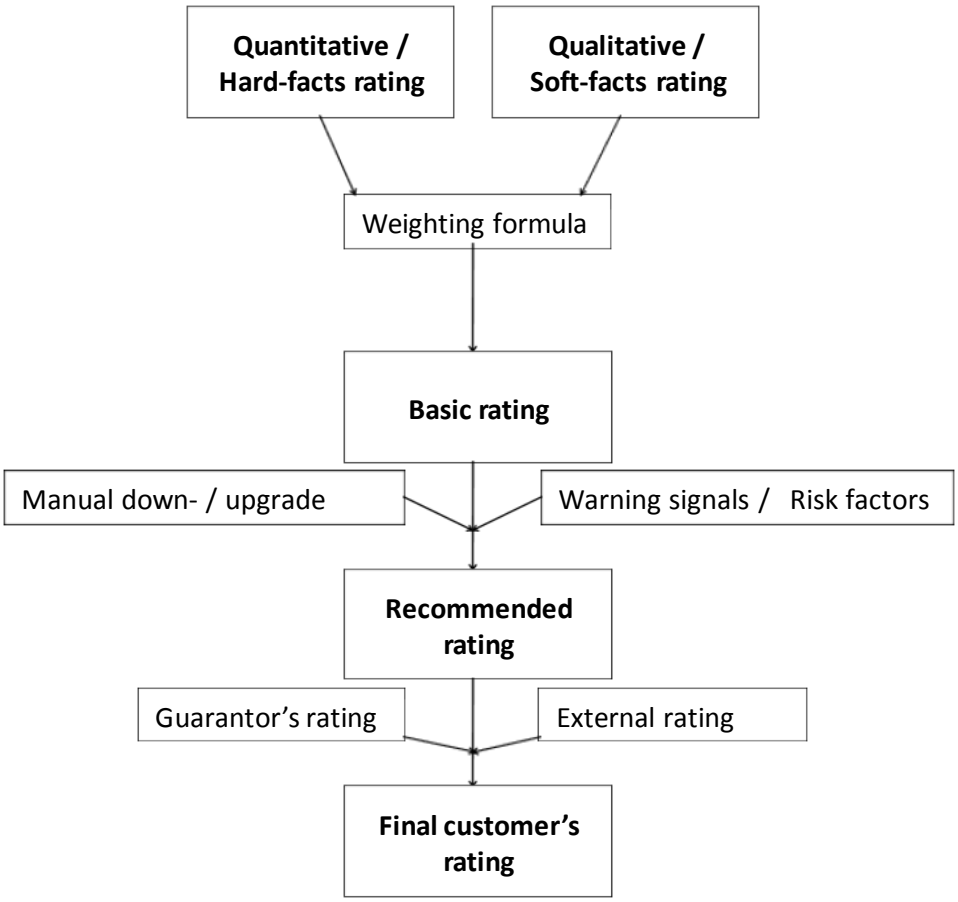
Next to the possible reasons for downgrade, all three banks compared use a fixed list of warning signals or risk factors. If one or more of them appear at the client, the rating must be downgraded. In one case, the warning signals are assessed by severity and the following downgrade can reach one, or two points of the rating scale, or can put the rating directly to the default category. The two other banks always downgrade the rating to the default category, if one (or more) of the warning signals appear. The warning signals include the non-fulfilled important payment obligations (over 90 days overdue for putting the rating to the default grade), fraud, insolvency proceedings and similar situations.

After the down- or upgrade or (the most common case) after non-use of this possibility, the basic rating becomes the **client's rating or recommended rating**, which can (or must under some circumstances), be modified by other guarantor's rating or external

rating, if existing. The banks use exact and similar-to-each-other rules, at what circumstances the rating of the guarantor or the external rating (usually made from one of the big rating agencies like Moody's or S&P) must be used.

When the last step (guarantor's rating or external rating) is made or skipped, the rating becomes **overruled rating** or **final customer's rating**.

Figure 1 The basic structure of the rating systems



Source: Author

Quantitative indicators (hard facts)

For comparison of quantitative as well as qualitative indicators, the overview scheme including all three rating systems was made by author of this paper. In some cases, the weight applies for two or three indicators together, which is represented by the merged and centered particular column in the scheme. Please note that the numbers of weights are rounded.

As the Table 1 shows, regarding the quantitative indicators (hard-facts), the highest emphasis is put on the Capital structure of the rated company. This applies to all three rating systems compared, whether in the form of Equity to Liabilities or Equity to Total assets. Two rating systems pair the Equity ratio with other one or two ratios respectively, concerning Liabilities.

Table 1 Quantitative indicators (hard facts). Please note that the numbers of weights are rounded.

Rating A			Rating B			Rating C		
-			Leverage	38%	(Current liabilities - Cash & Equivalents) / Total Assets	-		
Indebtedness	29%	(Trade payables + bank liabilities + notes payable) / (Liabilities + provisions)			(Trade payables + Notes payable + interest bearing liabilities) / (Liabilities - Advances)	-		
Equity ratio		Equity / Liabilities			Equity / Total assets	Capital structure	35%	Equity / Total assets
Financial Strength	24%	Operating Income / (Interest + similar expenses)	-			Interests coverage	23%	(EBT + Financial expenses) / Financial expenses
		(Profit or Loss of the Year + Depreciation and Amortization) / Liabilities	Debt coverage	9%	Cash Flow / (Liabilities - Advances)	Debt coverage by operating CF	9%	(Operating Income + Depreciation and Amortization + Financial expenses) / (Bank liabilities - Cash and equivalents - bank accounts)
Profitability	17%	(Operating Income + Depreciation and Amortization) / Sales	Profitability	25%	Ordinary profit / Sales	Profitability	8%	(EBT + Depreciation and Amortization) / Sales
-					(Net profit + Interest Expenses + Income Taxes + Depreciation) / Total Assets	-		
Growth	8%	(Sales (N) - Sales (N-1)) / Sales (N-1)	Growth	7%	Sales / Previous Year's Sales	-		
Liquidity	6%	(Cash + equivalents) / Working Capital	-			Liquidity	10%	(Cash and equivalents + bank accounts) / Working capital
Capital tied-up	16%	(Trade payables + notes payable) / Sales	Activity	10%	((Notes payable + Trade payables)*360) / Sales	Turnover of liabilities	15%	Trade payables / Sales
-			Productivity	11%	Personnel expenses / Sales	-		

Source: author by using banks "A", "B" and "C" rating manuals.

There are three other categories of quantitative indicators (hard facts), used in specific form in all three rating systems. These indicators are (i) Cash Flow to Liabilities (in two cases together with Income to Interest in slightly different form), (ii) Profit to Sales (in one case together with Profit to Total Assets) and (iii) Trade payables and Notes payable to Sales; all these indicators have important, but lower weight than the capital structure of the company.

In two cases, the indicators for Growth and for Liquidity are used, is slightly different forms. For the rating system B, where the most indicators (nine) occur, the unique one measures Personnel expenses against Sales with 10% weight (rounded).

Qualitative indicators (soft - facts)

The Comparison of qualitative (soft-facts) indicators is made by high-level categories, because of keeping the scheme uncluttered. The extent of this paper does not allow to perform a deeper analysis of this topic, too.

It should be mentioned, that in every high - level category (topic) more particular questions / opinions are concentrated. Answering of the questions and making of the soft-facts rating is usually a result of collaboration of key account manager / relationship manager / banker (which can be just different names for very similar positions in the banks) and the member of risk management team or Chief risk officer respectively. In all cases, the four-eye principle is kept, with respect to possible subjectivity of both involved persons, especially the key account manager / relationship manager / banker (who usually gets benefit for every deal made).

Anyway, the scheme shows apparently, that all the rating systems agree on some of the categories, but the similarity is lower than by quantitative indicators and the topics of the queries overlap only partially.

Table 2 Qualitative indicators (soft - facts). Please note that the numbers of weights are rounded.

Rating A		Rating B		Rating C	
Management	15%	Strategy	17%	Management	30%
Internal organisation (Accounting, Technology)	15%	-		Accounting	20%
				Qualifications of employees / Technology	10%
Market / Industry	15%	Influence / Market position	27%	Market incl. supplier and customer structure	30%
Relationship with the bank	40%	-		Relationship with bank	10%
Miscellaneous (Age of the company, Location...)	15%	Economic situation (general, influence on the company)	27%		
		Divergence from planning in last 3 yrs.	15%		
		Business expectations incl. bank's view	15%		

Source: author by using banks "A", "B" and "C" rating manuals

An interesting difference to mention is surely the category Relationship with the bank, which includes the period as well as the quality of the collaboration between the bank and the customer (thus the rated company). One of the rating systems take this indicator as the most important one with the weight of 40% (rounded), the second one makes do with 10% weight and the third one does not use this indicator at all (includes only problems in the relationship / previous collaboration with the customer as a warning signal, if existing). Even the later approach can make a good sense, considering the result of the rating process as a universal transferable number (which can, but does not need to be relevant in this situation).

Another noteworthy difference between the rating systems are the unique indicators of rating system "B", concerning the divergence from company's planning in last three years and the company's business expectations including the bank's own view and opinion to these expectations.

The scales of rating results

Concerning the scales used for the final rating result, the differences between the rating systems are rather unessential. This is rarely a surprise, if we take into consideration that all the rating systems have one common goal: to estimate the PD (probability of default)of particular customers of the bank between 0 and 100% for the following year. The rating systems also have to fulfill some given requirements in order to be accepted as a tool for counting the capital requirements of Basel II or Basel III respectively.

On the high end of the scale, the banks A and B use rating grades 1-1 and 1-2 or 1(AAAA) respectively for customers, who even do not have corresponding Moody's rating and PD. The bank B describes this category as clients with „no credit risk at all", which is

rarely a real situation. The bank A uses the first two grades just for sovereigns and another banks, thus even the best rated company clients can only get the grade 1-3, which corresponds with best grade of Moody's rating and real PD. Similar situation exists at the another two banks: the best company clients can reach he rating grade 1(AAA) or 1A respectively, but even such a result is more of theoretical case.

On the lower end of the scale, all the banks use special grades for default clients, corresponding with Moody's grade C. The bank A uses as much as eight particular grades (8-1 to 8-8) for separate reason for default (like insolvency proceeding, overdue payments, restructuring etc.). An experienced user of the rating system can thus easily see the reason for the default grade of the rating. The bank B distinguish three default grades (16, 17 and 18) by the estimated next progress of the client's situation. One grade represents the situation, where the bank believes in possible recovery of the transaction after restructuring. In the next grade the possible recovery is described as unlikely. The last grade is a definitive default of the transaction and the client, with no hope on recovery. The bank C use a method similar to bank A, but there are five grades of the default rating only. Another common feature for all three banks and their rating systems is, that the default rating grade (or more precisely any default grade) can be achieved only by existing risk factors (warning signals) or signs of default, but never by bad financial results or financial indicators only. The worst possible rating grade by financial statements only without any warning signals is 7 or 15 or 4E respectively.

Table 3 The scales of rating results. Please note that the PDs are rounded. Default (defined according to Basel II) = 90 days past due or unlikely to pay

Rating A	Rating B	Rating C	*Moody's*	*Indicative PD in 1 year*
1-1	1 (AAAA)			
1-2				
1-3	1(AAA)	1A	*Aaa*	
2-1			*Aa1*	*0,01%*
2-2	1(AA+)		*Aa2*	
2-3	1(AA)	1B	*Aa3*	*0,02 - 0,03%*
3-1	1(AA-)	1C	*A1*	
3-2	1(A+)	1D	*A2*	
	1(A)	1E	*A3*	
3-3	1(A-)	2A		
4-1	2	2B	*Baa1*	*0,11%*
	3	2C		
4-2		2D	*Baa2*	
	4	2E		
4-3	5	3A	*Baa3*	*0,4% - 0,5%*
5-1	6	3B	*Ba1*	*0,6% - 0,8%*
5-2	7	3C	*Ba2*	
	8			
5-3	9	3D	*Ba3*	
		3E		*1,8% - 2,8%*
6-1	10	4A	*B1*	*3% - 4%*
	11			
	12	4B	*B2*	
6-2	13			
6-2	14	4C	*B3*	
		4D		*9% - 15%*

7	15	4E	*Caa 1-3*	
7			*Ca*	*20%*
8-1 - 8-8	16	5A	*C*	*Default*
		5B		
	17	5C		
		5D		
	18	5E		

Source: author by using banks "A", "B" and "C" rating manuals

4 Conclusions

The result of the research shows, that the structures of compared bank's internal rating systems are very similar, based on integration of hard-facts rating based on quantitative indicators and soft-facts rating based on qualitative indicators, with possible following steps according to the client (e.g. existing or non non-existing guarantor, external rating etc.).

Concerning the quantitative indicators (i), the highest emphasis is put on the capital structure of a company (whether in the form of Equity to Liabilities or Equity to Total assets) in all three compared rating systems. Cash Flow to Liabilities, Profit to Sales and Trade payables and Notes payable to Sales are other indicators used universally; the other indicators used for the calculation differ in the systems, as well as the total number of indicators (from 6 to 9).

For soft-facts (ii) all rating systems agree on some of the basic categories (e.g. the quality of the management, market situation and sensitivity of the rated entity to market fluctuations etc.), but otherwise the number and the topics of the queries overlap only partially.

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Intangible Assets in Pharmaceutical Companies in the Czech Republic

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Abstract*:Due to the technical and scientific progress, the cost structure of business entities changes significantly. An important item of costs are costs associated with intangible assets such as software, patents, licenses, copyrights and goodwill. We can assume that the share of these assets in total assets of companies has changed over time. The paper is focused on the evaluation of the share of intangible assets in total assets of entities involved in chemistry in the Czech Republic. The analyzed sample of companies represents entities preparing financial statements in accordance with the Czech Accounting Legislation. The results are compared with the companies operating in the chemical industry and prepare their financial statements according to IFRS. The aim of this paper is to evaluate the materiality of this category, its structure and its changes over time and to identify possible reasons for this situation.*

Keywords: Intangible Assets, Fixed Assets, GDP, Goodwill, IFRS.

JEL Code: M41

1 Introduction

In the beginning of the 20th century, among the world's largest companies were manufacturing companies (US Steel, Jersey Standard, Pullman and American Tobacco). Their success rested with their physical assets: oil fields, railroads and factories. In the recent days besides these companies there are some new companies operating in quite different kinds of industries (Apple, IBM, McKesson, United Health, CVS Health). This situation is associated with a structural change from traditional manufacturing to new more innovation-intensive activities. As a potential source of innovation and productivity gains are identified intangible assets. The structure of companies´ assets has been changing since 80th of the 20th century. The share of intangibles in the total assets has increased from 5% in 1978 to the current 75-85 % of all assets in selected companies.

IAs – assets without material substance – become the main impetus in the creation of value in corporations. Despite of this fact, not all intangible items could be recognized as items of assets and could be reported in financial statements of companies. In terms of financial reporting by companies, this is bringing about a situation in which an increasingly large portion of elements which create value for a business, such as knowledge, technology and clients, are excluded from the balance sheet (B/S) pursuant to prevailing reporting practices. According to Lev, Daum (2004), intangible assets become a possible contributor to the disparity between accounting companies´ value and their market value. It is necessary to understand the criteria for intangible assets recognition is in the eyes of accounting systems.

The world´s most significant reporting systems define intangible assets in the following way:

International Accounting Standards Board (IASB) standard 38 (IAS 38) defines an intangible asset as: "an identifiable non-monetary asset without physical substance." This definition is in addition to the standard definition of an asset which requires a *past event* that has given rise to a resource that the entity *controls* and from which *future economic benefits* are expected to flow. Thus, the extra requirement for an intangible asset under IAS 38 is *identifiability*. This criterion requires that an intangible asset is separable from the entity or that it arises from a contractual or legal right. IAS 38 contains examples of intangible assets, including: computer software, copyright and patents.

The Financial Accounting Standards Board (FASB) Accounting Standard Codification 350 (ASC 350) defines an intangible asset as an asset, other than a financial asset, that lacks physical substance.

The world's accounting standard setters are considering how to address this issue in the most suitable way. In the interests of greater transparency and comparability in financial records, companies are encouraged to disclose information about all the assets that are used in the business, but not shown on the balance sheet. IAs can be categorized in two subgroups should be distinguished within Intangible Assets: recognized Intangible Assets and non-recognized Intangible Assets in bookkeeping and accounting.

On the other hand, the Czech Accounting legislation defines intangible assets in the decree 500/2002 Sb., as individual items with the useful life over one year (results of research and development, legal rights), and in the Czech Accounting Standards, Standard Nr. 13, in the common way for tangible and intangible assets.

The lack of physical substance is a defining characteristic of an intangible asset in all over-mentioned systems.

The inclusion in the balance sheet and measurement of intangible assets on the basis of prevailing reporting standards is fraught with complications. There are principles for assets recognition, pursuant to which such intangible assets are taken direct to the result. Also, the various categories of intangible production asset differ by type, so that it is not always possible to break them down for reporting purposes. According to Hussi (2004), the current reporting methods are not able to capture intellectual capital. This hidden part determines the future success of company. Investments in intellectual capital are reported as costs, they are reported as short-term expenses, even though they should be seen as essential investments from the new value creation perspective. Intellectual capital is complementary, not subordinate, to financial information. Intangible resources can include skills, human assets, information and organizational assets, and relational and reputational assets. These all represent what a firm has. Another class of intangible resource is capabilities or competences that represent what a firm does (Hill et al., 2007).

Another approach to IAs uses OECD (2011). OECD groups intangibles into three types: computerized information (such as software and databases), innovative property (such as scientific and nonscientific R&D, copyrights, designs, trademarks) and economic competencies (including brand equity, firm-specific human capital, networks joining people and institutions, organizational know-how that increases enterprise efficiency, and aspects of advertising and marketing).

There are studies concerning the role of IAs in the economy. The study carried out by the European Patent Office and the Office for Harmonization in the Internal Market (OHIM) published in 2013 and in 2015 using European Union (EU) data. The studies showed that about 39 % of total economic activity in the EU is generated by IP intensive industries. The study OHIM (2013) also concludes that European companies owning IP achieve considerably better economic performance than their competitors not owning IP. According to these studies especially ownership of patents, trademarks and designs is strongly associated with improved economic performance of individual companies.

With respect to conclusions of studies carried out on factors of companies´ success, the interest is moving from tangible to intangible factors due to the realization of the high potential of intangible resources (Hand, 2001, Zigan, Zeglat, 2010). The shift towards consideration of power of IAs and their contribution to companies´ economic growth is attracting attention of researchers (García-Ayuso, 2003, Volkov, Garanina, 2007, Jerman, Kavčič, Kavčič, 2010, Hussi, 2004, Gerpott, Thomas and Hoffmann, 2008, Boekenstein, 2009). Also Grüber (2014) concluded that major production inputs do no longer comprise of items, such as property, plant and equipment, but rather of brands, knowledge and other technological innovation and intangible values have continuously become significant value drivers of companies in today's economy, despite these facts, financial accounting and reporting still lacks to incorporate and to report such values properly.

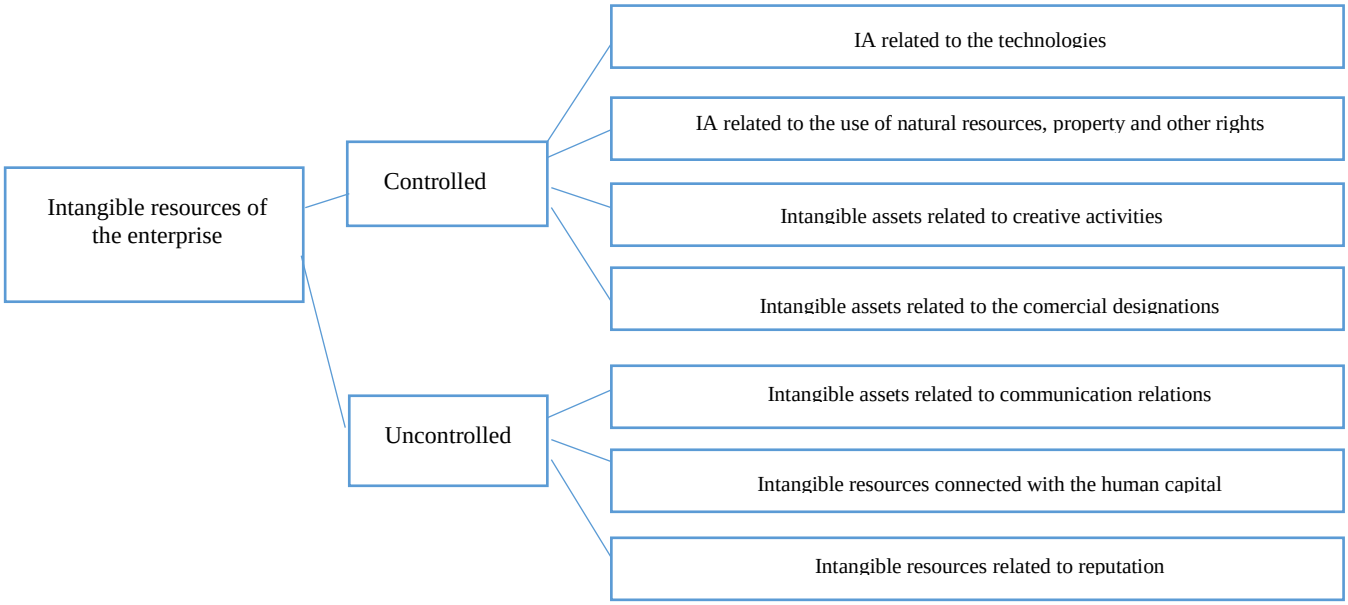
There are some studies concerning the significance of IAs within European companies (Nell, Tettenborn, Rogler, 2013, Jerman, Kavčič, Kavčič, 2010). Nell, Tettenborn, Rogler (2013) examine both the materiality of intangibles and the related disclosure quality under IFRS in the notes of firms on the German benchmark stock index DAX during the four-year period 2008-2011. The study of Jerman, Kavčič, Kavčič (2010) aims the significance of IAs in transition economies like Croatia, Slovenia, the Czech Republic, Germany and USA. The study is based on data of the period 2004-2008. The results of the study prove that intangibles constitute an important asset for traditional market economies, while it was not proven for post-transition and transition economies. Despite the fact that many analyses underline their growing significance in today's business environment.

Also the studies of Dunse, Hutchinson and Goodacre (2004), Edvinsson (2000) proved that a creation of the future value is significantly based on IAs such as IP and goodwill. A company's IAs — especially those related to internally generated information technology and other internally generated IAs — are not well reported on corporate balance sheets according to these studies. The vast majority of intangible spending is expensed, due to strict criteria for recognition of IAs in an accord with IFRS or US GAAP (Lev, Daum, 2004). There are some exceptions – goodwill arising in acquisitions, the other exception is a small portion of software or development costs (after fulfillment the criteria for recognition according to IAS 38 or Topic ASC 350-30). The special item of intangibles is goodwill which is recognized and reported only due to business combinations, in individual companies could not be recognized despite the fact that it is clear that there are some factors of success of the firm which could not be described by current accounting treatments.

Research has confirmed that, although most executives agree that intellectual capital is critical to the continued success of their businesses, their methods of measuring and managing these invisible enablers of performance are either poor or non-existent.

The importance of this special item of intangibles became apparent in mergers and acquisitions. Acquisitions reveal the hidden value of IAs (Boekenstein, 2009, Sedláček, Valouch, Hýblová, Křížová, 2014), that did not meet the criterion for their recognition previously. The results of Boekenstein's study (carried out for pharmaceutical sector) revealed that in mergers and acquisitions the total value of the acquired company increases approximately six times. The special approach to IAs reporting was considered also in the Exposure draft of Lease reporting, the rights connected to leased assets were considered as an IA (Svoboda, Bohušová, 2014), the final standard IFRS 16 does not work with this idea any more.

Figure1 Structure and classification of Intangible Assets in industrial enterprises



Source: own work based on literature survey

2 Methodology and Data

The purpose of this paper is to assess the role of intangible assets on the B/S of Czech companies operating in chemical industries – pharmaceutical industry. The selection of industry is based on conclusions of studies carried out - the significant power of IAs is expected (patents, licences, research and development).

Based on the conclusion of literature review, the aim of the paper is to evaluate the changes in the share of intangible assets during the past 10-year period and to asses a relation between intangible assets and company performance.

Intangible assets reporting of a sample of 71 Czech companies reporting according to the Czech accounting legislation operating in chemical industry (pharmaceutical production) are analysed. The sample covers all companies reporting according to the Czech accounting legislation operating in the chemical industry – production of pharmaceutical products (NACE 21).

The system ARES (Access to Registers of Economic Subjects) was used for companies according the NACE identification. ARES is an information system allowing a retrieval of information on economic entities registered in the Czech Republic. This system intermediates a display of data from particular registers of the state administration. The financial statement and their notes of identified companies published in the Public Register were processed. The research covers period from 2005 to 2015. The firms which did not publish the complete information in notes were excluded. The final dataset covered 60 firms (in total 660 firm-years). The average values were used for the analysis.

The development in total amount capitalized in intangible assets and the structure of the category IAs during the researched period was evaluated.

$$IABTi\ (IA\ in\ B/S\ Total) = \frac{Net\ amount\ of\ IA}{B/S\ Total} \qquad (1)$$

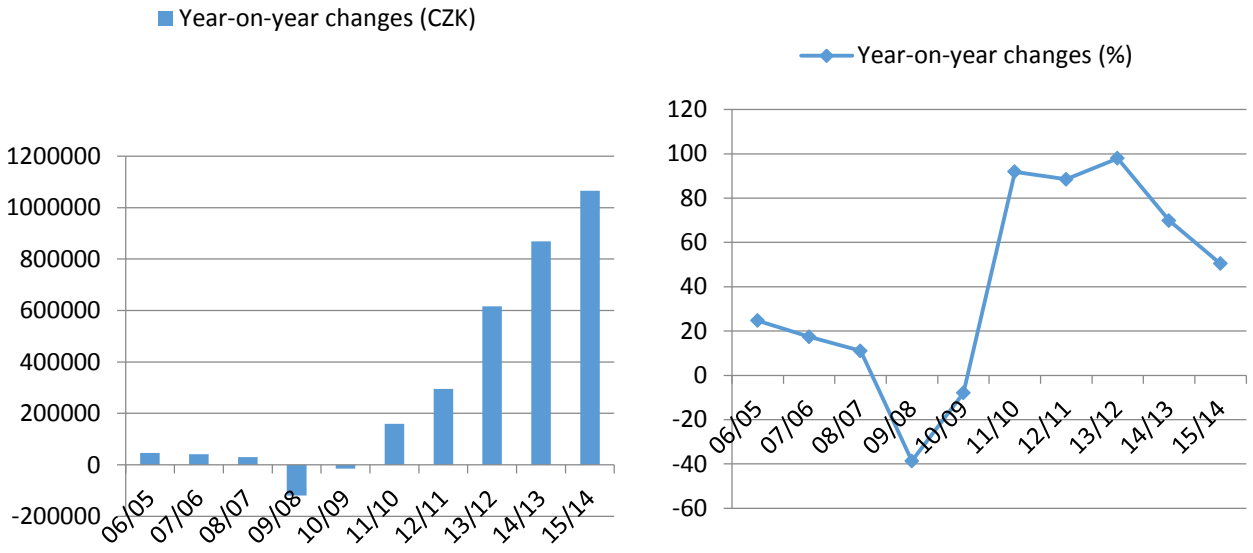
The impact of IAs on ratios describing the level of performance was analysed. Due to limited extent of the paper the figures and charts were used for presentation.

$$Return\ on\ of\ IAs = \frac{Operating\ Revenue}{IAs} \quad (2)$$

3 Results

The pharmaceutical industry is a subject of the research of IAs over the world. The high number of researches is concerned with companies reporting according to IFRS or US GAAP. However, the majority of the Czech companies are reporting according to the national GAAP. Due to this fact, the sample covers especially small and medium companies (only 2 companies operating in chemistry are reporting in accord to IFRS in the Czech Republic, they were subject of previous research). Based on the researched data set, there was revealed that the total value capitalized in IAs (according to the Czech Accounting legislation) is increasing during the whole period. The only exceptions are in the years 2009 and 2010, the slight decrease is supposed to be connected to the beginning of the economic crisis, as seen from Figures 2a, b.

Figure 2 Changes in value of IAs in CZK and in %



Source: own work based on annual reports

The average share of IAs in the B/S total is described in the Figure 3. The share of IAs in B/S total differs significantly in particular companies (from 0.0% to 69% in 2005, and from 0% to 77% in 2015). The results were compared to the general results of study of Jerman, Kavčič, Kavčič (2010) concerning the Czech Republic (publicly traded companies reporting according to IFRS) and to study Bohušová, Svoboda (2017) carried out in the Czech publicly traded companies. According to results of the fore-mentioned studies, the share for the companies was 6.01% for the year 2005 up to 6.40% in 2008 (Jerman, Kavčič, Kavčič, 2010), and from 8.67% in 2005 to 19.81% in 2008 (Bohušová, Svoboda, 2017).

The share of IAs in B/S total in pharmaceutical companies reporting according to CAL is lower in comparison to results fore-mentioned studies. It could be caused by the fact that the sample covers companies reporting according to CAL ie small and medium-sized entities. These companies have usually not such possibilities of increasing of equity or liabilities for financing investment to intangible assets in comparison to large listed companies. Despite this fact there are some differences in recognition and measurement of IAs reported according to CAL. The criteria for the recognition and measurement are so not as strict as in IFRS (R&D, start-up cost (till 2016), internally generated IAs. Due

to fore-mentioned different condition for doing business for different size of companies, the companies were sorted according to balance sheet total to micro, small, medium-sized and large groups. The criteria level is an accord to the Czech Accounting Act.

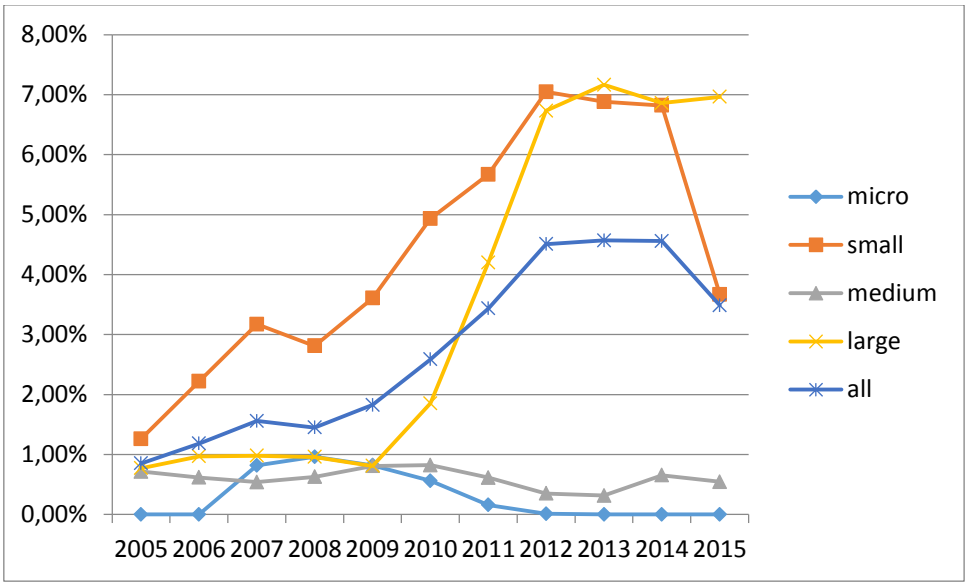
According to the results of number of studies carried out on publicly traded companies, the IAs are getting more significant in a span of time, as seen of the Table 1 and Figure 3, the results of the analysis of the IAs in the Czech pharmaceutical companies reporting according to CAL is in line with these conclusions (only exception 2015). The analysis made by Jerman, Kavčič, Kavčič (2010) proves that IAs are becoming more and more important for today's business environment, but there is still a significant difference between different types of economies. The detail analysis in Table 1 and Figure 3 describes the development of the particular categories of companies.

Table 1 Share of IAs in B/S total by categories in %

Type/Year	05	06	07	08	09	10	11	12	13	14	15
micro	0,00	0,00	0,82	0,96	0,82	0,56	0,16	0,01	0,00	0,00	0,00
small	1,26	2,22	3,17	2,81	3,61	4,93	5,67	7,05	6,88	6,82	3,67
medium	0,71	0,62	0,54	0,63	0,81	0,82	0,61	0,35	0,31	0,65	0,55
large	0,77	0,97	0,98	0,96	0,81	1,85	4,20	6,73	7,16	6,86	6,96
All	0,85	1,18	1,56	1,45	1,83	2,59	3,43	4,51	4,57	4,56	3,49

Source: own work based on annual reports

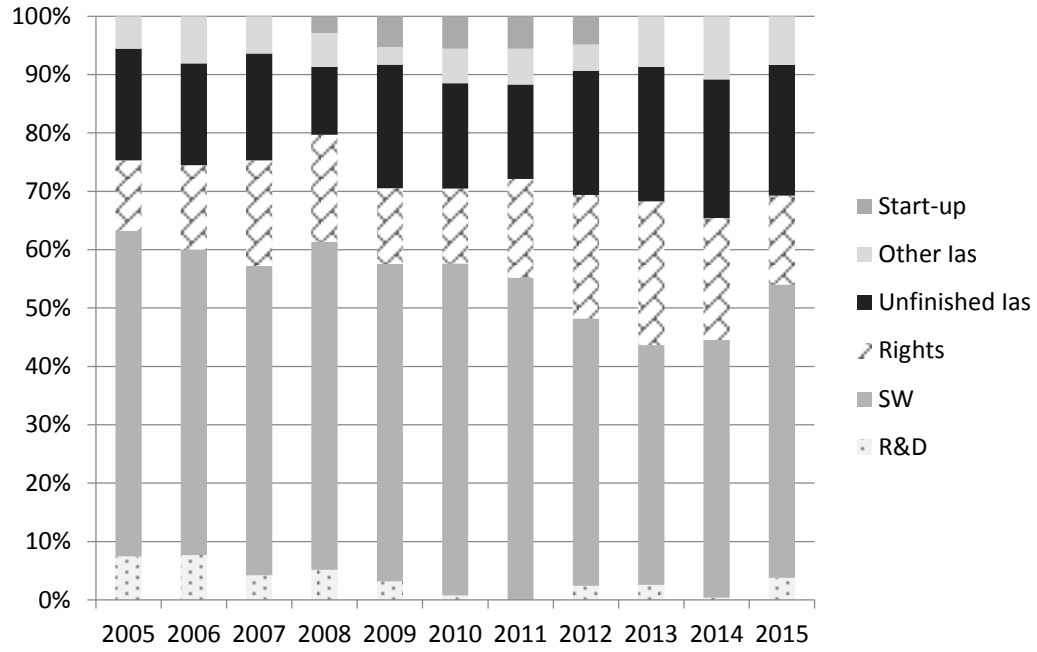
Figure 3 IAs/Balance sheet total



Source: own work based on annual reports

The closer analysis of the structure of IAs carried out revealed quite a different structure of the IAs in each company. The average structure of IAs in their development over time describes the Figure 4. It is evident that the most significant item of IAs is software (the share is from 55.8% in 2005 to 50.2% in 2015), followed by rights and patents (from 12.0% in 2005 to 24.6% in 2013) and results of research and development (from 0.02% in 2011 to 7.7% in 2006).

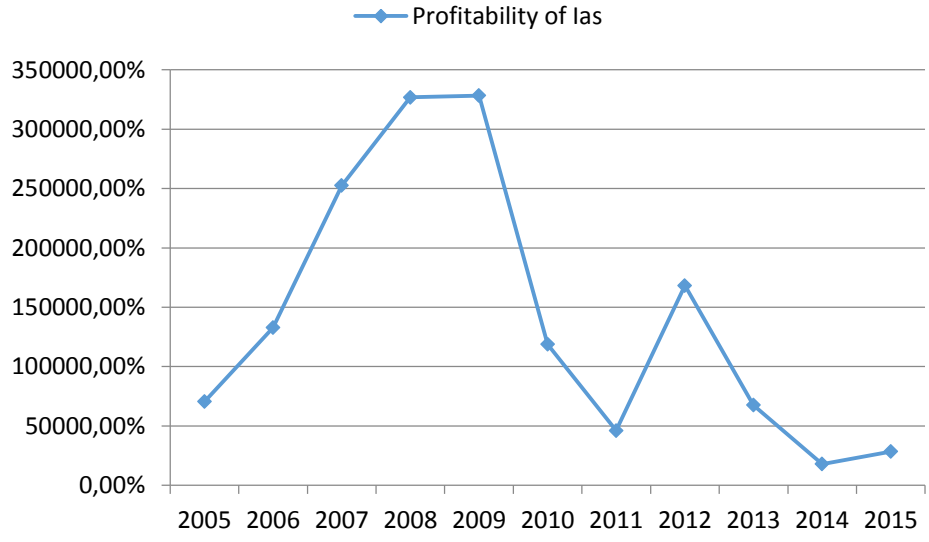
Figure 4 Average structure of IAs in %



Source: own work based on annual reports

Our research concerns the companies operating in the pharmaceutical sector in the Czech Republic and the importance of intangible assets in these companies. It is desirable to increase the Return on IAs indicator continuously. In the observed time series, this indicator has fluctuated considerably (Figure 5). Since the level of the indicator is affected in both by the amount of revenue and the amount of input IAs involved, the influence of the factors will be examined in a future research.

Figure 5 Return of IAs (%)



Source: own work based on annual reports

4 Conclusions

The paper is a part of research concerning the role of intangible assets in a performance of business companies and possible ways of measurement of their efficiency. The paper

concerns companies reporting to the Czech Accounting Legislation and the comparison to companies reporting according to IFRS. Recently, it has been proposed to extend the capitalization of intangibles to expenditure on research and development (R&D) in IFRS. There are not any treatments for reporting the majority of intangible capital (knowledge, human capital, education, training, market position, etc.) in financial statements of companies according to current financial reporting treatments.

The IAs category is getting more significant in a span of time. Based on results of analysis, the role of IAs in pharmaceutical industry increases. The most significant item in IAs structure is the structure of IAs in a software, followed by patent and licenses with increasing bias.

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Comparison between CreditMetrics™ and KMV

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Abstract: *The topic of this paper is comparison between Creditmetrics™ and KMV. The goal is to estimate the benchmarks for both the Creditmetrics™ model and the KMV model, and then compare these two models theoretically and diagrammatically. Credit risk is determined in a portfolio that consists of ten selected quoted companies in the Frankfurt Stock Exchange (FSE) with a total nominal value of 10 million euro and the time horizon is one year, from March 24th, 2016 to March 24th, 2017. Under the framework of Creditmetrics™ and KMV, credit risk associated with the portfolio is quantified in terms of the values of economic capital. After calculating the expected loss and the unexpected loss for the whole portfolio by Creditmetrics™ (at a 99,9% confidence level) and KMV, the values of economic capital, which is the difference between the expected loss and the unexpected loss, equal to 513 316 € and 870 370 €, respectively. The most essential difference between two models is that Creditmetrics™ is a backward-looking model, while KMV is a forward-looking model.*

Keywords: Economic capital, credit risk, Creditmetrics™, KMV, VaR

JEL codes: G11, G21, G24, G31

1 Introduction

Both the CreditMetrics™ model and the KMV model have enjoyed a widespread popularity in the credit risk management. The CreditMetrics™ model is originally envisioned by J.P. Morgan's Risk Management Research division in 1997, while the KMV model is originally proposed by a private company named KMV in 1990s and maintained by Moody's KMV nowadays. The project aims to estimate an effective benchmark for quantifying credit risk at a portfolio level under the framework of CreditMetrics™ and KMV, and to make a comparison between these two models graphically and theoretically. The description of CreditMetrics™ follows J.P. Morgan (1997); while the description of KMV follows Crosbie and Bohn (2002), Crouhy, Galai and Mark (2000), and Kealhofer and Bohn (2001).

2 Description of CreditMetrics™ and KMV methodology

In this section, we will describe both the CreditMetrics™ model and the KMV model in detail, including the basic parameters, the frameworks, and the procedure of calculating the economic capital theoretically.

CreditMetrics™

The CreditMetrics™ model is a tool for estimating the distribution of changes in the market value of a portfolio of credit exposures based on the data for migration rates, default rates, and spreads of borrowers. Roughly speaking, there are three main parts in the description of the CreditMetrics™ model, including risk management framework, credit quality correlation, and interpretation and application of results. Before we start, it is essential to know what is the VaR and the economic capital.

Value at risk (VaR) represents the maximum potential losses at a given confidence level, usually 99% but more frequently 99.5% or even 99.9%, over a specific time interval. It can be interpreted in two ways:

- losses from the portfolio of debt assets $\left(-\Delta\widetilde{\Pi}\right)$ set at a significance level of α, which is greater than the predetermined value losses (VaR), can be expressed as:
  $\Pr\left(-\Delta\widetilde{\Pi} \geq VAR\right) = \alpha$; (1)
- profits from the portfolio of debt assets $\left(\Delta\widetilde{\Pi}\right)$ set at a significant level of α, which is less than the predetermined value gains (-VaR), can be expressed as:
  $\Pr\left(\Delta\widetilde{\Pi} \leq -VAR\right) = \alpha$. (2)

Economic capital, which is the difference between unexpected losses and expected losses, represents an estimation of the amount of the required capital to maintain unexpected losses at a specific significance level. It can be computed when using the probability distribution of portfolio gains as:

$$Economic\ capital = VaR_{\alpha} - \mathrm{E}\left(-\Delta\widetilde{\Pi}\right), \quad (3)$$

where $\mathrm{E}\left(-\widetilde{\Pi}\right)$ is the mean value of the losses, VaR_{α} is determined so that the simulated values of the portfolio returns are ranked according to the order and the value of VaR at a specific significance level will be equal to *n*-th worst. However, with the opposite sign, it is possible to use the following formula mathematically:

$$n = \alpha \cdot N . \quad (4)$$

where *n* is the ordered number of the experiment and *N* is the number of scenarios.

In general, there are four steps to calculate the credit risk for a portfolio by using the CreditMetrics™ model. The first is credit rating migration. The CreditMetrics™ model assumes that each exposure has been assigned a rating either produced by rating agencies or referred to an internal rating. Besides, those rating grades are indicative of the default and migration probabilities for the subsequent year. Then, risk comes. It is important to estimate both the likelihood of default and the chance of migrating to any possible credit quality state at the same risk horizon.

The second is calculation of the present value of a bond. Values are determined at the risk horizon and there are usually eight revaluations in simple one-bond case because value should be calculated separately for each migration state. Moreover, the eight valuations can be divided into two categories – one is in the event of default, and other is in the event of upgrades or downgrades. In the first case (in the event of a default), the recovery rate is estimated depended on the seniority classification of the debt. Table. 1 summarizes the RRs in the state of default.

Table 1 Recovery Rates by Seniority Class (% of Face Value, i.e., "Par")

Seniority class	Mean (%)	Standard deviation (%)
Senior secured	53,80	26,86
Senior unsecured	51,13	25,45
Senior subordinated	38,52	23,81
Subordinated	32,74	20,18
Junior subordinated	17,09	10,90

Source: Carty & Lieberman [96a] – Moody's Investors Services

In the second case (in the event of upgrades or downgrades), the change in credit spread is estimated based on a straightforward present value bond revaluation. The present value (PV) of a bond can be calculated as:

$$PV = \frac{C}{(1+i)} + \frac{C}{(1+i)^2} + \cdots + \frac{C+M}{(1+i)^n}, \tag{5}$$

where *C* is coupon payment, *n* is number of payments, *i* is interest rate or required yield, *M* is value at maturity or par value, and *C+M* is nominal value.

The third is calculation of the discount rate. The discount rates can be determined for different rating categories and years. The calculation of these rates is based on the risk-free rate and the implicit expectations theory, which can be expressed as:

$$f_t = \frac{(1+r_t)^t}{(1+r_{t-1})^{t-1}} - 1. \tag{6}$$

The fourth is credit risk estimation, which aims at estimating the volatility or standard deviation of value due to credit changes for a single exposure. According to what we have already obtained from previous two steps, it is able to obtain the likelihoods of all possible outcomes and the distribution of value with each possible outcome.

Asset value model is based on the proposal that a company's asset value drives its credit rating changes and defaults. Because the value of a company's asset determines the ability to meet its obligations, and if the value of the company's asset is too much low to meet its obligations, the company will default. Let us parameterize the asset value process to model the change in company's asset value to evaluate its credit rating, namely the percent changes in asset value are normally distributed, the mean is denoted by μ, and the standard deviation is denoted by σ. Besides, given the fact that the value of μ will not influence the result of the exposition, we can assume $\mu = 0$ to make it easier. Use Z_{Def}, Z_{CCC}, Z_B, etc. to satisfy the situations in which if $R < Z_{Def}$, the company will default; if $Z_{Def} < R < Z_{CCC}$, the company will be re-rated to CCC; if $Z_{CCC} < R < Z_B$, the company will be re-rated to B; and so forth. Table 2 presents the transition probabilities of a BB-rated company as an example.

Table 2 Transition Probabilities and Thresholds for A BB-Rated Company

Rating	Probability from transition matrix (%)	Cumulative probability (%)	Threshold
Default	$\Phi(Z_{Derf}/\sigma)$=1,06	1,06	-2,30σ
CCC	$\Phi(Z_{CCC}/\sigma)-\Phi(Z_{Def}/\sigma)$=1,00	2,06	-2,40σ
B	$\Phi(Z_B/\sigma)-\Phi(Z_{CCC}/\sigma)$=8,84	10,90	-1,23σ
BB	$\Phi(Z_{BB}/\sigma)-\Phi(Z_B/\sigma)$=80,53	9,43	1,37σ
BBB	$\Phi(Z_{BBB}/\sigma)-\Phi(Z_{BB}/\sigma)$=7,73	99,16	2,39σ
A	$\Phi(Z_A/\sigma)-\Phi(Z_{BBB}/\sigma)$=0,67	99,83	2,93σ
AA	$\Phi(Z_{AA}/\sigma)-\Phi(Z_A/\sigma)$=0,14	99,97	3,43σ
AAA	$1-\Phi(Z_{AA}/\sigma)$=0,03	100,00	

Source: own calculation

Monte Carlo simulations, developed by Stanislaw Ulam and John Von Neumann, are designed to estimate the parameters of a particular probability distribution from the historical data and then the extraction of *N* simulated values for the risk factors. The Cholesky decomposition, also named Cholesky factorization, is commonly used in the Monte Carlo simulations. In the case of two variables only, A and B, the covariance matrix can be decomposed as:

$$\Sigma = \begin{bmatrix} {\sigma_A}^2 & {\sigma_{A,B}}^2 \\ {\sigma_B}^2 & {\sigma_B}^2 \end{bmatrix} = \begin{bmatrix} \sigma_A & 0 \\ \dfrac{{\sigma_{A,B}}^2}{\sigma_A} & \sqrt{{\sigma_B}^2 - \left(\dfrac{{\sigma_{A,B}}^2}{\sigma_A}\right)^2} \end{bmatrix} \cdot \begin{bmatrix} \sigma_A & \dfrac{{\sigma_{A,B}}^2}{\sigma_A} \\ 0 & \sqrt{{\sigma_B}^2 - \left(\dfrac{{\sigma_{A,B}}^2}{\sigma_A}\right)^2} \end{bmatrix} = AA'. \quad (7)$$

Similarly, the correlation matrix can be decomposed as:

$$\Sigma = \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ \rho & \left(1-\rho^2\right)^{1/2} \end{pmatrix} \cdot \begin{pmatrix} 1 & \rho \\ 0 & \left(1-\rho^2\right)^{1/2} \end{pmatrix}. \quad (8)$$

The following equations are often used to calculate individual elements of the Cholesky decomposition matrix:

$$p_{ii} = \left(\sigma_{ii} - \sum_{k=1}^{i-1} {p_{ki}}^2\right)^{\frac{1}{2}}, \qquad for\ i = 1, 2, \ldots, N, \quad (9)$$

$$p_{ij} = \left(\sigma_{ij} - \sum_{k=1}^{i-1} p_{ki} \cdot p_{kj}\right) \cdot {p_{ii}}^{-1}, \qquad for\ i = 1, 2, \ldots, N, \quad (10)$$

$$p_{ij} = 0, \qquad for\ i > j; i = 1, 2, \ldots, N, \quad (11)$$

where p_{ii} and p_{ij} are individual elements of the Cholesky decomposition matrix.

KMV

The KMV model is developed by the California-based company KMV in the 1990s. The acronym KMV comes from the last names of the three founding partners, namely Steven Kealhofer, Jogn Andrew McQuown, and Oldrich Vasicek. KMV is a straightforward extension of the Merton model, whose major contribution is the empirical testing and the implementation by using a large proprietary database. While CreditMetrics™ usually uses Moody's or Standard & Poor's statistical data to assign a probability of default, KMV calculate the expected default frequency (EDF), which refers to the actual probability of default during the forthcoming year(s).

There are mainly three steps in the derivation of the EDF, including estimation of the asset value, V_A, and the volatility of asset return, σ_A; calculation of the distance-to-default (DD); and calculation of the EDF.

The asset value and the volatility of asset return is estimated from the market value, the volatility of equity, and the book value of liabilities. Since the equity holders have the right, but not the obligation, to pay off the debt holders, and the residual claim on the remaining assets, the equity can be regarded as a call option on the underlying assets with a maturity (T) and a strike price (X) equal to the book value of the company's liabilities. This is known as the limited liability feature of the equity. Therefore, if the value of assets is sufficient to meet the liabilities, the shareholders will obtain a payoff that is equal to $V_T - X$; if the value of assets is insufficient, the shareholders will not exercise the call option, which means the payoff is zero.

According to the Black-Scholes (BS) option-pricing model, a special case of the Merton model, it is possible to illustrate the relationship between the market value of equity and the market value of assets by the following equation:

$$V_E = V_A \cdot \mathrm{N}(d_1) - Xe^{-rT} \cdot \mathrm{N}(d_2), \quad (12)$$

where V_E is the market value of the equity, r is the risk-free rate, and $\mathrm{N}(\cdot)$ is the standard normal cumulative density function, while d_1 and d_2 are defined as follows:

$$d_1 = \frac{\ln\left(V_A / X\right) + \left(r + \frac{{\sigma_A}^2}{2}\right)T}{\sigma_A \sqrt{T}}, \tag{13}$$

$$d_2 = d_1 - \sigma_A \sqrt{T}\,. \tag{14}$$

Moreover, the relationship between the equity and asset volatility and the relationship between V_A and σ_A is required to find a unique pair, which can be expressed as the following:

$$\sigma_E = \frac{V_A}{V_E}\mathrm{N}(d_1)\sigma_A, \tag{15}$$

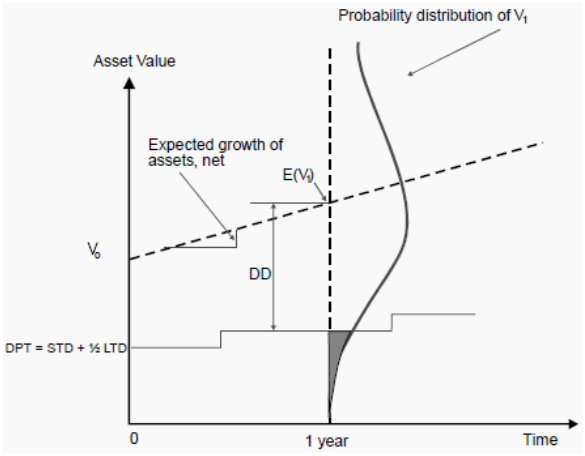
where σ_E denotes the volatility of the equity.

KMV implements an intermediate phase rather than calculate the probability of default directly. The intermediate phased is the calculation of the distance-to-default, as presented in Figure 1 in a graphic way, which is the number of standard deviations between the expected asset value and the default point. Instead of having only a single liability as the assumption in the Merton model, the company's debts are comprised of both short-term and long-term debt actually. Consequently, KMV innovates a new concept named the default point (DP), which can be expresses as

$$DP = STD + \frac{1}{2}LTD, \tag{16}$$

where STD and LTD denote short-term debt and long-term debt, respectively

Figure 1 Distance-to-default (DD)



Source: Crouhy, M., D. Galai and R. Mark. 2000. A comparative analysis of current credit risk models. Journal of Banking and Finance 24:59-117. 90p

As the definition suggests, the distance-to-default (DD) is calculated by:

$$DD = \frac{\mathrm{E}(V_A) - DP}{\sigma_A}. \tag{17}$$

The asset value, V_t, is assumed to obey a standard geometric Brownain motion (GBM) based on the Merton model as:

$$V_t = V_0 \exp\left\{\left(\mu - \frac{\sigma^2}{2}\right)t + \sigma\sqrt{t}Z_t\right\}, \tag{18}$$

where $Z_t \sim \mathrm{N}(0,1)$. Moreover, V_t follows a lognormal distribution with the expected value at time t, $\mathrm{E}(V_t) = V_0 \exp\{\mu t\}$. Then it can rewrite the equation of the DD as:

$$DD = \frac{\ln\frac{V_A}{DP_T} + \left(\mu - \frac{\sigma_A{}^2}{2}\right)T}{\sigma_A\sqrt{T}}. \tag{19}$$

The shaded area in Figure 1, which refers to the EDF, can be computed by:

$$PD = P[V_A \le DP_T] = \mathrm{N}(-DD) = N\left(-\frac{\ln\frac{V_A}{DP_T} + \left(\mu - \frac{\sigma_A{}^2}{2}\right)T}{\sigma_A\sqrt{T}}\right). \tag{20}$$

3 Results and Discussion

There is a portfolio consists of ten different quoted companies in the Frankfurt Stock Exchange (FSE) with a total nominal value of 10 million euro. The time horizon is one year, from March 24th, 2016 to March 24th, 2017. The basic information in Table 3 are used for the CreditMetrics™ model. Each bond, therefore, is represented equally in a nominal value of 1 million euro in order to avoid bias caused by high nominal values of some bonds. Besides, the basic information in Table 4 are used for the KMV model. All basic information can be accessed on the official website of the Frankfurt Stock Exchange.

Table 3 Basic Information of Bonds of the Selected Companies

Name	Ratings	Coupon	Nominal value	Maturity	Market price	Pcs.
Deutsche Post	A-	2,75%	1 000 €	10/2023	113,67%	1 000
E. ON	A-	5,80%	1 000 €	4/2018	106,69%	1 000
Metro	BBB-	1,50%	1 000 €	3/2025	100,01%	1 000
Volkswagen	A+	2,37%	100 000 €	9/2020	105,80%	10
NIKE	AA-	2,25%	2 000 €	5/2023	99,98%	500
Commerzbank	BBB+	0,08%	1 000 €	6/2023	97,34%	1 000
Bayer	A-	1,87%	1 000 €	1/2021	107,25%	1 000
Nestle Holdings	AA	4,25%	2 000 €	3/2020	104,26%	500
Danone	BBB+	3,00%	200 000 €	6/2022	101,54%	5
Oracle	A+	2,80%	2 000 €	7/2021	102,81%	500

Source: Frankfurt Stock Exchange (FSE)

Table 4 Basic Information of Stocks of the Selected Companies

Name	Market capitalization	Volatility of equity return	Default point
Deutsche Post	33 460 000 €	27,62%	7 420 000 €
E. ON	13 100 000 €	37,92%	24 828 500 €
Metro	8 900 000 €	31,03%	9 173 000 €
Volkswagen	60 880 000 €	46,66%	150 383 500 €
NIKE	85 940 000 €	58,91%	1 050 000 €
Commerzbank	7 580 000 €	36,73%	263 205 000 €
Bayer	74 580 000 €	29,92%	27 983 000 €
Nestle Holdings	207 400 000 €	19,04%	27 777 500 €
Danone	38 750 000 €	23,32%	15 121 000 €
Oracle	157 740 000 €	28,63%	23 802 500 €

Source: Frankfurt Stock Exchange (FSE)

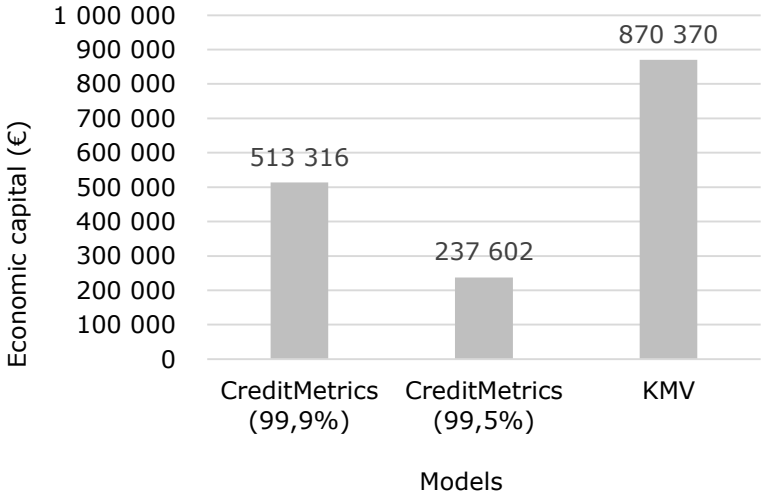
Table 5 and Figure 2 summarize the values of economic capital calculated by both the CreditMetrics™ model and the KMV model. The value of economic capital computed by KMV is much higher than that computed by CreditMetrics™. As shown in Table 5, the value of economic capital is 870 370 € under the KMV model, while those are 513 316 € and 237 602 € under the CreditMetrics™ model at the confidence levels of 99,9% and 99,5%, respectively. CreditMetrics™ assumes that all issuers within the same rating class are credit–homogenous, while KMV assumes that each issuer is specific. As mentioned previously, CreditMetrics™ and KMV are substantially different from each other in the simplifying assumptions when facilitating the implementations although both two models rely on the asset value model originally proposed by Merton. The values of economic capital computed by CreditMetrics™ and KMV are therefore quite different.

Table 5 Summary of Values of Economic Capital

Models	Expected loss	Unexpected loss	Economic capital
CreditMetrics™ (99,9%)	5 056 €	518 372 €	513 316 €
CreditMetrics™ (99,5%)	5 056 €	242 640 €	237 602 €
KMV	168 592 €	1 038 962 €	870 370 €

Source: Frankfurt Stock Exchange (FSE)

Figure 2 Values of Economic Capital by CreditMetrics™ And KMV



Source: Own calculation.

Both the CreditMetrics™ model the KMV model have enjoyed widespread popularity in the credit risk management. However, from the description and analysis above, two models are quite different on the basic idea of modelling. The main differences are summarized as the following:

- The measurement criteria of KMV, EDF, is mainly based on the data analysis of the changes of the market price of the stock issued by the company; while CreditMetrics™ focuses on the actual rating changes and the credit-migration probabilities of the company to measure the credit risk. This is one of the most fundamental differences between the two models.
- Because KMV is based on the market data, the market value of equity and the volatility of equity, it is possible to timely renew the input data corresponding to the changes of the market data and then obtain the new EDF. Consequently, KMV is a dynamic model that can provide a continuous credit monitoring process and reflect the current credit risk of the company. However, CreditMetrics™ highly relies on the credit rating, no matter the internal rating or the external rating, which usually remains static for a quite long period of time.
- Meanwhile, KMV is a forward-looking model, because the stock market reflects not only the company's historical and current economic conditions, but also the expectations of the company's future development by the investors. On the contrary, CreditMetrics™ is a backward-looking model because of the dependence on the historical data. KMV overcomes the shortcoming of the backward-looking method that history tends to repeat itself.
- KMV provides a cardinal measurement, which can reflect both the rank among the different credit ratings and the degrees of the variation; while CreditMetrics™ provides an ordinal measurement, which is only able to reflect the rank. KMV, therefore, is more accurate and good for the loan pricing.
- CreditMetrics™ fits the modern portfolio theory more because of the emphasis on the correlation among the companies' credit ratings. KMV, however, emphasizes the market data and the credit status of each single company, and fails to provide enough analysis of the correlation among the companies' credit ratings.

4 Conclusions

At a general level, it is essential to measure the diversification at a portfolio level in the bank portfolio management. The CreditMetrics™ model is an effective and sensitive measurement for assessing the changes of the portfolio's value associated with the credit rate migration and can be considered a static and backward-looking model. However, it assumes that all issuers within the same rating class are credit–homogenous, which is questioned by KMV. Besides, CreditMetrics™ is insensitive to the underlying changes of the market. Unlike CreditMetrics™, the KMV model is much more sensitive to company's specific characteristics and is a dynamic and forward-looking model. The most explicit advantage of KMV is that it removes the normally distributed assumption. However, among the criticisms, it oversimplifies the capital structure of the companies, and the relationship between the distance-to-default (DD) and the empirical EDF is usually open to question. Moreover, KMV is based on an implicit assumption that the portfolio is already well diversified. It may misestimate the value of economic capital if the portfolio is not diversified enough in the reality.

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The Tale of Twin Deficits: Which Comes First?

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Abstract: *This paper is aimed at contributing to the ongoing debate on the possible bi-directional relationship between government budget deficit and current account deficit in the European Union. While there is a bulk of empirical papers addressing the underlined question this paper takes the most recent time series covering longer time paper (2004Q1-2014Q4) and fairly large number of countries and shows that twin deficits still poised a problem with no clear evidence whether the causality goes from budget deficit to current account or vice versa. This study based on a Pairwise Granger test for all EU countries and indicates that the direction of the causality goes from current account deficit to budget deficit and not vice versa. Splitting the sample into "new EU" and "old EU" members, however, the results seem to suggest that the relationship turns bidirectional. The estimates based the VAR model and corresponding response functions seem to suggest fairly week relationship between budget and current account deficits.*

Keywords: twin deficit, current account balance, budget balance, VAR

JEL codes: F41, E6, H6

1 Introduction

Numerous papers have been devoted to addressing the dilemma that still persists in determining the relationship between government budget deficit and current account deficit. Most of the initial studies are grounded on the phenomenon of the twin deficits the US economy experienced in the 1980s. This was partly due to the tax reform that was advocated in line with the "supply-side" economic-policy emphasis at that time and later translated into mounting government budget deficit hand in hand with the current account deficit, triggering piles of articles to figure out the direction of the causality. The empirical studies are nonetheless far from being conclusive. The studies so far may be grouped into three lines of stand, from those that claim to have found no relationship between government budget deficit and current account deficit to those who claimed to have found only one directional relationship and to those who claim a bidirectional link between the two variables. The differences among studies are either due to the type of economy that is the subject of investigation and the time period of observation or the empirical strategies that are used to address the research question.

This paper makes an endeavor to contribute to the ongoing debate in two directions. First, the paper uses the data of EU member states during the time period that encompasses both the pre-crisis and the crisis period (2004Q1-2014Q4). Second, the paper also splits the sample into "new-EU" and "old-EU" members to take into account the potential impact a relatively stable economic-policy environment as well as the level of economic development on the co-movement of the government budget and current account balances.

The rest of the paper is organized as follows. Part two presents a brief summary of literature review followed by part three that discusses data and empirical approaches and the final part concludes.

2 A brief literature review

There is a general consensus that a current account deficit is associated with the saving-investment gap. Hence, current account deficit is a phenomenon of countries with higher level of domestic investment in comparison with national savings. The savings-investment gap can be expressed using a simple macroeconomic identity (eq. 1). The saving-investment gap reflects both the gap in the private sector ($S_p - I_p$) and public sector ($S_g - I_g$) of an economy.

$$S - I = (S_p - I_P) + (S_g - I_g) = (S_p - I_p) + (T - G) \quad (1)$$

Rearranging the equation, one can obtain the link between the twin deficits, where current account mirrors the gap between saving and investment of the private sector and government budget deficit (eq. 2).

$$CA = (S_p - I_p) + (T - G) \quad (2)$$

The hypothesis of twin deficit is rooted in the possible endogeneity that exists between current account deficit (CA) and government budget deficit (T-G) and suggests the direction of the causality is not perfectly clear. The relationship would go from higher public finance deficit to higher current account deficit but a reverse causation is hard to rule out. From a policy perspective, it is necessary to understand the causes of a current account deficit. As is argued, current account deficit may reflect the saving-investment gap keeping public finance gap constant. However, from the perspectives of economic policy it is also critical to figure out whether the deficit was caused by an increase in investment or a decrease in savings in the economy. Likewise, it is equally necessary to explore whether the current account deficit is transitory or a long-term issue and if the deficit has been anticipated or not (Sachs, 1981). A current account deficit that is triggered by increasing productive investment activities and financed via foreign savings should not give rise to unsustainable current account deficit in the long term. Analogically a deficit triggered by a decrease in savings would lead to unsustainable current account deficit.

The empirical literature on the direction of causality does not offer unified results either. The empirical studies are either based on a single country analysis or panel of countries. In one of the first empirical works, Abell (1990) estimates the VAR system with a number additional independent variables and concludes that the link between budget deficit and current account deficit is insignificant and that government budget deficit does not trigger current account deficit, while recognizes a possible indirect relationship via interest rates, exchange rate and capital flows. Almost a decade later, Miller and Russek (1999) empirically investigate the post-World War II evolution of current and budget deficits in the United States and confirm the phenomenon of secular relationship between budget and current account deficits but only under flexible exchange rate regime. However, their study does not find any long-term relationship between current account and government budget deficits. From a different perspective, Fidrmuc (2003) finds the phenomena of twin deficits in several EU member states, albeit cross-country variation in the 1980s and 1990s. Beetsma et al (2007) using the data of selecting EU countries conclude that budget deficit can worsen current account deficit with a time lag of two years. Similarly, Siranova (2013) concludes the negative impact of budget deficit on current account balance for Euro Area countries in light of the financial crisis.

Taking the twin hypothesis argument from the perspective of the Ricardian Equivalence hypothesis the results are quite mixed. The Ricardian Equivalence Hypothesis (REH) opposes the twin deficit hypothesis on the ground that the private sector is forward looking in terms adjusting savings to government expenditure (Barro, 1974). Some authors claim to have evidence in favor of the underlined hypothesis (Hatchison and Pigott, 1984; piersanti, 2000, among others), while others do not find any evidence for the Ricardian Equivalence hypothesis (Rewald and Ulan, 2002). In recent paper, Alka

Obadić, Tomislav Globan and Ozana Nadoveza (2014) apply a VAR model for selected new EU members and conclude that the twin hypothesis does not hold for these economies. The variation in the empirical results esteem mainly from variation in empirical strategies as well as sample selection. As Bartolini and Labiri (2006) rightly point out part of the reasons why studies have failed to offer consistent results is also due to either less number countries in the data or shorter time periods that do not give significant variation of time.

3 Data and Empirical Specifications

The data in this paper consists of the government budget deficit (DEF) and current account deficit (CA) compiled from the IMF World Economic Outlook (2017) and encompasses the time period 2004Q1-2014Q4. The data include 18 EU member states for which data was available for the entire period excluding three outliers (Greece, Portugal and Slovenia) that have recorded extremely high level of government budget deficit. The data is divided into three samples. The first sample (all) consists of all the 23 countries and the second sample ("old EU") takes into account only the data of advanced EU member states in order take into account both the relatively stable economic-policy environment as well as the level of development of these economies. The third sample ("new EU") includes new EU members. Both the current account and budget deficit are deflated by GDP in order to account for the size variation across countries.

Table 1 Descriptive statistics

	BUDGET	**CA**
Mean	-2.485622	-0.184442
Median	-2.200000	-0.200000
Maximum	10.90000	12.90000
Minimum	-22.40000	-25.60000
Std. Dev.	4.178667	5.914608
Skewness	-0.446781	-0.693447
Kurtosis	4.114746	4.124074
Jarque-Bera	79.26315	123.7625
Probability	0.000000	0.000000

Source: author's computations

Empirical specifications

In this paper, we first checked for the time series properties of our data during the period under consideration using a panel unit root test. The results seem to suggest both current account (CA) and budget deficit balance (BUDGET) contain unit roots, therefore one cannot test for cointegration as the variables are not non-stationary in levels and stationary in first difference. We conducted the usual panel root test based on various methods (Levin, Lin & Chu, Im, Pesaran and Shin and ADF - Fisher Chi-square, and PP - Fisher Chi-square). The results seem to suggest one cannot reject the unit root null at conventional significance levels for these two variables (Table 2). Accordingly, we followed the unrestricted the unrestricted Vector Autoregressive (VAR) model instead of our initial intention of running a cointegration test (König, K. Horvát, P, Ostrihoň, F. (2013).

Table 2 Panel unit root test: Summary

	Budget balance		Current account balance	
Test type	Level	First difference	Level	First difference
Levin, Lin & Chu t	0.56909 (0.7154)	6.67212 (1.0000)	-1.03000 (0.1515)	-21.6281 (0.0000)
Im, Pesaran and Shin W-stat	-2.54017 (0.0055)	-22.4075 (0.0000)	-0.81962 (0.2062)	-30.8702 (0.0000)
ADF - Fisher Chi-square	56.7453 (0.0152)	355.981 (0.0000)	40.4924 (0.2787)	495.361 (0.0000)
Time span	2004Q1-2014Q4	2004Q1-2014Q4	2004Q1-2014Q4	2004Q1-2014Q4
Cross-sections	18	18	18	18
No. of obs.	846	846	846	846

* The numbers in parentheses are standard errors.

Source: author's computations

Panel Vector Autoregression Model (VAR)

We followed the following simplified VAR model in order to investigate the link between government budget balance and current account balance.

$$BUDGET_t = \alpha_0 + \sum_{i=1}^{p} \delta 11, iBUDGET_{1-i} + \sum_{i=1}^{p} \delta 12, iCA_{1-i} + \ell_{i,t} \quad (3)$$

$$CA_t = \beta_0 + \sum_{i=1}^{p} \delta 11, iCAD_{1-i} + \sum_{i=1}^{p} \delta 12, iBUDGET_{1-i} + \ell_{i,t} \quad (4)$$

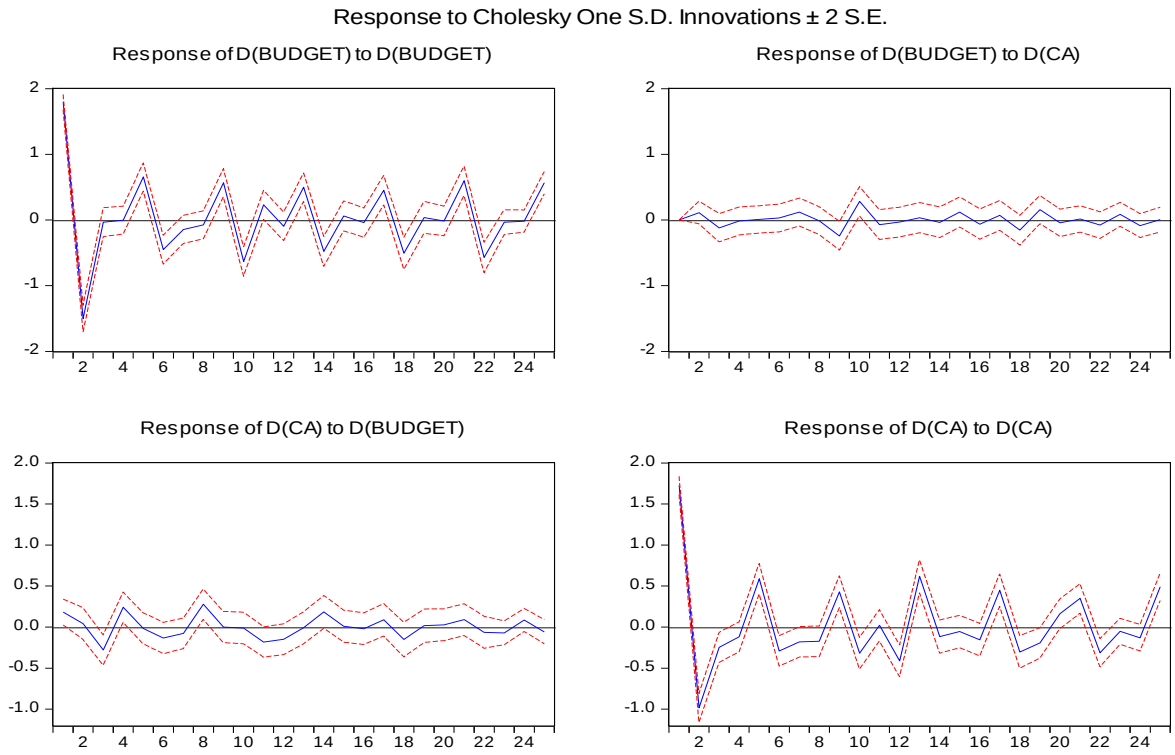
Lag structure

We choose p (the number of lags) based on final prediction error (FPE), Akaike information criterion (AIC), and sequential modified LR test statistic (each test at 5% level). In our case, the time periods are quarterly data. This may of course show the presence of autocorrelation.

Impulse response function

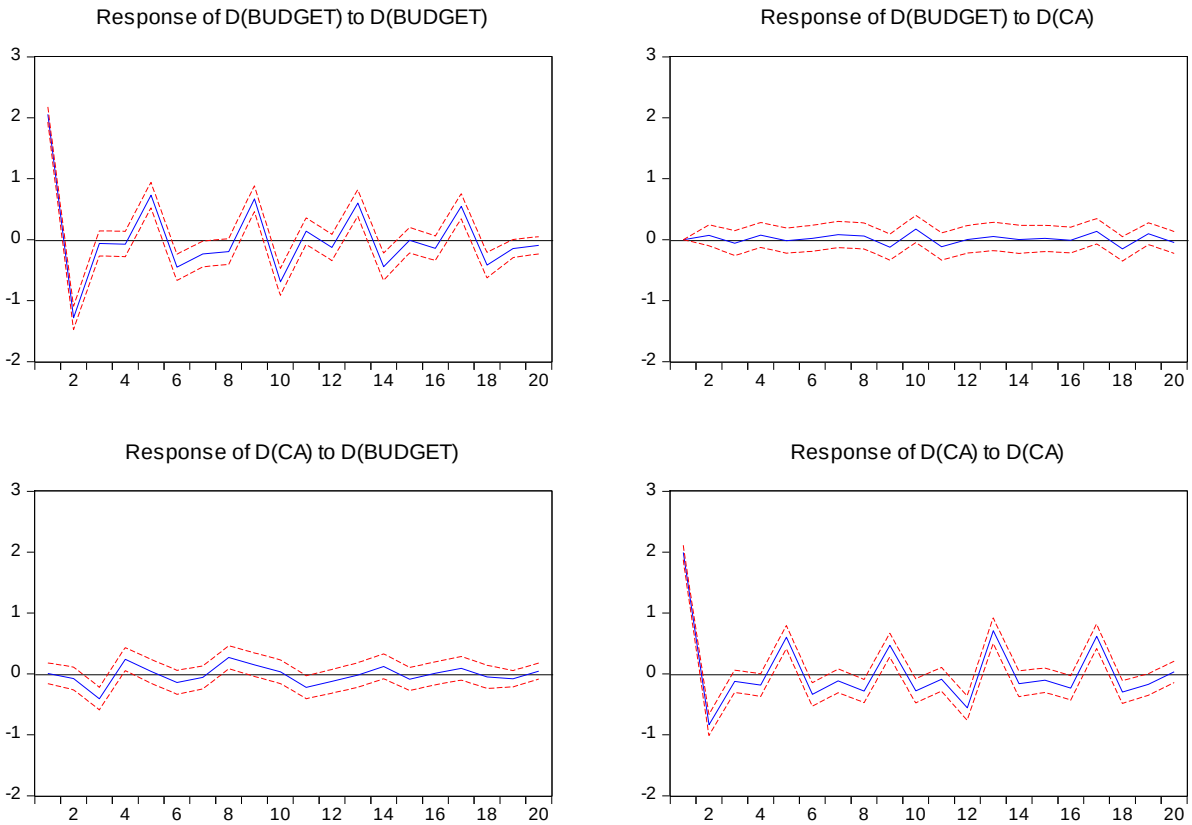
After VAR we ran impulse response function for full sample as well as for "old EU" and "new EU" member states. Since autocorrelation has been detected in the levels we report the impulse response functions based on differenced data.

Figure 1 Impulse response for full sample (2004Q1-2014Q4)



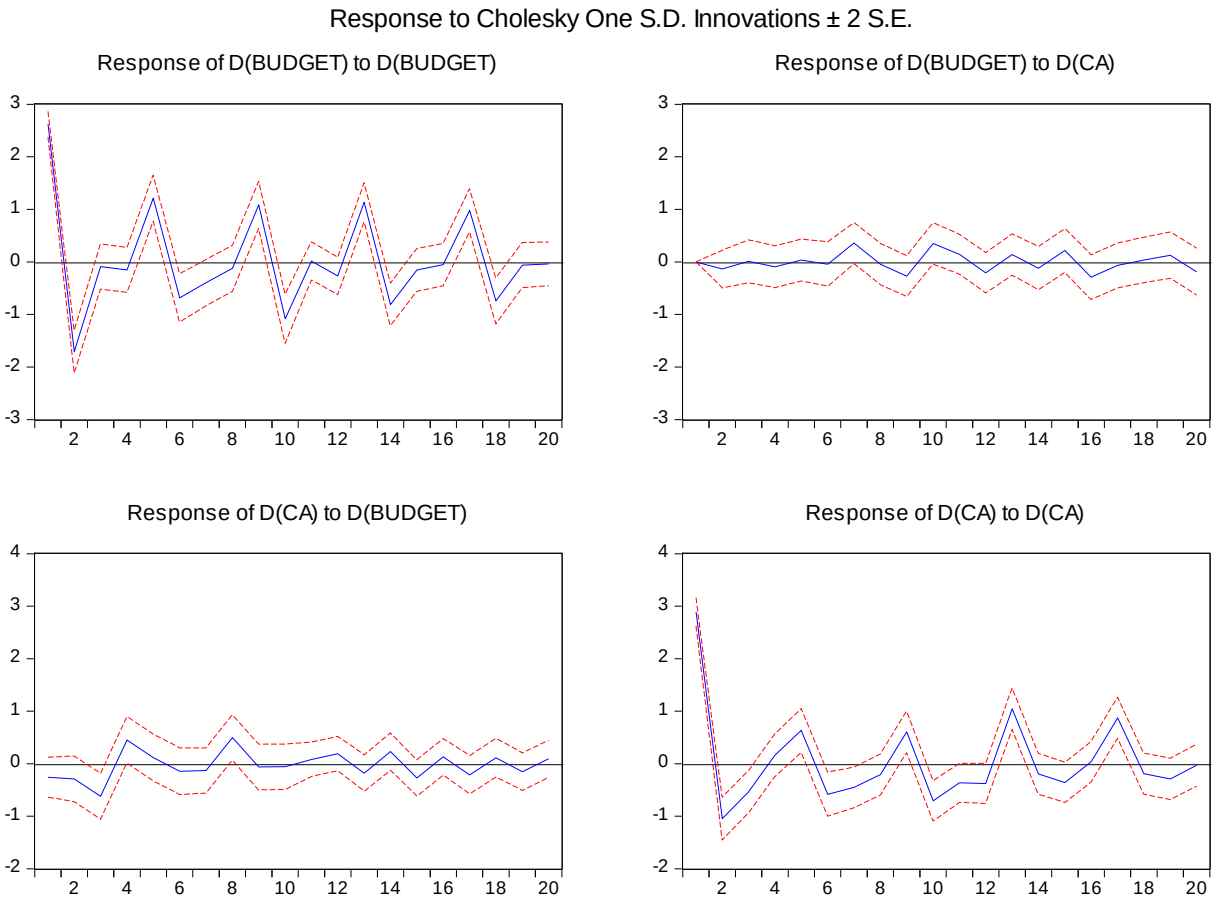
Source: Author's computations

Figure 2 Impulse responses for "Old-EU" (2004Q1-2014Q4)



Source: Author's computations

Figure 3 Impulse responses for "New-EU" (2004Q1-2014Q4)



Source: Author's computations

4 Results

For the full sample, the impulse response functions seem to suggest current account triggers budget deficit, while the impact of current account deficit on current account seems fairly small. This is in line with the results we obtained from a simple granger causality, which indicate the causality runs from current account to budget balance and not the other way around. For both the "old-EU" and "new-EU" the results from granger causality seem to suggest there is a bidirectional causality between budget balance and current account balance, hence confirming the hypothesis of twin deficit. However, the results from the VAR and the corresponding response functions do not confirm the phenomenon of the twin deficit.

The impulse response functions for "old-EU" sample seem to suggest while there is bidirectional causality but the causality that runs from current account to budget balance seems to be slightly stronger. The results seem to be fairly the same for "new-EU" members. However, the responses are stronger compared with "old-EU" group. It is also worth to notice that the responses of both current and budget balances to their own lags are rather shaky and unstable. These results have also been confirmed by previous empirical studies on selected Easter European economies (Ganchev, Stavrova, and Tsenkov, 2012). We also present (see the appendix) a show case of two countries (Slovakia and Germany) with different dynamics of current and budget balances. While the granger causality test in both cases suggests bidirectional causality between the two variables, the results from the VAR model are far from being certain.

Nonetheless, there is some work to be done regarding the time series properties of the data that include autocorrelation, seasonality and additional explanatory variables, which may potentially yield better results.

Acknowledgments

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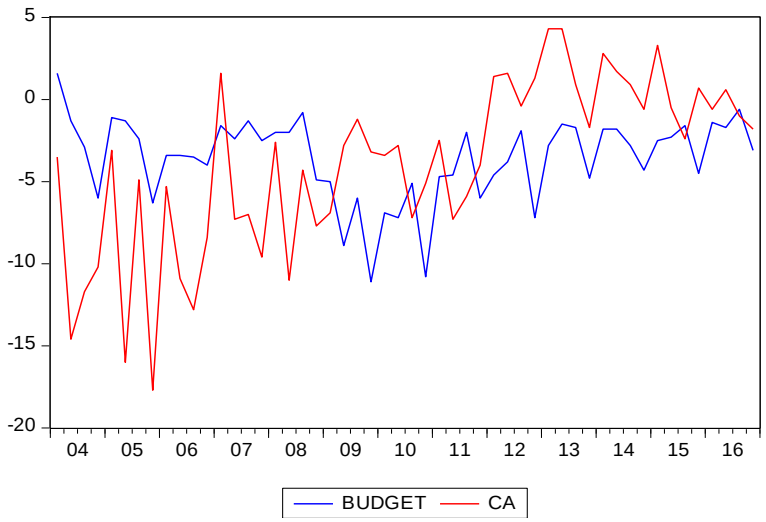
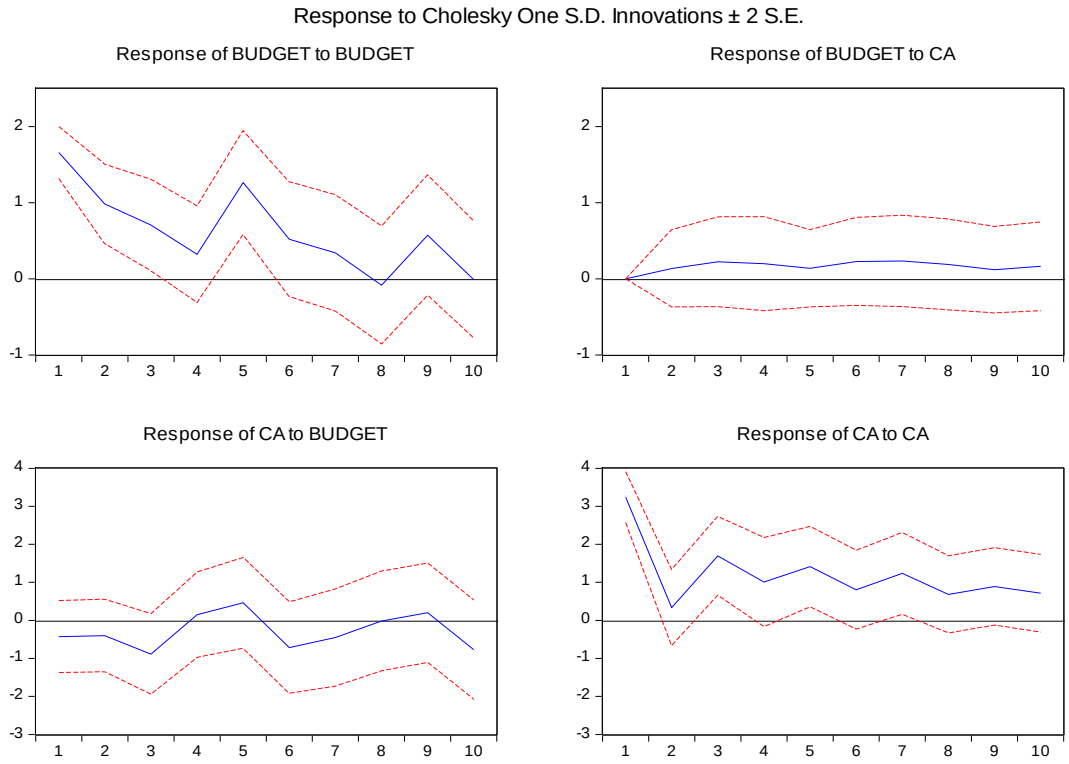
Appendix

A sow case: two economies with different dynamics of budget and current account balances.

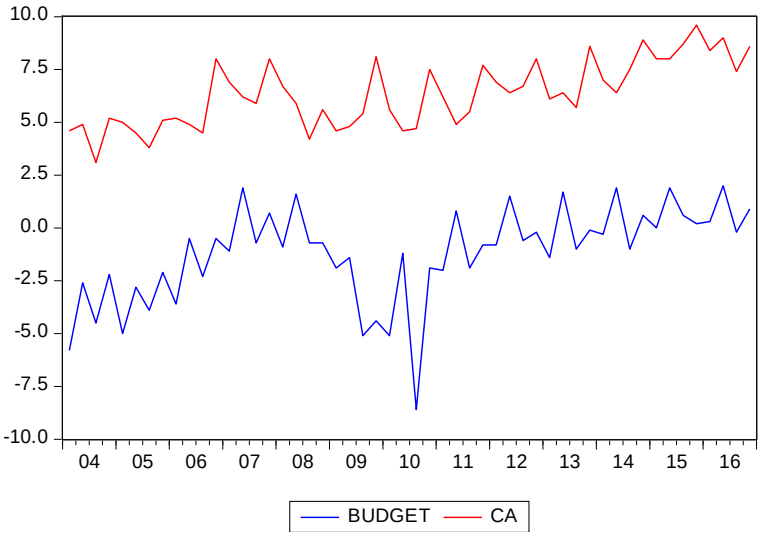
Figure 4 Slovak Republic



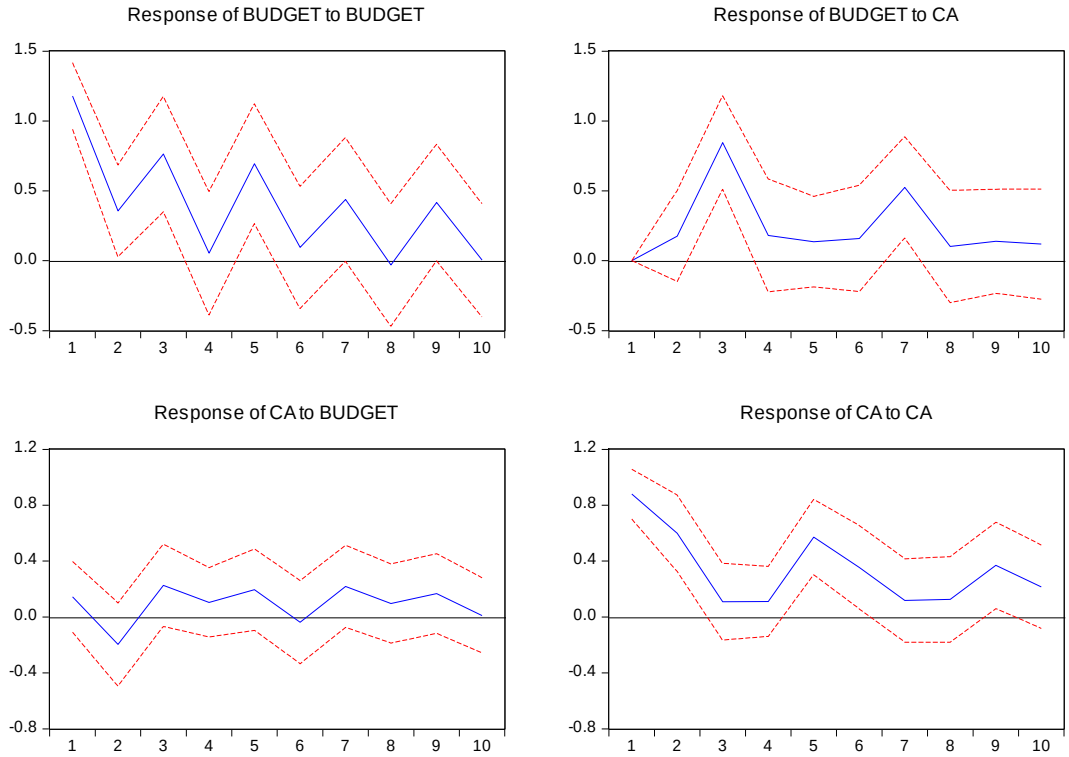


Source: author's computations

Figure 5 Germany



Response to Cholesky One S.D. Innovations ± 2 S.E.



Source: author's computations

Identifying and Managing Construction Risks in the Public Sector

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Abstract: *The paper aims to outline some issues related to risk identification in implementation of investment projects in the public sector, with the focus on distribution of risk in projects carried out under public-private partnerships (PPP). In particular, it is an attempt to find out which types of risks Polish public investors are exposed to when performing construction undertakings, as the right identification of construction risk is a prerequisite for sound management when conducting public investment projects. The paper contains a review of scholarly literature.*

Keywords: construction, risk management, public projects, public-private partnership, public sector

JEL codes: D81, H4, L7, P35

1 Introduction

Both in theory and in practice, risk in the construction industry should be regarded not only as a strictly technical category (industry-specific risk profile), but also as an economic and legal category. The cross-disciplinary character of the construction risk makes it difficult to come up with one explicit definition. Such attempts, however, have been made in the scholarly literature by a number of authors: Burtonshaw-Gunn (2009), Smith et al. (2007), Walker and Greenwood (2002), Weatherhead et al. (2005), Holland (2006), Sklar (2007), Saporita (2006), Hickman (2002), Tworek (2012), Tworek (2009), Boussabaine and Kirkham (2004), Revere (2003), Tworek (2014), Tworek and Myrczek (2015), Tworek (2013), Dallas (2006), Tworek (2010b). When it comes to investment projects in the public sector, it should be noted that there are four basic subcategories of risk, namely the risk of time, price, quality and safety (Walewski et al. 2003; Schieg, 2007; Cristóbal, 2009; Tworek, 2012). It is also important not to ignore other subcategories of the construction risk, including the political risk (Tworek, 2015) and, most of all, the legal risk (Hickman, 2002), which is closely related to the regulations governing public procurement contracts (Act, 2015). All these types of risk make up an overall picture of risk exposure in the construction industry and should be properly managed, with the use of specific methods, techniques and tools (Tworek, 2012). Another important thing is that the construction risk tends to be perceived differently by different actors involved in investment and construction process, such as a public investor, a contractor, an architect as well as other participants, e.g. a bank which finances a project. Therefore, there is a need for complete integration of construction project participants as only such an approach is likely to ensure effective management of risk, on one hand, and of the entire investment process, on the other hand. In practical terms this is particularly important when performing projects under public-private partnerships (PPP), which „(...) may be defined as an undertaking of public benefit, carried out by cooperating private and public entities, with combined institutional and capital involvement and more or less joint division of risk to be faced in and gains to be generated from this undertaking" (Moszoro, 2005). The distribution of risk is emphasized in the Polish legal regulations (Act, 2009) which apply to public-private partnerships (Adamek-Hyska and Tworek, 2010). Under the Polish law, the subject of public-private

partnership is joint execution of a project, based on the distribution of tasks and risks between the public entity and the private partner (Adamek-Hyska and Tworek, 2010).

Therefore, the paper aims to outline some issues related to risk identification in implementation of investment projects in the public sector, with the focus on distribution of risk in projects carried out under public-private partnerships (PPP). In particular, it is an attempt to find out which types of risks Polish public investors are exposed to when performing construction projects. These issues have become particularly relevant in Poland due to the fact that a number of projects have been carried out under such partnerships over the last few years. This form of cooperation in investment and construction processes, however, has been popular worldwide for many years now and widely discussed in the literature on the subject: Moszoro (2005), Adamek-Hyska and Tworek (2010), Yescombe (2007), Akintoye et al. (2003), Pretorium et al. (2008), Regan (2011), Ke et al. (2010), Korbus and Strawiński (2006). At present China is undoubtedly a leader in this area as they have carried out huge and numerous investment projects in the public sector. The significance of this topic also results from the fact that one of the main reasons behind decisions to execute projects in this way is the diversification of risk. Appropriate risk identification is a prerequisite for effective management of public investment projects and the paper attempts to present a synthetic outline of the selected issues in the field.

2 Methodology and Data

This paper is part of a research project entitled: „Risk in public management. Stage I and stage II (scientific potential 2016-2017). The project is carried out by the Department of Public Management and Social Sciences, the University of Economics in Katowice, Poland, with Piotr Tworek, Ph.D., as the project leader.

3 Results and Discussion

Due to numerous investment projects performed in the public sector in Poland in the years of 2004-2016 (Tworek, 2011) „(...) some attempts have been made in order to establish the legal framework for risks which occur when projects are executed under Public-Private Partnerships (PPPs) (Tworek, 2013). The Regulation of the Minister of Economy, dated 21 June 2006, on risks related to projects executed under public-private partnerships (Regulation, 2006) was published to specify the types of risks which have to be taken into account by the public investor, as well as the private partner, when performing an investment project" (Tworek, 2013). In practical project management the following types of risk have to be considered: „(...) risks related to the construction (a risk resulting in a change in construction costs and deadlines, alteration or extension within the scope of the project, operation of assets which have already been put in use and, in particular, the risks of: a delay in completion of construction works, in compliance with the conditions specified in work completion standards, a rise in costs, inconsistencies in the specification for the selection of a private partner, the impact of external factors, solutions in project documents which are not fit for purpose, the emergence or the use of new technologies in the project, occurrence of physical or legal faults which adversely affect the value or usefulness of an asset); risks related to availability (the method, quality or quantity of services provided under a public-private partnership contract and, in particular, the risk related to: inability to deliver the contracted volume of services, inability to provide services of a specific quality, a lack of compliance with safety standards or any other industrial standards, a rise in costs, the method and quality of work performed in order to deliver services, inappropriate qualifications of workforce, availability and quality of funds or assets needed to execute the project, occurrence of technological changes); risks related to the demand (a change in demand for specific services, in particular the risk related to: the emergence of competition, cyclical demand, a change in prices, the use of obsolete technologies, the appearance of new market trends); risks related to the project preparation (costs and

duration of a bidding process and, in particular, the risk related to: availability of information about a planned project, the introduction of changes to the specification for selection of a private partner, the method and quality of the selection procedure, a decision to abandon a project); the market risk related to the availability of funds for the project execution (the risk which affects the cost, amount, quality and timing of funds provided in order to finance the project and, in particular, the risk related to: inability to acquire the specific amount of funds, the inability to acquire funds by specific deadlines, changes in prices, due to the emergence of competition, due to logistics, due to the labour market); the political risk (a risk of changes in politics, which affect the undertakings carried out under public-private partnership); the legislative risk (a risk of changes to legal regulations, which may affect the undertakings carried out under public-private partnership); the macroeconomic risk (the risk which affects the economic situation and, in particular, the risk related to: inflation, changes in interest rates, exchange rates or demographics, the pace of economic growth); the regulatory risk (the risk of changes in regulations applicable to systems of payments for a given type of public services, which may affect the project costs or lead to some changes in the scope of rights and obligations of the parties involved in the project); the risk related to return on investment (the risk which may affect the level of revenues to be generated from the investment project and, in particular, the risk related to: the compensation system of the private partner under the project, changes to the valid pricing mechanism, changes due to the implementation of a payment collection mechanism under the project); the risk of force majeure; the risk connected with resolution of disputes (the risk which may affect the manner and effectiveness of resolution of a dispute on the execution of a contract under the public-private partnership); the environmental risk (the risk leading to an obligation to take actions in order to improve the condition of the natural environment before the commencement of an investment project or the risk of the project having adverse impact on the natural environment); the project location risk (the risk which may affect the accessibility of the area on which the project is to be executed and, in particular, the risk connected with the legal status of the real property, archaeological discoveries or any other discoveries connected with the cultural heritage, due to the existing infrastructure, availability of workforce); the risk connected with transfer of assets (the risk which may affect the conditions and deadlines for the transfer of assets under the project and, in particular, the risk related to: the condition of assets before the transfer, flow of information on assets involved in the project, the performance of obligations and the exercise of rights related to the transfer, receivables or any other right attached to a given asset, the need to transfer the workforce); the risk connected with the final value of assets (the risk related to the value of tangible assets at the time of completion of the public-private partnership); the risk connected with a lack of social acceptance (the risk of protests and opposition from local communities, in particular, when implementing and executing infrastructural projects under the public-private partnership)" (Regulation, 2006). These are the types of risks which are most common in the Polish construction industry and may be a starting point for the development of an effective risk identification tool in public projects, e.g. a checklist. This risk identification method, however, seems not to be so popular in the Polish construction industry. The results of the empirical research show that only 7% of the largest Polish constructors take advantage of a checklist when identifying risk (Tworek, 2010a). Also, only 7% of respondents use a public debate in their practical activities (Tworek, 2010a). The best results in identification of potential risk sources are obtained from actual inspections on construction sites (18% of respondents) and an interview with key project participants (48% of respondents) (Tworek, 2010a). It should be noted here that due to another amendment to the Polish construction law, the Regulation referred to above is no longer valid. Nonetheless, public investors still use the taxonomy of risks proposed there. The empirical results given in Table 1 below show what this issue looks like in the construction sector in China.

Table 1 Risk Allocation in China's Public-Private Partnership (PPP) Projects

Case no. /Risk	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Change in law	×		×											×		
Permits and approvals				×												
Political decisions				×			×				×					
Public protests				×												
Indecisive government	×	×			×	×	×		×	×	×				×	
Force Majeure	×				×											
Financial risk					×											
Insufficient funding						×		×				×				×
Competition								×	×			×				×
Risk related to utilities on the construction site													×			
Changing demand								×	×	×		×				×
Change in customs duties										×						
Corruption															×	

Case 1	Jiangsu wastewater treatment plant
Case 2	Changchun Huijin wastewater treatment plant
Case 3	Shanghai Dacheng basin
Case 4	Beijing basin no.10
Case 5	Hunan power plant
Case 6	Tianjin Shuanggang garbage burning plant
Case 7	Quingdao Veolia wastewater treatment plant
Case 8	Hangzhou Bay bridge
Case 9	Fujian Xinyuan Minjiang bridge no. 4
Case 10	Shandong Zhonghua power plant
Case 11	Chinese – French Basin of Guangdong Lianjiang
Case 12	Fujian Quanzhou Citong bridge
Case 13	Wuhan Tangshunhu wastewater treatment plant
Case 14	Shanghai Yan'an (E) tunnel
Case 15	Shenyang basin no. 9
Case 16	Pekin Jingtong dual carriageway

Source: Ke et al. (2010)

As can be seen above, Table 1 presents sixteen infrastructural projects carried out in China, covered by the research, with the most significant types of risks which occurred during their execution (Tworek, 2013). In Poland this problem looks quite similar. In the Polish construction sector as many as 76% largest contractors experience difficulties in keeping a healthy cash flow balance (Tworek, 2012). The empirical research shows that the risk contractors most frequently face is the one related to the financing of their construction project (Tworek, 2012). This is largely about the problems of public and private investors to make payments in due time. The problems with organisation of the project execution are faced by 16% of respondents and 12.5% of them pointed out to the risk of acts of god (force majeure risk) (Tworek, 2012). It should be added that according to the Guidelines of the European Commission, the basic types of risks under PPP can be divided into the following groups: firstly, the income risk; secondly, the risk connected with the selection of a private partner; thirdly, the risk of construction works; fourthly, the exchange risk; fifthly, the risk connected with correct performance of

contracts and public regulation of public-private projects; sixthly, the political risk; seventhly, the risk connected with the need to meet environmental requirements; eighthly, a risk of hidden defects; ninthly, the risk of (a lack of) public acceptance; tenthly, the risk of a loss of public control over provision of services; eleventhly, the risk of hidden protectionism (Korbus and Strawiński, 2006). This issue is illustrated in Table 2.

Table 2 Risk Allocation between PPP (Public-Private Partnership) parties in countries in the EU including Poland

Types of risk	Risk allocation		
	Public entity	Private partner	Joint
Project development risk	×		
Construction planning risk		×	
Social acceptance risk	×		
Project location risk	×		
Accessibility risk		×	
Demand risk		×	
Environmental risk	×		
Dispute resolution risk			×
Force majeure risk			×*
Regulatory risk		×	
Macroeconomic risk		×	
Political risk		×	
Market risk		×	
Financial risk		×	
Legislative risk	×		
Construction risk		×	
Revenue risk		×	
Service provision management risk		×	
Post-cooperation infrastructure quality risk	×		
Final asset value risk			×

* *PPP parties tend to transfer this type of risk onto an insurer*

Source: Korbus (2005)

The European Commission, when describing the risk of public acceptance, gives a number of examples of projects disrupted due to a lack of public acceptance (Adamek-Hyska and Tworek, 2010). Such a risk is often linked to payment of compensation by public authorities which, in turn, reduces the budget and badly affects the positive image of a public-private partnership (Adamek-Hyska and Tworek, 2010). In Poland the usual consequence is litigation.

4 Conclusions

Risk in the construction sector has its own unique profile (Tworek, 2010b). In particular, it is related to the execution stage of civil engineering, water and specialised construction projects. However, the risk management process – to be effective and run smoothly – must start with correct identification of risk (Tworek, 2016). Any mistakes made at this stage of the risk management process may lead to subsequent errors in risk assessment and, consequently, incorrect selection of methods or risk responses (Tworek, 2013). Therefore, public investors first need to be able to identify potential risks in order to commence the execution of a public project. In particular, risks on the part of the

construction project investor comprise, first of all, „(...) the investor's risk from an architect, secondly, the investor's risk from the contractor, i.e. the risk connected with a stage in the construction process and resulting in a change in costs and deadlines for the project execution (e.g. a risk of a delay in completion of construction work, inconsistency between performed work and established standards, a rise in construction costs), a risk of an insufficiently precise contract; thirdly, the investor's risk from the project location; fourthly, a risk arising out of the investor's business activities; fifthly, the force majeure risk; sixthly, the investor's risk from third parties' activities (e.g. a risk of an absence of social acceptance, protests and resistance of local communities during the implementation and execution of an investment project); seventhly, the political risk, the legal risk and the country risk (e.g. in the area of politics, e.g. a risk of changes in politics, which affect the undertakings of a specific type, changes in legal regulations); eighthly, the investor's financial risk (e.g. payment backlogs), the macroeconomic risk, which affects the economic situation (e.g. the risk of inflation, changes in interest rates, exchange rates, the risk related to planned revenues from the undertaking; ninthly, the investor's technical risk (e.g. a risk of insufficient control over the quality of and the progress in works); tenthly, other types of the investor's risks (e.g. a risk related to resolution of disputes on the execution of a contract for construction works, the risk related to the condition of natural environment, leading to an obligation to take actions in order to improve the condition of the natural environment before the commencement of an investment project or the risk of the project having adverse impact on the natural environment)" (Grzyl and Apollo, 2011). To protect oneself against such risks, the public investor may arrange insurance. According to the empirical research conducted in this respect in Poland, only 11.8% of the largest construction and assembly companies claim that in their experience insurance for investment projects is mainly arranged by investors (Tworek, 2013). In Poland contractors who would like to win contracts in tender procedures often have to include the construction insurance cost in their quotations, as required by public investors (Tworek, 2013). The investment and construction market in Poland is currently the (public and private) investor's market, more than the contractor's one. Summing up, no matter how risk is understood and defined in the construction sector, in practical project management attention should be paid to three most essential facts: firstly, there is a variety of risk identification methods which may be freely chosen and applied by the public investor, depending on a situation and their needs; secondly, risk identification methods have their advantages and disadvantages; thirdly, different methods bring different effects (Tworek, 2010b). Risk identification is the first and most important stage in the entire risk management process (Tworek, 2016). It would be advisable to use the methods which are available in international risk management standards in order to identify risks in public project management in an effective manner (Tworek, 2013). The main benefit offered by the methods derived from the standards is their universal character.

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Healthcare benefits: luxury or necessity goods? EU countries case revisited

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Abstract: *The aim of presented research is to analyse, whether healthcare services are luxury or necessity goods, taking into account several differences (income, healthcare's financing system) between European countries. We have posed the following hypotheses: (H1): the character of healthcare services is affected by the level of national income; (H2): the character of healthcare services is affected by the model of healthcare financing. We have employed data coming from 28 European countries, covering the years 2004-2014. Data were obtained from Eurostat Database and OECD Health Data. Using the LS and WLS methods, we can conclude that: (1) in richer Europeans countries healthcare services are luxury goods; (2) in poorer European countries healthcare services are necessity goods; (3) in countries, where healthcare services are finance based on Beveridge system, healthcare benefits are necessity goods, while (4) in countries, where Bismarck system is employed – healthcare services are luxury goods. We have also found, that both in "poor countries" and "Beveridge countries" subgroup, the reduction of income inequalities, as well as the lowering of the ratio of people at risk of poverty, decrease the level of healthcare spending, while in the subgroup of "rich countries", as well as in "Bismarck countries" this influence is entirely opposite.*

Keywords: healthcare services, healthy life years, income elasticity, demand, luxury good, necessity good

JEL codes: I10, I14, I15

1 Introduction

Health benefits are one of the most important public goods in most states, not only due to some humanitarian motives, but also its influence on economic development. Depending on the adopted model of healthcare financing and the level of socio-economic development, a range of benefits, that are financed, or guaranteed, by the state, would obviously be different, however, with the increasing prosperity of societies, usually improved access to healthcare services can be observed, especially for people with lower economic status. This process is, usually, strongly supported by public bodies, being a part of public health policy. Of course, this intervention is justified, if we consider the healthcare benefits as necessity goods, which, in certain situations (sickness, accident)

citizens must buy, regardless of the current financial situation. If, however, we believe that healthcare is a luxury, whether such intervention is justified?

The aim of this research is to analyse, whether healthcare services are luxury or necessity goods, taking into account several differences (income, healthcare's financing system) between European countries.

It seems, that results presented in the literature are rather consistent. Many authors confirmed, that healthcare services are necessity goods – among them Dreger and Reimers (2005) and Okunade and Suraratdecha (2000), using data form 21 OECD countries, Sen (2005) who analysed 15 OECD countries or Costa-Font, Gemmill and Rubert (2009, 2011) using meta-analysis method. Also Khan (et al., 2016) found, using data from SAARC countries, that healthcare benefits should be assessed as a necessity good, as well as Yavuz, Yilanci and Ozturk (2013) - in the case of Turkey.

On the other hand, based on our first study in this area[24], we concluded, using data from 26 EU countries, covering the years 2004-2014, that healthcare benefits are, in fact, luxury goods for European citizens. This different results, and, actually, quite opposite characteristic of healthcare services encourage us to study this phenomenon more profoundly. We based on Kujawska and Kordalska (2011) observations, who found, using data from 39 European countries, that though, on the level of whole sample healthcare is luxury good, but in countries characterized by lower-than-average income it should be assessed as necessity one. Also Okunade and Suraratdecha (2000) detected important differences between countries. Inspired by observations, presented above, we have posed the following hypotheses:

H1: the character of healthcare services is affected by the level of national income.

H2: the character of healthcare services is affected by the model of healthcare financing.

The hypothesis H1 refers to the assumption, that the level country wealthiness may affect the nature of the health benefits – in poorer countries those kind of services are, with higher probability, the character of necessity good (Kujawska and Kordalska, 2011), (Khan et al., 2016), (Yavuz, Yilanci & Ozturk, 2013).

The hypothesis H2 seems to be the more interesting and innovative, on its grounds there is the assumption, that the nature of the healthcare benefits can derive from the system of healthcare financing (Bem & Michalski, 2015), (Szczygiel, Rutkowska-Podolowska & Michalski, 2015), (Gavurova, Grof & Vagasova, 2017), (Michalski, 2017), (Soltes & Gavurova, 2016).

2 Methodology and Data

A luxury good this is a good, for which demand increases, more than proportionally as income rises, and, while, in the case of a necessity good, demand increases proportionally less than income. That means, that income elasticity for luxury goods is higher than 1, while for necessity goods – should be lower than 1.

The hypotheses require the analysis on national level. We have employed data coming from 28 European countries, covering the years 2004-2014. Data were obtained from Eurostat Database and OECD Health Data.

We have estimated 5 econometric models, using the method of least squares estimation. In order to measure the level of health care expenditure (HCE) we have employed one dependent variable: total health expenditure per capita (THCEPC), while for income, as the main explanatory variable – gross domestic product per capita (GDPPC), due to the fact, that most studies confirmed, that income per capita was the most important

[24] The paper entitled: "Are health care services luxurious goods?" presented during The Annual Conference on Finance and Accounting, ACFA 2017, 26.05.2017

determinant of per capita expenditure on health (Sen, 2005). All variables are expressed in PPP USD.

Apart from GDP, in the study we have employed additional explanatory variables, representing population's state of health and population's socio-economic status. These were: healthy life years, accordingly for men and women (HLYm, HLYf) and health state self-assessment (HSA) for both sexes – in order to measure population's state of health (Ucieklak-Jeż & Bem, 2015 a,b). Population's socio-economic status was described by: the ratio of people at risk of poverty or social exclusion, by age and sex (PRP) and Gini coefficient (GINI), which measure income inequality in societies, by analysing the statistical dispersion of wealth distribution of a nation's residents (Bem, Ucieklak-Jeż, Prędkiewicz, 2014).

In order to verify the H1 hypothesis, we split the research sample, based on GDP per capita, into groups: the group of richer European countries (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland and United Kingdom) and the group of poorer countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia). In order to prove the H2 hypothesis, 28 European countries were divided into two groups, representing two main models of healthcare financing: Birmarck's model (Austria, Belgium, Czech Republic, Estonia, France, Netherlands, Lithuania, Luxembourg, Germany, Poland, Slovakia, Slovenia, Hungary, Malta, Romania, Bulgaria) and Beveridge's model (Switzerland, Denmark, Finland, Greece, Spain, Iceland, Latvia, Norway, Portugal, Sweden, Cyprus).

3 Results and Discussion

During the first step of our study, we have confirmed, that income elasticity of demand for healthcare services is higher than 1. We have estimated, that when GDP per capita grows by 1%, healthcare expenditures per capita would grow by 1,15%. That also means, that HCE grows faster than income. It is also interesting, that when Gini coefficient (GINI) rises by 1% - THCEPC grows by 0,14%, and when the ratio of people at risk poverty (PRP) grows by 1% – THCEPC decreases by 0,18% (table 1). Obtained model is well fit and its parameters are highly statistically significant (table 1, table 2, table 3).

Table 1 Estimation of model's parameters for dependent variable THCEPC

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	-3,51389	0,589297	-5,9629	<0,0001	***
l_HLYf	-0,195708	0,0547714	-3,5732	0,0005	***
l_HLYm	0,241837	0,0656952	3,6812	0,0003	***
l_PRP	-0,180094	0,0482057	-3,7360	0,0003	***
l_GDPPC	1,15257	0,0495496	23,2609	<0,0001	***
l_HSA	-0,322366	0,187212	-1,7219	0,0870	*
l_GINI	0,141781	0,0509739	2,7814	0,0061	***
Austria	0,0606724	0,0157936	3,8416	0,0002	***
Belgium	0,0679269	0,0186975	3,6330	0,0004	***
Croatia	-0,326261	0,0438985	-7,4322	<0,0001	***
Cyprus	-0,238722	0,0315379	-7,5694	<0,0001	***
Denmark	-0,425272	0,0383231	-11,0970	<0,0001	***
Estonia	-0,164831	0,0207459	-7,9452	<0,0001	***
Finland	0,151907	0,0140482	10,8133	<0,0001	***
France	0,120752	0,0235899	5,1188	<0,0001	***
Germany	0,101668	0,033097	3,0718	0,0025	***
Hungary	-0,0957132	0,0293649	-3,2594	0,0014	***

Italy	-0,237465	0,0267252	-8,8854	<0,0001	***
Latvia	-0,250724	0,0312246	-8,0297	<0,0001	***
Lithuania	-0,547589	0,0435472	-12,5746	<0,0001	***
Malta	0,0722404	0,023546	3,0681	0,0025	***
Netherlands	-0,25872	0,032441	-7,9751	<0,0001	***
Norway	-0,191695	0,0190289	-10,0739	<0,0001	***
Portugal	-0,335255	0,0342619	-9,7850	<0,0001	***
Romania	-0,0722059	0,0305209	-2,3658	0,0192	**
Slovakia	-0,12447	0,0325385	-3,8253	0,0002	***
Slovenia	-0,0943117	0,0257411	-3,6639	0,0003	***
Spain	-0,101027	0,0268767	-3,7589	0,0002	***

Table 2 Basic statistics for weighted data

Residual sum of squares	188,1565	Final prediction error	1,077710
Coefficient of determination R-squared	0,994354	Adjusted R-squared	0,993413
F(27, 162)	1056,693	p-value for test F	8,2e-168
Credible interval	-268,6721	Akaike Information Criterion	593,3441
Schwarz'Bayes- Criterion	684,2608	Hannan-Quinn Criterion	630,1731

Table 3 Basic statistics for the original data

Average value of dependent variable	7,544892	Standard deviation of the dependent variable	0,545587
Residual sum of squares	0,516115	Residual standard error	0,056444

In order to verify the H1 hypothesis we have analysed the research sample again, but split into two subgroups: poorer European countries (table 4, table 5, table 6) and richer ones (table 7, table 8, table 9).

Table 4 Estimation of model's parameters for dependent variable THCEPC ("poor countries")

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	−0,118686	1,2398	−0,0957	0,9241	
l_HLYf	−0,274396	0,100977	−2,7174	0,0089	***
l_HLYm	0,360133	0,130873	2,7518	0,0081	***
l_PRP	−0,387736	0,0793088	−4,8889	<0,0001	***
l_GDPPC	0,87471	0,104124	8,4006	<0,0001	***
Czech Republic	−0,349566	0,0514023	−6,8006	<0,0001	***
Estonia	−0,43798	0,0395827	−11,0649	<0,0001	***
Latvia	−0,164666	0,0314406	−5,2374	<0,0001	***
Lithuania	−0,201959	0,0321422	−6,2833	<0,0001	***
Poland	−0,197306	0,0226819	−8,6988	<0,0001	***
Romania	−0,345978	0,0282413	−12,2508	<0,0001	***
Slovakia	−0,129387	0,037741	−3,4283	0,0012	***

Table 5 Basic statistics for weighted values ("poor countries")

Residual sum of squares	61,66331	Final prediction error	1,078637
Coefficient of determination R-squared	0,979880	Adjusted R-squared	0,975704
F(11, 53)	234,6521	p-value for test F	7,67e-41
Credible interval	−90,51831	Akaike Information Criterion	205,0366
Schwarz'Bayes- Criterion	231,1293	Hannan-Quinn Criterion	215,3318

Table 6 Basic statistics for the original data ("poor countries")

Average value of dependent variable	6,903891	Standard deviation of the dependent variable	0,283189
Residual sum of squares	0,197707	Residual standard error	0,061076

Table 7 Estimation of model's parameters for dependent variable THCEPC ("rich countries")

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	−4,41397	0,469073	−9,4100	<0,0001	***
l_PRP	0,13879	0,0264079	5,2556	<0,0001	***
l_GDPPC	1,1102	0,0514043	21,5974	<0,0001	***
l_GINI	0,16824	0,0544433	3,0902	0,0025	***
Austria	0,0304037	0,0125863	2,4156	0,0173	**
Cyprus	−0,428497	0,0417333	−10,2675	<0,0001	***
Finland	−0,182163	0,0213467	−8,5336	<0,0001	***
France	0,10617	0,018223	5,8262	<0,0001	***
Germany	0,0803885	0,0201636	3,9868	0,0001	***
Greece	−0,0950958	0,0407757	−2,3322	0,0215	**
Luxembourg	−0,518736	0,0436471	−11,8848	<0,0001	***
Netherlands	0,111373	0,021007	5,3017	<0,0001	***
Portugal	−0,201785	0,0340388	−5,9281	<0,0001	***
Slovenia	−0,0789924	0,0422008	−1,8718	0,0639	*
Spain	−0,141312	0,0287429	−4,9164	<0,0001	***
Sweden	−0,200728	0,0309387	−6,4879	<0,0001	***
Portugal	−0,0702446	0,0152002	−4,6213	<0,0001	***

Table 8 Basic statistics for weighted data ("rich countries")

Residual sum of squares	122,8309	Final prediction error	1,051943
Coefficient of determination R-squared	0,974068	Adjusted R-squared	0,970330
F(16, 111)	260,5848	p-value for test F	4,05e-80
Credible interval	−178,9860	Akaike Information Criterion	391,9719
Schwarz'Bayes- Criterion	440,4564	Hannan-Quinn Criterion	411,6714

Table 9 Basic statistics for the original data ("rich countries")

Average value of dependent variable	7,883520	Standard deviation of the dependent variable	0,290661
Residual sum of squares	0,313087	Residual standard error	0,053109

We have find, the income elasticity of demand for healthcare services is quite different. While in "rich countries" the growth of GDP by 1% stimulates the growth of THCEPC by 1,11%, in the group of "poor countries" the strength of this influence is significantly lower – THCEPC would grow only by 0,87%. That allow us to adopt the H1 hypothesis – we can not only confirm the important difference but also conclude, that income elasticity in poorer countries is lower than 1, while in richer ones – higher than 1.

Additionally in "poor countries" the growth of PDP stimulates more noticeably the decrease of THCEPC than on the level of the whole research group (0,38% comparing to 0,18%). In the group of "rich countries" the direction of relationship between PRP and THCEPC, as well as between GINI and THCEPC is opposite.

In order to verify the H2 hypothesis, we have analysed the research sample once again, but split into another two subgroups: countries where the healthcare financing system bases on Bismarck model (table 10, table 11, table 12) and countries which employed Beveridge system (table 13, table 14, table 15).

Table 10 Estimation of model's parameters for dependent variable THCEPC (Bismarck model)

	Coefficient	**Standard error**	**t-Student**	**p-value**	
const	-4,05277	0,587352	-6,9001	<0,0001	***
l_GINI	-0,483709	0,0926897	-5,2186	<0,0001	***
l_HSA	1,34323	0,300316	4,4727	<0,0001	***
l_HLYf	-0,332083	0,133919	-2,4797	0,0146	**
l_HLYm	0,44415	0,165967	2,6761	0,0085	***
l_GDPPC	1,12094	0,0409019	27,4054	<0,0001	***

Table 11 Basic statistics for weighted values (Bismarck model)

Residual sum of squares	94,37547	Final prediction error	0,909865
Coefficient of determination R-squared	0,974448	Adjusted R-squared	0,973327
F(5, 114)	869,5020	p-value for test F	5,38e-89
Credible interval	-155,8600	Akaike Information Criterion	323,7200
Schwarz'Bayes- Criterion	340,4449	Hannan-Quinn Criterion	330,5121

Table 12 Basic statistics for the original data (Bismarck model)

Average value of dependent variable	7,480404	Standard deviation of the dependent variable	0,612326
Residual sum of squares	4,691359	Residual standard error	0,202860

We have found, that in countries where the healthcare system in financed based on the Beveridge model the growth of GDP by 1% cause the increase of THCEPC by 0,99%, while in the countries, where the Bismarck model is employed – the same growth of GDP stimulate the growth of THCEPC by 1,12%. That allow us to adopt the H2 hypothesis – we can conclude that the system of healthcare financing influence significantly the character of healthcare services. We can also observe that the patterns for others models' parameters in Beveridge are closer to the group of "poor countries" while, in the case of Bismarck countries – rather like in "richer countries".

Table 13 Estimation of model's parameters for dependent variable THCEPC (Beveridge model)

	Coefficient	Standard error	t-Student	p-value	
const	−3,73503	0,975647	−3,8283	0,0003	***
l_GINI	0,486149	0,141538	3,4348	0,0010	***
l_HLYm	0,206312	0,0483819	4,2643	<0,0001	***
l_ PRP	−0,253954	0,0837921	−3,0308	0,0035	***
l_ GDPPC	0,991986	0,0794519	12,4854	<0,0001	***

Table 14 Basic statistics for weighted values (Beveridge model)

Residual sum of squares	64,66831	Final prediction error	0,997445
Coefficient of determination R-squared	0,930666	Adjusted R-squared	0,926400
F(4, 65)	218,1236	p-value for test F	6,69e-37
Credible interval	−96,55286	Akaike Information Criterion	203,1057
Schwarz'Bayes- Criterion	214,3482	Hannan-Quinn Criterion	207,5714

Table 15 Basic statistics for the original data (Beveridge model)

Average value of dependent variable	7,655442	Standard deviation of the dependent variable	0,386097
Residual sum of squares	0,952929	Residual standard error	0,121080

Research results have confirmed, that health services, in the countries of the European Union, at least in analysed period and on the level of the whole sample, were luxury goods – along with increasing wealth, the share of spending on health increases. Our results are consistent with observations of Getzen (2000), who, using meta-analysis confirmed that at macro-level health services are luxurious good. On the other hand, we have fully confirmed Kujawska and Kordalska (2011) findings, who found, that that overall income elasticity in UE countries is higher than one, while for poorer countries – is lower than 1. There have been a number of studies which suggest, that material status affects a health state and overall well-being. Health issues has many personal or idiosyncratic emotional and lifestyle ramification (Ortenburger et al., 2017; Ortenburger et al., 2017; Wąsik et al., 2016; Szerla et al., 2017). Poverty has many faces.

When taking into consideration only the group of poorer countries, our findings are consistent with previous research, which identified healthcare services as necessity goods (Dreger & Reimers, 2005), (Okunade & Suraratdecha, 2000), (Sen, 2005), (Costa-Font, Gemmill & Rubert, 2009), (Costa-Font, Gemmill & Rubert, 2011), (Khan et al., 2016) (Yavuz, Yilanci & Ozturk, 2013).

4 Conclusions

Our study suggest, that in richer countries healthcare services are luxury good – when income grows more prosperous societies seem to spend higher part of wealth on healthcare benefits. In poorer European societies healthcare services have still a character of a necessity good – when income grows the ratio of healthcare spending to total spending should be lower. We can also observe, that, generally, the reduction of income inequalities causes the increase in expenditure on health. On the other hand when the ratio of people at risk of poverty and social exclusion grows, the volume of expenditure on healthcare benefits decrease, because fewer people can afford to buy them. These dependencies are visible at the level of the total sample and in the group of poorer countries. It is very interesting, that in the group of richer countries, both the increase of income inequalities and the ratio of people at risk of poverty stimulate the

growth of healthcare spending. This phenomenon definitely requires further studies, which would include also sources of financing.

The most important findings concern the different patterns of healthcare demand in different financing models. We can confirmed, that in the Beveridge system healthcare services should by assessed as necessity goods – while wealth increase societies set lower part of income apart for healthcare benefits. As in the group of poorer countries the reduction of income inequalities, as well as the lowering of the ratio of people at risk of poverty, decrease the level of healthcare spending. In this especially important, because in from group (Switzerland, Denmark, Finland, Greece, Spain, Iceland, Latvia, Norway, Portugal, Sweden, Cyprus) only Latvia is a part of the "poor country" subgroup.

The analyses of "Bismarck" subgroup (Austria, Belgium, Czech Republic, Estonia, France, Netherlands, Lithuania, Luxembourg, Germany, Poland, Slovakia, Slovenia, Hungary, Malta, Romania, Bulgaria), although the different level of GDP in this group, leads to quite opposite findings. In this countries healthcare services should be perceived as luxury goods and the redistribution process rather stimulate the growth of healthcare spending. This might suggest, that the construction of the healthcare financing system is much more important predictor, than the level of national income.

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Performance of Czech hospitals: comparison with ideal solution

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Abstract: *Healthcare system is in general considered as an important consumer of state expenses. Therefore the attention should be paid to its performance. For modelling the financial situation, models predicting financial distress are frequently used. They are usually based on monitoring financial indicators. Specific area of health care consists of hospitals that can have various legal forms. In the paper, we compare selected hospitals based on The Technique for Order Preference by familiarity to Ideal Solution (TOPSIS). The aim of the paper is to create list of hospitals ranked according to their performance. Additionally, we aim to identify if, how and why the position of hospitals changed in consecutive years. In the paper we consider data from the Czech Republic. Based on the analysis we can read if some strong differences exist in performance of hospitals. Results can eventually help the hospital management in looking for improvements in the process of decision making.*

Keywords: hospitals, performance, TOPSIS

JEL Classification: I11, C6

1 Introduction

Financial health assessment is carried out in all businesses. An atypical example of businesses are hospitals, which, due to their nature, are classified into the non-profit sector. From the point of view of the chosen legal form, they can be business entities. Maximum use of inputs leads to desirable outputs. The diagnosis of financial health is carried out regularly in enterprises and the interest is mainly on the companies themselves through the adoption of managerial decisions leading to the achievement of the stated goals. Financial management requires a correct decision and a decision taken at the right time. This is done by financial analysis tools, whose outputs can be used to set the performance management. The performance of the company is well described in both Czech and foreign literature (Fibírová and Šoljaková, 2005; Frolick and Ariyachandra, 2006).

Performance management is a continuous process that leads to increasing performance within an organization (Wagner, 2009). The issue can lie in a way of measuring performance. According to Aguinis (2011), the systems are exclusively evaluated and the result is not incorporated into the management strategy, the findings are not realized. If the enterprise wants to effectively manage its performance, it must have a defined model of management, parameters, indicators and performance goals it wants to achieve (Mitáček, 2015). The best-known method of enterprise performance management is the Balanced Scorecard (Kaplan and Norton, 1996), which evenly decomposes goals and measures into four aspects: financial, customer, internal processes and learning and growth.

The aim of the paper is to create list of hospitals ranked according to their performance. Additionally, we aim to identify if, how and why the position of hospitals changed in consecutive years.

2 Methodology and Data

Data from hospitals for the period 2012-2015 were used to perform the analysis. The data matrix was filled with secondary data that was obtained from the annual hospital reports found on hospital websites and financial statements (MFČR, 2017). Due to the preservation of the breadth of data collection in the time series, the number of data obtained from all hospitals were not complete in all analysed years. Out of the 90 original hospitals from which financial data were collected in various years, complete data was collected from 29 hospitals, which stands for 32 % of the potential hospital sample and 15.4 % of the total number of hospitals in the Czech Republic. There are 188 hospitals in the Czech Republic since 2012. In 2012-2013, there were 188. The number increased to 189 in 2014 and to 187 hospitals in 2015 (ÚZIS, 2017).

First of all, the individual balance sheet and income statement items were collected:

EBIT, Sales, Net Profit, Depreciation, Total debt, Total Assets, Employee benefit expense

Several financial indicators characterizing profitability and indebtedness (Table 1) were designed and analyzed to find out the results. The selection of indicators is based on previous research (Hajdíková and Pevná, 2014). Authors dealing with the use of financial indicators most often use the EBIT and EAT indicators. Hospitals mostly report the positive EBITDA and their EBIT is often negative. The use of the ROS indicator was considered because the analyzed hospitals are working in different legal and organizational forms and this indicator differs for businesses with different activities. Taking into account the analyzes performed, this indicator was included in the analysis. In the final selection, the included payroll productivity indicator is significant because personnel costs are the main cost category in the hospital sector. When choosing the leverage ratio and monitoring the hospital's debt, it was decided to use the measurement of the level of short-term and long-term debt (Hajdíková, 2016).

Table 1 Overview of surveyed indicators

Indicator	Meaning	Description
U1	EBIT/operating income	The impact of the cost structure (ROS)
U2	Net profit + depreciation / total debt	EAT to total debts
U3	Operating income (sales) / total assets	Activity indicator
U4	Cost of employee benefits / operating income (sales)	Wage productivity

Source: own processing

Subsequently, the research problem was analyzed using the TOPSIS method (Hwang, C.L., Yoon, K., 1981).

The TOPSIS method is used for creating the rank list of hospitals according to their performance. The principle of the TOPSIS method is to arrange the alternatives (e.g. hospitals) in relation to their distance from the ideal and basal alternative (see e.g. Fiala, 2008). The method results from the criterion matrix $Y = y_{ij}$ that represents evaluations of alternatives *i* according to criteria *j*.

To ensure the comparability of the data in matrix it needs to be normalized - values in the normalized criterion matrix R correspond to the relation

$$r_{ij} = \frac{y_{ij}}{\sqrt{\sum_{i=1}^{p} (y_{ij})^2}} \qquad (1)$$

where $i = 1, 2, \ldots, p$ and $j = 1, 2, \ldots, k$. By multiplying each column of R by corresponding weight of criterion (v_j) the weighted criterion matrix W is created (based on formula $w_{ij} = r_{ij} \cdot v_j$).

Then both ideal and basal solutions can be identified. For the ideal solution $A = (A_1, A_2, \dots, A_k)$ it holds that $A_j = max_i(w_{ij})$ in case of benefit criteria and $A_j = min_i(w_{ij})$ in case of cost criteria, where $j = 1, 2, \dots, k$. The basal solution $B = (B_1, B_2, \dots, B_k)$ is identified according to $B_j = min_i(w_{ij})$ for benefit criteria and $B_j = max(w_{ij})$ for cost criteria, where $j = 1, 2, \dots, k$.

Distance of alternative from the ideal solution d_i^+ and from basal solution of d_i^- computed by using the Euclidean metric is given by:

$$d_i^+ = \sqrt{\sum_{j=1}^{k}(w_{ij} - A_j)^2}, where\ i = 1, 2, \dots, p \quad (2)$$

$$d_i^- = \sqrt{\sum_{j=1}^{k}(w_{ij} - B_j)^2}, where\ i = 1, 2, \dots, p \quad (3)$$

Relative closeness to the ideal solution is then computed as $c_i = \frac{d_i^-}{d_i^+ + d_i^-}$, where $i = 1, 2, \dots, p$. The higher the closeness, the better the alternative.

3 Results and Discussion

In order to achieve the objective of this paper, calculations of the selected indicators were carried out in all the analyzed years (2012-2015) for a selected sample of hospitals. Using the TOPSIS method, optimization is chosen based on the principle of minimizing the distance from the ideal variant (the variant achieving all the best possible criteria) – i.e. maximizing the closeness to the ideal variant, and maximizing the distance from the basal variant (the variant having all the criteria at the lowest stage in all criteria). The more the value of the relative distance indicator is close to zero, the closer is the variant to the basal variant. For values of the indicator approaching one, these values approximate to the ideal variant (see Figure 1).

Figure 1 Relative distance indicator with a graphical interpretation

Hospital	2012	2013	2014	2015	
ALMEDA a.s Neratovice	0,781004507	0,78169161	0,612615905	0,654628475	
Oblastní nemocnice Kolín, a.s.	0,431503261	0,571514413	0,728162454	0,655915249	
Jindřichův Hradec	0,256297062	0,55140925	0,621936583	0,628674152	
České Budějovice	0,328425191	0,61902309	0,705679498	0,676437666	
nemocnice Český Krumlov	0,314434863	0,623182946	0,648671492	0,396992546	
Prachatice	0,317137941	0,623430518	0,653504115	0,635545777	
Strakonice	0,266514336	0,505916864	0,608404097	0,624448368	
Tábor	0,312945395	0,598885978	0,648385867	0,643154241	
Domažlická nemocnice, a.s.	0,307220935	0,462431767	0,619440874	0,661345962	
Klatovská nemocnice, a.s	0,257104912	0,562173818	0,67854933	0,64342794	
Nemocnice následné péče LDN Horažďovice, s.r.o.	0,291203913	0,673527731	0,647472147	0,644255954	
Nemocnice Sušice o.p.s.	0,338818182	0,452082674	0,212202045	0,508480342	
Rokycanská nemocnice, a.s.	0,32135802	0,643015848	0,59143429	0,640422273	
Stodská nemocnice, a.s	0,301281874	0,62999361	0,595294583	0,571044961	
Nemocnice Kadaň s.r.o	0,324735596	0,15682086	0,64898708	0,75160552	
Česká Lípa	0,127595695	0,256524331	0,624720626	0,668822552	
Hradec Králové	0,332890397	0,61996679	0,628900924	0,615925055	
Jesenická nemocnice	0,340573443	0,538629782	0,675986252	0,681704237	
Fakultní nemocnice Ostrava	0,341266819	0,622049131	0,66354783	0,63173627	
nemocnice Boskovice	0,395502107	0,441123627	0,662184079	0,686387204	
Nemocnice Milosrdných bratří Brno, p.o	0,26052654	0,580832438	0,559906848	0,623356191	
Tišnov p.o	0,174057244	0,384015882	0,450589672	0,4647251	
Městská nemocnice Hustopeče	0,237899174	0,138566393	0,423521094	0,461670808	
Krajská nemocnice T.BATI, a.s.	0,064739814	0,181895694	0,607409261	0,617164621	
Kroměřížská nemocnice a.s.	0,212812578	0,208653363	0,709351252	0,67923892	
Vsetínská nemocnice, a.s.	0,14093439	0,339281862	0,644173691	0,692923043	
nemocnice Havlíčkův Brod, p.o	0,251754444	0,567834685	0,547595085	0,616952257	
nemocnice Jihlava p.o.	0,259865329	0,559823778	0,562101581	0,593620443	
nemocnice Pelhřimov, p.o	0,295744312	0,589231925	0,563821218	0,570111042	

Source: own calculations

After that, comparison of hospitals was done using one of multivariate methods (Kubickova & Jindrichovska, 2015). Namely, a simple sum of a sequence. The results are shown in Table 2. For each criterion (here the relative distance 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.

Table 2 Ranking and overall ranking

Hospital	2012	2013	2014	2015	sum	rank
ALMEDA a.s Neratovice	1	1	18	10	30	3
Oblastní nemocnice Kolín, a. s.	2	13	1	9	25	1
Jindřichův Hradec	22	17	16	17	72	19
České Budějovice	8	9	3	6	26	2
nemocnice Český Krumlov	12	6	10	29	57	14
Prachatice	11	5	8	15	39	7
Strakonice	18	19	19	18	74	20
Tábor	13	10	11	13	47	9

Domažlická nemocnice, a. s.	14	20	17	8	59	16
Klatovská nemocnice, a. s	21	15	4	12	52	13
Nem. násl. péče LDN Horažďovice, s. r. o.	17	2	12	11	42	8
Nemocnice Sušice o. p. s.	6	21	29	26	82	24
Rokycanská nemocnice, a. s.	10	3	22	14	49	11
Stodská nemocnice, a. s.	15	4	21	24	64	17
Nemocnice Kadaň s. r. o	9	28	9	1	47	9
Česká Lípa	28	25	15	7	75	21
Hradec Králové	7	8	14	22	51	12
Jesenická nemocnice	5	18	5	4	32	4
Fakultní nemocnice Ostrava	4	7	6	16	33	5
Nemocnice Boskovice	3	22	7	3	35	6
Nemocnice Milosrdných bratří Brno, p. o.	19	12	25	19	75	21
Tišnov p. o.	26	23	27	27	103	28
Městská nemocnice Hustopeče	24	29	28	28	109	29
Krajská nemocnice T. BATI, a. s.	29	27	20	20	96	27
Kroměřížská nemocnice a. s.	25	26	2	5	58	15
Vsetínská nemocnice, a. s.	27	24	13	2	66	18
Nemocnice Havlíčkův Brod, p. o.	23	14	26	21	84	26
Nemocnice Jihlava p. o.	20	16	24	23	83	25
Nemocnice Pelhřimov, p. o.	16	11	23	25	75	21

Source: own processing

4 Conclusions

The contribution determines the ranking of the examined hospitals from the point of view of financial health according to selected indicators in determining the optimal value for the examined period. The research was conducted on the basis of a secondary data analysis that was collected from the financial statements and internal resources of the hospitals for the period 2012-2015. The TOPSIS method found the optimal value of each examined hospital in years. The development of selected indicators in the time series is presented graphically. Using the ordering method, a unique order of subjects was determined. The first place was the Regional Hospital of Kolín, a. s. The second place was the hospital České Budějovice and third place occupied ALMEDA a. s. Regional Hospital Kolín, a. s. can be considered from the surveyed sample as a hospital with the optimal results. The hospital, as well as ALMEDA a. s. Neratovice, is located in the Central Bohemia Region. České Budějovice Hospital is based in the South Bohemian Region. Most hospitals in the first three positions have legal form a. s. and are owned by the county. In the third hospital, Almeda a. s. Neratovice, the main shareholder is VAMED MEDITERRA a. s. The range of services provided are very similar to the hospitals in Kolín and České Budějovice. The analysed hospitals have basic departments such as surgery, gynecology, ENT, internal medicine departments and others. Significant differences are among the first hospitals in terms of their size, measured by the number of doctors, the number of beds and the number of employees. The largest hospital is the hospital in České Budějovice with 447 doctors, 1190 beds and 2557 employees. The second place is the Kolín Hospital, a. s. with 188 doctors, 663 beds and 1109 employees. Almeda Hospital in Neratovice has 36 doctors, 74 beds and 133 employees. Because only financial ratios have been examined in the paper, it is possible that other quantified data may influence the ranking of hospitals. In further research, it is necessary to focus on

non-financial indicators that can be obtained and expressed quantitatively as well. Possible limitation of performed analysis may also involve assigning the same importance (weights) to the individual financial indicators in TOPSIS. Thus the next step in exploration of the hospital performance contains looking for more suitable weights of given indicators. Further refinement of empirical findings employs the collection of data from a larger sample of hospitals and the extension of research to other time periods.

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Analysis of the Czech state-funded institutions accounting data

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Abstract: *This paper deals with starting points of possible economic analysis carried out within the Czech state-funded institutions. State-funded institutions represent the most frequent organizationally-legal type of accounting units operating in the Czech non-profit sector and dispose of significant financial sources. Their accounting outputs, primarily financial statements, are harmonized and prepared in a unified form from 2011. Statements are a subject to authorization by the founder but not an external audit. The paper concentrates on one type of these units, i.e. the state-funded institutions that are founded by the state, more precisely particular Czech ministries. For purposes of this paper the state-funded institutions were selected according to their prevailing CZ NACE (International classification of economic activities) and further analysed and compared. It seems that financial statements and other supplemental data create suitable database for possible economic analyses. As the main data sources besides scientific articles and relating legal regulations, financial accounting data from the server Monitor administered by the Ministry of Finance of the Czech Republic were used. Description, analysis, comparison, and synthesis of main findings were used as basic scientific methods in the paper.*

Keywords: state-funded institution, contributory institution, financial reporting, state administration

JEL codes: H83, H11, H50

1 Introduction

State-funded institutions (alternatively called contributory organizations) represent economic subjects that operate within the non-profit sector. This sector may be understood as a part of national economy which does not operate primarily to create a profit and which may encompass both public and private organizations (Pestoff, 1995). Non-profit sector in the Czech Republic includes traditionally various organizationally-legal types of subjects, among them also above mentioned state-funded institutions. They may be founded either by the state entities (for example ministries), or municipalities. Founded by the state they usually provide elemental functions such as defence, health care or security for public or individuals. Organizations founded by municipalities then provide rather services for specific region or municipality. General legal framework of the state-funded institutions founded by the state is created by the Act No 219/2000 Coll., on the Property of the Czech Republic and the Representation of the Czech Republic in Legal Relations, as amended. Basic financial principles are regulated by the Act No 218/2000 Coll., on Budgetary Rules and Amendments to Some Related Acts (Budgetary Rules), as amended.

For financial reporting purposes these subjects are included into a group of subjects called in Czech "vybrané účetní jednotky" (selected accounting units) that are obligated to reveal their financial statements in prescribed form from 2011 on regular basis (closely see for example Vodáková, 2012). Before 2010 financial reporting of non-profit organizations varied across organizationally-legal types in the Czech Republic and financial accounting was organized mainly on the cash basis. In 2005 the Czech Republic similarly as other developed countries has decided to shift to the accrual basis also in the non-profit sector. Accounting reform was planned as a part of a complex public finance reform recommended also by European Commission and other international or

supranational subjects. The whole process is known as a new public management (Hood, 1991) that should implement business-like elements to management of the public sector. From the beginning this process had its supporters (Box, 1999, Pina and Torres, 2002, Lüder and Jones, 2003) but also opponents (closely see Carlin, 2005). Nevertheless some academic disputes the process continues till nowadays.

It can be stated the Czech Republic successfully implemented the accrual basis formerly used mainly by businesses also to the public (or non-profit) sector accounting and harmonized accounting rules across various parts of the public (or non-profit) sector till 2010. As a consequence accounting data of various organizationally-legal types of subjects may be comparable and able to consolidate them. An important step forward means also increase of accounting data transparency. Financial reports are published electronically from 2011 also for various analytical purposes. On the other hand some studies suggest that gathering and publishing of accounting data still remain rather an administrative procedure without any wider utilization for managerial purposes (for example Sangers, 2012).

2 Methodology and Data

This paper deals with an attitude to economic analysis of the state-funded institutions that were founded by the state, more specifically particular Czech ministries. The aim of the paper is to examine some starting points and possibilities of economic analysis carried out in the state-funded institutions mainly with accounting outputs utilization.

The paper follows in our former research directed to the state-funded institutions and their accounting data. It was verified that Czech ministries manage 205 state-funded institutions in total at present while character of their activities, subordination, size, property structure, number of employees, location and other factors vary significantly (closely see Vodáková, Krč, 2017). We further examined basic characteristics of units including their prevailing activities. For this purpose we utilized CZ NACE (Classification of Economic Activities) that is compatible with EU NACE and divided all units into relating NACE groups. In this paper we continue in previous research by selecting one specific NACE section, i.e. NACE 86 – medical care because it is the second numerous group with 47 units (almost 23 % of all units across several ministries) so that our findings could be further applicable.

In the first part of the survey we reflect some theoretical starting points as relevance and reliability of input data, homogeneity of examined sample and proper analytical tools. In the second part we analyze and compare several possible economic indicators and their trends, i.e. net income as an example of absolute measure and two key analytical indicators of financial performance (KAU) as relative measures. Reasons are evident: net income represents complex, relevant and easily accessible indicator of economic activities and KAU were recommended by the Government of the Czech Republic as sufficient accounting indicators of performance (MF ČR, 2013). Though from methodological point of view their ability of performance measurement may be debatable construction of KAU is simple, data for computation are easily accessible and information capability of KAU is satisfactory because they reflect important expense groups. In fact they represent simple ratios comparing expenses to number of employees.

KAU1 is constructed as a ratio of salaries and wages to number of employees and it is calculated in mil Czech Crowns per employee per year. As wages and salaries represent one of the most important expense this indicator is definitely weighty. KAU2 is a ratio of controllable operational expenses to number of employees and it is calculated again in mil Czech Crowns per employee and year. As controllable expenses are identified consumption of material, energies, repair and maintenance, travel expenses, services, other operational expenses. In our opinion these ratios may serve as a good starting point of any more sophisticated analyses.

On the base of our former knowledge we formulated following research questions:

- May available accounting and other published outputs serve as a proper source of information for potential economic analyses and comparison within the state-funded institutions?
- What criteria and tools would be beneficial to use as a starting points of potential analyses?
- What are middle-term time trends in development of three selected indicators?

Because of limited extent of the paper and relatively vast and heterogeneous sample of the state-funded institutions the survey was limited to institutions founded and managed by the Ministry of Defense with prevailing activity relating to NACE section 86. Our sample now includes 4 units, i.e. Military university hospital Prague (ÚVN Praha), Military hospital Brno (VN Brno), Military hospital Olomouc (VN Olomouc), and The Institute of aviation medicine, Prague (ÚLZ). Net income and KAU 1 and KAU 2 are analyzed and compared in middle-term time horizon of 5 years (period 2012 – 2016).

In the paper we used description for explanation of previous situation and the current state in the state-funded institutions, analysis and comparison mainly for exploration of used analytical indicators development, and synthesis for summarization of main findings and formulation of recommendation and relating questionable points. As main data sources monographs, scientific papers and relating legal regulations were used. In analytical part of the paper Monitor database administered by the Ministry of Finance of the Czech Republic was used.

3 Results and Discussion

This chapter summarizes main findings of the paper. The first part concentrates on data accessibility, examined sample and possible analytical tools from theoretical point of view. The second part comments current development of selected indicators that may characterize economic activities of the state-funded institutions within 2012 and 2016.

Theoretical starting points of the state-funded institutions analysis

Input data. As it was stated before the state-funded institutions reveal electronically a set of statements on a regular basis. This set includes basic characteristic, financial statements and financial report. Financial statements are prepared either as a full version that includes 5 statements or as a shorten version with 3 statements. Full version is prepared only if the accounting unit accomplishes two criteria, i.e. total assets 40 mil Czech Crowns or higher and total revenue 80 mil Czech Crowns or higher. Criteria must be fulfilled for two subsequent accounting periods. Full version includes statement of financial position, statement of financial performance, notes, cash flow statement, and statement of changes in owner´s equity. Last two statements are not included in shorten version. Financial statements must be prepared consistently on the accrual basis, strictly in prescribed form and authorized by the founder. On the base of our survey we have found that only 86 state-funded institutions, i.e. 42 % reveal financial statements in the full version. Majority of units (119, i.e. 58 %) report shorten version of financial statements. This fact of course could limit any analysis based on cash flow and owner´s equity indicators however other statements may be used for analytical purposes as usual.

As for reliability of financial statements it can be stated that act. No. 563/1991 Coll. on Accounting, as amended excludes all selected accounting units from the obligation to verify their financial statements by external audit which may be questionable because authorization as it was stated before is prescribed only by the founder though a certain role of external control plays the Czech Republic Supreme Audit Office at present. This situation however is relatively common also in other countries and partly criticised (for example see Lüder and Jones, 2003) because these units may dispose of relatively significant sources. We have verified that 203 units, i.e. 99 % had their financial

statements authorized by the founder for period 2015. This fact may have certain positive influence on credibility of analysed data.

Besides financial statements the state-funded institutions prepare financial report that encompass two parts, the first one includes expenses and revenue data, the second one data concerning salaries and wages, transfers or number of employees that may be used for calculation of key analytical indicators of financial performance introduced by the Government of the Czech Republic in 2013 to evaluate performance of the Czech state administration units. To summarize this text extract it may be stated that in our opinion published data may serve as a relevant source of information for analyses of both external and internal users.

Examined sample. Basic sample of all 205 state-funded institutions that are founded by Czech ministries represents heterogeneous group of units that vary by subordination, size, type of activities and other factors. To compare their data mutually it would be desirable to divide them into homogenous groups. As classification criterion could be used size defined by several accounting or budgetary indicators such as total assets, total revenue, expenses, income, expenditures, or number of employees. But some indicators (such as net income for example) need not be necessarily influenced by size of a unit, especially in the case of the non-profit subject. Further possibility is dividing analyzed units according to the founder, however in this case some groups would be too small to compare them effectively because number of units founded by particular ministries vary significantly, moreover some subjects may have a unique character.

Probably the best solution means in our opinion dividing units into groups according to their relating NACE. For purposes of general analysis would be probably sufficient NACE sections, for deeper analysis and comparison should be used more detailed NACE classification. Main advantage of NACE criterion lies in possibility of cross-departmental or even international comparison and taking into consideration specifics of particular public sector activities. Besides a combination of NACE criterion and size of unit may be used eventually.

Analytical tools. There exist relatively wide evidence concerning analytical tools utilization in the non-profit sector. On the other hand it refers to the public administration mostly. The state administration seems more resistant to any economic tools utilization though it consumes important financial sources (OECD, 2008). And even if any tools are utilized provable evidence of their positive economic consequences is rather missing (see for example Sangers, 2012). Among more frequently applied tools may be included reporting, financial analysis, controlling, benchmarking or others. As more complex tool may be beneficial balanced scorecard that works also with non-financial criteria. Last years in the Czech state administration (the Ministry of Defense or the Ministry of Interior) an intention appears to implement controlling (Vodáková, Krč, 2017). In our opinion it would be reasonable to start at least with a set of simple absolute or relative indicators with possibility of their gradual development. Besides, some of these indicators may be used later within a process of implementation any more sophisticated tool such as controlling or even balanced scorecard. Next section of the paper demonstrate utilization of three simply applicable economic indicators.

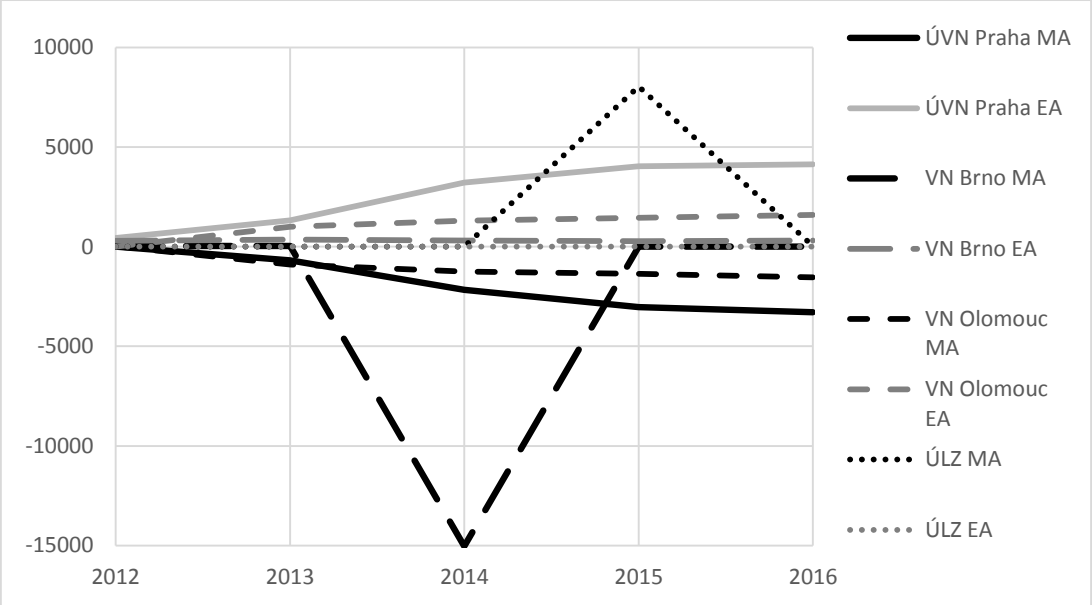
Current trends in selected economic indicators development

Net income from the main and economic activities was selected as the first illustrative indicator that may be used for mutual comparison and trend analysis within a group of subjects with relating NACE. The reason is evident: nevertheless all specifics of the non-profit sector organizations it still represents a complex indicator of their economic activities and it is also easily reachable. For purposes of any relevant analysis of course a scope of compared absolute indicators should be much larger however because of limited length of the paper only net income is presented here.

As Decree No. 410/2009 Coll. to Act. No. 563/1991 Coll. *on Accounting* prescribes net income must be presented separately for main activities and economic (side, or business) activities in the statement of financial performance. As main activities are regarded activities for that accounting unit was constituted and they should correspond to relating NACE. Public sector organizations generate income from main activities through rendering services to public or realization of projects. In the case of selected state-funded organizations, as main activities are regarded mostly rendering of complex medical care (preventive, diagnostic, therapeutic, medical, advisory), i.e. NACE section 86. Economic activities include business, complementary or side activities that enable to utilize sources more effectively and to contribute to improvement of the total net income. If economic activities occur loss, it should be a signal either to change price calculations or limit economic activity, notably in the longer-term time horizon. As economic activities, in the case of four selected units, rental, transportation, alimentation, laundry or maintenance for foreign clients are regarded.

Figure 1 illustrates net income development in 4 selected units within period 2012 – 2016. Net income from economic activities (grey lines) oscillates above zero in all cases which is positive. In the case of VN Olomouc and ÚVN Praha it has even a growing tendency in last years. The highest values of net income from economic activities were recorded in ÚVN Praha in 2016 (4.1 mil Czech Crowns) and 2015 (4.0 mil Czech Crown). On the other hand ÚLZ shows no net income from economic activities.

Figure 1 Net income from main and economic activities (thousands Czech Crowns)



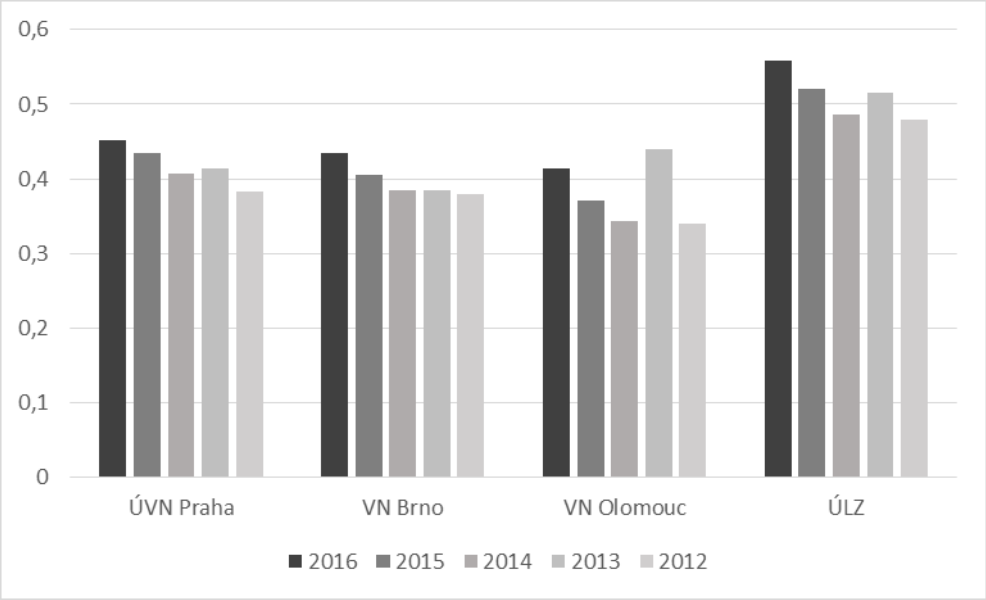
Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

Net income from main activities (black lines) demonstrates a very specific development in particular units in time. Absolutely it oscillates between – 15.1 mil Czech Crowns (VN Brno in 2014) to 8.0 mil Czech Crown (ÚLZ in 2015). ÚVN Praha occurs losses from 2013 while these losses shows increasing trend in medium-term time horizon. Similar development may be observed in VN Olomouc, trend is declining from low net profit in 2012 to gradually growing loss in 2016 (1.5 mil Czech Crowns). On the other hand VN Brno recorded relatively balanced net profit development in analyzed time period except of 2014 when slightly high loss (15.1 mil. Czech Crowns) was recorded. In other years low net profit was presented. ÚLZ recorded either zero or low net profit in analyzed period, year 2015 with relatively high net profit (8.0 mil Czech Crowns) excepted. Closer analysis of revenue and expenses suggests that main reason of net income from main activities extraordinary fluctuation lies in transfers. Their drawing projects to revenue and

expenses which influence significantly from year to year. Besides, increasing net loss is influenced by growing expenses not accompanied by relevant growth of revenue.

Positive finding concerns a mutual relation of net income from main and economic activities. Almost in all cases of analyzed subjects and time it was proved that net loss from main activity was compensated by net profit from economic activity so that the total result was recorded as profit. There was only one exception described above (VN Brno in 2014). It may be concluded that net income from economic activities really served to compensation of losses recorded in main activities.

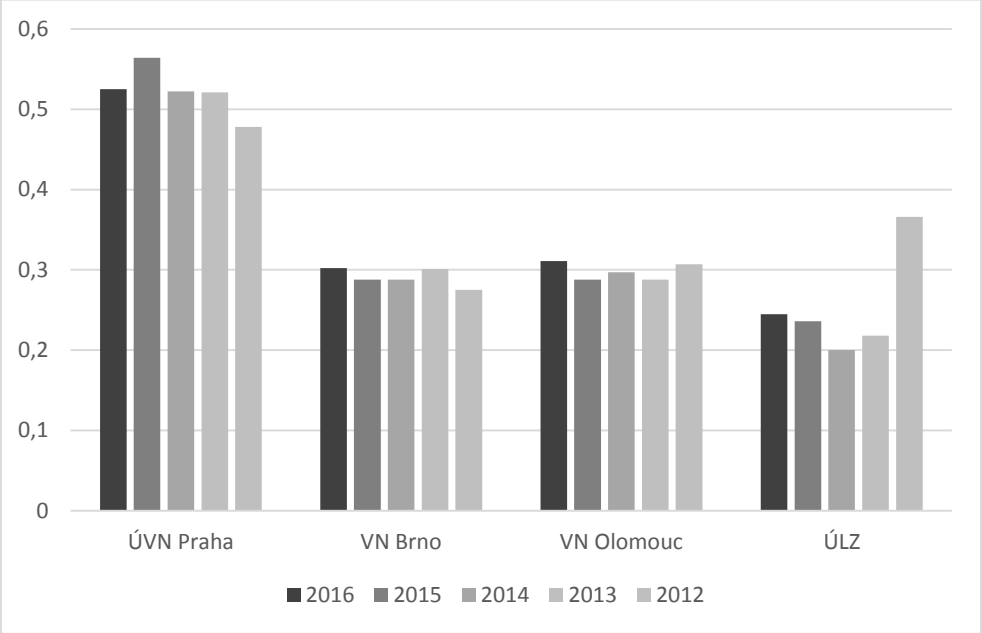
Figure 2 KAU 1: Ratio of salaries and wages expenses per employee



Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

As relative measures two key analytical indicators of financial performance described in chapter 2 were chosen. Values of KAU1 for period 2012 – 2016 are shown in Figure 2. They implies that highest values of the ratio were recorded by ÚLZ, absolutely highest value in 2016 (0.559 mil Czech Crown per employee and year), the second highest in 2015 (0.52 mil Czech Crown per employee). The lowest values of the ratio were presented by VN Olomouc in 2012 (0.34 mil Czech Crown per employee) and 2014 (0.344 mil Czech Crown).

Figure 3 KAU 2: Ratio of controllable operational expenses per employee



Source: own, based on the Ministry of Finance of the Czech Republic data (Monitor 2017)

Development trend of KAU1 is rather growing; highest values were recorded in 2016 by all analyzed units. As the number of employees was relatively stable in examined period a growth of the ratio was caused mostly by an increase of salaries and wages. In my opinion the ratio may serve for analytical purposes well. It is simple, transparent and comparable among various subjects not only with similar NACE. Input data are accessible for external and internal users, KAU1 may be further modified or divided according to needs of analysts. For example it may be divided into external and internal expensiveness. In the case of selected hospitals it may not play any important role but in other cases it may be useful. KAU1 may be also further worked out to lower level of management, i.e. divisions, departments, and so on.

As the second relative indicator above described KAU2 was chosen. Its values for period 2012 – 2016 are shown in Figure 3. As these values implies with exception of ÚLZ development of the ratio is relatively stable in analyzed period of time with slight growth. The highest values of the ratio were recorded in ÚVN Praha (0.564 mil Czech Crown per employee in 2015, 0.525 mil Czech Crown in 2016 and 0.522 mil Czech Crown per employee in 2014). These values are almost double in comparison with other units. The lowest values were reported by ÚLZ and they fluctuated from 0.2 mil Czech Crowns in 2014 to 0.366 mil Czech Crowns in 2012. Also this indicator may be used comfortably for mutual comparison, trend analysis or standard setting purposes. For deeper analysis it may be further decomposed according to particular expense groups or their combinations.

4 Conclusions

Czech ministries have founded and manage 205 state-funded institution with differing subordination, size, activities or location. Nevertheless their considerable variability it is possible to analyze and mutually compare their economic results thanks to standardized accounting outputs and other quantifiable data that are accessible to both internal and external users from 2011. The main source of data represents financial statements that are required to be authorized by the founder but not liable to external audit. For purposes of any analysis seems advantageous to divide units firstly into homogenous groups according to their size or subordination. In our opinion probably the most

beneficial would be utilization of NACE classification that would enable interdepartmental or even international comparison. Besides more sophisticated methods a set of several simple financial indicators would be helpful as the first step. Among others it could be any complex measure as for example net income, or a set of key analytical indicators of financial performance introduced by the government in 2013. For purposes of this paper KAU1 and KAU2 were monitored for period 2012 – 2016. Any more detailed analysis of course would require larger research sample and a set of indicators which could be an object of further research.

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Non-pension privileges in Poland – the impact of professions on taking financial decisions

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Abstract: *In Poland there are many occupational privileges. The groups benefiting from these privileges in Poland include miners, teachers, uniformed services and farmers. This study found that these professional groups make different financial decisions from those made by professionally non-privileged persons. In terms of saving money for financing current needs, they save far less frequently than others. The reason may be their better financial situation, stability of employment, or the multiplicity of forms of support received from the employer (mainly the State), which is the result of having a privileged profession. The aim of the article is to present the non-pension privileges existing in Poland as well as indicate that the beneficiaries of these privileges make financial decisions that differ from those made by other professional groups. The article uses data from 11,740 households with 35,279 members examined within the 'Social Diagnosis 2015' survey. The logistic regression method was applied (with the use of the IBM SPSS Statistics 24 software) while attempting to reach the research aim of this study.*

Keywords: privileges, profession, financial awareness, savings,

JEL codes: D14, D31, H55, J32

1 Introduction

In Poland there are numerous non-retirement occupational privileges. These privileges differ in nature. All of them generate costs for the employer or the Polish state, however, they provide benefits for the user. In order to provide a full picture of them, it should also be pointed out that some of these solutions are not unfounded privileges, but only a due compensation resulting from a certain distinctiveness of a particular occupational group. What are the sources of this distinctiveness? Probably, it may stem from social solidarity and can be regarded as a kind of contribution of a given occupational group to the functioning of society (Rorty, 1985). Ultimately, these professions, due to the benefits received, differ from the majority. They use certain benefits that will be discussed in this work.

When analysing the issue of privileges in subject literature, pension privileges are the ones that are most frequently referred to. These privileges are predominantly analysed for the sake of eliminating occupational privileges (Armeanu, 2010; Inglot, 2016). Unfortunately, non-pension privileges are not examined in fact, not to mention their cross-sectional examination in terms of several professional groups.

In this context it is worth noting that Krupa and Walczak (2016) and Friedberg and Webb (2006) pointed to the influence of the profession on financial decisions taken. In addition to the profession itself, financial decisions are influenced by gender, age, education, place of residence and income (Ford and Kent, 2009; Worthington, 2006; Guiso and Jappelli, 2008, Pieńkowska-Kamieniecka, 2016). Renneboog and Spaenjers (2012) also pointed out that religious households consider themselves more trusting, and have a stronger bequest motive and a longer planning horizon.

In view of the above, the aim of the study is to present the non-pension privileges existing in Poland as well as to indicate that their beneficiaries make different financial decisions. Based on that, the following research hypothesis was formulated:

H1: possessing current savings varies depending on the occupation.

2 Methodology

In the scope of non-pension privileges, the binding Polish legal acts were subjected to dogmatic and legal analysis. The analysis of the presented source data on saving was made using the logistic regression model (Hosmer, Lemeshow and Sturdivant, 2013). It allowed to, with the use of the IBM SPSS Statistics 23 software, determine the impact of individual characteristics of household (or of household's head) on the propensity to have current savings. The findings are presented in Table 1. The dependent variable (having current savings) in the model was dichotomous, *i.e.*, binary. The variable took the following form:

$$Y = \begin{cases} 1, \text{in case that the event happens} \\ 0, \text{otherwise} \end{cases}$$

The logit model for dichotomous variable Y is determined by the following dependence (Hosmer, Lemeshow and Sturdivant, 2013):

$$E(Y|x) = \pi(x) = \frac{e^{\beta_0+\beta_1 x}}{1+e^{\beta_0+\beta_1 x}} \quad (1)$$

In order to verify the research hypothesis set, the respondents were divided into four privileged occupational groups (the 'occupational' variable). The breakdown was made due to the occupation performed currently or in the past. Out of all participants covered by the study (N = 11705), the following were distinguished:

1) teachers (N=458),
2) miners (N=493),
3) uniformed services (firefighters, policemen, military men) (N=331) and
4) farmers (N=1541).

In the case of the 'income' variable, which was originally contained between PLN 100 and PLN 30,000, the answers received were divided by 1,000. For this reason, the interpretation of this variable will refer to changes by one unit, *i.e.*, one thousand PLN. Due to their age, respondents were divided into five age groups (generations).

The research presented in the article comes from a representative study conducted in Poland in 2015 by the Social Diagnosis study. In 2015, this study examined 11,740 households with 35,279 members and 24,324 individual members of those households aged 16 and over. In order to widen the interpretability of the study, households were compared with heads of these households (Belke, Dreger and Ochmann, 2015; Aktas et al., 2010, 1-30).

Table 1 Descriptive statistics for the independent variables

Variable	Variable description	Nature of the variables
Occupational	Occupational group	1 = others
		2 = teachers
		3= miners
		4 = uniformed services
		5 = farmers
People	How many people live in household?	people

Income	What personal monthly net income (in PLN) have you been receiving during the last three months?	PLN
Church	On average, how often in a month do you take part in a church service or other religious meetings?	number
Age	Age	1 = 'Matures' (born before 1945)
		2 = 'Baby Boomers' (1946–1964)
		3 = 'Generation X' (1965–1976)
		4 = 'Generation Y' (1977–1993)
		5 = 'Generation Z' (1994-)
Financial	What is your satisfaction with the financial situation of the household?	1 = very happy
		2 = quite satisfied
		3 = rather dissatisfied
		4 = unhappy
		5 = very unhappy
Residence	Place of residence	1 = Cities > 500k
		2 = Cities 200-500k
		3 = Cities 100-200k
		4 = Towns 20-100k
		5 = Towns < 20k
		6 = Rural areas
TV	Do you have paid TV at home?	0 = no 1 = yes
Gender	Gender	0 = women 1 = men

Source: own study

3 Results and Discussion

The work presents four professional groups in Poland which benefit from the most numerous non-pension privileges. These are as follows:

- teachers,

- miners,

- uniformed services,

- farmers.

Undoubtedly, one may be tempted to indicate a wider group of professions, such as, for instance, judges, prosecutors and priests, who also benefit from certain privileges. However, these privileges are not as numerous as the ones indicated in the text. In addition, in case of judges and prosecutors, the privileges generally come down to the level of remuneration as well as to the pension privilege that is not taken into account in this work.

First, the privileges of only several groups will be indicated. Employees paid by the State budget in Poland (Act of 1997) are entitled to an extra bonus salary (one months extra pay). Its value is set at 8.5% of the total remuneration received by the employee during the calendar year. Due to the amount actually paid out to employees (100/8.5≈12), corresponding to the amount of one monthly salary, it is referred to as the thirteenth salary or 'a thirteenth'. These are teachers that obtain this benefit. Theoretically, miners, police officers, military men and other members of uniformed services are not eligible to this benefit. However, miners, as well as military men and policemen, can count on an additional cash bonus paid under separate regulations. In case of miners, the so-called 'the Miners' Charter' that has been valid from 30 December 1981 guarantees such a benefit (Act of 1981) to employees of mines paid out on the occasion of the miner's day (4th of December). Furthermore, under the same law, miners are entitled to the so-called '*Barbórkowe* bonus' that can be called their 14th annual salary. Miners also have the right to the free coal allowance (8 tonnes of coal a year). This allowance can be received in-kind or in cash equivalent (which happens most frequently). The price of coal is subject to change, however, taking into account a coal price amounting to a few hundred zlotys per tonne, it can be stated that miners receive their 15th annual salary in the form of in-kind coal allowance. Regulations governing the payment of the free coal allowance are defined in the agreements concluded between the Management Board of the relevant mine (or union of mines) and trade unions. On the other hand, based on Art. 83 of the Act on the Military Service of Professional Soldiers (Act of 2003), a professional soldier holding a professional military service for the whole calendar year acquires the right to an additional annual salary equal to 1/12 of the basic salary plus allowances. In addition, military men are entitled to cash equivalent for uniforms and clothing not issued in-kind, including spending on cleaning of uniforms and clothing (Act of 2015). This allowance ranges from 2,302 to 4,460 PLN and is paid annually. In spite of its purpose - uniforms - the allowance, in fact, has been transformed into an additional annual salary.

Soldiers leaving military service (*e.g.*, due to their retirement) also benefit from a Golden handshake payment (Act of 1995, Act of 2016). There is even a special calculator for calculating this payment available on the Agencja Mienia Wojskowego (the Military Property Agency) website. This value depends, among other things, on the number of years of service, grade or family size. According to the calculations, this allowance may amount up to 665,646.72 PLN (as of March 10, 2017). When analysing privileges that are exclusive for teachers, it is important to point out the most well-known and most frequently criticized one, *i.e.*, different weekly working time. In accordance with the Teachers' Charter (Act of 1982), for most teachers it is 18 teaching hours per week. However, this is the actual time of running didactic classes and does not include preparation time for lessons or organizational responsibilities. Also, once every seven

years teachers have the right to take health leave. During this period, they retain the right to their monthly basic salary, service premium, and other employee benefits, including social benefits.

In addition, in 1972 (Act of 1972) the regulation was passed that sets out (Article 43):

a) Teachers employed in rural areas and housing estates as well as in towns with no more than 2,000 inhabitants have the right to free housing in the workplace ...
b) If the National Council cannot provide a free flat to a teacher, they are obliged to pay this teacher an appropriate allowance (called a Rural area housing allowance).
These regulations though slightly modified have been in force until today. The change relates, for example, to the number of residents of a place where the Rural area housing allowance remains in force - at present it is 5,000 inhabitants. On September 1, 1983, another monthly allowance was introduced benefiting also teachers – the allowance for persons who are employed in rural areas (called a Rural allowance). It amounted to 10% of the basic monthly salary and the only criterion for granting it is the fact of working in a rural area (Act of 1982). Teachers who start working are also entitled to an allowance equal to two monthly basic salaries paid to the teacher (a Golden hello payment).

Similar to teachers, miners have reduced working time, too. Based on the Miners' Charter (Act of 1981), miners work underground up to 7.5 hours per day. According to the Act of 4 March 1994 on Employee Social Benefits Fund (Act of 1994), employers employing more than 20 employees and employers operating in the form of budgetary units and self-government budget institutions are obliged to create such a fund (privileges for teachers and miners). As indicated, this privilege also applies to employees working in the private sector, in companies with more than 20 employees. Therefore, this is not a privilege reserved only for the analysed occupational groups. Military men and other militia formation workers are not covered by this fund, since according to the law, it is not created in their units. However, under separate regulations, they have the right to a number of benefits, such as, for instance, a Golden hello payment or annual holiday pay. These benefits may be considered as approximate to those awarded to persons benefiting from the social fund.

The farmer occupation is completely different, so the privileges in this case are completely different. Farmers do not pay income tax. Regardless of the level of income earned, they are charged only a small agricultural tax. Farmers, as the only professional group in Poland, have the right to the refund of excise duty on purchased fuel (Act of 2006) for agricultural production. They also benefit from subsidies for insurance premiums paid for plant cultivation and livestock (Act of 2005) as well as for subsidized agricultural credits. The Polish state pays for both investment and replacement loans to support farmers in the event of natural disasters.

Table 2 Non-pension privileges in Poland

Privilege	Teachers	Miners	Uniformed services	Farmers
Bonus salary (one months extra pay)	+	+	+	-
Additional cash bonus	-	+ *	+	-
Shorter working time	+	+	-	-
Seniority	+	+	+	-
Rural allowance	+	-	-	-
Rural area housing allowance	+	-	-	-
Health leave	+	-	-	-
Golden hello	+	-	+	-
Golden handshake	-	-	+**	-

Exemption from income tax	-	-	-	+
Reimbursement of excise duty on fuel purchased	-	-	-	+
Subsidized production insurance (crops and animals)	-	-	-	+
Subsidy for loan interest rate payments	-	-	-	+
Company Social Benefits Fund	+	+	+***	-

Note: *the so-called 'Barbórkowe bonus'; ** only for military men; *** for uniformed services equivalent benefits.
Source: own study

There are many factors that can affect financial awareness and financial decisions. As indicated in Table 3, exercising a privileged profession influences the decision to save for current needs. Privileged professionals are less likely to save for this purpose. Why?, because, according to Dardanoni (1991), 'savings. . . arise as a precaution against future income risk'. In turn, due to their privileges, these people have little income risk, so they do not save for current needs. In case of miners, the chances of making savings in their households are 34.3% smaller. However, in case of uniformed services, they are 32.1% smaller (in case of teachers and farmers, the result is similar, however, the variable is insignificant) than in case of other non-privileged respondents.

An interesting cognitive result was obtained with regard to the number of people per household. The increase in the number of people in the household by one person increases the chance of having savings for current needs by 9.9%. Undoubtedly, this results from a rational decision, which in a larger household means the need to increase the level of savings for current needs. In smaller farms, current needs are smaller, so these savings occur in a lower number of households.

Increasing nominal income negatively affects the chances of having such savings. Why? People with higher earnings do not need to save for current needs. Affluent people can do well when current expenses appear unexpectedly. Probably, in case of other forms of saving, for instance, for old age - increasing income increases savings. On the one hand, these people can afford to make additional savings, on the other hand, however, the solutions in force in Poland do not guarantee high pensions in the future. Accordingly, the obligatory regulations oblige, especially the rich, to save, (Chamon, Liu and Prasad, 2013; Kowalczyk-Rólczyńska and Rólczyński, 2016; Pieńkowska-Kamieniecka and Walczak, 2016). The assessment of one's own financial situation has a similar impact to that of the nominal income. Farms which are very dissatisfied with their own situation, if compared to the satisfied ones, are 83.5% more likely to have current savings.

Younger people are less likely to save for current consumption. These individuals are more likely to make a use of the present day, often even without thinking about unforeseen current expenses. In case of savings for current needs, 'Residence', 'Gender', or 'TV' are insignificant variables.

Table 3 Estimates of logit model after dropping out insignificant variables – the analysed dependence: 'savings for current needs'

	Variable	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp (B)**
Occupational	**1 = others (base)**			12.372	4	.015	
	2 = teachers	-.043	.133	.104	1	.747	.958
	3= miners	-.420	.150	7.806	1	.005	.657
	4 = uniformed services	-.387	.177	4.757	1	.029	.679
	5 = farmers	-.084	.094	.792	1	.373	.920

People		.094	.020	21.314	1	.000	1.099
Income		-.096	.022	19.928	1	.000	.908
Church		-.027	.010	7.596	1	.006	.974
Age	**1 = 'Matures' (base)**			24.948	4	.000	
	2 = 'Baby Boomers'	-.086	.074	1.368	1	.242	.918
	3 = 'Generation X'	-.266	.093	8.111	1	.004	.767
	3 = 'Generation Y'	-.515	.117	19.400	1	.000	.598
	5 = 'Generation Z'	-1.827	1.063	2.953	1	.086	.161
Financial	**1 = very happy (base)**			52.872	5	.000	
	2 = happy	.040	.139	.082	1	.775	1.041
	3 = quite satisfied	.126	.138	.835	1	.361	1.135
	4 = rather dissatisfied	.549	.152	13.141	1	.000	1.732
	5 = unhappy	.548	.161	11.597	1	.001	1.729
	6 = very unhappy	.608	.199	9.371	1	.002	1.836
Const.		-.498	.173	8.301	1	.004	.608
N= 5,279; Log likelihood = 6,793.076; Nagelkerke's R-squared = 0.049 Cox–Snell's R-squared=0.036; Chi-square (16) =193.112 (0.000); HL test =9.149 (0.330)							

Source: own study based on Social Diagnosis (2015)

4 Conclusions

In Poland there exists numerous non-pension privileges. They take different forms. Some of them are monetary in nature, such as, for instance, extra pay or allowances related to work experience. Some of them are indirectly related to one's earnings, *e.g.*, shorter working time. Each privilege, however, is ultimately related to additional costs for the employer, which is often the Polish state. This means that the actual income of persons performing the aforementioned occupations is significantly different from the monthly basic salary.

The presented privileges apply to many professions. Undoubtedly, their full analysis requires a comprehensive characterization of the profession and the factors that have affected the introduction of particular privileges. Some of them, as a result of such an analysis, would not be defined as a privilege but as a legal distinction resulting from the specifics of the profession. This indication in the summary is intended to signal the complexity of the problem discussed in this work.

The content of the work indicated that the type of occupation affects the tendency to make savings on a current basis. Persons performing privileged occupations are less likely to save for current needs than other professional groups. Due to their privileges, these people do not have to save for this purpose. Current needs do not pose a problem for them for which they would need to save, in case of need. The income earned has a similar effect on the level of savings. Better-paid people also save less for current needs.

Based on the research conducted, there is no reason to reject the hypothesis of the impact of occupation on the level of current savings. Based on the research done, one more conclusion can be drawn. Income, which theoretically increases the volume of savings, in the case of savings for current needs has a negative impact. One may point out that a common saying 'rich people save more' seems to be irrelevant. Consequently, when conducting research on the issue of saving, it is important to focus on specific savings motives, and not on the level, purposes and motives of saving in a broad sense.

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The selected issues of tax legislation on the use of estimation method based on expenses for physicians' income calculation in the case of tax fraud in Poland

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Abstract: *The aim of this article is to determine the possibility of using the rules concerning the based on taxpayer's expenses method of income estimation in case of tax fraud committed by physicians doing business. The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem. The income of physicians who commit the tax fraud can be determined on the basis of methods of tax base estimation regulated in Tax Ordinance or as the income of not revealed sources of incomes regulated in Personal Income Tax. Most of the statuary methods of estimation of the tax base rather cannot be used for income estimation of physicians. The changes in 2016 in the tax law on the provisions of not revealed sources of incomes can be seen positively. The new rules are more precisely than the old ones which were claimed as unconstitutional. However, there are doubts if the based on expenses of taxpayer method can be applied in a situation when the physician claims receiving the sources from the business. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes. The conclusions of paper could be used by the legislator.*

Keywords: combating tax fraud, income taxes, the estimation of tax base, health care institutions

JEL codes:H26, H25, H24, K34, I18

1 Introduction

Tax frauds are getting more and more important issue. Especially the tax frauds in VAT are discussed as public finance problem. However, the problem of tax frauds concerns also income taxes. Tax frauds in income taxes are involved with different kinds of business activity including the medical professions as well. The effect of such activity is the possibility to decrease their prices of medical services. It makes the economic conditions of doing business more difficult for the honest taxpayers or even can make them going bankrupt. Therefore they need to be protected from unfair competition from health institutions which cut their tax liabilities in not a legal way. The provisions foresee varieties of instruments which should help the tax administration to reduce the scale of gray economy. One of such instruments is the income estimation of the taxpayer. The provisions point out different methods of tax base estimation. One possible method to establish the taxpayer's income is the estimation based on expenses of the taxpayer. The provisions on not revealed sources of incomes in Personal Income Tax foresee to use such a method. The rules concerning this method in PIT were changed in 2016.

The aim of this article is to determine the possibility of using the rules concerning the based on taxpayer's expenses method of income estimation in case of tax fraud committed by physicians doing business.

The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem.

2 Methodology and Data

The descriptive study including critical attitude to the tax acts and literature was used to solve the research problem.

3 Results and Discussion

Tax evasion is a part of economy all over the world. Tax frauds are also an important issue in Poland. The scale of shadow economy in Poland shows the Table 1.

Table 1 The scale of shadow economy in Poland as percentage of GDP in years 2012-2016

	2012	**2013**	**2014**	**2015**	**2016**
The scale of shadow economy, %	21,1	19,9	19,5	19,2	19,7

Source: Ptak (2017).

The data in Table 1 show that tax frauds are an important problem in Poland. The scale of shadow economy accounts for around 20 % of GDP in Poland. Therefore it is need to be combated. The provisions foresee varieties of instruments which should help the tax administration to reduce the scale of gray economy. One of such instruments is the income estimation of the taxpayer.

The discussion on the estimation based on expenses of the taxpayer in Poland requires firstly analysis of provisions of Tax Ordinance Act and Personal Income Tax.

Generally, the Tax Ordinance Act allows tax authorities to estimate the tax base of the taxpayer in cases like (Adamiak et. al. 2012; Durczynska 2014):

- 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 Tax Ordinance Act provides tax authorities with a list of six tax base estimation methods they can use. These are (Dzwonkowski 2016):

- 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 indicated in the provisions methods are not the only ones the tax administration may apply. In the literature following methods of tax base estimation as 'non-statutory' methods are presented (Schneider, 2007; Brzeziński B. et al., 2007; Kosikowski, Etel, 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.

One of the methods indicated in the literature is estimation a company's incomes based on its expenses. In the case of natural persons, this method is called the estimation a taxpayer's incomes based on its expenses.

The Personal Income Tax states that if it is not possible to calculate income (loss) on the basis of the tax records, the value of income (loss) is estimated. The provisions indicate revenue ratios which can help to calculate income, but they should be used for the foreign companies (PIT, Art 24b). It means the rules and methods of income estimation established in the tax ordinance should be applied.

Moreover, the provisions had foreseen the use of an estimation income of taxpayer method based on its expenses in Personal Income Tax in the case of not revealed sources of incomes (taxation of income not covered by disclosed sources or income from undisclosed sources; revenues unmatched by the disclosed sources or derived from undisclosed sources).

The Polish Personal Income Tax distinguishes different sources of revenues of natural person. It includes for example revenues from doing business, employment relationship, and other sources. One kind of other revenues is income from undisclosed sources. This is a special procedure to determine the tax liabilities when the property and expenditures of the taxpayer are higher than his income (Dzwonkowski, 2009). It also a way to combat tax fraud. The effect of determining the income as not revealed sources of incomes is applying the 75% tax rate (Bartosiewicz, Kubacki, 2015).

However, the rules in PIT concerning not revealed sources of incomes have not been described precisely. It caused lots of commentaries on this provisions. The literature data concentrated very often on procedural issues (Dzwonkowski, 2009; Pietrasz 2007; Strzelec, 2015).

Moreover, the Constitutional Tribunal stated the provisions as unconstitutional as the provisions did not meet legislative requirements predicted for tax regulations. Admittedly, Constitutional Tribunal reprieved its ruling till February 2016 so the tax administration had been able to assess tax liabilities by the use of this unconstitutional provisions till the time limited in by the Constitutional Tribunal (Kubacki, 2014).

Due to fact that Constitutional Tribunal reprieved the ruling on revenues unmatched by the disclosed sources or derived from undisclosed sources till February 2016 the parliament established new provisions. They were implemented in the beginning of 2016.

They concern following issues (Marciniuk, 2016):

- the definition and the way of establishing revenues unmatched by the disclosed sources or derived from undisclosed sources,
- the day of arising of tax obligation moment,
- the way of calculating the tax base,
- the level of tax rate and the way of its establishment,
- the procedure questions including the proof's burden.

New provisions define the revenues unmatched by the disclosed sources and derived from undisclosed sources. The revenues unmatched by the disclosed sources or derived from undisclosed sources are higher than the expenditure diminishes by the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. To the taxable revenues (incomes) or revenues (incomes) exempted from the taxation are included such revenues (incomes) which were earned before the incurred expenditure. So the income from the disclosed sources, income from the disclosed sources but indicated by the taxpayer in not a proper level is treated as covered by disclosed sources. The revenues unmatched by the disclosed sources and derived from undisclosed sources comprise the income from sources not disclosed by the taxpayer or not determined by the tax administration (Marciniuk, 2016).

The provisions define expenditure for the not revealed sources of incomes (Strzelec 2016b). Firstly, the value of assets accumulated in the tax year is recognized as the expenditure. If it is impossible to determine the tax year in which the expenses and value of assets are accumulated, it means the expenditure is equal to the level of expenses incurred by the taxpayer during the tax year (Mariański, Nowak-Piechota 2016).

According to law the provisions of PIT are not applied to revenue arising from activities that cannot be the subject of a legally enforceable agreement. Sometimes, the taxpayers used this provisions to avoid the taxation. In the case of not revealed sources of incomes, they maintained they had earned the income from activities that cannot be the subject of a legally enforceable agreement (for example prostitution). Since, the amendment in 2016 the taxpayer has to prove that he earned the income from activities that cannot be the subject of a legally enforceable agreement (if he claims so) (Marciniuk, 2016).

The provisions define the day of arising of tax obligation moment. The day of arising of tax obligation is on the last day of the tax year when the revenues were determined as the revenues unmatched by the disclosed sources or derived from undisclosed sources are higher than the expenditure diminishes by the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. The tax can be assessed in the period of 5 years (Marciniuk, 2016).

The way of calculating the tax base is defined as the surplus of expenditure above the taxable revenues (incomes) or revenues (incomes) exempted from the taxation. If there are more than one surplus the tax base is the total amount of such surpluses (Marciniuk, 2016).

The level of the tax rate is determined as the 75% lump-sum tax imposed on the revenues (PIT art. 25e).

The next issue is the procedure questions including the proof's burden. Generally, the procedures established in the Tax Ordinance should be applied in the case of not revealed sources of incomes. The provisions in PIT states that the proof's burden on the indicating of revenues (or incomes) equaling the expenditures is imposed on the taxpayer. However, this rule is not applied in the case of incomes which are known for the tax administration, also from its records, databases or other public data (Strzelec 2016a).

As the rule, the new provisions are commented positively. In particular, they were implemented including the adoption of remarks of the Constitutional Tribunal (Strzelec 2016a; Mariański, Nowak-Piechota 2016).

As the literature data shows the proceeding using the calculation of the income based on expenses can be applied to different professions. The Ministry of Finance had indicated some professions which belong to the higher risk level of tax fraud and should be controlled more thoroughly. Moreover, according to the Ministry of Finance, the tax provisions in case of not revealed sources of incomes should be applied by the tax administration. Among those professions, the physicians were indicated as well (Strzelec, 2015). However, there is a lack of papers discussing the possibility of using the rules concerning the based on expenses method of income estimation in case of tax fraud by physicians doing business especially after the changes in PIT in 2016.

Following discussion assumes that physician doing business had committed tax fraud and this fact was discovered by the tax administration. The question is if there is the possibility of using the rules concerning the based on expenses method of income estimation in case of tax fraud.

Analysing the use of provisions in case of not revealed sources of physicians' incomes at least two different cases should be indicated.

- the physician does not want to indicate the sources of his revenues,

- the physician claims to receive the sources from the business.

The first issue concerns case when the physician does not want to indicate the sources of his revenues (or his explanations are not true). The tax administration during the control had discovered that the property and expenditures of the physician were higher than its income. Of course, it is very likely the income was earned from doing business but another possibility is money earned from employment relationship (but also paid unofficially). However, the tax administration is not always able to prove that the income was earned exactly from taxpayer's business. The tax administration has to proof that the tax records are not reliable or correct. If tax authorities do not manage to indicate the source of income, it means the provisions of not revealed sources of incomes should be applied. In such a case the based on expenses method of income estimation is applied. The tax administration has to obey the rules established in the PIT on the not revealed sources of incomes discussed in this article. However, in the case of estimation of physician's income, another question can appear. The Polish tax system gives the physicians (also nurses) the opportunity to pay lamp-sum taxes. Such a kind of a tax is Tax card. In the case of this tax, there are following conditions which have to be fulfilled by the taxpayer: the range of supplied service, the limits in employment and the usage of other subjects' service, no conduction of specific kinds of taxpayer's or spouse's activity. The tax base and tax rate are calculated in simplified form. The tax depends on the number of working hours of a taxpayer in a month. The tax rate is increasing if the number of working hours in a month increases as well. The more hours the physicians are doing their business the more tax they have to pay. The taxpayers do not have to keep any tax books for income calculation purposes.

The taxpayer may try to explain that his earned money in the past, and bought the property from his savings. It would be very difficult for tax authorities to prove that income was not earned in the past, especially when the taxpayer did not have to use tax records. Such explanations are possible only if the physician had chosen the tax card in the past.

The next case is the situation when the physician claims receiving the revenues from doing business. Then, the question arises if the tax administration is allowed to use the estimation based on expenses of the taxpayer. There are no doubts that the estimation methods indicated directly in the Tax ordinance can be applied. However, it is not always possible to use them all. Following statuary methods of estimation of the tax base rather cannot be used for income estimation of physicians (Witczak, 2016):

- the inventory method,
- the production method,
- the cost method,
- the 'income as a percentage of turnover' method.

Following statuary methods of tax base estimating can be used for income estimation of physicians:

- the internal comparative method,
- the external comparative method.

However, we may indicate the obstacles of using the internal comparative and the external comparative method for estimating of income in health institutions (Witczak, 2016). One important obstacle is the professional secrecy. It is not the aim of the article to discuss this issue in more detail. Nevertheless, such discussion in separate articles is advisable. So if the statuary methods of the tax base estimation are not always applicable the estimation based on expenses of the taxpayer is to be considered. It could be very helpful for tax administration to use the based on expenses of taxpayer income estimation method as one of other methods not indicated in the provisions. However, there are doubts whether such a method of tax base determination could be named as the estimation. According to Schneider (Schneider, 2007), this method is one of the tax base estimation method. However, there are opinions not accepting the assessment of

not revealed sources of incomes as an estimation method determining the tax base (Dzwonkowski, 2009; Pietrasz, 2007). According to Strzelec (Strzelec, 2011), in the assessment of not revealed sources of incomes the tax base estimation foreseen in the Tax Ordinance Act can be used. It means the assessment of not revealed sources of incomes is not an estimation itself. It would be the obstacle using the income based on expenses method. Although for example, the German provisions foresee the calculation of the income based on expenses as one of the income estimation methods (Carlé, 2006). However, the German tax law does not include separate provisions on not revealed sources of incomes. The solution similar to the German tax law is advisable. The step further should be taken. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes.

4 Conclusions

The income of physicians who commit the tax frauds can be determined on the basis of methods of tax base estimation regulated in Tax Ordinance or as the income of not revealed sources of incomes regulated in Personal Income Tax. The methods indicated in Tax ordinance are not always able to be applied in the case of physicians doing business. Then, the provisions of not revealed sources of incomes could be applied in the case of tax fraud. The changes in 2016 in the tax law on the provisions of not revealed sources of incomes can be seen positively. The new rules are more precisely than the old ones which were claimed as unconstitutional. They foresee the based on expenses of taxpayer method as the way to determine the taxpayer's income. However, the changes do not solve question concerning the physician claims receiving the sources from the business. There are doubts if the based on expenses of taxpayer method can be applied in such a situation. It is advisable to change the law. The based on taxpayer's expenses method should be indicated as one of the methods of income estimation regulated in Tax Ordinance. It could be determined in more detail in the provisions like provisions of not revealed sources of incomes.

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Assessing financial condition of municipalities using taxonomic methods

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Abstract: *The goal of this paper is to develop a concept of assessing* and comparing *financial condition of municipalities (communes) using taxonomic methods and implement this concept into communes of Lower Silesia region in Poland. To analyze financial condition of the municipalities authors proposed 14 financial indicators which fall into four categories: related to incomes (four indicators), related to expenditures (four indicators), related to current balance (two indicators) and related to debt (four indicators). Selection of indicators was based on the revision of the literature, guidelines for municipalities, conducted local and international researches and best practices discussing financial condition of local governments. These indicators were calculated for all Lower Silesia municipalities (169 communes) for the year 2015. In order to group similar municipalities, in terms of financial conditions, authors created rating scale. The scale includes five categories and their qualitative description. Among all indicators, using merit and statistic methods, those were chosen which best show the financial condition of examined objects. Subsequently the degree of similarity was computed based on chosen dissimilarity coefficients. Finally communes were split into ordered clusters that present similar financial condition and assigned to previously prepared rating scale. Developed concept allows to compare financial condition of the municipalities, to draw conclusions about sources of incomes as well as usage of financial resources and potential of development. It is also a very useful indicator for investors.*

Keywords: municipalities financial condition, financial indicators, municipalities rating, taxonomic methods

JEL codes: H7, C8

1 Introduction

The financial condition of a municipality reflects the municipality's ability to provide public services (Partick, Trussel, 2011). Problem of defining and evaluating financial condition of local government has been a topic of concern in literature, legislation and guidelines for local governments. Groves and Valente (1994) defined financial condition as a government's ability to: generate enough cash to pay its current liabilities (cash solvency), generate enough revenues over its normal budgetary period to meet its expenditures and not incur debts (budgetary solvency), to pay all the costs of doing business in the long run (long-run solvency) and to provide services at the level and quality that are required for the health, safety, and welfare of the community and that its citizens desire (service-level solvency). Maher and Nollenberger (2009) describe financial condition as an organization ability to maintain existing service levels, withstand economic disruption, and meet the demands of growth and decline. Following Groves and Valente they state that financial condition can be described by cash solvency, budgetary solvency, long-run solvency and service-level solvency. Similar definition, based on the mentioned four levels of solvency is adopted by Wang et al. (2007). According to DiNapoli (2008) financial condition may be defined as the ability of a local government to

balance recurring expenditure needs with recurring revenue sources, while providing services on a continuing basis. The Governmental Accounting Standards Board (GASB, 2012) defines a government's financial condition as a government's ability and willingness to meet its financial obligations and commitments to provide services.

In this article financial condition is understood as the ability of the local government to meet its obligations as they come due and to finance the services its constituency requires (Mead, 2001) and is analyzed in three dimensions of solvency: budgetary solvency, long-run solvency and service-level solvency. A community in good financial condition generally maintains adequate service levels during fiscal downturns, identifies and adjusts to long-term economic or demographic changes, and develops resources to meet future needs. Conversely, a community in fiscal stress usually struggles to balance its budget, suffers through disruptive service level declines, has a difficult time adjusting to socioeconomic forces, and has limited resources to finance future needs (DiNapoli, 2008).

There is no single measure that fully captures the financial condition of a local government. Rather, governments need to take a comprehensive approach that focuses on both external and internal fiscal indicators that are easy to measure, evaluate and understand. Ideally, a financial indicator system should be comprehensive enough to match the complexity of the analyzed government, operationally manageable and should unable local governments to produce regular, reliable reports for decision making (DiNapoli, 2008).

Selection of indicators, which can be used for analyzing financial condition of local governments has been the subject of broad researches. In 1981 Groves, Godsey and Shulman worked out a set of financial indicators which included six categories: revenues, expenditures, earnings, debt structure, unfunded liabilities, and condition of capital plant and approximately 30 related financial ratios. This model was next developed by Groves and Valente in 1986 and 1994 and Groves, Valente and Nollenberger in 2003. The revised version of the model includes seven categories: revenues, expenditures, operating position, debt, unfunded liability, capital plant, community needs and resources and is often a primary source for indicators selected by local governments in the USA to asses their financial condition. One of the most commonly used studies on local government financial condition is Brown's 10-point test. It is based on 10 ratios, that are considered useful for assessing four basic financial factors for a city: revenues, expenditures, operating position and debt structure (Brown, 1993). Wang et al. (2007) in their study suggested 11 indicators to measure four dimensions of solvency. Polish Ministry of Finance worked out a system of 14 indicators which are used by local governments for evaluating their financial condition. Indicators follow into three groups: budget indicators, indicators per capita and debt indicators.

It must be underlined that several factors make analyzing the financial condition of local government difficult: there are few standards against which local government finances can be measured with confidence, financial difficulties emerge gradually and incrementally, it is difficult to compare one local government against another because of differences in populations, enrolments or other demographic characteristic, and there is a lack of "useable" and "understandable" dissemination vehicles and formats that can be used to assess financial condition (Petro, 1998).

The goal of this paper is to develop a concept of assessing and comparing financial condition of municipalities using taxonomic methods and implement this concept into municipalities of Lower Silesia region in Poland. To analyze financial condition of the communes authors proposed 14 financial indicators. In order to group similar municipalities, in terms of financial conditions, authors created rating scale. Among all indicators, using merit and statistic methods, those were chosen which best show the financial condition of examined objects. Subsequently the degree of similarity was computed based on chosen dissimilarity coefficients. Finally communes were split into

ordered clusters that present similar financial condition and assigned to previously prepared rating scale.

2 Methodology and Data

As it was mentioned above financial condition is understood as the ability of the government to meet its obligations as they come due and to finance the services its constituency requires (Mead, 2001) and is analyzed in three dimensions of solvency: budgetary solvency, long-run solvency and service-level solvency.

Development of the idea for evaluating and comparing financial condition of local governments consists of a few steps: choosing a complex phenomenon, determining the set of objects and the set of variables substantively related to the analyzed complex phenomenon, identifying preferential variables, describing pattern and/or anti-pattern object, deciding on variable normalization, selecting the distance measure, interpreting results (Walesiak, 2008). Initially authors selected a sample of local governments for analysis. The sample used in this study includes all municipalities (169) of Lower Silesia Region. Financial data for communes cover the year 2015. Next 14 indicators were chosen. They can be assigned to one of four categories: related to incomes (four indicators), related to expenditures (four indicators), related to current balance (two indicators) and related to debt (four indicators). Selection of these indicators was conducted using different criteria. First, attention was paid on the theoretical validity (merit criteria). Authors analyzed literature, recommendations for municipalities, local and international researches and best practices discussing financial condition of local governments. Second, availability of data was crucial to construct indicators and ensure the possibility of updating the model it in the future. Third, indicator's relevance to the commune's government interest was considered. Finally, selected indicators should be easily understood by local officials and the public and unable to produce regular, reliable reports for decision making.

Financial data applied in the analysis were collected from budgetary statements, which Polish communes are obliged to supply to Regional Chamber of Accounts and Central Statistical Office of Poland. The financial indicators primary used in this analysis are presented in the Table 1.

Table 1 Indicators used to measure financial condition

ID	Indicator	Dimension	Category
i1	**Total revenues/Population**	Service solvency	Related to incomes
i2	**Own revenue/Total revenue**	Budget solvency	Related to incomes
i3	**Tax revenue/Total revenue**	Budget solvency	Related to incomes
i4	**Capital expenditure/Total expenditure**	Budget solvency	Related to expenditures
i5	**Expenditure on wages/Current expenditures**	Budget solvency	Related to expenditures
i6	**(Current balance)/Total revenue**	Budget solvency	Related to current balance
i7	**Total liabilities/Total revenues**	Long-run solvency	Related to debt
i8	**Total liabilities/Population**	Long-run solvency	Related to debt
i9	**Debt servicing/Total revenue**	Budget solvency	Related to debt
i10	**Debt servicing/Own revenue**	Budget solvency	Related to debt
i11	**(Current balance + capital revenue)/Capital expenditures**	Budget solvency	Related to current balance
i12	**Debt servicing/Current**	Budget solvency	Related to expenditures

	expenditures		
i13	**Capital expenditures/Population**	Service solvency	Related to expenditures
i14	**PIT+CIT/Own revenues**	Budget solvency	Related to incomes

Source: own study

From indicators presented in the Table 1 a few were selected (statistical criteria) based on the coefficient of variation. It is a way to measure the extent of variability in relation to the mean of the population (municipalities):

$$V_j = \frac{s_j}{\bar{x}_j}, \qquad j = 1..m \tag{1}$$

where:

s_j – standard deviation of j variable,

$\bar{x}_j$ – arithmetic mean of j variable

m – number of variables.

Table 2 presents values of above mentioned coefficient of variation as well as weights which were assigned to each of the indicators. For all indicators with value of coefficient of variation below 25% authors assigned weight 0%. It was determined arbitrarily, based on subjective criteria. Finally three out of 14 indicators have been removed from further research (i2, i5 and i14).

Table 2 Weights assigned to indicators based on coefficient of variation

Indicator ID	**i1**	**i2**	**i3**	**i4**	**i5**	**i6**	**i7**
Coefficient of variation	26%	21%	27%	54%	12%	61%	52%
Weight	3,8%	0,0%	3,9%	7,9%	0,0%	9,0%	7,6%
Indicator ID	**i8**	**i9**	**i10**	**i11**	**i12**	**i13**	**i14**
Coefficient of variation	62%	84%	92%	57%	91%	76%	24%
Weight	9,2%	12,3%	13,4%	8,4%	13,3%	11,2%	0,0%

Source: author's compilation

All variables used for description of communes are measured on metric scale. Since the adopted indicators are measured on incomparable scales, normalization of variables has been done by standardization.

Each of the indicator was characterized as stimulant or destimulant. Nominants were not distinguished. Table 3 shows results of this step.

Table 3 Preferential variables distinguished among indicators

	Variables
Stimulant	i1, i3, i4, i6, i11, i13
Destimulant	i7, i8, i9, i10, i12

Source: own study

Subsequently, the concept of the pattern of development and measure of development as a method of linear ordering (Hellwig, 1972) was adopted to the conducted research. Initial data matrix $[x_{ij}]_{n\times m}$ (where x_{ij} – the value of the j-th variable on i-th object), after rejecting three out of fourteen indicators, had dimension $n \times m$, where n is the number of objects (municipalities) and m is the number of chosen variables (indicators). To the set of objects pattern object was added, which is an upper pole of development; it means, that for this object values of all indicators were chosen from the best possible.

That resulted in a final data matrix $[x_{ij}]_{n'\times m}$ with dimension $n' \times m$, where $n' = n + 1$.

The next step was to select the distance measure, which takes into account weights of variables. There is a complex catalogue of that kind of measures among which one can find *inter alia*: Manhattan distance, Euclidean distance, Minkowski distance, Canberra distance (Cox and Cox, 2001) or Generalized Distance Measure (GDM) (Walesiak, 2002). In this paper authors focused on the GDM, based on a generalised correlation coefficient which is well known in statistical literature (Kendall, 1955). It is given by the following equation (Walesiak, 1999):

$$d_{ii'} = \frac{1}{2} - \frac{\sum_{j=1}^{m} w_j a_{ii'j} b_{i'ij} + \sum_{j=1}^{m} \sum_{i''}^{n} w_j a_{ii''j} b_{i'i''j}}{2\left[\sum_{j=1}^{m} \sum_{i''=1}^{n} w_j a_{ii''j}^2 \cdot \sum_{j=1}^{m} \sum_{i''=1}^{n} w_j b_{i'i''j}^2\right]^{\frac{1}{2}}} \tag{2}$$

where:

w_j – weight of j-th variable,

$i, i', i'' = 1..n'$ – number of object,

$j = 1..m$ – number of variable.

The biggest advantage of this measure is, that it can be used for variables measured on different scales. In equation (2) for variables measured on the metric scale, the following substitution is applied:

$$\begin{aligned} a_{ikj} &= x_{ij} - x_{kj} \text{ for } k = i', i'' \\ b_{i'lj} &= x_{i'j} - x_{lj} \text{ for } l = i, i'' \end{aligned} \tag{3}$$

where:

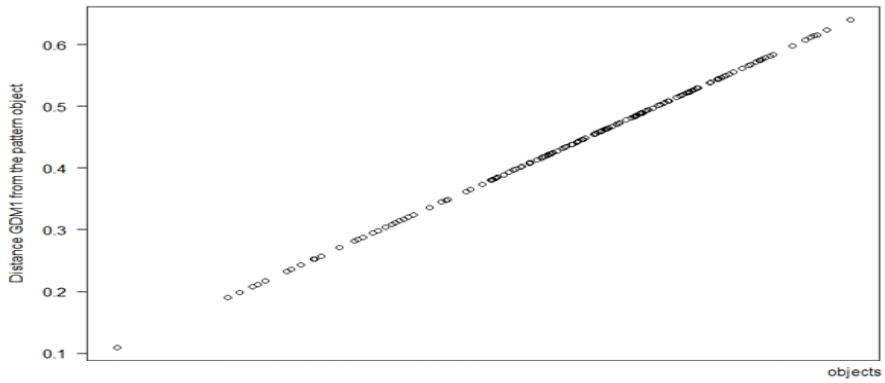
$x_{ij}(x_{i'j}, x_{i''j})$ – the value of the j-th variable on i-th (i'-th, i''-th) object.

Finally the distance between pattern object and the rest of all objects has been measured.

3 Results and Discussion

The linear ordering of 169 objects was carried out in terms of 11 indicators describing financial condition of those objects. The *pattern.GDM* function of the *clusterSim* package applied in R program was used (Walesiak and Dudek, 2017). The configuration of 169 municipalities was presented in a two-dimensional space in Figure 1.

Figure 1 Graphical presentation of linear ordering of 170 objects containing 169 municipalities and pattern object referring to Lower Silesian municipalities financial condition



Source: authors' compilation

Each municipality was marked with random sequential numbers. Because of the wide range of objects, the x axis is not clearly readable, so the above chart is only an

illustration showing how close objects were situated. It also shows, that division of objects into clusters is not clear. Table with computed data was prepared for further analysis. Due to the volume of the article this table will not be presented.

Selected for assessing financial condition indicators can serve as the basis for intergovernmental comparisons. Peer comparison is useful for splitting local governments into clusters that present similar financial condition and highlight position of the entity. In order to group and grade local governments according to their financial condition authors created rating scale. The scale was divided into five categories related to financial condition. The maximum distance (1,00) has been divided equally into 5 intervals:

- from 0 (pattern object) to 0,2 (included): category "superior" (A),
- from 0,2 to 0,4 (included): category "strong" (B),
- from 0,4 to 0,6 (included): category "average" (C),
- from 0,6 to 0,8 (included): category "poor" (D),
- from 0,8 to 1,0 (included): category "the worst" (E).

It was also possible to use maximum computed distance (0,64) as the worst category (instead of "1,0"), but in opinion of authors of this paper, it would make the research too individually as well as the rating concept unclear. There is no reason to consider the municipality distant the most from the pattern, as the municipality with the weakest rating in general.

Table 4 shows number of municipalities included in each category.

Table 4 Number of municipalities by category

Category	No. of municipalities in each category
A	3
B	42
C	118
D	6
E	0

Source: authors' compilation

4 Conclusions

The paper proposed to evaluate the financial situation of Lower Silesian municipalities by comparing them with pattern object (upper pole of development). The best category includes three out of 169 communes. The penultimate category includes six municipalities. Any commune received the worst rank.

Municipalities qualified to the best category (Katy Wroclawskie, Kobierzyce, Twardogóra) have some similar (other than financial condition) features:

- close neighborhood of the city of Wroclaw (capital of the Lower Silesia),
- they are easy accessible – located close to European routs, two of them are located near Wroclaw International Airport,
- most of the population is in working age,
- they are leading regions in terms of the number of companies with foreign capital invested.

We can as well distinguish common features of municipalities which fell into the category D (Jemielno, Jelenia Gora, Mirsk, Pielgrzymka, Kudowa Zdroj, Gluszyce):

- they are located in the significant distance from Wroclaw,
- they are situated on the protected landscape areas or nature reserves cover part of their territory,
- most of their population is in a post working – age,

- important part of their area is covered by agricultural areas and forest.

In authors' opinion, the presented method was just a preliminary part, a trial of preparing complex rating for municipalities in general, referring to their financial condition. Further research should focus on searching better idea for dividing results into clusters (equal intervals are not enough for the complexity of this phenomenon). Variation in time should also be included (financial data for communes used in the research covered the year 2015).

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Effectiveness of Financing the Public Expenditures on Health Care

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Abstract: *The human capital and the person value are the main factors of economic growth and government prosperity in the knowledge-based economy. During the "age of human capital" in the study of public finance management issues, it is necessary to place emphasis on the person and his characteristics. Qualitative characteristics of the human capital are indicators of public health. Therefore, one of the most important state problems is the assessment of effectiveness of government expenditure on health care financing that is the aim of the paper. The complex indicator is based on specially criteria developed system (fertility, mortality, incidence, disability) that allows to create a numerical evaluation of health care public investment effectiveness and to draw conclusions about the quality of public health, the medical care development, training, medico-improving technologies in Russian Federations' regions. The system of quantitative indices includes a group of health care resource provision indicators and a group of health care availability and quality indicators. Using the methods of economic, system analysis, mathematical statistics and solution optimization makes it possible to identify and select factors that affect the resource provision, accessibility and quality of health care. For technique approbation the official open databases of the Federal State Statistics Service, the Ministry of Finance and the Fund of obligatory medical insurance of the Russian Federation for 2015 have been used. The practical implementation of the proposed technique (on the example of the Russian Federations' regions) gives a chance to range territories on effectiveness of public health care financing. Monitoring and analysis of the numerical region rank allow to adopt effective financial decisions at the state level that improve the quality and accessibility of health care, placing emphasis on the human capital, the person value in the knowledge-based economy for prosperous development of the state.*

Keywords: human capital, public health care, effectiveness, public finance management, complex indicator

JEL codes: H51, I15, I18, I38, E24

1 Introduction

Over the years, scholars in many countries around the world have been paying special attention to the issue of assessing the efficiency of spending public funds for health care (Arrow, 1963; Anderson and Poullier, 1999; Getzen, 2000; Berger and Messer, 2002; Alfonso and Miguel, 2005; Bokhari et al., 2007; Blomqvist, 2011; Tae and Shannon, 2013; Kulkarni, 2016). This interest is due to the fact that public health is one of the key parameters determining human capital (Blomqvist, 2011). As many authors have noted (Anton and Onofrei, 2012; Bitran, 2012; Bokhari et al., 2007; Novignon et al., 2012), the lack of financing of the health care sector and low efficiency of public policy in the health care field are particularly acute in developing countries.

Crisis phenomena periodically occurring in the world economy aggravate these problems even more (Anton and Onofrei, 2012). As a result, despite of increasing public expenses for health care, their efficiency remains low (Anton and Onofrei, 2012; Chakraborty et al., 2013).

When assessing the efficiency of public expenses for health care many authors traditionally analyze such parameters as population life expectancy, infant mortality rate, surplus of births over deaths, sufficiency of medical institutions for population, etc.

The results of studies by a large number of scholars (Anton and Onofrei, 2012; Novignon et al., 2012) come to a conclusion that the differences in indicators characterizing population health in many developing countries of the world, as well as in Eastern European countries are conditioned by various levels of GDP and overall expenses for health care. These results also coincide with the results of other researchers (Rajkumar and Swaroop, 2008; Bhalotra, 2007). The methodological principles, which these researches were based upon (Anton and Onofrei, 2012; Rajkumar and Swaroop, 2008; Bhalotra, 2007), are related to the use of a regression analysis of structured statistical data and econometric approaches (Gerdtham and Jonsson, 2000).

At the same time, a number of studies (Kulkarni, 2016; Alfonso and Miguel, 2005; Berger and Messer, 2002; Bokhari et al., 2007; Tae and Shannon, 2013) rebuts the direct correlation between public expenses for health care and population health indicators and shows contradictory results.

So, using the health care production function and regression analysis Kulkarni (2016) showed that there is a direct interrelation between the health indicators and GDP per capita, as well as between the literacy level of the adult population and personal expenditures of the population of the BRICS countries with developing economy. The author also found out that an increase of the amount of expenses for public health care in the BRICS countries cannot ensure improvement of the population health indicators, unless the system of financing of health care institutions is significantly improved. The research also confirmed the conclusion that in developing countries, where per capita income is low, a non-selective increase of public expenses for health care with high net cost may have an adverse effect on the health care efficiency. A possible reason for this abnormality may lie in the fact that the marginal profit from increasing public expenses may be lower than the costs due to high taxes. The empirical results of a study carried out in relation to the BRICS countries show negative correlation between the expenses for public health care and children mortality rate. So, an increase in public expenses is not enough to achieve the desired improvement of results regarding population health (see also Getzen, 2000).

To assess public expenses for education and health care Alfonso and Miguel (2005) applied the non-parametric statistics methods. The authors developed an indicator of the efficiency of public expenses for education and health care, that allowed to rank the OECD countries by the efficiency levels. Alfonso and Miguel (2005), as well as Kulkarni (2016), came to a conclusion that different GDP per capita level or adult population education level in the studied developed countries to a greater extent conditions different results of assessing the health care or education efficiency, than an efficient public policy. In this regard many authors (Anderson et al., 2000; Thomson et al., 2009; Stabile and Thomson, 2014) highlighted the change of the role of public expenses in improvement of population health indicators in developed countries.

In their work (Berger and Messer, 2002) the authors also showed that an increase of medical insurance coverage in twenty OECD countries to a greater extent has an impact on mortality reduction, than the level of public expenses for health care. Strenghtening the role of additional private medical insurance as one of the grounds of improving population health indicators was also highlighted in the work (Rebba, 2014).

At the same time, Bokhari et al. (2007) using an econometric method studied the interrelation of public expenses for health care per capita and average per capita income and the two indicators characterizing population health: children aged under 5 mortality and maternal mortality. The authors managed to find out that there was a reverse interrelation between these indicators, which was confirmed by negative indicator values of elasticity between the two above specified indicators and budgetary expenses for

health care. Similar results regarding the interrelation of infant mortality and public expenses were received by Tae and Shannon (2013). However, based on the results of the study by Tae and Shannon (2013), the elasticity of the expected life expectancy at birth and the public expense level in seventeen OECD countries was positive.

The objective of this work is to study the efficiency of public financing of health care in regions of the Russian Federation using a methodology developed by the authors, by differentiating the regions by the quality level of managing public finances in the health care sector, as well as by assessing the impact of the public financing policy in the health care field on key indicators of the population life and health.

2 Methodology and Data

The authors of this article suggested a methodology of assessing the efficiency of the public policy of the Russian Federation regions health care financing using econometric approaches and mathematical statistics methods. The methodology meets the ease of use requirements conditioned by the accessibility of source information, since the assessment is based on the analysis of the official data from open databases of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation for 2015. This methodology was approved based on the data on 85 regions of the Russian Federation as of 2015.

To this end, 47 indicators were considered, which were divided into two groups. The first group characterizes health care resource support. In particular, the first group indicators include the following ones:

- Gross regional product per capita across the constituent entities of the Russian Federation,
- Subventions from the budget of the Federal Compulsory Medical Insurance Fund to budgets of territorial compulsory medical insurance funds in relation to the number of insured persons,
- Subventions of constituent entities of the Russian Federation from the federal budget for health care in relation to the number of population,
- Expenses for health care of consolidated constituent entities of the Russian Federation in relation to the number of population,
- Receipt of funds to the budget of territorial compulsory medical insurance funds in relation to subventions from the Federal Compulsory Medical Insurance Fund,
- Subventions from Federal Compulsory Medical Insurance Fund in relation to the gross domestic product by constituent entities of the Russian Federation,
- Average wage of doctors and health care workers with higher medical or another higher education,
- Sufficiency of medical personnel per 10,000 residents,
- Sufficiency of hospital beds per 10,000 people (including the beds of day-patient facilities),
- Sufficiency of medical institutions for population (per 10,000 residents) and others.

The second indicator group is represented by indicators reflecting health care affordability and quality. The indicators of this group include:

- The number of insured persons in relation to the number of population,
- The number of population per one doctor as of the end of a year,
- The share of institutions having day-patient facilities in medical institutions,
- Hospitalization level (ratio of the number of people hospitalized by emergency ambulance services to 1,000 persons of population),
- The share of working-age population in the overall population,
- Population life expectancy,
- Infant mortality,

- Surplus of births over deaths,
- The number of abortions per 100 births and others.

The above mentioned indicators were grouped by their impact on the efficiency of the Russian Federation regions health care financing system.

Using expert assessment methods in relation to each analytical indicator the authors revealed the limit standard values of these indicators for a conditionally reference region with high (region 1) and low (region 2) quality level of managing public finances in the health care sector. Formation of the two sets of threshold values of indicators (region 1 and region 2) allows to split the aggregate of analyzed regions into three groups: regions with a high level of efficiency of the public policy of health care financing, regions with a low level of such efficiency and regions that, falling in the value interval between the first two groups, demonstrate moderation in managing public finances in the health care sector.

Further, the authors of this study carried out a standardization of the above mentioned indicators and determined an integral indicator of the efficiency of the public policy of the Russian Federation regions financing. The essence of the standardization is that during assessing the level of managing public finances in the health care sector the calculated indicators may have various dimension, importance or weight. In this regard, the authors used a method based on linear conversion of initial indicators: so, the values of standardized indicators will fall within the specified interval from 0 to 1. Such standardization will result, on the one hand, to loss of dimension, however, on the other hand, the structure of changes in certain indicators is preserved, which makes it possible to compare them and to display in a unified coordinate system. To carry out the standardization process indicators are classified by two groups of impact on the efficiency of the Russian Federation regions health care financing system: an increase in value of one indicators results in decrease of the quality of managing public finances in the health care sector, and an increase in value of other indicators results in increase of the quality of managing health care public financing. Calculation of standardized indicators is carried out according to the following formulas.

Minimizing indicators group:

$$Z_{ij}^{*} = \frac{Z_{ij} - Z_{i\min}}{Z_{i\max} - Z_{i\min}}, \quad 0 \le Z_{ij}^{*} \le 1. \tag{1}$$

Maximizing indicators group:

$$Z_{ij}^{*} = \frac{Z_{i\max} - Z_{ij}}{Z_{i\max} - Z_{i\min}}, \; 0 \le K_{ij}^{*} \le 1. \tag{2}$$

where Z_{ij} is the calculated value of the i^{th} coefficient of the system of health care public financing efficiency indicators in the j^{th} region,

Z_{ij}^{*} is the standardized indicator of the i^{th} coefficient of the system of health care public financing efficiency indicators in the j^{th} region,

$Z_{i\max}$ - the highest calculated value of the i^{th} coefficient,

$Z_{i\min}$ - the lowest calculated value of the i^{th} coefficient.

To receive a numerical comprehensive assessment of the efficiency of public financing of health care in regions the authors added the suggested methodology with a calculation of

an integral standardized indicator ($Z^{*health\ care}_{complex\ j}$). This indicator is calculated as the sum of coefficients included in the criteria system used to assess the quality level of health care public financing in regions of the Russian Federation including the two groups of indicators.

$$Z^{*health\ care}_{complex\ j} = \sum Z^{*}_{ij} \quad (3)$$

where $Z^{*health\ care}_{complex\ j}$ is of the quality level of managing public finances in the health care sector of the j^{th} region.

The received value of this indicator is compared with a corresponding value of the integral standardized indicator reflecting the standard value for a region, relating to a group with high, medium and low level of the efficiency of regional health care public financing. The lower the value of the integral standardized indicator of the quality of managing public finances in the health care sector in regions ($Z^{*health\ care}_{complex\ j}$), the more efficient is the carried out public policy of health care financing in such regions. It allows to rank regions by value $Z^{*health\ care}_{complex\ j}$, with simultaneous splitting them into groups (high, medium and low quality level of managing public finances in the health care sector).

The second part of the research involves studying the efficiency of public financing of health care by analyzing the interrelation of standardized indicators of health care resource support groups and standardized indicators reflecting health care affordability and quality in regions of the Russian Federation. When carrying out this part of the research, the authors used a regression analysis.

3 Results and Discussion

Practical implementation of the suggested methodology covered 85 regions of the Russian Federation and allowed to rank the territories by the effectiveness of health care public financing as of 2015. Ranking was carried out based on the integral standardized indicator of the quality of managing public finances in the health care sector in regions. A rating of regions by the quality level of managing public finances in the health care sector in 2015 is shown in Table 1. Leading regions in each of the above specified quality levels of managing public finances in the health care sector in regions are shown in Table 1. The Table 1 demonstrates that regions with high quality level of managing public finances in the health care sector are absent.

Table 1 Rating of regions of the Russian Federation by quality level of managing public finances in the health care sector in regions, 2015 (a fragment)

Region of the Russian Federation	**Indicator value** $Z^{*health\ care}_{complex\ j}$	**Place in the rating**
Regions with medium quality level of managing public finances in the health care sector		
Kamchatka region	37.59	1
Khanty-Mansiysk Autonomous District	38.34	2
Murmansk region	38.50	3
Yamalo-Nenetsk Autonomous District	38.84	4
Magadan region	40.62	5
Sverdlovsk region	41.19	6
Kostroma region	41.54	7

Chelyabinsk region	42.14	8
Moscow region	42.38	9
Rostov region	42.54	10
Regions with low quality level of managing public finances in the health care sector		
Tomsk region	46.30	31
Primorye region	46.38	32
Republic of Karelia	46.55	33
Republic of Chuvashia	46.75	34
Republic of Komi	46.81	35
Penza region	47.04	36
Republic of Bashkortostan	47.16	37
Belgorod region	47.28	38
Saratov region	47.43	39
Republic of Buryatia	47.64	40
…		
Tver region	51.42	72
Ivanovo region	51.64	73
Evreiskaya Autonomous District	51.77	74
Pskov region	51.87	75
Tula region	52.30	76
Lipetsk region	52.35	77
Bryansk region	52.36	78
Republic of Mordovia	52.43	79
Republic of Kalmykia	53.86	80
Republic of Mari El	54.46	81

Source: authors' calculations based on the data of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation

The received results of determining a numerical value of a region rank will allow to make at the governmental level efficient financial decisions in relation to specific regions of the Russian Federation, which will foster the improvement of the health care quality and affordability, while focusing on the human capital.

Some most interesting results of assessing the closeness of interrelation between standardized indicators of health care resource support groups and standardized indicators reflecting health care affordability and quality in regions of the Russian Federation are shown in Table 2.

Table 2 Results of a regression analysis of the closeness of interrelation between standardized indicators of life expectancy, infant mortality and health care resource support indicators, 2015 (a fragment)

Health care resource support indicators	**Life expectancy standardized indicator**			**Infant mortality standardized indicator**		
	α	**β**	**R^2**	**α**	**β**	**R^2**
Gross regional product per capita across the constituent entities of the Russian Federation	0.58	0.58	0.0004	0.17	0.10	0.01
Public expenses for health care of regions of the Russian Federation in relation to the number of population	0.52	0.22	0.11	0.24	0.14	0.03

Average wage of doctors and health care workers with higher education	0.69	-0.17	0.06	0.32	-0.07	0.01
Sufficiency of hospital beds per 10,000 people	0.28	0.70	0.53	0.13	0.32	0.09
Sufficiency of medical institutions for population	0.31	0.60	0.32	0.22	0.11	0.01

Source: authors' calculations based on the data of the Federal State Statistics Service, the Ministry of Finance and the Federal Compulsory Medical Insurance Fund of the Russian Federation

The data in Table 2 show that the differences in life expectancy and infant mortality levels in regions of the Russian Federation can be explained to a greater extent by various degree of sufficiency for population of various regions of hospital beds per 10,000 people, sufficiency of medical institutions for population, than by the level of gross regional product per capita and expenses for health care. The received results coincide with the results received by Kulkarni (2016) and demonstrate that to improve the population health and life quality, which are ones of the most important components of the human capital, an increase in public expenses is not enough (see also Getzen, 2000). One needs to improve the system of financing of medical institutions itself, as well as to increase the affordability of the whole set of medical services for population; financing of innovations in medicine and their further implementation in the practice of medical institutions is also important.

4 Conclusions

Public health indicators are ones of the key components of the human capital. In this regard, as assessment of the efficiency of financing of public expenses for health care plays an important role when assessing the population life and health indicators.

The study conducted by the authors in this work allows to come to a number of important conclusions. Firstly, the efficiency of health care financing depends largely on the quality of managing public finances by territorial authorities. The methodology, developed by the authors, of a comprehensive assessment of the efficiency of public policy of health care financing, allowed to rank the territories by the effectiveness of health care public financing. It is expected that a regular monitoring of regional ranks will encourage taking effective financial decisions aimed at improvement of health care quality and affordability.

Secondly, the authors carried out an assessment of the interrelation of the developed standardized indicators of life expectancy, infant mortality and health care resource support indicators. The authors found out that the amount of expenses for health care to a lesser extent impacts on the life expectancy and infant mortality indicators in regions, than the directions of spending such funds. In particular, the most strong interrelation of life expectancy and infant mortality was established with the standardized indicator of sufficiency of hospital beds per 10,000 people. The received results coincide with conclusions received by other researchers (see, for example, Kulkarni, 2016; Getzen, 2000). An increase in the population health indicators is possible through reforming the system of financing of medical institutions aimed at increasing of affordability of medical services and development of innovations in medicine.

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Personal income tax redistribution: new possibilities for fiscal federalism in Russia

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Abstract: *The purpose of this study is to develop a calculation mechanism for differentiation of personal income tax revenues among three budget levels: Federal, regional and local, instead of currently existing administrative distribution mechanism, which does not take into consideration real economic capacity of the territories. The authors tested the following hypothesis: return of tax revenues differentiation between Federal, regional and local budget levels within the framework of economic model, taking into consideration a number of differentiating criteria, developed with allowances made for regions social and economic indexes, will allow to tie territories taxable capacity with social and economic peculiarities of their development. Methods of factor analysis, time-series analysis allowed to test the algorithm built for dividing tax revenues, confirming their relevance and significant value. We evaluated each criteria received for 83 regions of the Russian Federation for the period of 2010-2014 and identified the possibility of splitting revenues from personal income tax between the Federal, regional and local budgets. Nizhny Novgorod region, one of the regions of Russian Federation, was taken as an example in the course of study. As the result of this study the authors exposed 4 groups of personal income tax possible distribution among three budget levels. Check-up analysis showed, that the model, offered by the authors of this research for consideration, allows to increase territories tax potential, the level of their own revenues, financial stability of these territories, and it can be used in the countries with federal form of government. Replacement of existing mechanism of tax revenues administrative distribution according to budget levels for differentiating calculation mechanism would create additional incentives for development of the economy in regions, which will encourage the implementation of justice concept in tax assessment.*

Keywords: tax redistribution , personal income tax, tax revenues, budget, fiscal federalism

JEL Classification: H21, H61, H77, H230

1 Introduction

The issue of tax proceeds differentiation among budget levels became one of the most challenging issues in the 21st century for Federative States. Taxes are not only the main source of budget revenues, but are the basis of financial stability, independence of each budget level and of the State in general (Creedy, 2010; Oates, 2006; Yashina et al., 2017). Representatives of unitary states also joined the research in this area within the last five years (Rattso and Stokke, 2017). In many developed countries in North America and Europe the distribution of tax proceeds among budget levels takes place in accordance with proportionate established level of tax rate (territorial and unified federal tax rate components are distinguished (Creedy, 2010). The size of territorial component depends on the region development degree, its distance from financial and administrative centers (Hassan and Bogetić, 1996; Jackson and Brown, 1994; Jenderny, 2016). However, regulatory documents do not contain the information on mathematical (calculated) justification of such a division, gradation of tax rates is conventionalized, it depends on subjective approach of financial institutions and Governments of specific countries (De Rooy, 1982; Naseem and Reesor, 2011; Yashina et al., 2017).

2 Methodology and Data

That is why the purpose of our study is to create calculation mechanism of tax differentiation among budget levels, with personal income tax taken as an example (income tax, employment tax). To achieve this purpose, we: developed econometric model of personal income tax redistribution, including three budget levels – federal, regional and local; improved differentiating indexes system, presented in the earlier published articles (Yashina et al., 2017); chose integrated index to compare data in temporal series; calculated indexes for 1 138 randomly selected municipal settlements of 83 territorial entities of Russian Federation (this equals 5% of the total number of municipal settlements in Russia) for the period from 2010 until 2014 in accordance with official data of Federal Revenue Service and Federal Office for National Statistics of Russian Federation; using theory of weights, we conducted distribution of personal income tax proceeds on percentage basis among federal, regional and local budgets in the regions of Russian Federation; conducted mathematical check of the developed algorithm. Personal Income Tax is a budget revenue generating tax. According to economists and scientists opinions, income tax (personal income tax in Russia) - is the major tax, that covers the highest amount of taxpayers, and it is the most productive tax as well (the change in approach in its collection reflects on the amount of the State revenue really fast) (De Rooy, 1982; Ferrando et al., 2012; Gómez et al., 2014; Montero and Picón, 2010; Yashina et al., 2017). In this regard, the rational distribution of its proceeds can have major impact on budgets revenue. It is necessary to mention, that up until now the detailed distribution algorithm is still not developed. Scientific researchers and economists just offer various indexes, that could be taken into consideration within such an algorithm, though the systemized approach to the issue of tax distribution still does not exist. While distributing personal income tax among budget levels the scientists suggest to take into consideration: the size of tax potential of the region (Gómez et al., 2014; Jenderny, 2016); territories investment activity (Hassan and Bogetić, 1996; Perese, 2011); population social needs (Pereira and Pereira, 2014); population wealth (Yashina et al., 2017). Scientific literature research showed, that, despite of the three-level authority system existence in Federative States, the issue of mathematical distribution of income tax among three levels of the budget was not brought up yet. Taking into consideration the results, obtained by foreign researchers, as well as the results, obtained in the course of our own studies, we formulated the following hypothesis. We suggested that:

- personal income tax has to be distributed among three levels of the budget (federal, regional and local) on the basis of calculation mechanism, taking into consideration a number of differentiating criteria.

In the course of study on distribution of personal income tax proceeds among federal, regional and local budget levels, we developed calculation methods for 9 differentiating criteria:

1) Tax Base EQuality Indicator (TBEQI) - the ratio of the tax base and tax amount of individual taxpayers registered in the territory of each region.

2) Tax Base Immensity Indicator (TBII) - is the ratio of the tax base to the amount of tax revenues in the region. The second option is calculation in relation to overall income in the region.

3) Tax Base Stability Indicator (TBSI) - the share of tax in the main indicator of a country's development – in GDP.

4) Tax Base Efficiency Indicator (TBEI) - the ratio of the amount of the additional payments received in the course of tax audits and the amount of tax paid.

5) Tax Base Disbalance Indicator (TBDI) - the ratio of personal income tax and regional budget expenditures.

6) Well-Being Indicator (WBI) - the ratio of the tax base and a level of incomes of the population in a particular region.

7) Tax Base Mobility Indicator (TBMI) - the ratio of the tax base and the number of organizations in the region.

8) Social Tension Indicator (STI) – the ratio of the tax base and the number of employable population.

9) Activity Indicator (AI) – the ratio of the tax base and the population number of municipal settlement.

The two last indicators specify mobility indicator from the social point of view. During the time of our reseach it was important for us to determine, how invariable is each indicator for each specific municipal settlement in the course of several years. For each indicator temporal series were built, taking into consideration the data, used for its calculation. To expose the dynamics of the series received, variation coefficient was used, which reflected data point dispersion degree, and which allowed to evaluate the block of data for consistency. We used generally recognized statistical border at 33.3% as a boderline case. If the value received was below the borderline, then the aggregate was considered to be consistent, if not – non-homogenious. In our case consistency indicates data stability, used when calculating the criteria. Stable data provide tax allocation according to a certain criteria to the subject budget. Data instability can indicate the necessity of additional control and centralization. Accordingly, in this case it is necessary to allocate the tax to a higher budget level (for example, regional level) (Yashina et al., 2017).

3 Results and Discussion

For the study, we adopted as an axiom the results, obtained in a previous study, of dividing income tax between the regional and federal levels (Yashina et al., 2017). According to our division algorithm, which was created and mathematically proven on the error, the regions of the Russian Federation were divided into 8 groups according to the size of the tax deductions - table 1.

Table 1 Groups of regions of Russian Federation according to the share of personal 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% - 14.5%	85.5% - 95.5%	Regions: Ivanovo, Smolensk, Tula, Tver, Ryazan', Yaroslavl', Archangelsk, Murmansk, Vologda, Rostov, , Samara, Saratov, Ul'yanovsk, Kurgan, Tumen', Novosibirsk, , Chita Autonomous areas: Republics: Tatarstan, Kareliya , Agigeya, Kabardino-Balkariya, Severnaya Osetiya, Mariy-El, Udmurtiya, Chuvashiya, , Khakassia, Saha Territoties: Krasnodar, Stavropol', Altay, Primorskiy, Khabarovskiy	0% to the Federal budget, 85% to the regional budgets (except for some types of activities)
2	14.5% - 24.5%	75.5% - 85.5%	Regions: Nizhny Novgorod ,Vladimir, Kaluga, Kostroma, Belgorod, Kursk, Kaliningrad, Leningrad, Novgorod, Pskov, Orenburg, Sverdlovsk, Irkutsk, Amur, Magadan, Sakhalin,	

			Evreiskaya Cities: Moscow, Sankt-Petersburg Territories: Krasnoyarsk, Kamchatka, Khanty-Mansiisk Republics: Kalmykiya, Buryatiya,Tyva
3	24.5% - 34.5%	65.5% - 75.5%	Regions: Omsk, Tomsk, Orel, Tambov Republics: Dagestan
4	34.5% - 44.5%	55.5% - 65.5%	Regions: Lipetsk, Vologda, Astrakhan`, Kirov, Chelyabinsk Republics: Ingushetiya, Komy, Chechnya
5	44.5% - 54.5%	45.5% - 55.5%	Regions: Penza Republics: Karachaevo-Cherkessia, Mordoviya, Altay, Bashkortostan
6	54.5% - 64.5%	35,5%- 45.5%	-
7	64.5% - 74.5%	25.5% - 35.5%	-
8	74.5% - 84.5%	15.5% - 25.5%	Autonomous area: Chukotka, Yamalo-Nenec

Source: authors

For each of 83 Russian regions the percentage of deductions in the regional budget was taken into consideration, which is represented by a fragment of the table 1. To illustrate how this algorithm works, let's take a look at Nizhny Novgorod region. According to table 1 average income tax division between the regional and federal level looks like 80% (in the regional budget) to 20% (federal budget). For research purposes we conventionally assigned to federal level 20% of income tax revenues and continued research in the direction of the division of the remaining 80% tax between the regional and local level. We calculated 9 mentioned above indicators for the period of 2010-2014. Then the variation coefficient is an integral indicator time series was calculated. An example of the calculation is one of Russian municipalities of Nizhny Novgorod region - the city of Nizhny Novgorod, is presented in table 2.

Table 2 The value of indicators defining the theoretical criteria for the distribution of personal income tax for the city of Nizhny Novgorod and the value of the variation coefficient for 2010-2014

Indicator	**Tax period (year)**					**Coefficient of variation, %**
	2010	**2011**	**2012**	**2013**	**2014**	
TBEQI	0.78	0.65	0.69	0.92	0.71	37.4
TBII	0.27	0.21	0.17	0.14	0.29	32.4
TBSI	0.10	0.10	0.09	0.04	0.12	21.1
TBEI	0.88	0.67	0.69	0.23	0.73	36.2
TBDI	0.51	0.38	0.54	0.76	0.52	33.6
TBMI	0.47	0.64	0.35	0.78	0.81	35.9
WBI	0.32	0.39	0.44	0.35	0.49	28.9
STI	0.42	0.56	0.39	0.61	0.70	38.3
AI	0.56	0.47	0.44	0.51	0.50	33.1

Source: authors

According to Table 2, variability of the following indicators: Tax Base Immensity Indicator (TBII), Tax Base Stability Indicator (TBSI), Well-Being Indicator (WBI) amounted to less than 33.3%, which means the possibility of tax proceeds distribution in favor of the city of Nizhniy Novgorod, and as for the other indicators, it showed that the tax proceeds distribution was in favor of Nizhniy Novgorod region, as variability of other indicators was more than 33.3%. To achieve this we use the theory of determining weight indicators (Fishborn Formula). For the compilation of the weighting system we transposed indicators in descending order of importance. For us the significance of descending would mean the removal of the threshold values in 33.3%. Bearing in mind that the lower the coefficient of variation, the more stable the system is, it will be enough for us to arrange the values of coefficients for each subject in ascending order. After that we can take advantage of the proposed formula for calculating the weight of each indicator:

$$a_i = \frac{2 \times (n - i + 1)}{n \times (n + 1)} \quad (1)$$

where a_i- the i-th indicator weight, *i*-the number of indicator for a specific region, *n* - is the number of indicators.

Then, for personal income tax distribution between regional and local budgets on the basis of the weights of each indicator, we added weghts of those coefficients, that are attributed to regional or local levels of suggested budgets. The results, received for the city of Nizhniy Novgorod, are shown in Table 3.

Table 3 The value of the weights coefficients of variation for the city of Nizhny Novgorod. Match the value of indicators and budget levels for the city of Nizhniy Novgorod

Indicator	The coefficients of variation, %	Weight of the coefficient	Recommended level of budget
TBSI	21.1	0.200	Local budget
WBI	28.9	0.178	
TBII	32.4	0.156	
AI	33.1	0.133	
TBDI	33.6	0.111	Budget of the region
TBMI	35.9	0.089	
TBEI	36.2	0.067	
TBEQI	37.4	0.044	
STI	38.3	0.022	

Source: authors

Acording to Table 3, by adding weights of indicators, attributed to one budget level, we have:

Share of tax proceeds to Regional budget =13,3%+11,1%+8,9%+6,7%+4,4%+2,2%=46,6%

Share of tax proceeds to Local budget = 20%+17,8%+15,6%= 53,4%.

If we take into consideration, that 80% of personal income tax proceeds make it to consolidated budget (regional and local budgets) of the subject (Nizhniy Novgorod region) according to the result of previous research, then the real flow of revenue is:

To the regional budget=80%*46,6%=37,28%,

To the local nudget = 53,4%*80%=42,72%.

Thus, according to the results of conducted research, we suggest for Nizhniy Novgorod region to redistribute personal income tax proceeds among the budgets in the following

way: 20% to Federal budget, 40% to regional budget and 40% to the local budget. Similar calculations were conducted for all regions of Russian Federation, all the data received is presented in Table 4.

Table 4 Distribution of personal income tax between levels of budget (fragment)

	The share of income		
Name of region/municipality	**To the Federal budget**	**To the budget of the region**	**To the local budget**
Voronezh region/city of Voronezh	50.00%	25.00%	25.00%
Moscow region / city of Moscow	50.00%	45.00%	5.00%
Orel region / city of Orel	10.00%	60.00%	30.00%
Tula region /city of Tula	30.00%	40.00%	30.00%
Vologda region / city of Vologda	40.00%	35.00%	25.00%
Kaliningrad region/ city of Kaliningrad	15.00%	55.00%	30.00%
Republic of Dagestan /city of Mahachkala	85.00%	10.00%	5.00%
Republic of Ingushetiya /city of Magas	60.00%	25.00%	15.00%
Orenburg region / city of Orenburg	20.00%	50.00%	30.00%
Perm territory / city of Perm	55.00%	40.00%	5.00%

Source: authors

Using Sturges formula and statistical dispersion formula, we studied municipal settlements, (1 138 settlements) in Russian Federation, that we divided into 10 groups with dispersion of proceeds – 2,5%, Table 5.

Table 5 Groups of regions of Russian Federation according to the share of personal income tax revenues to the local budget and regional budgets (fragment)

Group	**The recommended share of revenues to the local budget**	**Cities**	**The current ratio of revenues to the local budgets and regional budgets**
1	5% - 9%	Moscow, Krasnodar, Stavropol, Perm, Yaroslavl`	15% (max) to the local budget, 85% [max] to the regional budgets
2	9% - 13%	Vladimir, Kaluga, Kostroma, Belgorod, Kursk	
3	13% - 17%	Omsk, Tomsk, Nadim, Lipetsk, Sankt-Petersburg	
4	17% - 21%	Chelyabinsk,Penza, Ufa, Kirov, Irkutsk, Amursk	
5	21% - 25%	Salehard, Voronegh, Novgorod, Pskov, Murmansk	
6	25% - 29%	Ivanovo, Smolensk, Tver, Penza, Rostov, Samara	
7	29% - 33%	Tula, Ryazan`,Archangelsk, Orenburg, Kaliningrad,	
8	33% - 37%	Novosibirsk , Saratov, Ul'yanovsk, Kurgan, Tumen	
9	37% - 41%	Khabarovsk, Kaluga, Krasnoyarsk,	
10	41% - 45%	Nizhny Novgorod, Tambov, Vladivostok	

Source: authors

Using the same approach, we divided all the subjects of Russian Federation in 8 groups, with 7% dispersion of proceeds. The financial bodies of the territories can use tables 1 and 5 (full version) data for individual division of personal income tax proceeds or to use different extended groups of territorial division. Thus, according to the results of our previous research (Yashina et al., 2017), we also distinguished two big groups of personal income tax proceeds possibile division between federal and reginal levels (10% to 90% and 20% to 80%). Municipal settlements can be divided into 4 big groups, with

the maximm number of settlements as the main criteria (10%, 15%, 25%, 35%). As the result we have 8 groups of personal income tax division among three levels – Table 6.

Table 6 Groups of regions of Russian Federation according to the share of personal income tax revenues t the local budget and regional budgets (fragment)

Group	The recommended share of revenues to the			Cities
	Federal budgets	regional budgets	local budgets	
1	**10%**	**80%**	**10%**	Mahachkala, Yakutsk, Kaliningrad,
2	**10%**	**75%**	**15%**	Yaroslavl`,Magas
3	**10%**	**65%**	**25%**	Orel, Vologda, Orenburg, Sankt-Petersburg
4	**10%**	**55%**	**35%**	Khabarovsk, Kaluga, Krasnoyarsk
5	**20%**	**70%**	**10%**	Moscow, Yaroslavl`, Ekaterinburg
6	**20%**	**65%**	**15%**	Omsk, Tomsk, Nadim,
7	**20%**	**55%**	**25%**	Voronezh, Novgorod, Pskov, Murmansk
8	**20%**	**45%**	**35%**	Nizhny Novgorod, Tambov, Vladivostok

Source: authors

To check the results obtained, we used fuzzy majority principle, as well as conducted approximation error check. According to fuzzy majority principle, to determine weight coefficients a system was built for 9 variability indexes. To achieve this we chose basic function of weight determination, that accepts only two borderline values 0 (0%) или 1 (100%), that is F(0)=0 и F(1)=1, second degree polynomial $f(x) = ax^2 + bx + c$, and took into consideration an assumption, that the meaning of the first weight coefficient in our case corresponds to the weight, received by using Fisburn formula, which is 20%. While solving the issue, we found fixed multipliers and got weight values, similar to the ones, presented in Table 3. Thus, as in the case of weight determination according to Fisburn formula using fuzzy majority principle, the ratio of personal income tax proceeds for Nizhniy Novgorod region has to be distributed among the budgets approximately in the following proportions: 20% to the Federal budget, 40% to the regional budget, and 40% to the local budget. Since Fisburn model is not economically founded, we checked the data received through multiple regression equation. Then, using the tabular format of significance level (F-тест), composed by Fisher at different degrees of freedom, we determined the value of the built model. According to calculations, using the data received earlier, at significance level $\alpha = 0,0005$, factual significance (F) will amount to 24,91, that is higher than table factual significance ($F_{tabl} = 3,44$), that is why the equation of regression is statistically significant, as the built model as a whole. For reliability assessment we calculated average relative error of approximation as:

$$A = \frac{1}{9} * \sum_{j=1}^{9} \left| \frac{y_j - y_j^*}{y_j} \right| * 100\% \approx 0,48723\% \qquad (2)$$

Approximation error within 5-7% attests of good model fitting to given data. Since in our case A<5%, it is possible to say, that the model, built by the authors, has a fair accuracy.

4 Conclusions

The results, that were received, allow us to claim, that formulated hypothesis of the possibility of personal income tax redistribution in Russia among three budget levels on the basis of calculation mechanism, which takes into consideration a number of differentiating criteria, is proved to be true. The suggested algorithm, which uses statistical methods, allowed us to determine weight values in order to distribute personal income tax among regional and local budgets. The results of our study made the

suggestions of Jenderny, 2016; Montero and Picon, 2010; Naseem and Reesor, 2011 of the necessity to create calculation mechanism in distribution of tax proceeds to be more specific. Our conclusions partially confirm the conclusions, received by De Rooy, 1982; Creedy, 2010; Pereira and Pereira, 2014, about the fact, that personal income tax has to be left at the Federal budget's disposal in order for the State to conduct its social policy. On the other hand, they reject these conclusions, as we proved the effectiveness of personal income tax three-level distribution. Check-up analysis showed, that the model, offered by the authors of this study for consideration, allows to increase territories tax potential, the level of their own revenues, financial stability of these territories, and it can be used in the countries with federal form of government. Replacement of existing mechanism of tax revenues administrative distribution according to budget levels for differentiating calculation mechanism would create additional incentives for development of the economy in regions, which will encourage the implementation of justice concept in tax assessment. As a continuation of our research, we plan to develop an algorithm, that will allow to conduct not only gradual paired differentiation of tax proceeds among the three levels of the budget, but a simultaneous one. The calculation algorithm of personal income tax differentiating among the three levels of the budgets (federal, regional and local), suggested by us, can be used by federal and regional financial bodies of power for independent determination and validation of tax proceeds possible division among the budget levels.

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Assessment of Changes in the Trend of Interdependences between the Capital Market of Germany and the Markets of Poland, the Czech Republic and Hungary

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Abstract: *The subject of the article concerns the identification of a common factor (latent variable) describing the interdependence system for selected capital markets. Within the study we conducted an analysis of the correlation between the capital market of Germany and the markets of Poland, the Czech Republic and Hungary. The values of conditional correlations derived from the DCC-GARCH model were used to evaluate the interdependence between the capital markets. Then, based on the established interdependencies between the markets, a cointegration analysis was carried out. The degree of integration of conditional correlation series using the Phillips-Perron test was tested. Based on the Johansen procedure, a long-term system of linkages between the capital markets was determined. The identification of the cointegration process for the interdependence system was an argument for identifying a common factor on the basis of the affirmative factor analysis. The common factor reflects the leading direction of changes in the interdependence system between the German capital market and the markets of Poland, the Czech Republic and Hungary. The estimation of the square trend parameters for the identified common factor allowed us to determine the direction of change in the interdependence system between the examined capital markets. The results obtained confirmed that the increase in the level of interdependence was due to the global financial crisis and the slow stabilization of the analyzed markets.*

Keywords: capital markets interdependence, DCC-GARCH model, conditional variance, conditional correlation, confirmatory factor analysis

JEL codes: G12, G15, C58

1 Introduction

As a result of globalization progresses, there is a systematic increase in the interdependence between capital markets. This phenomenon is primarily due to the growing fundamental relationships whose structure and strength are disturbed by the transmission of shocks of different scales. When analyzing international relations, one can conclude that the dynamics of interdependence is constantly changing in the financial markets, which is particularly dynamic in the context of deep economic disturbances. Equally, when examining interdependence of capital markets, the importance of the period of stability ('tranquility') and the period of increasing instability ('crisis') are often highlighted. In times of tranquility, we are most likely to deal with the transmission of shocks that result from the majority of fundamental relationships. The existing market

clearing mechanisms allow shocks to be eliminated and markets returned to the state of relative equilibrium. In times of crisis, in turn, it is possible to generate shock transmissions, which are largely caused by factors that go beyond the existing fundamental linkages. A change is also possible in the fundamental linkages themselves, caused by these factors. Finally, under crisis there can often be noticed a growing correlation between capital markets, which in itself can be an interesting empirical problem. This issue creates the background to the analysis performed in this article, where a study of interdependence will be conducted between selected capital markets. The analysis of interdependence in capital markets had been addressed in numerous international empirical studies (Arshanapalli et al., 1995; Bekaert and Wu, 2000; Pericoli and Sbracia, 2003; Vychytilová, 2015; Fałdziński et. al., 2016; Heryán and Ziegelbauer, 2016; Meluzín and Zinecker, 2016; Vukovic et al., 2017).

Occurrence of crisis situations on financial markets can have a significant impact on changes in the functioning of the global economy, since shocks transmissions cannot be offset by the existing interdependence between markets. In the selected crisis period successive shocks, in addition to triggering a disturbance in the functioning of financial markets, may undermine the functioning of real economies (see: Gawrońska-Nowak and Grabowski, 2016; Glinka, 2016, Lenart et al., 2016; Balcerzak, 2016). Indeed, as a result of the recent global financial crisis, the financial market has not only declined, but the socio-economic situation of most economies significantly changed (Miklaszewicz, 2016; Lajtkepová, 2016; Balcerzak, and Pietrzak, 2016a; Pietrzak and Balcerzak, 2016a). Although the United States were the source of the global financial crisis, European economies suffered from it to a greater degree. In the EU countries there was a slowdown in foreign direct investment and in the level of enterprise investment. This has had a negative impact on the level of competitive potential of European economies and on the labour market (Kowalczuk, 2016; Murawska, 2016; Hadaś et al., 2016).

The major objective of the article is to identify the interdependence system between the capital markets of Germany, Poland, the Czech Republic and Hungary. The achievement of the assumed objective enabled us to distinguish a common factor which as a latent variable describes the formation of interdependencies for selected capital markets. The results of the analysis of global changes indicated that during the global financial crisis of 2007-2010 there was a significant increase in the interdependence between the studied markets.

2 Methodology and Data

The study carried out deals with identifying the system of linkages between the German capital market and the markets of Central and Eastern Europe (within the Visegrad Group). Despite substantial differences in the potential of Visegrad economies, global financial investors still treat them as a relatively homogeneous group, which is most often included into the emerging markets category. The study uses time series for the following stock indices: DAX (Germany), WIG (Poland), BUX (Hungary), PX (Czech Republic) for the years 2004-2014. Data was downloaded from the financial web site of 'yahoo' (http://www.finance.yahoo.com).

The DCC-GARCH model was used to identify the connections between the capital markets of Germany, Poland, the Czech Republic, and Hungary. In the DCC-GARCH model, in addition to equations for conditional variance, there are also conditional correlation equations (see: Engle 2002, 2009; Balcerzak et al. 2016; Szumilo et al., 2017). A correct identification of interdependence will allow to assess the strength of mutual interdependencies between the markets and to characterize changes in linkages over time. In order to establish a model specification, the AR-GARCH model was estimated based on return rates for individual stock indices. The selection of the best model specification for a single index was based on information criteria. For the DAX and BUX indexes, the model specification was established in the form of GARCH(1,1) model, and

for the PX and WIG indices, the model specification was AR(1)-GARCH(1,1). Therefore, the DCC-GARCH model specification can be written as follows (Engle, 2009):

$$\begin{aligned}
&\mathbf{Y}_t = \boldsymbol{\mu}_t + \boldsymbol{\varepsilon}_t,\ \boldsymbol{\varepsilon}_t \big| \mathbf{F}_{t-1} \sim t(0, \mathbf{H}_t, v),\ \mathbf{H}_t = \mathbf{D}_t \mathbf{R}_t \mathbf{D}_t,\\
&\mathbf{R}_t = \mathbf{Q}_t^{*-1} \mathbf{Q}_t \mathbf{Q}_t^{*-1},\\
&\mathbf{Q}_t = (1-\alpha-\beta)\mathbf{S} + \alpha(\mathbf{z}_{t-1}\mathbf{z}_{t-1}^{'}) + \beta \mathbf{Q}_{t-1},\\
&\mu_{i,t} = \gamma_{i,0} + \gamma_{i,1} y_{i,t-1},\ h_{i,t} = \omega_{i,1} + \alpha_{i,1}\varepsilon_{t-1}^2 + \beta_{i,1} h_{i,t-1}
\end{aligned} \tag{1}$$

where: $\mathbf{Y}_t$ - multivariate process, t - conditional t-distribution with *v* degrees of freedom, $\boldsymbol{\mu}_t$ - the conditional mean matrix, $\mathbf{H}_t$ - the conditional variance matrix, $\mathbf{R}_t$ - conditional correlation matrix, $\mathbf{Q}_t$ - quasi correlation matrix, $\mu_{i,t}$ - *i*-th equation of the conditional mean, $h_{i,t}$ - *i*-th equation of the conditional variance, $\alpha, \beta, \gamma_{i,0}, \gamma_{i,1}, \omega_{i,1}, \alpha_{i,1}, \beta_{i,1}$ - parameters of equations.

The next stage of the study was to check the stationarity of conditional correlation processes using the Phillips-Perron test. Having made a stationary analysis, cointegration was tested for conditional correlation processes. The cointegration analysis based on the Johansen procedure enabled us to ascertain whether interdependencies between the markets form a specific long-term linkages system (see: see: Engle and Granger, 1987; Boswijk and Doornik, 2004; Johansen, 1988; Zinecker et al., 2016; Pietrzak et al., 2017).

In the last step, a common factor was identified with the use of conditional correlation values corresponding to the market linkages in a given group. The values of a common factor reflect in a synthetic way the leading direction of changes for the interdependence system between selected capital markets. Confirmatory factor analysis was used to isolate the common factor (see: Loehlin, 1987; Bollen, 1989; Balcerzak and Pietrzak, 2016b, 2016c; Pietrzak and Balcerzak, 2016b).

3 Results and Discussion

According to the assumed research objective of the article, the analysis of the structure of relations between the capital markets of Germany, Poland, the Czech Republic, and Hungary using the DCC-GARCH model was conducted in the first step of the study. DCC-GARCH model parameters for DAX, WIG, BUX, and PX indexes are presented in Table 1. In case of the equations for conditional correlation and conditional variance only autoregressive parameters for the DAX and BUX indexes were statistically insignificant at the 5% significance level. The parameter *v* of the degrees of freedom of t-Student distribution as well as the parameters of the conditional correlation equation obtained in the second step of estimation are statistically significant. The conditions for the sum of the parameters α1, β1 and the sum of the parameters α, β are also satisfied.

As a result of the estimation of DCC-GARCH model parameters (for more details see Table 1) it was possible to determine the conditional correlation values for further pairs of indices. Analysis of the conditional correlation process allows assessing the strength of interdependencies between the examined capital markets as well as the identification of the upward or downward trends.

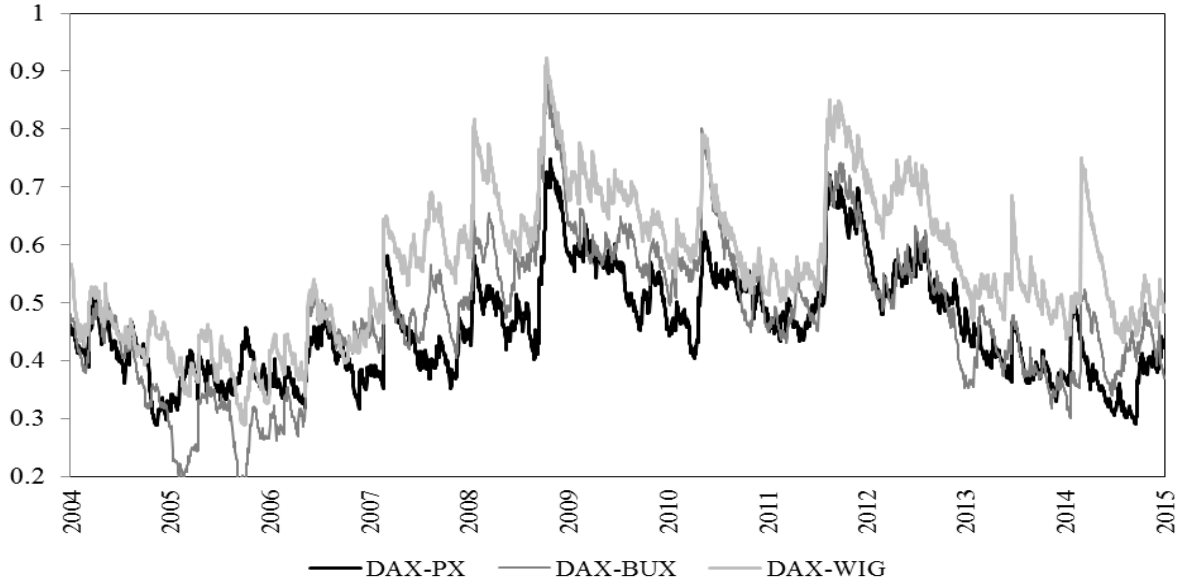
Table 1 DCC-GARCH model parameter estimation results.

The conditional variance equations					
Parameter	Estimate	p-value	Parameter	Estimate	p-value
γ_0 (DAX)	0.083	~0.000	γ_0 (BUX)	0.050	0.012
γ_1 (DAX)	-0.007	0.902	γ_1 (BUX)	0.027	0.172
ω_1 (DAX)	0.030	0.001	ω_1 (BUX)	0.040	0.001
α_1 (DAX)	0.097	~0.000	α_1 (BUX)	0.088	~0.000
β_1 (DAX)	0.886	~0.000	β_1 (BUX)	0.897	~0.000
γ_0 (WIG)	0.068	0.005	γ_0 (PX)	0.098	0.005
γ_1 (WIG)	0.060	~0.000	γ_1 (PX)	-0.002	0.002
ω_1 (WIG)	0.014	0.009	ω_1 (PX)	0.023	0.007
α_1 (WIG)	0.063	~0.000	α_1 (PX)	0.093	~0.000
β_1 (WIG)	0.928	~0.000	β_1 (PX)	0.897	~0.000
V	9.353	~0.000	-	-	-
The conditional correlation equation					
Parameter	Estimate	p value	Parameter	Estimate	p value
α	0.018	~0.000	β	0.957	~0.000

Source: own estimations

Figure 1 shows the conditional correlations between the DAX index and the BUX, PX 50 and WIG indices. Analysis of correlation shows that the interdependence between the German capital market and the Czech, Polish and Hungarian markets are similar. The strongest interdependence was noted between the German market and the Polish market. The weaker interdependencies can be found between the capital market of Germany and the Hungarian and Czech markets. It can be said that in the period under scrutiny, shock events in the neighboring German capital market are moving in a similar fashion to the Czech, Polish and Hungarian stock exchanges. This means that valuation of quotes on each of the examined capital markets is heavily dependent on the situation on the German capital market.

Figure 1 The interdependence system between selected capital markets



Source: own estimations

In the next step we investigated the degree of integration of conditional correlation processes for selected pairs of markets. For this purpose, the Phillips-Perron test was repeated and the test results for the time series examined are shown in Table 2 (see Phillips and Perron, 1988). The obtained results show that all the conditional correlation processes under investigation are integrated to the first degree. The identification of variability in variance may indicate the vulnerability of the examined capital markets to shocks from other markets and the long-term impact of shocks on the formation of interdependencies. Consequently, the Johansen procedure was carried out in the further part of the analysis, verifying the cointegration between the selected conditional correlation processes. The results are shown in Table 2. The test results for the number of cointegrating vectors indicate the presence of two cointegrating vectors.

Table 2 Results of analysis of integration and cointegration

Analysis of integration – Phillips–Perron test				
Indices	Time series	Test statistics	p-value	Order of integration
DAX, BUX	Levels	-0.747	0.392	I(1)
	Differences	-53.375	0.001	
DAX, PX	Levels	-0.629	0.444	I(1)
	Differences	-55.586	0.001	
DAX, WIG	Levels	-0.635	0.442	I(1)
	Differences	-53.665	0.001	

Analysis of cointegration - Johansen procedure				
Number of cointegrating vectors	Max-Eigenvalue test		Trace test	
	Test statistic	p-value	Test statistic	p-value
None	43.103	0.001	25.396	0.003
At most 1	17.707	0.006	17.270	0.004
At most 2	0.437	0.571	0.437	0.572

Source: own estimations

The last stage of the study consisted in conducting a confirmatory factor analysis (see: Bollen, 1989; Pietrzak and Balcerzak, 2016b). Based on the conditional correlation series for the pairs of indices (DAX, PX), (DAX, WIG), (DAX, BUX), a common factor was identified. This factor, as a latent variable, reflects in a synthetic way the synergy between the German market and the selected markets in Central and Eastern Europe. The results of the analysis are presented in Table 3, where the occurrence of only one factor was pre-assumed. All standardized evaluations are greater than 0.9, indicating the correct co-generation of the factor by all three conditional correlation processes. In this way, one factor explaining the evolution of conditional correlations for selected stock indices was determined for the interdependence system.

Table 3 Confirmatory factor analysis

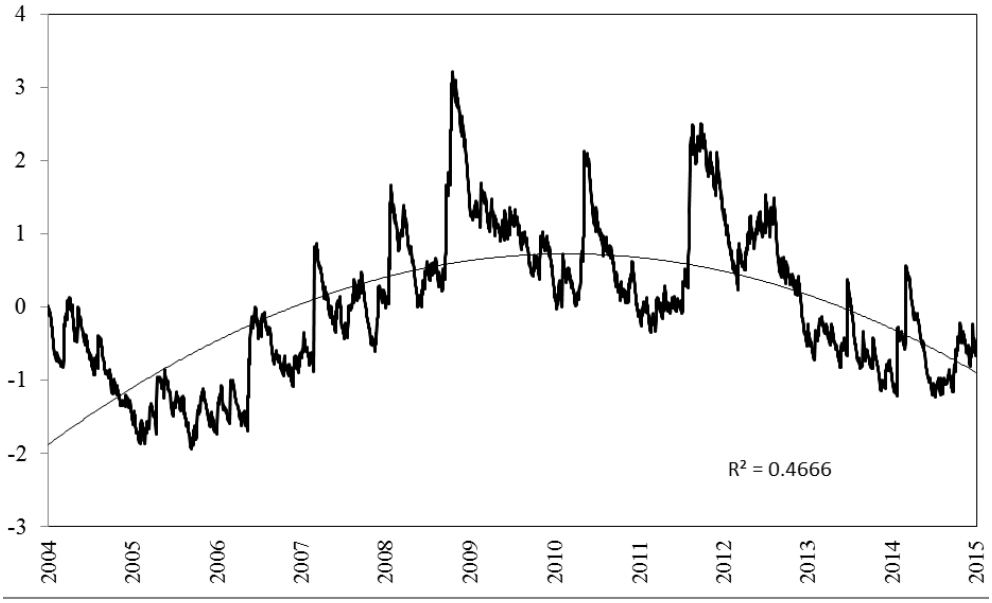
Correlation	**Parameter**	**Estimate**	**Standardized estimate**	**Factor Score Weights**	**p-value**
DAX-PX	α_1	1.000	0.962	0.012	-
DAX- WIG	α_2	1.486	0.931	0.011	~0.00
DAX-BUX	α_3	3.213	0.918	0.023	~0.00

Source: own estimations

The values of the common factor were obtained as the sum of products of values of Factor Score Weights (given in Table 3) and the values of the conditional correlations

between the markets. Analysis of the common factor value makes it possible to assess the interdependence system between selected capital markets (see: Figure 2). The volatility of the common factor allows two regularities to be identified. Firstly, there is a period of a systematic increase in interdependencies between markets. This period falls on the years of the common financial crisis in the period 2007-2012. Secondly, one can see a weakening of the level of interdependence between the capital markets after 2012 and the transition of these markets to a period of tranquility. These facts are confirmed by the shape of the square trend line model the parameters of which are estimated based on the value of the common factor. The model is correct in terms of statistical properties, the trend model parameters were found to be statistically significant, and the degree of matching the model to empirical data was 46.66%.

Figure 2 The common factor values and the square trend line



Source: own estimations

4 Conclusions

The paper examines the correlation between the capital market of Germany and the selected markets in Central and Eastern Europe. The observed systematic growth of interdependence between the capital markets is the result of the progressive globalization process. The study covered the interval 2004-2014, including a period of the global bull market preceding the speculative bubble burst on the US real estate market, the biggest global financial system volatility (2007-2010) in recent decades, and the period of a gradual return of the markets to the so-called 'normal functioning'.

Within the assumed objective, the system of interdependence between the capital markets of Germany, Poland, the Czech Republic and Hungary was identified. The use of the DCC-GARCH model allowed the obtainment of values of conditional correlation processes that describe the interdependencies between markets. Based on the conditional correlation processes for the selected pairs of indices (DAX, PX) (DAX, WIG) (DAX, BUX), the degree of integration was investigated and the cointegration analysis was performed. The determination of the cointegration between the conditional correlation processes was a justification for identifying a common factor. This factor, as a latent variable, describes in a synthesized way the interdependence of the system of selected capital markets. The results of the analysis of change directions in the common factor indicated that during the global financial crisis of 2007-2012 there was a significant increase in the interdependence between the studied markets. A transition of these markets to the period of tranquility following 2012 was observed. The study

confirmed that under a crisis financial markets are most likely to note an increase the level of interdependence between markets.

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