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Analysis of cash flow in agricultural primary production in Slovakia

JEL Classification: *Q10; Q14; M21*

Keywords: *agriculture, agricultural primary production, financial analysis, economic indicators, cash flow*

Abstract

Research background: Cash flow monitoring is very important for the business. An enterprise may make a profit but may not have enough cash to pay its liabilities, which may endanger its existence.
Purpose of the article: The aim of the paper is to analyze the state and development of cash flows in agricultural primary production in Slovakia in the period 2008 - 2017.
Methods: As the cash flows were quantified on the basis of selected asset and capital items, we evaluated the contribution of property and capital in agricultural

primary production in Slovakia and we can say that the value of the property together increased to 2017 compared to 2008, this positive change was due mainly to the increase in both fixed (long-term) and current assets. Long-term asset is predominantly represented by tangible fixed assets, stocks and short-term receivables predominate from current assets. From the point of view of capital structure, own capital prevails over foreign capital.

Findings & Value added: Based on the quantification of selected cash flow indicators, we can say that net cash flow reached a negative value in 2013 due to a negative cash flow from investment activity. It comes from the balance cash flow that most expenses were spent on investment activities, which include the value of fixed assets, including depreciation. From sources, internal funding outweighs external resources.

Introduction

Cash flow statement is financial reprint which provides information to investors, creditors, and others, useful in making rational decisions. The ultimate success or failure of the business depends upon the amount of cash generated (Motlagh, 2013) The company´s cash levels can vary considerably over time depending on payment and collection cycle. Made full and timely payment of sufficient operating capital to keep and disruption of operations, i tis important to predict cash levels (Ceren Oral & CenkAkkaya, 2015). Accounting net income measures economic performance which does not necessarily match up with the timing of cash flow. Many profitable businesses have been killed by cash flow problems, often in the start-up phase. A business has three types of cash flows: operating, investing and financing. Managers must pay particular attention to the difference in timing between when cash is collected from customers from the sale of inventory and when cash must be paid to suppliers for the purchase of that inventory. A significant discrepancy between those numbers indicates a potential cash flow problem (Stice et al., 2017). Exploring the effects of cash flow statements to firm value would not only be beneficial for capital budgeting in terms of corporate finance but also provide valuable information for enterprises in decision making (Ni et al., 2019). Increases in cash flow volatility may result in greater cash holdings as a precaution, the source of that cash may be determined by how much operating cash flow a firm generates. Firms with the lowest operating cash flow may issue debt, while firms with higher operating cash flow may have sufficient internal resources to meet their needs (Harris & Roark, 2018).

Research methodology

Cash flow represents the cash flows of an enterprise over a period of time. The cash flow statement is part of the financial statements of businesses accounting for the double-entry accounting system together with the balance sheet and profit and loss statement. Cash flow can be determined by two direct and indirect methods. The data used to elaborate the paper were obtained from sources from the Ministry of Agriculture and Rural Development of the SR, and the Green Reports. In the paper we focused on the analysis of the status and development of assets and its items, equity and liabilities together with its items in the period 2008 - 2017. We quantified the average for the whole period as well as the change between years 2017 and 2008. From cash flow we analyzed cash flow I. – IV., net cash flow and balance sheet cash flow.

Cash flow tracks cash flows in business, revenue, and expenses. CF is always monitored for two consecutive years.

$$Cash\ flow\ I =$$
$$= EAT + deprecitation \pm change\ in\ reserves \qquad (1)$$
$$\pm change\ in\ tme\ distinction\ of\ asset\ and\ liabilities$$

$$Cash\ flow\ II = \ CF\ I \pm change\ in\ reserves \qquad (2)$$

$$Cash\ flow\ III = \ CF\ II \pm change\ in\ ST\ receivables \qquad (3)$$

$$Cash\ flow\ IV = \ CF\ II \pm change\ in\ ST\ receivables \qquad (4)$$

The net cash flow consists of the sum of CF from the economic area and financial area.

The balance sheet composition of the CF is based on the balance between incomes and expenditures. Incomes resp. resources are a sum of internal resources and external resources. Expenditure of money or the use of money is in economic, investment and financial terms. Incomes = Expenditures

Results

Development and structure of assets and own equity and liabilities

Based on data from tab. 1, we can say that the value of assets shows a fluctuating trend during the analyzed years, influenced predominantly by values of fixed and current assets. The average value of the assets together in agricultural primary production is 2 723 € / ha of agricultural land. The assets together show an increase of 823.31 € / ha in 2017 compared to 2008. This increase is influenced by the increase in all the basic indicators that make up the property together. The average value of fixed assets was 1620 € / ha. The largest share of long-term assets consisted of tangible fixed assets (which accounted for 94% of fixed assets). Current assets have an average value of 1 086 € / ha. for the whole period analyzed. The development of current assets was mainly affected by stocks, which accounted for 48% of the value of current assets, short-term receivables (38% of current assets) and financial accounts made up 12% of current assets. Long-term receivables were slightly 2%. Time resolution are short-term and long-term revenues and costs, while the average time resolution value is 19.226 € / ha of agricultural land. Receivables from subscribed equity decreased the value of assets and their average value was -1.241 € / ha.

The development of equity and liabilities together copy the assets in the agricultural primary production enterprises, as the balance sheet balances the two items. The value of equity and liabilities was influenced together by the development of all three basic indicators, which consist of equity, liabilities and accruals (time resolution) on the liabilities side. Equity reached an average value of 1 262.422 € / ha of agricultural land. The indicator influenced the development of the following items: capital (40% share of own resources), capital funds (46% share of own resources), funds from profit (8% share), profit from previous years (5% share) as well as the economic result for the accounting period (1% equity share). Liabilities in agricultural primary production increased by 294.71 € in 2017, their average value for the whole analyzed period was 1 131 € / ha. The increase in liabilities was due to an increase in long-term liabilities and short-term liabilities. The value of reserves as well as the use of bank loans decreased by 2017 compared to 2008. Short-term liabilities accounted for 48% of the liabilities structure, 31% of bank loans and financial assistance, 19% of long-term liabilities and approximately 2% of reserves. Accruals (time resolution) on the liabilities side are long-term and short-term revenues and expenditures of the future periods, and the average accrual value was 330 € / ha.

Cash Flow analysis

When assessing the company's financial situation, it is also necessary to pay attention to the cash flow analysis. This is mainly due to the fact that while an enterprise may be profitable, but when it does not have enough cash to pay its liabilities, it may become financially troubled and become insolvent and may seriously threaten its liquidity.

Fig. 1 gives us an insight into the development of cash flow from economic activity, which is divided into four groups to better assess the impact of individual factors over time. Cash flow I, otherwise called self-financing cash flow, reached the highest value in 2013, namely 482.28 ths. €. In the period of 2014, its level decreased rapidly to 87.45 thousand €. This high difference is mainly due to a change in the timing of time resolution of liabilities. The increase in cash flow value in cash flow II in 2014 points to the fact, that this year there was a significant decrease in stocks compared to 2013 (this fact affected not only the value of cash flow but also the values of total liquidity and stock turnover time). When comparing cash flow III with cash flow II, we see a sharp decline in 2016 due to an increase in short-term receivables. The increase in receivables is accompanied by a higher commitment of company assets, which does not affect the cash flow of farms in positive way.

This indicates that farms have reduced the value of short-term receivables, in particular receivables from trade, in the next period, thus freeing up cash, thereby directly affected cash flows. Only in the last analyzed year was recorded a decrease in cash flow IV, compared to cash flow III, due to a decrease in short-term liabilities, which represented an outflow of funds of the company. In all other years, cash flow IV increased compared to cash flow III, influenced from year to year by the increasing short-term liabilities that accumulated cash in the company.

Looking at net cash flow (Tab. 3), it can be stated that two basic requirements have been met, namely that the cash flow from the operating activity of the business have received positive values and cash flow from the investment activity have received negative. We consider the fact that the value of cash flow from investment activities in 2013 exceeded the cash flow from operating activities. Farmers had lack financial resources for financial activities, which was also reflected in the negative result, the so-called net cash flow, which in 2013 reached the level of 16.6 thousand €. Thus, in 2013, the cash position at the beginning of the period was higher than at the end of the period. The opposite situation can be seen in the next analyzed years in which net cash flow was positive. In these years, busi-

nesses had more cash at the end of the accounting period than at the beginning. In the last analyzed period net cash flow reached 22.03 thous. €.

The balance cash flow arrangement, which gives an opportunity to look at sources of money as well as their use in isolation, is shown in tab. 4. Within the framework of economic activity, the most significant change occurred in short-term receivables, for which we recorded a decrease between 2015 and 2016 by 83.92 ths. €. From the pointof view of the use of funds for investment activity, an increase can be observed in the last years 2014-2016, reflecting the increase in fixed assets in whole analyzed period. On the other hand, the use of funds for financial activity is characterized by a highly volatile trend. Looking at internal sources of coverage, cash flow plays an important role, with a volatile trend. Stocks also play an important role, with the money being increased significantly in 2014.

External sources of coverage occured a significant change in long-term liabilities, the value of which until 2017 increased to 41.62 thousand €. Ultimately, it can be stated that, as with the money used, there was a highly volatile trend, and the sources of money had the same development. In the balance cash flow arrangement, and therefore the only one, the condition was that the cash resources should be equal to the money used, which was met in each of the analyzed years.

Conclusions

Knowing the financial situation in which a business is located, is not only an advantage, but also a necessity. Without knowing what kind of financial resources the company has and what these financial resources cost it, what is the development of its assets, what is behind the achieved economic results, or what its cash flows are, it is almost impossible to succeed in the current highly competitive environment. Cash flow analysis is critical to the enterprise in terms of providing real cash flow information. In the income statement, revenue is recognized, but it may not be a real income, but also a cost that is not always an expense, which means that a business entity making a profit could have financial problems and vice versa. Cash flow is a comprehensive representation of liquidity changes. Based on our analysis, we conclude that 2013 was a particularly challenging year for agricultural primary production enterprises. In this year, cash flow from economic activity reached its lowest level because cash was accumulated in short-term liabilities, which directly affected cash flows. Our statement is also confirmed by the net cash flow analysis, because in 2013, as in the only among all the analyzed years, negative cash flow was achieved, indicating that

farms could lack the cash. Cash flow analysis revealed the problem of low cash held in that year, which led to problems in paying for liabilities. According to the Green Report in 2013, there was a significant price disparity manifested in the opening of price scissors, i.e. the fall in agricultural product prices (4.9%) and the increase in input prices - supply to agriculture (3.6%), which was also reflected in a decrease of 6% in the value of gross agricultural output, expressed in current prices. We appreciate the fact that by 2017, farm cash flows have improved significantly. According to the Green Report, agricultural product prices have risen, reflecting a 4.7% increase in own product sales compared to the previous year.

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Annex

Table 1. Development and structure of assets in 2008 - 2017 (in € /ha)

Indic./Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
ASSETS	2460,9	2403,2	2457,1	2562,4	2547,8	2876,86	2671	2846,2	3121,99	3284,21
Receivables from own equity	1,8	-0,1	-0,67	-0,29	-0,59	-0,37	-1,58	-5,07	-3,47	-2,07
Intangible assets	1468,9	1459,5	1513,7	1550,81	1549,87	1552,93	1582,3	1712,08	1856,67	1948,88
LT intangible assets	2,8	3	2,81	4,21	4,07	2,83	2,8	3,28	9,25	6,89
LT tangible assets	1407,9	1394,8	1434,3	1478,6	1468	1472,1	1487,2	1600,5	1717,86	1787,28
LT financial assets	58,2	61,7	76,6	68	77,8	78	92,3	108,3	129,56	154,71
Current assets	976,4	929,3	930,7	995,8	982,7	1308,2	1069,6	1114,6	1242,11	1306,75
Stock	502,4	445,8	452,3	484	476,8	789,4	510,4	520	531,48	536,94
Receivables	368,9	367,8	361	391,6	369,7	389,7	421,3	454,2	567,66	604,81
Fin. Accounts	105,1	115,7	117,4	120,2	136,2	119,6	137,9	140,4	142,97	165
Time resolution	13,8	14,5	13,36	16,08	15,82	16,1	20,68	24,59	26,68	30,65

Source: Ministry of Agriculture and Rural Development of the SR, Green Report, authors own processing.

Table 2. Development and structure of own equity and liabilities total in 2008 – 2017 (in € /ha)

Indic./Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Own equity and liabilities total	2460,9	2403,2	2457,1	2562,4	2547,8	2876,86	2671	2846,2	3121,99	3284,21
Own equity	1293,1	1148,4	1182,6	1248,12	1206,95	1194,53	1218,6	1275,2	1385,3	1471,4
Liabilities	1022,1	996,1	1052,6	1098,7	1131,9	1183,1	1079,2	1157	1271,8	1316,8
Reserves	24	18,1	17,6	22,4	18,6	18,7	23,1	22,8	23,92	22,72
LT liabilities	173,2	180,5	185,8	205,8	211,3	211,2	223,8	243,7	250,97	292,59
ST liabilities	444,2	464,1	473,3	492,9	520,5	558,6	569,5	585,3	648,26	635,85
Bank loans and ST financial assistance	380,7	333,4	369,9	377,6	381,5	394,6	262,8	305,2	348,58	365,65
Time resolution	145,7	258,7	221,9	215,58	208,95	499,23	373,2	413,98	464,93	496,03

Source: Ministry of Agriculture and Rural Development of the SR, Green Report, authors own processing.

Table 3. Development net cash flow

Indic./Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
EAT	-67,7	-7,8	51,72	21,75	-12,97	13,73	11,62	40,6	67,13
Depreciation	203,2	220,1	217,6	212,86	205,15	199,96	198,66	210,69	209,58
Reserves	-5,9	-0,5	4,8	-3,8	0,1	4,4	-0,3	1,15	-1,23
ST bank loans and financial assistance	-35,475	27,375	5,775	2,925	9,825	-98,85	31,8	32,535	12,8025
Time resolution of liabilities	113	-36,8	-6,32	-6,63	290,28	-126,06	40,81	50,95	31,1
Time resolution of assets	0,7	-1,14	2,72	-0,26	0,28	4,58	3,91	2,09	3,97
Stock	-56,6	6,5	31,7	-7,2	322,1	-288,5	9,6	11,48	5,46
ST receivables	5,3	-6,8	32,1	-25,1	17,3	26,6	32,5	116,42	24,54
ST financial assets	0	0	0	0	0	0	0	0	0
ST liabilities	19,9	15,2	13,6	27,6	38,1	10,9	15,8	62,96	-12,41
CF from economic activity	277,625	219,015	220,655	287,26	190,81	261,4	252,38	268,895	273,003
- depreciation	203,2	220,1	217,6	212,86	205,15	199,96	198,66	210,69	209,58
LT tangible and LT intangible assets	-12,9	39,31	45,7	-10,74	2,86	15,07	113,78	123,33	67,06
LT financial assets	3,5	14,9	-8,6	9,8	0,2	14,3	16	21,26	25,15
CF from investing activity	-193,8	-274,31	-254,7	-211,9	-208,2	-229,33	-328,44	-355,28	-301,79

Table 3. Continued

Indic./Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
- EAT	-67,7	-7,8	51,72	21,75	-12,97	13,73	11,62	40,6	67,13
Own equity	-144,7	34,2	65,52	-41,17	-12,42	24,1	56,59	110,08	86,07
LT bank loans	-11,825	9,125	1,925	0,975	3,275	-32,95	10,6	10,845	4,2675
LT liabilities	7,3	5,3	20	5,5	-0,1	12,6	19,9	7,27	41,62
LT receivables	-6,4	0	-1,5	3,2	2,7	4,9	0,4	-2,86	12,61
Receivables from own equity	-1,9	-0,57	0,38	-0,3	0,22	-1,21	-3,49	1,6	1,4
CF from financial activity	-73,225	56,995	36,845	-59,34	0,805	-13,67	78,56	88,855	50,8175
NET CF	10,6	1,7	2,8	16	-16,6	18,4	2,5	2,47	22,03

Source: authors own processing.

Table 4. Development of balance sheet cash flow

Indic./Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
ST liabilities									12,41
ST receivables	5,3		32,1		17,3	26,6	32,5	116,42	24,54
Stock		6,5	31,7		322,1		9,6	11,48	5,46
ST financial assets									
Fin.accounts	10,6	1,7	2,8	16		18,3	2,5	2,57	22,03
Expenditures from economic activity	15,9	8,2	66,6	16	339,4	44,9	44,6	130,47	64,44
Expenditures from investing activity	193,8	274,31	254,7	211,92	208,21	229,33	328,44	355,28	301,79
Receivables from own equity			0,38		0,22			1,6	1,4
L T receivables				3,2	2,7	4,9	0,4		12,61
LT liabilities					0,1				
LT bank loans	11,825					32,95			
ST bank loans and financial assistance	35,475					98,95			
Own equity without profit/loss	77			62,92					
Expenditures from financial activity	124,3	0	0,38	66,12	3,02	136,8	0,4	1,6	14,01
EXPENDITURES	334	282,51	321,68	294,04	550,63	411,03	373,44	487,35	380,24

Table 4. Continued

Indic./Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
CF I	241,9	176,14	265,08	224,44	482,28	87,45	246,88	301,3	302,61
ST receivables		6,8		25,1					
Stock	56,6			7,2		288,5			
ST financial assets									
Financial accounts					16,6				
LT receivables	6,4		1,5					2,86	
LT assets with depreciation									
INTERNAL SOURCES	304,9	182,94	266,58	256,74	498,88	375,95	246,88	304,16	302,61
Receivables from own equity	1,9	0,57		0,3		1,21	3,49		
ST liabilities	19,9	15,2	13,6	27,6	38,1	10,9	15,8	62,96	
ST bank loans and financial assistance		27,375	5,775	2,925	9,825		31,8	32,535	12,8025
LT liabilities	7,3	5,3	20	5,5		12,6	19,9	7,27	41,62
LT bank loans		9,125	1,925	0,975	3,275		10,6	10,845	4,2675
Own equity without profit/loss		42	13,8		0,55	10,37	44,97	69,48	18,94
EXTERNAL SOURCES	29,1	99,57	55,1	37,3	51,75	35,08	126,56	183,09	77,63
SOURCES	334	282,51	321,68	294,04	550,63	411,03	373,44	487,25	380,24

Source: authors own processing.

Figure 1. Development of cash-flow from economic activities (from self-financing)

	2009	2010	2011	2012	2013	2014	2015	2016	2017
CF I	241.9	176.14	265.08	224.44	482.28	87.45	246.88	301.3	302.61
CF II	298.5	169.64	233.38	231.64	160.18	375.95	237.28	289.82	297.15
CF III	293.2	176.44	201.28	256.74	142.88	349.35	204.78	173.4	272.61
CF IV	313.1	191.64	214.88	284.34	180.98	360.25	220.58	236.36	260.2
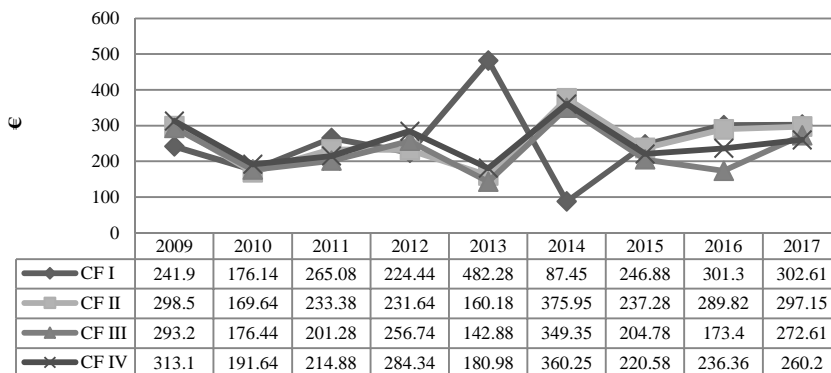
Source: authors own calculations.

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Transformation of the financial systems of the EU countries in the context of the debt crisis: experience for Ukraine

JEL Classification: *F30; F34; G01; H69*

Keywords: *transformation; financial system; debt crisis.*

Abstract

Research background: At the current stage of transformation of the financial systems of the EU countries the newer mechanisms for strengthening economic governance through sustainable monitoring of budget and economic policies and restoring public confidence in the financial system have been created. Nevertheless, there are still a number of problems. The debt crisis revealed shortcomings in the structure and caused the necessity to strengthen financial architecture by solving existing problems simultaneously identifying and preventing possible future threats that determines the relevance of the research.
Purpose of the article: The main goal of this paper is to identify the main directions of EU countries' financial systems transformation in the context of the debt crisis and the possibilities of their use for Ukraine.

Methods: The system analysis, trend analysis and correlation analysis were used in the paper, which allowed to determine the cumulative effect of unsecured bank loans and long-term government bonds yields of the EU countries and Ukraine on the level of their public debt.

Findings & Value added: The results of performed analysis show that during the transformation of the financial systems of the EU countries their further unification with the delegation of greater powers to supranational institutions is taking place. The obtained results of correlation analysis show the existence of correlation between unsecured bank loans and long-term government bonds yields of the EU countries and Ukraine with the level of their public debt. The study determines the further possibilities of using the experience of the EU countries' financial systems transformation for Ukraine, such as further convergence of banking sector regulation to the requirements of Basel 3 and implementation of LCR; introduction of annual banks stress testing; initiation of the process of creating a single mega regulator of the financial market.

Introduction

The transformation of financial systems (TFS) of the EU counties is a complicated process, which occurs under the influence of various factors such as expanding of the EU, a debt crisis in euro zone, a necessity to create a stable financial system and so on. However, the debt crisis itself has pointed out not only the necessity to build a more stable EU financial system, identifying disadvantages in its structure and causing an urgent need to strengthen financial architecture, but also the necessity to make this financial system able to ensure sustainable economic development.

Certainly, the experience of the transformation of the EU countries' financial systems is extremely important for Ukraine in the context of its European integration desires as well as due to the fact that the state of the debt area shows signs of a chronic crisis. However, it is necessary to take into account the differences in the economic development of the EU counties and Ukraine and to adapt European experience to Ukrainian realities, therefore, the research has both scientific and practical interest.

The analysis of recent studies and publications indicates that the chosen topic is a subject of scientists' attention. However, most researchers consider the period before the beginning of the debt crisis or separate aspects of the transformation of the EU countries' financial system. For example, the research of Allen *et al*. (2005) is dedicated to the question of the development of member states' financial systems after the EU expansion in 2004. Lots of studies are devoted to the reform of the banking system (Mi-

klaszewicz, 2016; Maier, 2013; Llorent *et al*., 2013; Shuba, 2017). Also, nowadays, there are a lot of researches concerning Brexit impact on the EU financial market today.

Nevertheless, there are only a few studies which consider TFS of the EU countries systematically. Among them, it is worth highlighting a research of J. Kundera (2013), that examines the institutional reforms of the EU financial system, which should make it more stable. In our opinion, the current studying of the transformation of the financial systems of the EU countries in general, rather than its separate aspects, is not given enough attention. Besides, taking into account the European choice of Ukraine, we suppose it is necessary to determine which measures of the EU financial system's reforming should be taken in our country. That is why this problem requires further enhanced studying.

The main aim of this article is to identify the key directions of the EU countries' financial systems transformation in the context of the debt crisis and the possibilities of their use for Ukraine.

Research methodology

The hypothesis concerning the relationship between components of the financial system of the country in the context of its transformation during 2007-2017 is used in this article. The system analysis has been used in the research and allowed to collect, systematize statistics on the EU countries and Ukraine for further analysis; a trend analysis and its results helped to identify tendencies of growth or fall of main components of financial systems of the EU countries and Ukraine; a correlation analysis and its results helped to explain the influence of the ratio of unsecured banks loans and long-term government bond yields of the countries on the level of their government debt and also the impact of the level of state budget revenue on such indicators of the functioning of the country's financial system as: state budget expenditures, government surplus, state debt. However, as promising directions of the research, it should be noted, that the methodology used does not consider the identification of factor loadings and does not allow to define which component of the functioning of the financial systems of the countries under study is the most significant regarding development prospects of the national financial system. Due to this reason it is proposed to carry out an additional factor analysis in follow-up studies.

Results

The TFS of the EU countries has started during the EU expansion, however, the fundamental changes in the financial system of the union occurred during the debt crisis.

The state deficit in the EU and the Eurozone in 2009-2010 is twice as much as the 3% indicated in the Maastricht Agreement. The state deficit of the Eurozone was 6.3% and 6.2% respectively, while in the EU – 6.6% and 6.4%. Regarding particular countries, the highest level of the state deficit during this period was in Greece – 15.1% and Ireland – 13.8%.

Most of the EU countries did not also comply with the another criterion of the Maastricht Agreement – the ratio of state debt to GDP, that must not exceed 60% of GDP. This rule was also violated during pre-crisis years, but, since 2008 the growth of the state debt in the EU in general has assumed a threatening character. Even the rate in Germany and France have exceeded the accepted level (for instance, in 2010 the ratio of the government debt to GDP in Germany accounted for 80.9%, in France – 85.3% (Figure 1)).

The main difference between the EU debt crisis and other regional debt crises is that most EU member states have common currency, so the widespread of the negative effects of the debt crisis of the PIIGS countries on other states of the union is faster and more intensive. Therefore, it seems appropriate to consider the impact of the of the ratio of unsecured banks loans and long-term government bond yields on the state debt of the EU countries, whose financial systems have proved to be the most sensitive to the global downturn, so-called PIIGS countries (involving Portugal, Italy, Ireland, Greece and Spain) and countries which are considered to be the EU's locomotives as Germany and France. Also, in relation to our study it is required to make similar calculations for Ukraine.

There has been the growth of the amount of unsecured loans in most EU countries. PIIGS countries (except for Spain) have the high enough level of such loans (Figure 2). In Germany and France, the ratio of the unsecured bank loans to their total amount is acceptable. In Ukraine the share of unsecured loans is growing at a swift rate and is the highest now among the countries under study.

Analyzing the dynamic of long-term government bond yields of the EU countries (Figure 3), it can be noted that during this period it was the highest in Greece and the lowest – in France. If the government bond yields of France were decreasing from 3.25 to 0.3% during 2009-2016, in Greece the same government bonds were offered with a yield of 5-25% during the same period. That reflects the loss of investors' interest and attempts of

Greek government to raise funds for financing the state budget deficit, which accounted for more than 15%.

In Ukraine, according to the results of 2017, the indicator of the ratio of the state debt to GDP declined for the first time since 2011 and amounted to 71.8% that is closer to the criterion of Maastricht Agreement than in many EU countries (for instance, in Greece the indicator was 178.6%, in Portugal – 125.7%, in France – 97%). However, Ukraine is listed in the group of countries with high debt load and considerable negative balance of payments.

In the study of Lajtkepová (2016), according to the results of a correlation analysis it was concluded that there is «moderate agreement between the ranking of indebtedness and share of social benefits in GDP, and between indebtedness and unemployment rate. The ranking of countries by economic level is only very weakly correlated with the ranking of countries by indebtedness» (Lajtkepová 2016, pp. 551-563). To determine the combined effect of the ratio of unsecured banks loans and long-term government bond yields of the countries on their state debt level we have calculated the multiple correlation coefficient. The results of the calculations are the following: the multiple correlation coefficient is $R = 0.86$ for Greece, $R = 0.98$ for Ireland, $R = 0.70$ for Portugal, $R = 0.90$ for Spain, $R = 0.96$ for Italy, $R = 0.81$ for Germany, $R = 0.96$ for France та $R = 0.70$ for Ukraine. It means that the combined effect of two above factors on the state debt of the countries under study is significant for all of them.

Besides, the correlation analysis has been made, the results of which made possible to estimate the presence of the influence of the volume of state budget income on such indicators of the country's financial system functioning as: state surplus, state budget expenditures, state debt (Table 1).

Analyzing the obtained results, it can be noted that for all reviewed countries the greatest interconnection exists between state budget incomes and a volume of state debt (an average meaning of the correlation coefficient is 0.5). The sufficiently considerable reciprocal effect of state budget incomes on state budget expenditures is typical for Spain, meanwhile, there is the significant reciprocal interconnection between state budget incomes and state surplus in Ukraine.

There is not any interconnection between the components of the financial system functioning in Germany and Ireland (Figure 4). The considerable relationships between the components are typical for the other countries under study.

Taking into account the depth and the speed of the spread of the debt crisis in the EU, the decision to radically enhance the oversight of the financial sector of state members has been made. The result must be a gradu-

al transformation of financial systems of the EU countries, where stricter regulation rules will be used and risks will be revealed at early stages. The main directions of the transformation of the modern European financial system in conditions of debt crisis are given in Table 2.

One of the key measures of the transformation of the financial systems of the EU countries is institutional reformation, which could correct the deficiencies, that had complicated the progress and delayed the resolution of the crisis of the Eurozone in 2008, and could help to prevent similar deep crises in the future. At the same time, the creation of powerful institutions in the euro zone will encourage the formation of a core of closely integrated member states.

Today the priority direction of transformation of the financial systems of the EU countries is the formation of a stable financial system. Creating a sustainable financial system can help restore the economy by allocating capital to new industries, as well as by increasing the efficiency of the capital mediation process by improving risk management, streamlining information flows, and aligning key areas with long-term social goals. Experts outline five key priorities for building a sustainable financial system in the EU, the so-called "5 R of Sound Finances" (Capital Reallocation and Raising, Risk, Responsibility, Reporting, Strategic Reset).

There are also other perspectives for the transformation of the financial systems of the EU countries (Figure 5).

Thus, today, the need to build a sustainable financial system that will be able to produce financial services, take into account the socio-environmental factors and provide efficient financing for the needs of sustainable developmentone is one of the main drivers of the transformation of the financial systems of the EU. One of the most important characteristics of the process of transformation of the EU financial system is that it is being reformed on the basis of the principle of delegation of authority to supranational institutions and other relevant organizations, both from national states and from the EU regulating institutions.

Following on from the results of authors' calculations, the study attempts to use the European experience of transforming financial systems to find ways to create a financial system capable of confronting crises and ensuring sustainable economic development of Ukraine.

Transformation efficiency will be achieved through comprehensive changes in regulators of the financial sector and its participants (Figure 6).

Conclusions

After summarizing the existing measures aimed at transforming the financial systems of the EU countries, it was concluded that they are conducted simultaneously in the following directions:
1. the creation of fundamentally new control systems for the activities of financial institutions;
2. a large-scale banking reform according to which the banking sector continues to comply with the requirements of Basel 3, as well as measures to expand the functions of the banking union are taken;
3. unification of the common regulatory platform (derivatives on the unorganized market, depositary and clearing and settlement activities, etc.).

The purpose of the transformation of the financial systems of the EU countries, within which the further unification of national financial systems takes place, is to build a financial system that will support the sustainable development of the economy of all EU countries. That is why the experience of European countries can be used and is already being used to find ways to create a financial system capable of ensuring sustainable economic development of Ukraine. In particular, further harmonization of the regulation of the banking sector with the requirements of Basel 3, as well as with the requirements of the Regulations for The Financial Instruments Markets, called MiFID II and MiFIR, are provided for. It seems reasonable to phase out the implementation of international standards for the functioning of the capital markets infrastructure, in particular the requirements of CSDR, EMIR, PFMI; implementation of reporting standards FINREP, COREP; introduction of annual stress testing of banks. In addition, it is worth considering the possibility of initiating the process of creating a single megaregulator of the financial market.

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Acknowledgments

Annex

Table 1. An assessment of the relationship between the main components of the functioning of the financial system of some EU countries and Ukraine

	Germany	France	Greece	Ireland	Portugal	Spain	Italy	Ukraine
State budget revenues / state budget expenditures	-0.14	0.53	0.19	0.59	0.11	-0.50	0.69	0.40
State budget revenues / state surplus	0.55	0.47	0.61	-0.31	0.538	0.78	0.14	-0.67
State budget revenues / state debt	-0.11	0.84	0.87	0.01	0.79	0.17	0.83	0.48

Source: own calculations based on data from Eurostat.

Table 2. The main directions of the transformation of the European financial system

A transformation direction	Year	Essence
Creation of new systems of control over the financial institutions performance	2010	The European System of Financial Supervision (ESFS) was introduced. It includes: The European Systemic Risk Board (ESRB) and three European Supervisory Authorities (ESAs), namely: The European Banking Authority (EBA); The European Securities and Markets Authority (ESMA); The European Insurance and Occupational Pensions Authority (EIOPA)
Creation of the European Stability Mechanism (ESM)	2012	Provides emergency loans, but in return, countries should carry out reform programs. In recent years, the European Parliament is considering several options of the ESM reforming. One of the key ideas is to transform ESM into 'European Monetary Fund'
Formation of supranational system of regulation of banking institutions	2009	- The Single Rulebook was created. It aims to provide a single set of harmonised prudential rules which institutions throughout the EU must respect. This will ensure uniform application of Basel III in all Member States.
	2009	- There widespread stress tests (EU-wide Stress Tests) were conducted to ensure the stable functioning of financial systems;
	2012	- It was decided to create the European Banking Union to keep stability and unity of the bank sector of the Eurozone and the EU;
	2013	- The European Union adopted a legislative package to strengthen the regulation of the banking sector and to implement the Basel III Agreement in the EU legal framework;
	2014	- The European Commission made out proposals about the solving of the «too big banks» problem by the EU regulatory authorities;
	2014	- The asset quality review started: the ECB evaluates the banks and, according to the results obtained, gives the list of the banks which fall within rehabilitation.

Table 2. Continued

A transformation direction	Year	Essence
Growth of integration of the settlement and clearing sector	2008	Start of realization of T2S (TARGET–2 Securities) project, that is one of the biggest infrastructure projects which were started by the Eurosystem.
Formation of the mutual regulation platform in the EU	2012	- The order for derivatives on an unorganized market, central counterparties (CCP) and trade repositories (EMIR) was issued.
	2014	- The order for central securities depositaries (CSDs) was issued.
Increase of safety, transparency and efficiency of financial markets	2014	- Start of implementation of the regulations of the new European legislation concerning the financial instruments markets (MiFID II та MIFIR).

Source: Compiled by the authors.

Figure 1. Government debt of some EU countries and Ukraine (% from GDP)
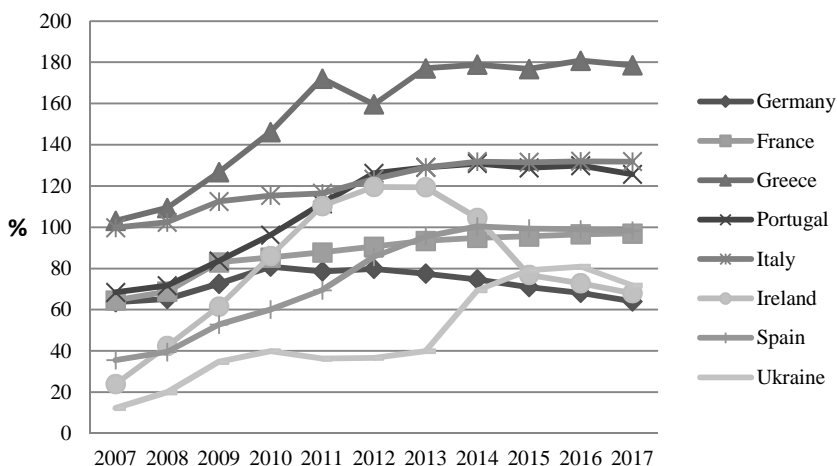
Source: Eurostat, Ministry of Finance of Ukraine.

Figure 2. Ratio of unsecured bank loans to their total number in some EU countries and Ukraine (%)
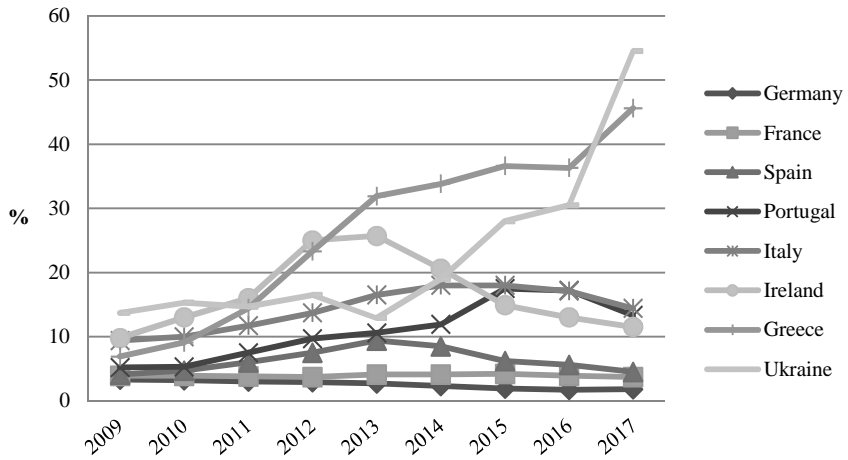
Figure 3. Dynamics of the average government bond yields of some EU countries (%)
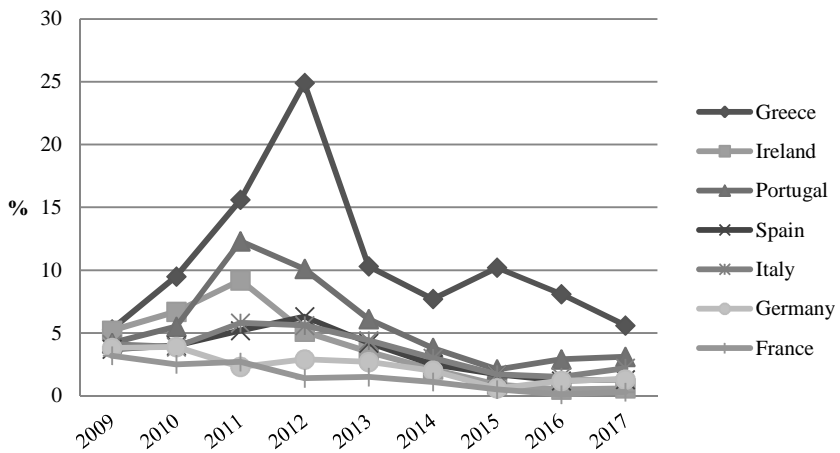
Figure 4. Degree of the interconnection of financial systems of some EU countries and Ukraine with the revenue part of the state budget
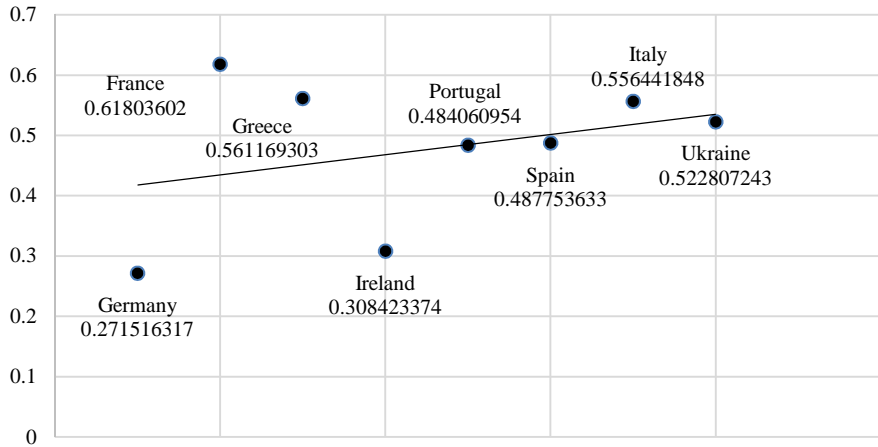
Source: own calculations based on data from Eurostat.

Figure 5. The main perspectives of the TFS of the EU countries
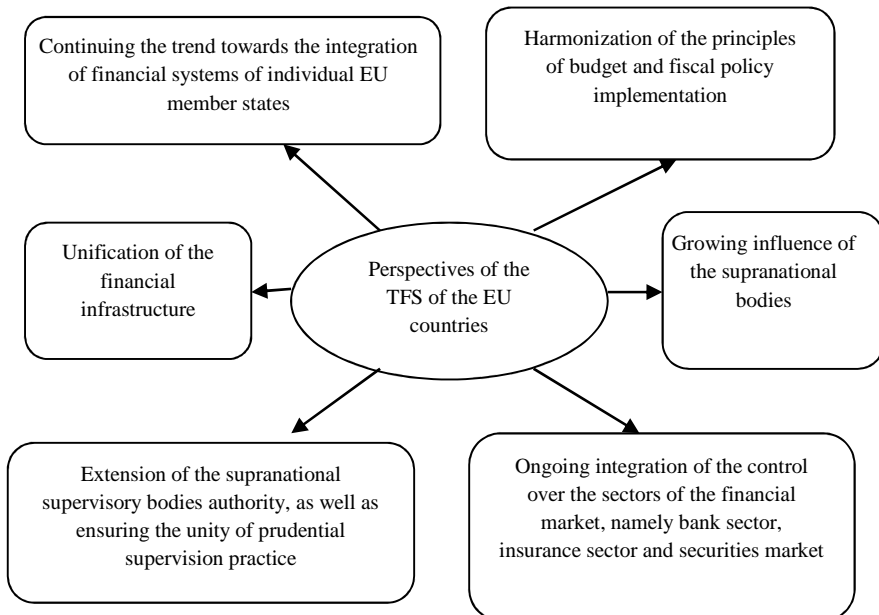
Source: Compiled by the authors.

Figure 6. The main directions of the transformation of the financial system of Ukraine

Ensuring the transparency and reboot of the financial system includes:

removing insolvent banks from the market;
expanding the list of mandatory disclosure information, banks disclosing their financial and prudential reporting;
transition to FINREP / COREP standards and the unified digital reporting standard;
conducting the stress-testing of banks in accordance with the recommendations of the Basel Committee on Banking Supervision, the Council for Financial Stability, the Council on European Banking Supervision;
legislative and technological support for the reformation of the stock exchange infrastructure of capital markets in order to protect the interests of investors through the gradual introduction of standards for the functioning of the capital markets infrastructure. In particular, implementation of the requirements of MiFID II and MiFIR;
improving the clearing and settlement infrastructure of capital markets through the gradual introduction of international standards for the functioning of the capital markets infrastructure, in particular the requirements of CSDR, EMIR, PFMI;
introduction of consolidated transaction reporting system unified for different classes of assets, taking into account requirements of EU acts, in particular MMSR, EMIR, SFTR, CSDR, REMIT;
initiation of the process of creating a unified megacelator of the financial market on the basis of the Banking Supervision Department of the National Bank of Ukraine and the National Commission performing state regulation in the field of financial services markets.

Ensuring sustainable development includes:

harmonization of banking regulations with Basel recommendations and EU directives;
the introduction of an effective method of banking supervision on the basis of risks, in accordance with the rules of the ECB;
taking measures at the national level to include sustainability in the strategy of the financial system;
the correspondence of lending and financing of the banking sector with the goals of sustainable development;
financial inclusion.

Source: Compiled by the authors.

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Private equity and venture capital: what macroeconomic and institutional factors do drive the demand side in Central and Eastern European markets?

JEL Classification: *E14; G24; C12*

Keywords: *Macroeconomics; Institutions; Private Equity; Venture Capital; Demand; Central and Eastern Europe*

Abstract

Research background: Recent academic studies identified many macroeconomic and institutional factors influencing private equity and venture capital market. In Central and Eastern Europe remains, however, the volume of projects covered by private equity and venture capital rather poor compared to their western European counterparts. Barriers on both the demand and supply side are discussed.

Purpose of the article: In this paper we intend to understand which macroeconomic and institutional factors influence the demand side of the venture capital market in Central and Eastern European countries, specifically in the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Croatia, Estonia, Lithuania, Latvia, Bulgaria and Romania.

Methods: We cover the period between 2006 and 2016. Secondary data from the World Bank Databank and Invest Europe are used. Our main methodological tools are descriptive statistics, Granger causality test and Kendal-Tau correlation.

Findings & Value added: The results of descriptive statistics show that institutional environment improved in the observed countries. The number of days to start a business and the number of start-up procedures lowered. The regulations protecting investors also recorded a slight improvement. The Granger causality test

offering a first hint at the relationships between PE/VC and the explanatory varia-
bles suggests that the following factors might be relevant: economic fitness rank-
ing, domestic credit to private sector, corruption perception index, enforcing con-
tracts and total tax rate. The Kendall Tau Correlation, however, confirms only one
statistically significant result of the previous Granger causality test: The correlation
between PE/VC investments and Economic Fitness Ranking. Thus the vast majori-
ty of explanatory variables proved to be statistically insignificant.

Introduction

Prior academic studies have proved that a well-developed private equity
and venture capital (PE/VC) market supports entrepreneurship and contrib-
utes significantly to the innovations and economic growth (e.g. Lahti, 2008;
Mason & Harrison, 2004; Cichy & Gradoń, 2016; Gollay *et al.*, 2016).
While identifying the driving forces behind PE/VC activity Schertler
(2003) and later Dias & Macedo (2016) discuss the demand and supply side
separately. The supply-side perspective emphasizes the transfer of both the
management experience and capital by investors (venture capitalists). The
demand-side is formed by investee companies, i.e. by entrepreneurs seek-
ing for capital. Schertler (2003) distinguishes three groups of factors affect-
ing demand for PE/VC. The first group is represented by "individual incen-
tives for entrepreneurship determining investment decisions". The second
group of factors is expressed by the "innovation potential of the economy
determining the number of innovative ideas". The last group involves the
"institutional environment determining the way in which innovative ideas
are financed". Similarly, Peneder *et al.* (2004) point out that a proper de-
velopment of PE/VC market depends on both individual and institutional
factors such as (1) the existence of suitable legal fund structures for PE/VC
investments and their tax treatment, (2) the involvement of competent in-
vestors, (3) an environment offering attractive investment opportunities and
(4) a functional capital market which ensures the liquidity of individual
investments. Dias & Macedo (2016) investigated factors having impact on
the supply and demand side in the PE/VC market in 25 countries covering
the period between 2006 and 2011. The authors conclude that the level of
PE/VC investments is affected by the development of the stock market,
laws protecting investors, social and environmental factors and the level of
entrepreneurship. Surprisingly, the GDP growth and taxation proved to
have a rather minor influence on the demand for PE/VC. Skalická *et al.*
(2017) analysed institutional determinants of PE/VC market in the Czech
Republic with a special focus on assessing the tax and legal environment

for investments. The authors conclude that the formal institutional settings in terms of legal and organizational structures support the PE/VC development while the tax law might be the real impediment causing a low level of PE/VC activity in the country.

The Central and Eastern Europe Statistics for 2017 (Invest Europe, 2018) show that the Central and Eastern European (CEE) region remains underdeveloped in terms of its share in the total European amount of invested capital and private equity investment measured as a percentage of GDP (5 and 0.239% respectively). PE/VC investments are highly concentrated in Poland which plays the role of a leading destination. The country attracts more than two thirds of the region's total investment value and almost a quarter of the companies receiving funding reside in Poland.

Using Granger causality test and Kendall Tau Correlation, this paper aims to understand macroeconomic and institutional factors affecting the PE/VC market in the Central and Eastern Europe. We believe that covering a knowledge gap will contribute to the implementation of the measures improving the existing institutional framework and a faster market development.

The structure of this paper is as follows: The methodological section explains the data and analytical tools used. The third section shows and interprets the research results. The conclusions are presented in the final section.

Research methodology

We used panel data from 11 Eastern European markets for the time period 2006 to 2016. All the countries under investigation are EU-member states: the Czech Republic, Hungary, Poland, Slovakia, Slovenia, Croatia, Estonia, Lithuania, Latvia, Bulgaria and Romania.

The demand side of the private equity activity is measured by the amount of resources invested into enterprises which are not public. The source of the amount of capital invested in each country in the sample was the Invest Europe. To capture private equity we used the definition made by European Venture Capital Association/EVCA (2012). According to this institution "private equity is equity capital provided to enterprises not quoted on a stock market" and includes venture capital, growth capital, replacement capital, rescue/turnaround and buyouts. Based on this definition venture capital is "a subset of private equity" and includes investments "made to support the pre-launch, launch and early stage development phases of a business" (EVCA, 2012).

It was essential to scale private equity investments by a measure reflecting the different size of Eastern European countries. Schertler (2003) argues that the gross domestic product (GDP) represents a suitable scale measure because it is related to both the capital and labour endowment on an economy.

The factors influencing the volume and number of private equity investments are a substantial object of academic research. Groh *et al.* (2010) found that the capital providers analyse several measures while making decision on investments. All these parameters assess both macroeconomic and microeconomic environment and include factors such as economic activity, taxation, investor protection, development of capital market, organization culture and social and environmental standards. Dias and Macedo (2016) identified six factors within the factor analysis: economic activity, development of stock markets, corporate governance, social and environmental development, entrepreneurship and taxation. Black and Gilson (1998) were focused on studying the role capital markets play in terms of the private equity development. They conclude that countries with more developed capital markets are rather predestinated to have more active investors than economies with a bank based financial system. Scherter (2003) studied driving forces of venture capital activity for 14 Western European countries over the period 1988 to 2000 delivers evidence that "the liquidity of stock markets, human capital endowment, and labour market rigidities positively affect early stage investments". Additionally, Cumming *et al.* (2006) put emphasis on the quality of legal system which might be more influential to facilitate private equity investments than the size of the stock market.

Our set of explanatory variables examining the influence of macroeconomic and institutional factors on private equity activity is based on previous academic research. The description of variables used is shown in Table 1. The source of our data series are the World Bank and Transparency International. While selecting the data series we were limited by data availability since the complete data set for all countries covers only the period between 2006 and 2016.

In this study we are focused on understanding the factors that determine the amount of capital allocated on the private equity market in 11 Eastern European countries (demand side). The data was processed by applying descriptive statistic, Granger causality test and Kendall Tau Correlation. All information is public and was obtained from the World Bank Database and from the Transparency International.

Research results

Table 2 shows selected descriptive statistics of the variables for our entire sample of countries. The total number of observation of the panel data set reaches 121 for all variables.

The average value of invested resources expressed as volume of PE/VC to GDP over all periods and all countries is about 0.14 per cent. Therefore, the volume of PE/VC investments is relative to the total economic activity at a very low level. The highest PE/VC investments were recorded for Bulgaria (1.95 in 2007) while zero values were registered for Slovakia (2009) and Lithuania (2008). On average, the inflow of investment in the region slowed after the Great Recession, in particular between 2010 and 2015.

The countries also differ significantly with respect to some macroeconomic and institutional factors. The GDP growth rates used as a proxy for the economic activity are in negative values during the Great Recession (almost -15 per cent in Lithuania, Latvia and Estonia in 2009) while the value 11.9 per cent was recorded in Latvia in 2006. In Estonia, the total tax rate was as high as 66.8 % in 2012, while in Croatia it was as low as 18.4 % in 2014. The number of days required to start a business varies over the observed period and tends to decrease. Similarly, the number of start-up procedures has lower levels in 2016 than in 2006. Government expenditures on tertiary education as percentage of GDP and percentage of enrollments for university studies are used as proxies for the human capital endowment. The Czech Republic, Hungary and Romania with expenditures below 1.0 per cent invest relatively less in human capital endowment than their counterparts Poland and the Baltic countries with expenditures above 1.2 per cent. With respect to the characteristics of institutional framework, the Eastern European countries have slightly improved their regulations protecting investors. The most significant improvements have been achieved in Slovenia, Croatia, Bulgaria and Latvia. Similarly, the overall values of the corruption perception index (CPI) capturing the way how both formal and informal institutions work have increased although the rate of improvement varies from country to country. The Czech Republic, Slovakia, Hungary and Croatia have experienced stagnation while Poland, Lithuania and Latvia significantly improved their position in this regard.

In the next step we applied the Granger causality test. The calculation results shown in Table 3 offer a first hint at the relationships between PE/VC and the explanatory variables. The results suggest that the following time series *X* Granger-cause *Y*: economic fitness ranking, domestic credit to private sector, corruption perception index, enforcing contracts and total tax rate. Lagged values of *X* have been used. The maximum delay time of *Y*

behind *X* amounts years. This test however rejects the assumption that the time required to start a business, GDP growth, the number of startup procedures to register a business, venture capital availability, government expenditures on tertiary education, tertiary school enrollments and strength of investor protection are able to predict the future values of PE/VC investments (as % of GDP).

The Kendall Tau correlations shown in Table 4 confirm only one statistically significant result of the previous Granger causality test: The correlation between PE/VC investments and Economic Fitness Ranking. The value of the coefficient is however in negative values and comparatively low (-0.1741). The vast majority of explanatory variables proved to be statistically insignificant. Noteworthy is the statistically insignificant correlation coefficient between PE/VCE investments and total tax rate (in %) suggesting a weak correlation.

Conclusions

In this paper we aimed to assess the impact of macroeconomic and institutional factors on private equity investments in eleven Central and Eastern European countries over the period between 2006 and 2016. The explained (dependent) variable is the amount of invested resources (PE/VC as % of GDP). There are thirteen explaining variables used which capture the macroeconomic and institutional environment.

The results suggest that the average value of invested resources expressed as volume of PE/VC to GDP remains over all periods and all countries relative to the total economic activity at a very low level. The institutional environment slightly improved in the observed countries. The number of days to start a business and the number of start-up procedures lowered. The regulations protecting investors also recorded an improvement. The Granger causality test suggests that the following factors might take influence on the PE/VC activity: economic fitness ranking, domestic credit to private sector, corruption perception index, enforcing contracts and total tax rate. The test rejects the assumption that the time required to start a business, GDP growth, the number of start-up procedures to register a business, venture capital availability, government expenditures on tertiary education, tertiary school enrolments and strength of investor protection are able to predict the future values of private equity investments. The Kendall Tau correlations confirm only one statistically significant relationship: between PE/VC investments and Economic Fitness Ranking. The vast majority of explanatory variables proved to be statistically insignificant.

In a follow-up research we will focus on studying a broader range of institutional factors that affect PE/VC market in the CEE region. A particular attention will be payed to informal institution. These are understood as "a set of values, attitudes, beliefs and underlying assumptions prevalent among individuals in a society" (Yong & Shaker, 2012).

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Annex

Table 1. Description of Variables Used

Variables	Definition	Data Source
Dependent Variable		
Invested resources	The amount of resources as % of GDP	World Bank
Explanatory Variables		
GDP growth	in per cent	World Bank
Economic Fitness Ranking	Economic fitness is both a measure of a country's diversification and ability to produce complex goods on a globally competitive basis (1 = high; 149 = low)	World Bank
Total tax rate	The data covering taxes payable by businesses, measure all taxes and contributions that are government mandated, apply to standardized businesses, and have an impact in their income statements (in per cent)	World Bank
Time required to start a business	Based on a standardized survey, data valid for a simple business case with assumptions about the legal form of the business, its size, its location, and nature of its operation (in days)	World Bank
Start up procedures to register a business	Based on a standardized survey, data valid for a simple business case with assumptions about the legal form of the business, its size, its location, and nature of its operation (number of procedures)	World Bank
Domestic credit to private sector	Domestic credit to private sector refers to financial resources provided to the private sector by financial corporations that establish a claim for repayment (as % of GDP)	World Bank
Venture Capital Availability	How easy is it for entrepreneurs with innovative but risky projects to find venture capital (1 = extremely difficult; 7 = extremely easy)	World Bank
Government expenditure on tertiary education	Government expenditures on tertiary education (as % of GDP)	World Bank
Scholl enrollment. tertiary	Gross enrollment ratio for tertiary school is calculated by dividing the number of students enrolled in tertiary education regardless of age by the population of the age group which officially corresponds to tertiary education, and multiplying by 100 (in per cent)	World Bank
Corruption Perception Index	Transparency, accountability, and corruption in the public sector assess the extent to which the executive can be held accountable for its use of funds and for the results of its actions by the electorate and by the legislature and judiciary, and the extent to which public employees within the executive are required to account for administrative decisions, use of resources, and results obtained (100 = very clean, 0 = highly corrupt)	World Bank, Transparency International
Strength of investor protection	The index measures the strength of minority shareholder protections against misuse of corporate assets by directors for their personal gain (between 0 and 10 (best))	World Bank
Disclosure index	This indicator measures the strength of minority shareholder protections against directors' misuse of corporate assets for personal gain (0 = less disclosure, 10 = more disclosure)	World Bank
Enforcing contracts	Cost (% of claim)	World Bank

Source: Own Processing based on the World Bank Database.

Table 2. Overall Sample Description

Variable	Number of Observation	Mean	Min	Max	St. Dev.
Invested resources	121	0.14006	0.0000	1.9500	0.22364
GDP grow	121	2.24628	-14.800	11.9000	4.59010
Economic Fitness Ranking	121	28.27273	12.0000	45.0000	8.06536
Total tax rate	121	40.79174	18.4000	66.8000	9.70864
Time required to start a business	121	20.68182	3.5000	61.5000	13.32604
Start up procedures to register a business	121	6.53719	2.0000	12.0000	2.22127
Domestic credit to private sector	121	56.95455	25.7000	101.3000	16.76729
Venture Capital Availability	121	2.83909	2.0100	4.3300	0.51428
Government expenditure on tertiary education	121	1.02149	0.6000	1.5000	0.21378
Scholl enrollment. tertiary	121	65.69174	44.8000	89.3000	11.38819
Corruption Perception Index	121	5.05041	3.1000	7.0000	0.91834
Strength of investor protection	121	5.47107	3.0000	7.5000	0.87244
Disclosure index	121	5.33058	1.0000	10.0000	2.80888
Enforcing contracts	121	20.96529	12.3000	33.8000	6.28608

Source: own Calculations.

Table 3. Granger Causality Test

Order	Variables Examined		p-Value	F Statistics
Y = f (X)	PE/VC invested resources	Time required to start a business	0.0768	2.6258
X = f (Y)	Time required to start a business	PE/VC invested resources	0.1916	1.6767
Y = f (X)	PE/VC invested resources	GDP growth	0.4905	0.7168
X = f (Y)	GDP growth	PE/VC invested resources	0.3135	1.1720
Y = f (X)	PE/VC invested resources	Economic Fitness Ranking	0.0317	3.5575
X = f (Y)	Economic Fitness Ranking	PE/VC invested resources	0.0850	2.5191
Y = f (X)	PE/VC invested resources	Domestic credit to private sector	0.0119	6.5179
X = f (Y)	Domestic credit to private sector	PE/VC invested resources	0.1411	2.1955
Y = f (X)	PE/VC invested resources	Corruption Perception Index	0.0195	5.6111
X = f (Y)	Corruption Perception Index	PE/VC invested resources	0.2858	1.1500
Y = f (X)	PE/VC invested resources	Strength of investor protection	0.3435	1.12180
X = f (Y)	Strength of investor protection	PE/VC invested resources	0.2534	1.3776
Y = f (X)	PE/VC invested resources	Enforcing contracts	0.0144	4.3996
X = f (Y)	Enforcing contracts	PE/VC invested resources	0.6539	0.42638
Y = f (X)	PE/VC invested resources	Total tax rate	0.0268	3.17973
X = f (Y)	Total tax rate	PE/VC invested resources	0.7272	0.4366

Source: own calculations.

Table 4. Kendall Tau Correlations

Variables	VC	TRSB	SPRG	GDPG	EFR	DCPS	CPI	SIP	EC	TTR
VC	1,000	-0,035	-0,045	0,070	-0,174*	-0,080	0,041	0,049	-0,053	0,100
TRSB	-0,035	1,000	0,640*	0,058	-0,106	-0,165*	-0,191*	-0,088	0,253*	-0,084
SPRG	-0,045	0,640*	1,000	0,075	-0,035	-0,231*	-0,329*	-0,302*	0,223*	0,023
GDPF	0,070	0,058	0,075	1,000	0,047	-0,156*	-0,013	-0,041	0,068	0,167*
EFR	-0,174*	-0,106	-0,035	0,047	1,000	0,250*	-0,196*	-0,169*	-0,184*	-0,172*
DCPS	-0,080	-0,165*	-0,231*	-0,156	0,250*	1,000	0,192*	0,020	-0,285*	-0,172*
CPI	0,041	-0,191*	-0,329*	-0,013	-0,196*	0,192*	1,000	0,116	-0,010	0,168*
SIP	0,049	-0,088	-0,302*	-0,041	-0,169*	0,020	0,116	1,000	-0,105	-0,314*
EC	-0,053	0,253*	0,223*	0,068	-0,184*	-0,285*	-0,010	-0,105	1,000	0,322*
TTR	0,100	-0,084	0,023	0,167	-0,172*	-0,172*	0,168*	-0,314*	0,322*	1,000

Note: Significant at 5% level *
VC = PE/VC invested resources; TRSB = time required to start a business; SPRG = start up procedures to register a business; GDPG = GDP growth; EFR = economic fitness ranking; DCPS = domestic credit to private sector; CPI = corruption perception index; SIP = strength of investor protection; EC = enforcing contracts; TTR = total tax rate.
Source: Own Calculations.

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Strategy of investment funds in the extension of multiple fund investment model

Abstract

Research background: Amount a lot of decisions, at which a company may arrive, no one brings to bear influence than employment of capital. Such investment decisions define the line of a business and further its market-value. That is why it is not a surprise that companies, business angels and private investors pay such a critical attention to this question.

Purpose of the article: There is a lot of economic literature that consider the problem of investment decisions. In most of them the investors are ranked as individual agents who don't have any attribute. Investment opportunities of an agent didn't depend on fund's characteristics and agent's parameters. The aim of the article is to identify functional connection between agent's investment opportunities and attributes of an investor and a fund.

Methods: The multiple fund investment model is analogous to the transportation model. The transport situation can be considered as an investment model with parameters, in which players control funds. The multiple fund investment model regards such situations, in which investors plough into one or many funds. Investors will face some limits. Investor's investment opportunities depend on behavior and action of other players. The profit received by investors can be different too. In this study, it is used capital distribution solution between investors by Bellman's equalization.

Findings & Value added: In the research paper are considered optimal strategies of funds' action for attracting investment by known investors' attributes. The authors defined graded principals of borrowed funds functional connection commitment in better characteristics. In consequence of analyzing of optimal strategies of funds investment in characteristics' improvement, distinguish those investors who cannot compete with others without association in coalition because either they have exaggerated preferences, which are not profitable for fund's improvement, or they do not have enough capital for competition with others.

Introduction

There are many decisions that person or firm can make, but none of them is likely so difficult and risky than financial investment. Such decisions define the financial future of a person or a company. It is no wonder, that they devote much time and effort to planning capital expenditure. To study the computer models in case of joint investment, it is needed to generate the set of game situations. In this paper are considered rules for examples' modeling. It is also necessary to analyze situation exercises.

One of the most important questions of the investment model is where to invest money and what will be the benefit. In this paper, we describe an extension of multiple fund investment model. In a situation of investment, agents can invest their capital in a certain number of funds. There are restrictions on the funds like a maximum number of capital units that can be invested in each of them. Also, the funds are characterized by parameters, which indicate the advantage and disadvantage of funds. The agents are described by the amount of capital they can invest and by their individual preferences. The profit of a player is formed from parameters of funds. That is, we consider the possibility that the return of an investment project depends on the player (eg., firm) that is involved in this project. Furthermore, investment opportunities are limited; we assume that player does not invest in project if his preferences do not match with parameters of the fund. In the second part of the article, we generate a set of game situations and use different solution methods.

Literature review

There is a lot of literature on economy that is devoted to the problem of investment. In most of this literature, players are shown as individually acting agents that do not have any attributes.

Wintein et al. (2006) introduced new class of cooperative situations, called multiple fund investment (MFI) situations. They define three cooperative games in characteristic function form, which for the bankruptcy case all coincide with the corresponding bankruptcy game. These games are based on three possible assumptions on the coalitional expectations of the return on their joint investments. One of the most famous results of this paper is solution of MFI situations. On the one hand, the authors use linear programs; on the other hand, they come to solution of MFI as linear production process.

The MFI model resembles the model of transportation situations as introduced in Sanchez-Soriano et al. (2001). A transportation situation can be seen as an investment situation with parameters in which also the funds controlled by players. Some solution methods were suggested by Zariphopoulou (1999) who studied the problem of optimal consumption and portfolio choice for a single investor.

Huang et al. (2012) described factors which influence investor's behavior. Their article proposes that fund is a kind of trust service. Not only the product factor, but also other factors of service marketing have influence on investor's buying behavior.

Research methodology

A multiple fund investment (MFI) situation is a tuple (N, M, e, A, d), where $N = (1, \dots, n)$ is the set of players, $M = (1, \dots, m)$ denotes the set of available funds and $e \in \mathbb{R}^M_{++}$ is the vector of fund restrictions. An element e_j denotes the maximum number of capital units that can be invested in fund $j \in M$. Furthermore, $A \in \mathbb{R}^{N \times M}_+$ is the return matrix, where an element A_{ij} denotes the revenue player i obtains when he invests one unit of his capital in fund j. Finally, $d \in \mathbb{R}^N_{++}$ is the vector of individual investment capital. We assume that $\sum_{j \in M} e_j < \sum_{i \in N} d_i$ (Winstein, 2002, p. 514).

We research the following extension

$$(N, M, e, A, d) \rightarrow (N, M, e, A, d, H, P),$$

where

$$H = \begin{pmatrix} a_{11} & \cdots & a_{n1} \\ \vdots & \ddots & \vdots \\ a_{1h} & \cdots & a_{nh} \end{pmatrix}$$

a_{ij} – parameters matrix of funds,

$$P = \begin{pmatrix} b_{11} & \cdots & b_{n1} \\ \vdots & \ddots & \vdots \\ b_{1h} & \cdots & b_{nh} \end{pmatrix}$$

b_{ij} – matrix of preferences for n players. $\forall i, j \in \mathbb{R}_+$, $P_{ij} \in [0,1]$ and $H_{ij} \in [0,1]$.

In order to define corresponding MFI games, we firstly state the program that determines the maximum revenue a coalition $S \subset N, S \neq \emptyset$ can obtain when the fund restrictions are given by a vector $z \in \mathbb{R}_+^M$. These direct revenues are denoted by $DR(S, z)$ and defined by:

$$DR(S, z) = \max_{x \in \mathcal{R}^{S \times M}} \sum_{j \in M} \sum_{i \in S} A_{ij} X_{ij},$$

such that $\sum_{j \in M} X_{ij} \leq d_i$, for all $i \in S$; $\sum_{i \in S} X_{ij} \leq z_j$ for all $j \in M$; $X_{ij} \geq 0$ for all $i \in S, j \in M$.

For simplicity, we define $DR(\emptyset, z) = 0$ for all $z \in \mathbb{R}_+^M$. By introducing a dummy fund or player in order to obtain equality restrictions, this problem is translated into a balanced transportation problem (Winstein et al., 2006, p. 415), which can be solved very efficiently.

Facing fund restrictions $z \in \mathbb{R}_+^M$, the players in S will construct an optimal plan $X^S \in \mathbb{R}^{S \times M}$ according to this program in order to maximise their total revenue (Zhang et al., 2010, p. 355). The set of all feasible plans is given by:

$$FP(S, z) = \{X^s \in \mathbb{R}_+^{S \times M} \mid \forall_{i \in S}: \sum_{j \in M} X_{ij}^S \leq d_i, \forall_{j \in M}: \sum_{i \in S} X_{ij}^S \leq z_j\}.$$

For a plan $X \in \mathbb{R}^{S \times M}$, the corresponding revenues are given by the direct payoff vector $O(S) \in \mathbb{R}^S$, where $O_i(X) = \sum_{j \in M} A_{ij} X_{ij}$ for all $i \in N$ (Tsai et al., 2011, p. 1698). The set of all optimal feasible plans X^s is denoted by $OP(S, z)$:

$$OP(S, z) = \{X^S \in FP(S, z) | \sum_{i \in S} O_i(X) = DR(S, z)\}.$$

Once the members of a coalition S have decided upon a particular plan X^S, they will invest their capital accordingly, thereby tightening the fund restrictions z for the remaining players. The resulting fund restrictions $z(X^S)$ are given by:

$$z_j(X^S) = z_j - \sum_{i \in S} X_{ij}^S$$

for all $j \in M$.

Using this notation, we now introduce three transferable utility (TU) games that correspond to an MFI situation. A TU game is a pair (N, v), where $N = \{1, ..., n\}$ is the set of players and $v: 2^N \to \mathbb{R}$ is the characteristic function, assigning to every coalition $S \subset N$ a value $v(S)$, representing the total monetary payoff the members of Scan guarantee themselves if they cooperate. By convention, $(v(\emptyset) = 0)$.

Depending on how the "guarantee" in the last paragraph is interpreted, an MFI situation gives rise to three TU games, which will be denoted by v^1, v^2 and v^3 (Kim, 2010, p. 618). The common feature is that first the players outside S can invest their capital and afterwards the members of S invest optimally given the resulting (tightened) fund restrictions. The difference between the games lies in the way the players outside S are assumed to behave in the first stage.

The game v^1 is defined by:

$$v^1(S) = \min\left\{DR\left(S, e(X^{N \setminus S})\right) \Big| X^{N \setminus S} \in FP(N \setminus S, e)\right\}, \forall S \subset N.$$

That is, the players outside S, facing fund restrictionse, are assumed to choose that feasible plan $X^{N}/_S$ for which the resulting revenue for S, facing fund restrictions $e(X^{N}/_S)$, is minimal. This pessimistic maxmin approach is standard practice in cooperative game theory. In this interpretation, the "guarantee" to coalition S is taken literally. Note that from this point of view, the members of $N \setminus S$ are not assumed to maximise their own payoff, but to obstruct S as much as possible.

For the second game, we again take a pessimistic approach, but with the assumption that the choice of the players in $N \setminus S$ is restricted to plans that maximise their own total revenue. This implicitly assumes that the players

outside of S do act rationally. They choose an investment plan in $OP(N\backslash S, e)$:

$$v^2(S) = \min\left\{DR\left(S, e(X^{N\backslash S})\right)\middle| X^{N\backslash S} \in OP(N\backslash S, e)\right\}.$$

For the third game, the players outside S also choose an optimal plan for themselves, giving them a revenue of $DR(N\backslash S, e)$. Next, we assume that the players in S can persuade the members of $N\backslash S$ to change their investment plan as long as those members still receive $DR(N\backslash S, e)$. Of course, coalition Swill persuade them to choose a plan in such a way that the two coalitions together generate a total revenue of $DR(N, e)$. After giving up the promised $DR(N\backslash S, e)$ to the members of $N\backslash S$, the net revenue of coalition S equals:

$$v^3(S) = DR(N, e) - DR(N\backslash S, e).$$

So, v^3 is the dual of the "direct revenue" game which assigns value $DR(S, e)$ to any coalition $S \subset N$ (Llorca et al., 2003, p. 90).

Due to the fact that the model introduced matrix preferences of players and restrictions on funds, there are two cases of the model.

It is assumed that a player or a coalition will not invest in the fund if their preferences do not correspond to the characteristics of the funds $p_{k,i} \le h_{k,j}$ for all $k = \overline{1, l}$.

To determine the behavior of the player, introduce the characteristic function y_{ij}:

$$y_{ij} = \begin{cases} 1 & p_{k,i} \le h_{k,j}, k = \overline{1, l} \\ 0 & others \end{cases}$$

The matrix A is transformed into a matrix $\tilde{A}$, which reflects the constraints imposed by the matrix $\tilde{A} = (A_{ij}y_{ij})$. Profit for the coalition

$$DR(S) = \max_{x \in \mathcal{R}^{S \times M}} \sum_{j \in M} \sum_{i \in S} \widetilde{A_{ij}} X_{ij}.$$

Values $v(S), TU$ situations are as follows:

$$v^1(S) = \min\left\{DR\left(S, e(X^{N\backslash S})\right)\middle| X^{N\backslash S} \in FP(N\backslash S) \wedge p_{k,i} \le h_{k,j}\right\},$$
$$v^2(S) = \min\left\{DR\left(S, e(X^{N\backslash S})\right)\middle| X^{N\backslash S} \in OP(N\backslash S) \wedge p_{k,i} \le h_{k,j}\right\},$$

$$v^3(S) = DR(N) - DR(N\backslash S),$$

provided that the following $p_{k,i} \le h_{k,j}$.

Based on the foregoing may be a situation where neither player will not invest in funds due to the fact that their preferences do not correspond to the characteristics of the funds. To resolve this behavior model with the prohibition of investments can be viewed from the reverse side. Assume that the funds are players who have the budget, there $b \in \mathbb{R}_+^M$ to improve its performance H. After the first stroke is defined as investors were divided their capital funds determine how to improve its performance in order to get the maximum revenue. As a result, there arises the problem of resource allocation. We introduce the coefficient k, which will show how much, a unit of capital increases the value of the characteristic h_{ij}. As we take the total efficiency of the profit function

$$DR(j) = \max_{x \in \mathcal{R}^N} \sum_{i \in N} \widetilde{A_{ij}} X_{ij}, j = \overline{1, m};$$

under condition

$$y(r) = \begin{cases} 1 & h_{k,j} + r_{k,j}k \ge p_{k,i}, \ k = \overline{1, l} \\ 0 & others \end{cases},$$

where r – the amount of resources allocated for the improvement of the parameter h; $r_{1j} + r_{2j} + \cdots + r_{lj} = b_j, r_{1j}, r_{2j}, \ldots, r_{lj} \ge 0, r_{1j}, r_{2j}, \ldots, r_{lj}$ – integer. Thus, we obtain a nonlinear programming problem.

Elements of the model are as dynamic programming. Variants of the solution at the i stage describes the amount of allotted resources r_i i object.
1. Step i is assigned to object $i, i = \overline{1, l}$.
2. Variants of the solution at the i stage describes the amount of allocated resources r_i i object.
3. State at stage i s_i expresses the remaining resources.

Bellman equation

$$Z_k(s_{k-1}) = \max_{r_k}\{F_k(s_{k-1}, r_k) + Z_{k+1}(s_k)\}$$
$$= \max_{0 \le r_k \le s_{k-1}} \{f_k(r_k) + Z_{k+1}(s_{k-1} - r_k)\}$$

where $Z_{n+1}(s_l) = 0$ (Tsai et al., 2011, p. 1698).

Definition 1 MFI situation – (N, M, e, A, d, H, P). Then, for the three scenarios we have $v^1(N) = v^2(N) = v^3(N) = DR(N, e)$ and $v^1 \leq v^2 \leq v^3$.

It should be noted that when the $|M| = 1$ and $A_{i1} = 1$ for all $i \in N$, bankruptcy situation is obtained. In this case, all three scenarios correspond to MFI bankruptcy, defined as $v_{e_1 d}(S) = max\{e_1 - \sum_{i \in N \setminus S} d_i, 0\}$.

After determining the three scenarios for the situation MFI, it is necessary to designate their properties. You need to check and balance the bulge.

Theorem 1 (N, M, e, A, d, H, P) is the situation MFI. Then the appropriate scenario v^3 convex (Owen, 1975, p. 362). Convexity of v^3 shows that direct income concave for many players. Thus, less than a coalition of players, the more it gets. On the other hand, direct income convex constraints on funds, respectively coalition, consisting of a large number of players will be able to get a greater benefit if the game will be a high limit on the funds.

Theorem 2 (N, M, e, A, d, H, P) is the situation MFI. Then for all, $e' \in \mathbb{R}^M$ such that $e' \geq e$ obtain

$$DR(T, e') - DR(T, e) \geq DR(S, e') - DR(S, e),$$

for all $S \subset T \subset N, S \neq \emptyset$ (Huang, 2011, p. 692).

The convexity of v^3 and proposition 1 implies that all three scenarios are balanced, hence, their core is not empty, the core of the game (N, v) is defined by:

$$C(v) = \{x \in \mathbb{R}^N \mid \sum_{i \in N} x_i = v(N), \forall_{S \subset N} : \sum_{i \in S} x_i \geq v(S)\}.$$

Scenarios v^1 and v^2 need not be convex. However, v^1 is completely balanced for each $S \subset N, S \neq \emptyset$, a game (S, v_S^1) of the definition as $v_S^1(T) = v^1(T)$ for all $T \subset S$ balanced.

Results

Applying the generator simulation game situations, we get several example games for analysis. We apply the method already described solution using Bellman function.

Example 1 MFI situation is represented in the following form: $N = \{1, 2, 3, 4\}$, $M = \{1, 2, 3\}$, $e = (6, 1, 11)$, $d = (23, 19, 3, 3)$, matrix of payments represents below:

$$A = \begin{bmatrix} 9 & 2 & 20 \\ 1 & 7 & 7 \\ 18 & 10 & 6 \\ 4 & 3 & 2 \end{bmatrix}.$$

The constraint matrix are as follows:

$$H = \begin{bmatrix} 0,18 & 0,13 & 0,07 \\ 0,59 & 0,21 & 0,24 \\ 0,29 & 0,89 & 0,05 \end{bmatrix}; P = \begin{bmatrix} 0,52 & 0,2 & 0,46 & 0,74 \\ 0,33 & 0,9 & 0,91 & 0,73 \\ 0,17 & 0,67 & 0,1 & 0,56 \end{bmatrix}.$$

Vector of capital to improve the parameters

$$b = \begin{bmatrix} 8 \\ 10 \\ 6 \end{bmatrix}.$$

Suppose that each unit of capital increases the property value of 0,1, i. e. coefficient $k = 0,1$. Most of the examples we will assume this is the default.

To plot graphic of dependences, share and capital for funds. Applying the Bellman function, we obtain the following results.

For the first fund schedule will represent on Figure 1. As for the fund attractive third player, then to the distribution of its capital to 5 the share is not growing, after an increase of the first and second characteristic third player starts to invest all your money in the first fund. You can then increase again the first response and then the first player to invest the remaining amount. Further increase does not make sense, since the restriction of the fund will be exhausted.

Figure 2 represent situation for the second fund. Despite the fact that the second largest capital fund, it does not have a sufficiently large number of investments due to the current limitations. To fund interested players second and third, but to improve the performance for 3 players in the fund is not enough capital, therefore, the characteristics will be improved only for second players.

The third fund has a very weak performance characteristics and the smallest capital, which is not enough to improve these characteristics Ac-

cordingly, the share increase will always be in the 0's also worth noting that the optimal plan third player or embedded, in any fund, therefore, it has no choice but to join the coalition.

Conclusions

The paper discusses the optimal strategy of behavior of funds for investments in certain preferences of investors. It may be noted the stepped nature depending raised funds from investments in improved performance. After analyzing the optimal investment strategy funds to enhance the performance stand out investors who cannot compete with others, not to join the coalition, either because they have inflated the preferences that are not beneficial to increase funds either do not have enough capital to compete with others.

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Estimation of the impact of systemic risk on the financial condition of the enterprise

JEL Classification: *C40, C45, C 65, G32*

Keywords: *enterprise financial risk; system risk; financial risk neutralization; enterprise insolvency.*

Abstract

Research background: The functioning of Ukrainian enterprises in modern conditions is accompanied by unprofitability of their activity. On the back of enterprises unprofitability, there is a problem of methodical provision of financial risk management, which lies in the fact that the major part of scientistific works in this area focus on the study of internal factors and indicators of financial risk. At the same time, the system risk is levelled out.

Purpose of the article: The aim of the study is the improvement of enterprises financial risk management tools based on the assessment of the company's ability to neutralize financial risk taking into account system risk effects.
Methods: The methodological apparatus includes: The "weight center" method; expert appraisal method; multidimensional factor analysis method; neural network apparatus.
Findings & Value added: As a result of the study, an approach to assessing the impact of system risk on the ability of an enterprise to neutralize financial risk is developed. The expert evaluation method is based on an integrated model that allows estimation of the ability of metallurgical enterprises to neutralize financial risks. The system risk factors, namely the factor of commodity markets state, the political and demographic, fiscal, monetary factors as well as the factor of the external balance financial estimates, were determined. By constructing a neural network, elasticity of enterprises' ability to neutralize financial risk in relation to systemic risk factors was calculated. The proposed approach allows conducting preventive financial risk diagnostics on the basis of assessing the current financial status and the ability to neutralize financial risk in an open economic system – taking into account the system risk impact.

Introduction

Destructive economic, geopolitical changes in Ukraine have had a negative influence on the financial position of enterprises. According to the official data for January-September 2018, the share of unprofitable enterprises is 29.8% of the total number of functioning ones, compared with the value of this indicator, 27.6% in 2017, 27% in 2016, 26.7% in 2015. This is explained by the negative growth dynamics in the share of unprofitable enterprises during 2015-2018 as well as the ongoing decline in their number (15.89% of large-sized and 5.43% of medium-sized enterprises in 2018) (State Statistics Service of Ukraine, 2019).

The high level of enterprises financial risk results from both the negative influence of external factors (system risk) and inefficient risk management system, in particular, inaccuracy of diagnostics, insufficient relevance of international and national standards, low level of scientific and practical achievements implementation in the activity of enterprises.

The disadvantage of diagnosis lies in the fact that it focuses on internal factors and indicators of financial risk (Chan-Lau, 2006; Kočišová & Mišanková, 2014; Antunes, Ribeiro & Pereira, 2017; Malichová & Ďurišová, 2015; Florio & Leoni, 2017; Fraser & Simkins, 2016), while external factors remain understudied, although their impact on the enterprises financial status is more than 10% (Pustovhar, 2014b). In this view, the aim of the research is to improve the financial risk management

tools for enterprises based on the assessment of the company's ability to neutralize financial risk taking into account system risk effects.

Research methodology

The development of an approach to diagnosis of system risk impact on the enterprise ability to neutralize financial risk is proposed to be carried out using the following algorithm:
1. definition of representative indicators of the enterprise financial risk;
2. construction of a model for enterprise financial risk neutralization;
3. system risk factors identification and quantificative evaluation;
4. modeling the system risk impact on the enterprise financial status and definition of the capacity for internal financial risk neutralization.

The method of "weight center" based on the calculation of Euclidean distances (formula 1) between the values of financial indicators was used to determine the representative indicators of the enterprise financial risk. Selection of representative indicators is based on the principle of minimizing the Euclidean distance in the middle of the groups and its maximization between the groups (Klebanova, Guryanova, & Bogonikolos, 2006).

$$d_{ij} = \sqrt{\sum_{k=1}^{m}(x_{ik} - x_{jk})^2}, \qquad (1)$$

where:
d_{ij} – the distance between indices i and j;
x_{ik} – value of indicator i for object k;
x_{jk} – value of indicator j for object k;
m – the number of objects.

In order to build the enterprise financial risk neutralization model at the enterprise, expert method was used to determine weighted values of indicators. The necessity to apply the expert method for building the enterprise financial risk neutralization model is stipulated by the fact that this method enables to determine the relative importance of the indicators provided that the resultant value is absent.

Experts in the study were employees of the planning and economic as well as financial departments of the following metallurgical enterprises of Ukraine: PJSC "Dniprospetsstal", PJSC "Mariupol Metallurgical Combine named by Ilyich", PJSC "Zaporizhstal", PJSC "Kremenchug Plant of Metal

Products", PJSC "Metal and Steel Plant", PJSC "Kyivmetalloprom", PJSC "Metalloprom", PJSC "Plant" Metallopribor", PJSC "Dneprovsky Metallurgical Combine named by F. E. Dzerzhinsky", PJSC "Evraz-Dnipropetrovsk Metallurgical Plant named by Petrovsky". The experts were asked to rank the financial indicators by the degree of their significance in the financial risk diagnosis (rank 1 corresponds to the most significant indicator, 6 – the least significant). Weighting coefficients of the financial risk representative indicators are determined by the Fishburne principle (Sitnik, 2017):

$$\alpha_i = \frac{2(n-i+1)}{n(n+1)}, \qquad (2)$$

where:
n – number of representative indicators;
i- rating position of the indicator.

The ability of enterprises to neutralize financial risk is determined by the availability of own financial resources, liquidity, profitability and economic and financial resources performance. Thus, it was proposed to present the enterprise financial risk neutralization model in the form of an integral estimation model, formed on the basis of financial indicators additive convolution, grounded on financial risks representative indicators, adjusted by their weight coefficients, determined by the expert method according to formula 2. The enterprise financial risk neutralization model takes the following form the form:

$$I = a_1 * X_1 + a_2 * X_2 + \ldots + a_n * X_n, \qquad (3)$$

where:
I – integral assessment of the enterprise financial risk neutralization level;
a_n – weight coefficient of the financial risk representative indicator significance;
X_n – value of the indicator representing the enterprise financial risk;
n – number of indicators representing the enterprise financial risk.

The assessment of the system risk impact on the company neutralization capacity is based on the method of multidimensional factor analysis and neural networks.

The use of factor analysis is justified by the fact that a large array of indicators describing system risks requires reduction due to the large dimension. The advantages of factor analysis lie in the fact that it allows to reduce the attribute space dimension and avoid multicollinearity without

any loss of informativity. In accordance with the factor analysis method, the composition of the factors is determined by the factor load values for the indicators with the corresponding factor, based on the factor model (Menke, 2018):

$$x_i' = l_1 * F_1 + l_2 * F_2 + \ldots + l_i * F_i + dv, \qquad (4)$$

where:
x_i' – the normalized value of the indicator;
l_i – factor load;
F_i – factor value;
dv – model residuals.

The calculation of factor loads is based on the hypothesis of the normal law of distribution of x_i, the absence of a correlation between factors F, the normal law of distribution of residuals dv. The optimality criterion in this case is the minimization of deviations in the covariance matrix, obtained by factor loads estimation, based on the covariance matrix of original features (Menke, 2018).

The model of the system risk impact on the enterprise financial state is constructed using the method of neural networks. The principle of the neural network is as follows: the neuron receives an incoming signal that passes through a connection (synapse) that has intensity. The current state of the neuron is determined by the post-synaptic potential function, which is calculated as a weighted sum of inputs with account taken of the threshold values. For a neural network of a multi-layer perceptron, the post-synaptic function (PSP) has the formula (Hosaka, 2019):

$$net_j = w_0 + \sum_{i=1}^{N} x_i w_{ij}, \qquad (5)$$

where:
net_j – post-synaptic function;
w_0 – threshold value of the function;
x_i – input signal of neuron i;
w_{ij} – weight of synaptic connection between neurons i and j;
$i, j = 1,2, \ldots, N$.

In neural networks, depending on the nature of the interaction between neurons, linear, logistic, hyperbolic, exponential, sinusoidal and step functions are used. The possibility of combining various patterns of interaction of its elements in one neural network provides the highest

accuracy of the modeling results, compared with other model classes (Azayite & Achchab, 2016).

In constructing the model of system risk impact on the enterprise financial status and the ability to neutralize, the quarterly values of 5 selected factors (F) describing the system risk were used as the input variables while the quarterly values of the integral indicator for the enterprise ability to neutralize the financial risk (I) for 2001-2017 were used as output variables (The World Bank Group, 2019; State Statistics Service of Ukraine, 2019).

Results

In the system of enterprise financial risks minimization methods, internal mechanisms of their neutralization play the integral part. Internal mechanisms of financial risks neutralization refer to a system of methods aimed at reduction of their negative consequences, which are selected and carried out within the framework of the enterprise itself. In the study, the assessment of the company financial risk neutralization capacity and its ability to react to system risk was carried out based on the example of enterprises in the metallurgical industry, the industry for which the problem of loss-making and insolvency is of particular relevance.

In order to estimate the financial risk of metallurgical enterprises, the financial status indicators (Altman & Hotchkiss, 2006; Fulmer, 1984; Springate, 1978; Toffler & Tishaw, 1977; Florio & Leoni, 2017; Tereschenko & Stetsko, 2017) are taken into account and classified according to the main types of financial risks: the risk of inappropriate capital structure, the risk of inefficient financial performance, the risk of liquidity reduction, the risk of ineffective operating activity, the risk of of cashflow imbalance and the risk of ineffective investment activity (Ismihan & Ozkan, 2012; Fraser & Simkins, 2016). The system of indicators for the enterprise financial risk level assessment is presented in Fig. 1.

One representative sample was chosen from each group of indicators (fig. 1) on the basis the "weight center" method. This indicator in the group of "risk of irrational capital structure" is the autonomy ratio (X_1), which has the smallest amount of Euclidean distances to the other objects in the group. A representative of the risk group of inefficient financial activity is the capital turnover ratio (X_2). The representative responsible for the liquidity risk is the absolute liquidity ratio (X_3). The risk group of inefficient operating activities represents the return on sales ratio (X_4). In the groups of "cashflow imbalance risk" and "risk of ineffective investment

activity", the representative indicators are the cashflow adequacy ratio (X_5) and total return on investment (X_6) respectively. The results of the weight ratio definition for formula 2 are presented in Table. 1

The resulting weigh ratio is calculated as the arithmetic average, determined by each of the experts. The reliability of the results is confirmed by the competence of the experts and the value of the concordation coefficient, which is 0.86 at a sufficient level of 0.7.

The integral model of enterprise financial risk neutralization with regard to certain weight ratios takes the following form:

$$I = 0.28 * X_1 + 0.18 * X_2 + 0.25 * X_3 + 0.15 * X_4 +$$

$$+0.09 * X_5 + 0.05 * X_6, \tag{6}$$

where:
X_1 – the value of the autonomy ratio;
X_2 – value of the capital turnover ratio;
X_3 – the value of the absolute liquidity ratio;
X_4 – the value of the return on sales ratio;
X_5 – the value of cashflow adequacy ratio;
X_6 – the value of total return on investment ratio.

The integral model is based on indicators, the growth of which positively characterizes the financial status of the enterprise, and, therefore, by its very nature, is a model of the company financial risk neutralization capacity. In order to create a universal model for financial risk and its neutralization capacity diagnosis in the current and the future period, the study proposes to take into account the impact of external factors, which companies cannot manage, but are forced to take into account and respond to. The factors that have the most significant impact on the metallurgical enterprises financial status and their neutralization capacity were found and proved to be 5 factors (Table 2) namely the commodity market factor, political and demographic, fiscal and monetary factors as well as the financial account of payments balance. The percentage of variance for these factors, which correspond to the strength of impact on the company financial risk neutralization capacity, are given in table. 2

In determining the composition of factors, the factor load values and the factor values (formula 4) were calculated in the program Statistica based on quarterly figures of the general economic, market, political and legal, as well as demographic indicators of the state for 2001-2017. The choice of these indicators is justified by the fact that they are the resultant external

factors, which reflect the impact of other indicators that form the system risk and create the threat of insolvency to metallurgical enterprises (Pustovhar, 2014a). The factor analysis was conducted on the basis of quarterly indicator values to ensure sample sufficiency. Application of relative indicators, in contrast to absolute indicators, enables to estimate the impact of external factors on the enterprise capacity to neutralize financial risk in statics and dynamics.

The adequacy of the factor analysis results is confirmed by:

1. sample sufficiency: in accordance with the requirements for conducting factor analysis, the number of observations should exceed the number of indicators by 2n + 1 times. With the number of indicators being 23, the number of observations in the study is 68;
2. the percentage of the total dispersion of 85.5% at a sufficient level of 80%;
3. integration of all indicators in factors and absence of one-indicator factors.

In addition to the direct application of the factor analysis method, which lies in data reduction, in this research, it was used to obtain factor values – integral values that were calculated in Statistica software, with account taken of the normalized indicator values and their weight ratios. The calculated factor values that characterize system risk are used to build a model of system risk impact on the enterprise financial risk neutralization capacity. The architecture of the constructed neural network is presented in Fig. 2.

The constructed neural network is represented by a multilayered perceptron with 2 layers of hidden neurons. The indicators, which demonstrate the statistical value of the model include educational, test and control errors whose values do not exceed 0.0004 at an acceptable level of 0.05. The error rates can assert the significance of the obtained simulation results with a probability of 95%.

The constructed model of system risk impact on metallurgical company financial risk neutralization capacity enabled to assess the elasticity of enterprise financial risk neutralization capacity in relation to system risk factors. Elasticity as a factor in the state of commodity markets amounted to +4.1. This means that with an increase in the value of the relevant factor by 1%, the integrated assessment of financial risk neutralization capacity will increase by 4.1%. An increase of 3.4% in metallurgical enterprise financial risk neutralization capacity leads to an increase in the importance of the political and demographic factor, 3.2% - for the fiscal factor, 2.1% - for the factor of financial payments balance. The destabilizing effect on the company financial risk neutralization capacity is made by the monetary

factor increase – the elasticity of the integral indicator for this factor is -2.9%.

Conclusions

As a result of the study, the approach to assessing the of system risk impact on enterprise financial risk neutralization capacity was developed by means of enterprise financial risk neutralization model buildup and its system risk impact modeling.

An integrated model that enables to estimate metallurgical enterprise financial risk neutralization capacity was elaborated on the basis of expert evaluation method. The system risk factors, the composition of which formed the commodity markets factor, political and demographic, fiscal, monetary factors as well as the factor of financial payments balance, was determined. By constructing a neural network, elasticity of enterprise financial payments balance in relation to system risk factors was calculated. All factors, with the exception of the monetary factor, were determined to have a positive impact on the enterprise financial risk neutralization capacity. The growth of the monetary factor by 1% was determined to lead to a decrease in the company financial risk neutralization capacity by 2.9%. The proposed approach enables to conduct preventive diagnostics of financial risk on the basis of of the current financial status and the enterprise financial risk neutralization capacity evaluation in an open economic system, taking into account system risk impact. The model is constructed and tested at metallurgical enterprises of Ukraine. The prospects for further research in this area are the study of insolvency problems and financial risk diagnosis for transnational corporations.

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Annex

Table 1. Value of weight ratios of financial risk indicators for metallurgical enterprises

Experts	Indicator					
	(X_1)	(X_2)	(X_3)	(X_4)	(X_5)	(X_6)
Expert 1	0.29	0.19	0.24	0.14	0.10	0.05
Expert 2	0.24	0.14	0.29	0.19	0.10	0.05
Expert 3	0.29	0.19	0.24	0.14	0.10	0.05
Expert 4	0.29	0.19	0.24	0.14	0.10	0.05
Expert 5	0.29	0.19	0.24	0.14	0.10	0.05
Expert 6	0.29	0.19	0.24	0.14	0.10	0.05
Expert 7	0.29	0.14	0.24	0.19	0.05	0.10
Expert 8	0.24	0.19	0.29	0.14	0.10	0.05
Expert 9	0.29	0.19	0.24	0.14	0.10	0.05
Expert 10	0.29	0.19	0.24	0.14	0.10	0.05
The resulting weighting factor	0.28	0.18	0.25	0.15	0.09	0.05

Source: authors calculation.

Table 2. Significant factor loads of system risk indicators

Indicator	Factor loads value	Dispersion, %
Factor 1		
GDP index, %	0.96	
Industrial product index, %	0.91	
Metallurgical production index, %	0.89	29.28
Capital investments index, %	0.98	
Metal exports index, %	0.84	
Metal import index, %	0.89	
Factor 2		
Real income index of population, %	0.87	
Natural population increase rate	-0.74	
Net migration rate through external migration	-0.80	
The level of democracy	0.75	27.47
The level of political stability	0.77	
Rule of law index	0.71	
Level of anticorruption efforts	0.76	
Factor 3		
Consolidated budget balance to GDP, %	0.94	
Domestic debt ratio to GDP, %	-0.81	14.64
External debt ratio to GDP, %	-0.76	
PFTS index growth level, %	0.70	
Factor 4		
Industrial producer price index, %	-0.76	
Consumer price index, %	-0.91	10.47
National Bank of Ukraine account rate, %	-0.73	
National currency devaluation index, %	-0.75	
Factor 5		
The ratio of net inflow of foreign direct investment to GDP, %	0.76	3.64
Portfolio investment ratio to GDP, %	0.79	

Source: authors calculation.

Figure 1. System of enterprise financial risk assessment indicators

Types of financial risks of an enterprise		Indicators of evaluation
Risk of business solvency reduction	Risk of irrational capital structure	Autonomy ratio Financial dependence ratio Current assets to equity ratio Financial risk ratio
Risk of insolvency	Risk of ineffective financial	Owner's equity return ratio Owner's equity turnover rate Return on equity ratio Capital turnover ratio
	Risk of liquidity reduction	Current liquidity ratio Quick liquidity ratio Absolute liquidity ratio Debt ratio Own working capital to equity ratio
	Risk of ineffective operation activity	Non-current assets return ratio Current assets return ratio Non-current assets turnover rate Current assets turnover rate Return on sales ratio Gross return on operating activity ratio Return on operating activity ratio
	Risk of cashflow imbalance	Liquidity cashflow ratio Cashflow effectiveness ratio Net cash flow adequacy ratio
Risk of ineffective investment activity		Total return of investment Return on investment ratio, excluding accounts payable Share of investment income in annual input cashflow

Source: Authors.

Figure 2. Neural Network Architecture for System Risk Impact on Metallurgical Enterprise Financial Risk Neutralization Capacity
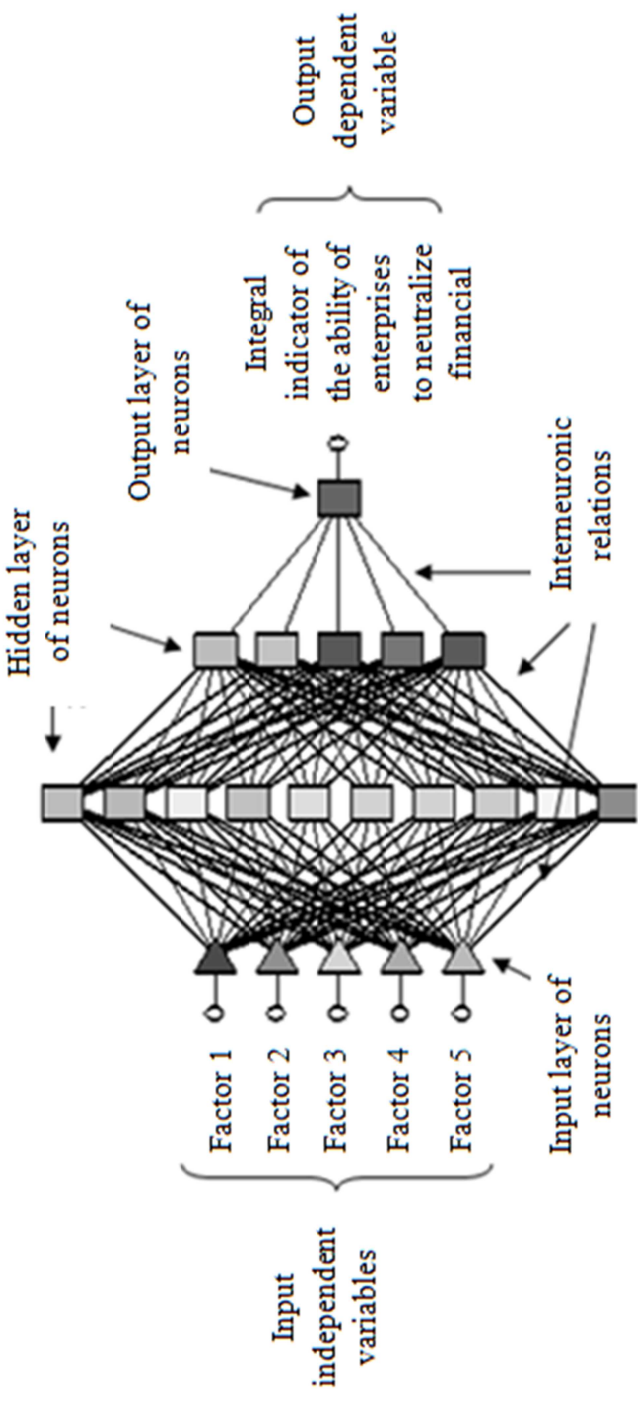
Source: authors calculation.

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Financial result of transport companies and its relation to exchange rates

JEL Classification: *R40; C58; F31*

Keywords: *correlation, exchange rate, financial result, transport company*

Abstract

Research background: Transport has a key meaning for the development and functioning of the industry, it is said to be its barometer. The development of the transport infrastructure (bridges, land, sea, rail roads, seaports, airports, logistics centers, terminals, border crossings etc.) is a necessary condition of the economy's efficient functioning. Wider, more modern understanding of this issue should cover entities dealing in transport, logistics or forwarding. The microeconomic approach to transport is determined by transport companies. Transport companies are a very important economic link. Many factors affect their economic condition, one of them being the exchange rate.

Purpose of the article: The purpose of the article is to show the importance of transport enterprises for the economy. The dynamics of their development will be shown from the point of view of the increase in financial results. The article will show the relationship between exchange rates and financial results of Polish transport enterprises. The expected research period will cover the years 2010-2017.

Methods: The first stage of research, based on the method of analysis and criticism of the literature, will be prepared in the area of the subject taken, including relations between the main concepts. This stage is auxiliary and constitutes a starting point for further research. Article will apply the data of National Polish Bank and the Statistical Office.

Findings & Value added: Analyzes and research will confirm the great importance of transport companies. The dynamics of their growth will be shown. The relationship between the financial result and exchange rates will be drawn clearly.

Introduction

Transportation plays a broad role in shaping economies. Transportation supports clusters and agglomerations, increases productivity, enhances jobs and labour market accessibility, pens new markets for businesses and enhances supply chain efficiency (see Rodrigue et al., 2017). The concept of transport is very wide and can be considered with many areas of the economy. The basic goal of transport is handling transport needs generated by the economy and the society. The following elaboration focuses on the connection of financial aspects of transport enterprise functioning with changeable retrenchment of macroeconomics. The following elaboration focuses on the supply side of the transport market, i.e. transport companies.

Unstable, changeable conditions of the outside surrounding create the frames of transport enterprises functioning, serving the transport needs of the society. A vigorous transport industry determines the further economic development in Poland. It is crucial to analyse the financial condition of companies providing transport services. The financial result, revenues and costs in view of the high degree of internationalization of the industry are mostly dependent on exchange rates. This dependence is twofold: direct and indirect. The direct impact of the exchange rate results from the costs (see Krawczyk, 2016, pp. 102-110) born in both domestic and foreign currencies. The indirect impact results from the general dependence of the economic situation, in particular the volume of export and import on the level of currency prices.

The goal of this elaboration is to present the financial result of transport sector enterprises broken down into revenues and costs. The financial result will also be separated for entities employing more than 49 people. The gross turnover profitability will be presented. The exchange rates fluctuations will be shown during the considered period. In the research part of this study, the change dynamics of the presented indicators will be calculated. Further considerations will be directed towards the relationship between financial results and exchange rates. The usefulness of Pearson's coefficient as a research tool for the correlation of the presented data will be verified. Research hypotheses for further research will be formulated.

The initial stage of the study begins with the critical analysis of the literature and industry reports. A review of the writing likewise references to

observation of business practice, own experiences and thoughts grants to create a theoretical basis for the study of numerical data with the assistance of statistical methods. Article will be divided into following sections: introduction, research methodology, results, conclusions.

Research methodology

The quantitative methods are used to analyse the data. The study is based on historical data to identify the relationship of defined variables. The study uses statistical data published by Statistics Poland (GUS – Główny Urząd Statystyczny) and National Polish Bank (NBP – Narodowy Bank Polski). Publications developed by these institutions are highly reliable, and thus the collected research material is credible. Information concerning the financial results of enterprises from the transport sector will be selected from the annual Statistic Poland reports - "Transport - activity results" in the analysed years 2010-2017.The second part of the analysed dependence - the average annual exchange rates will be calculated on the basis of archival data collected by the National Bank of Poland.

The presented data include activity results of economic entities which run (GUS):

1. an activity connected with the provision of goods or passenger transport, scheduled or non-scheduled, by rail, pipelines, road, water or air,
2. a supportive activity, such as e.g.: handling of goods, storing, maintenance, and small repairs of means of transport other than road motor vehicles, port and parking services,
3. renting transport equipment with a driver or operator.
   The analysed elements will be:
1. revenues from the sale of services include receipts from: transport of goods, passengers, luggage and mail, as well as receipts from handling of goods, freight, storage and warehousing of goods and other services connected with transport supporting activities, as well as revenues from the activities of travel agencies, tour operators and tour guides;
2. costs of obtaining revenues from total activity include: prime costs of products, goods and materials sold, connected with the main operating activity, which includes the value of sold goods and materials, as well as the total costs decreased by the cost generating benefits for the needs of the entity and corrected by the change in product inventories, other operating costs, financial costs;
3. the gross financial result (profit or loss) – represents the difference between net income gained from the sale of products, goods and materials

and costs bore for their obtaining, corrected by the balance of extraordinary profits and losses;

4. the profitability rate of gross turnover constitutes the relation of gross financial result to revenues from total activity, expressed in percent.

Correlation examines the relationships between pairs of variables. Pearson product-moment correlation coefficient is widely used in economics, social sciences, medicine, etc., as a measure of linear relationship between two variable X and Y. The mathematical formula for this coefficient developed by Pearson in 1895 is:

$$r_{XY} = \frac{C(X,Y)}{\sqrt{S_X{}^2 \cdot S_Y{}^2}} = \frac{\sum_{i=1}^{n}(x_i-\bar{x})(y_i-\bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i-\bar{x})^2 \cdot \sum_{i=1}^{n}(y_i-\bar{y})^2}} = \frac{C(X,Y)}{S_X \cdot S_Y}$$

C(X,Y) – covariance between features X i Y,
Sx^2 covariance features X,
Sy^2 covariance features Y,
Sx standard deviation X,
Sy standard deviation Y.

The Pearson correlation coefficient, r, can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association; that is, as the value of one variable increases, so does the value of the other variable. A value less than 0 indicates a negative association; that is, as the value of one variable increases, the value of the other variable decreases. The dependency gradation varies according to different researchers. The following research will use (Stanisz 1998):

– |r|=0 no correlation
– 0,0<|r|≤0,1 – faint correlation
– 0,1<|r|≤0,3 - weak correlation
– 0,3<|r|≤0,5 - average correlation
– 0,5<|r|≤0,7 – high correlation
– 0,7<|r|≤0,9 – very high correlation
– 0,9<|r|<1,0 – almost full correlation
– |r|=1 - full correlation

For each case we must check if the interpretation is in line with the particularities of data and the used model. Importantly, we have to be constantly aware of the limitation of any financial model. Correlations may be interpret as strong, weak and negative. This type of rendering is arbitrary and we can not treat it too closely. Moreover, Pearson's coefficient is very sen-

sitive to outliers (extreme). If we have even one of such outliers it can in-fluence our results in a very negative way. No financial model will ever be able to replicate complex economic reality perfectly. However, this does not mean models are useless.

Results

The financial reality is extremely complex, with thousands of entities, who may behave irrationally and numerous markets such as equity, fixed in-come, commodities, foreign exchange, real estate, and more, which are correlated. The study analyses the selected area, which is the result of the activities of Polish enterprises in the transport industry. It makes an attempt to provide a numerical proof of the relationship between the financial result and selected exchange rates.

First, it is worth presenting a numerical exemplification of the growing importance of the transport industry in the Polish economy. GUS data show that the transport industry employed almost 600,000 people. Transport cur-rently produces 5.8% of the total GDP of Poland, being the third most im-portant branch of the economy: after industry and trade, and before con-struction. The share of transport in generating GDP in Poland is at a much higher level than in most European coun-tries. The average for the whole Union is just over 2%, and in large developed countries, such as Germany or France, is on average below 2% of GDP. It clearly shows that transport has much more significance for the Polish economy than in other European Union countries. In quantitative terms, Polish transport companies begins to dominate in transport (for example: Eurostat data indicate that the share of Polish transport companies in this market segment in 2016 was 30.6%, when in 2010 it came to 24.7%).

By analyzing the results of transport enterprises (see Table 2) the clear increase is visible, in 2010 it was more than 8 147 mil zlotych and in 2017 it was 26 650 mln zlotych. This situation presents more than threefold growth over 8 years. The growth rate was the highest in 2011/2012 and approached to over 800%. In the observed years 2010-2017 there were also declines in the profitability of the industry, the largest in 2011 when the benefits from conducting this activity de-creased by 84.16% for all entities of the transport sector (see Table 3). The downfall in profitability will not affect larger entities employing more than 49 people. Despite temporary declines in income, the turnover in the industry is steadily growing. The highest dynamics was recorded in revenues and costs in 2012 (revenues increased by 20.06%, costs by 13.26%). Gross turnover profitability rate -

being the ratio of gross financial result to revenues also increased from the level of 2.4% in 2010 to 5.0% in 2017. The growth rate of profitability was the high-est in 2015 and amounted to 46.67%.

The exchange rate of the Polish currency varies, which can be seen in table 1. The highest difference in relation to the zloty is the British pound, its average exchange rate ranged from the lowest - 4.6587 in 2010 to 5.7675 in 2015, so that in the subsequent years after the referendum deci-sion to leave the European Union by the British fell to 4.8595. The smallest fluctuation in the zloty is in relation to the Euro, the lowest level of this exchange rate was 3.9939 in 2010, the highest in 4.3637 in 2016.

Writing and statistic data analysys show a large meaning of transport enterprises in the industry. This sector is developing in Poland very dynam-ically. One of the main factor that forms the level of financial result of transport industry and mainly those with a high level of internationalization are exchange rates. It is legitimate to lead further researches of these two areas. The first step of the analisis will be to formulate a hypothesis if there is a dependence between financial results of transport enterprises and ex-change rates. This verification will be carried out using the Pearson correla-tion coefficient.

Conclusions

The importance of the transport industry (see Rodrigue et al., 2017, pp. 98-115) called by some the barometers of the economic condition is enormous. Transport takes on even more importance in combination with internation-alization and globalization processes. Polish transport enterprises success-fully undergone a period of economic transformation and at present they perform a significant role in the area of European Union. In the audited period, their financial results increased, from PLN 8 147.1 million in 2010 to PLN 26 650 million in 2017 (Table 2). Profitability also increased, the gross turnover profitability indicator was 5.0% in 2017 as compared to 2.4% in 2010.

It must be said that the fluctuations of zloty have a remarkable impact on the economy from the macroeconomic point of view and they also affect individual entities, including the transport sector. Conducted analyses allow to formulate a research hypothesis for further research. Is there a relation-ship between the financial results of transport companies and exchange rates? The study may be deepened by the following questions:
– Is the dependence conditioned by the size of the enterprise?
– The dependence of which of the exchange rate in the analysed period

was the strongest and which was the weakest?
– The relation of which of the elements of the financial result (revenues, costs) is the largest?

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Annex

Table 1. Average annual exchange rate of foreign currencies: USD/PLN, EUR/PLN, GBP/PLN, CHF/PLN; period 2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017
USD/PLN	3,0179	2,9636	3,2581	3,1615	3,1537	3,7730	3,9435	3,7782
EUR/PLN	3,9939	4,1190	4,1852	4,1976	4,1845	4,1843	4,3637	4,2583
GBP/PLN	4,6587	4,7463	5,1605	4,9426	5,1919	5,7675	5,3405	4,8595
CHF/PLN	2,8983	3,3474	3,4724	3,4101	3,4453	3,9228	4,0027	3,8364

Source: Archiwum kursów średnich - tabele A, 2010-2017, https://www.nbp.pl/home.aspx?c=/ascx/archa.ascx (03.12.2018)

Table 2. Financial result of the transport industry, selected elements 2010-2017

	2010	2011	2012	2013	2014	2015	2016	2017
Revenues from total activity, million PLN	1415 80,1	1504 99,2	1806 96,8	1857 40,4	1957 70,9	2034 42,4	2285 30,8	2502 29,2
Costs of obtaining revenues from total activity, million PLN	1334 33,0	1492 08,7	1690 00,3	1757 90,6	1859 19,0	1922 28,4	2101 44,0	2235 79,2
Financial result, million PLN	8147,1	1290,5	11696,5	9949,8	9851,9	11214	18386,8	26650
Financial result, million PLN*	1823,1	1913,0	2158,9	2701,1	2766,1	4303,2	5001,6	6161,6
Gross turnover profitability indicator, %*	2,4	2,5	2,5	3,1	3,0	4,4	4,6	5,0

* data for entities employing more than 49 people
Source: Transport – wyniki działalności 2010-2017, http://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc (03.12.2018).

Table 3. Multi-base dynamics of selected elements of the financial result in the years 2010-2017 (in %)

	2010 /11	2011 /12	2012 /13	2013 /14	2014 /15	2015 /16	2016 /17
Revenues from total activity, million PLN	6,3	20,06	2,7	5,4	3,9	12,33	9,49
Costs of obtaining revenues from total activity, million PLN	11,82	13,26	4,02	5,76	3,39	9,32	6,39
Financial result, million PLN	-84,16	806,35	-14,93	-0,98	13,83	63,96	44,94
Financial result, million PLN*	4,93	12,85	25,11	2,41	55,57	16,23	23,19
Gross turnover profitability indicator, %*	4,17	0,00	24,00	-3,23	46,67	4,55	8,70

*data for entities employing more than 49 people
Source: own calculations based on GUS (2010-2017).

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The development of socially responsible investing in European Union countries

JEL Classification: *G11; M14; O16*

Keywords: *socially responsible investing, socially responsible investing strategies, financial market*

Abstract

Research background: Corporate social responsibility is a concept, which translates into financial markets and decisions making by investors. For many investors, social credibility is the basis for evaluation of companies. This means that more and more investors, in addition to criterion of efficiency of capital employed (economic criterion), take into account social, environmental, ethical and corporate governance aspects. This leads to diversification of capital market in which, beside the traditional investing, socially responsible investing is becoming increasingly important.
Purpose of the article: The aim of the article is to identify trends associated with the socially responsible investing in the European Union's capital markets.
Methods: The classical methods of research are used in this article, such as the study of the literature concerning socially responsible investing and the method of desk research based on documents showing trends of socially responsible investing in the European Union.
Findings & Value added: The conducted analysis showed that more and more investors in the European Union base their decisions not only on financial parameters, but also on social and environmental factors. However, this market is not homogenous. This results from both different rate of development of socially responsible investing in individual European Union Member States and the fact that

this type of investing is implemented in a different way, that is determined by the investors' preferences regarding investment strategy.

Introduction

The increasing social expectations for activities undertaken by companies are reflected in functioning of financial markets. This is due to the fact that more and more investors ae not purely focused only on maximizing financial benefits from investments, but are also interested in investing in a way that will contribute to solving the specific social and environmental problems. (Waring & Edwards, 2008, p. 135). The effect is the development of a new trend in investing, which is socially responsible investing (SRI), labeled by Sparkes (2002) as a "global revolution".

Socially responsible investing promotes a broader analysis of investment opportunities going beyond conventional strategies (Urwin, et.al., 2009, p. 2). However, it is not contrary to essence of traditional investing based on efficiency criteria. In the process of making an investment decision, financial factors are not the only criteria taken into account by investors. They are supplemented by socio-ethical, ecological and environmental aspects (Kreibohm, 2016, pp. 12-13).

Along with the development of the concept of socially responsible investing, not only new criteria for selection of assets to investment portfolio, but also separate investment strategies have been developed. These strategies provide guidance for managers of socially responsible investment portfolio. In addition, they can be treated as complementary to each other, and used by the same investor at different stages of investment process.

The aim of the article is to identify trends associated with the socially responsible investing in the European Union's capital markets.

Research methodology

The research conducted in the article relate to socially responsible investing in the European Union's capital markets. The selection of European Union market is determined by the fact that it is characterized by the largest share in the global market of socially responsible investing and by the largest number of initiatives undertaken to promote this form of investing. Thus, it can be assumed that trends taking place in this market determine the direction of development of socially responsible investing around the world.

In order to attain the article's purpose, different research tools were used. The article was based on descriptive method consists of analysis of literature related to socially responsible investing. In addition, the method of desk research, based on documents showing trends of socially responsible investing in the European Union, were applied. This analysis allowed for presentation of development of socially responsible investing in the European Union, as well as for show the territorial diversification of socially responsible investments in terms of value and in the cross-section of strategies that are being used in this process.

The applied methodology allowed to of the realization article's purpose and formulation of conclusions and recommendations concerning the socially responsible investing in the European Union's capital markets.

Results

Socially responsible investing is a concept that is increasingly popular among European Union countries. In 2009, the value of these investments amounted to EUR 4378 billion. While in 2015, it was about EUR 9517 billion, which means an increase of over 200%.

The initiatives undertaken by Eurosif and European Union play a special role in development of socially responsible investment in Europe. References to the concept of socially responsible investing can be found in many European Union's document, such as: *Europe 2020: A strategy for smart, sustainable and inclusive growth,* as well as *Resolution on corporate social responsibility: accountable, transparent and responsible business behaviour and sustainable growth.*

Despite the various initiatives, the SRI market in European Union is not unified. It is characterized by diversification in terms of value of socially responsible investments undertaken in individual countries (table 1).

The largest value of SRI market among European Union countries was characteristic in 2009 for: France and Great Britain. They constituted over 63% of total EU market. Among these countries, the French market had the largest share in EU market (42%). Other markets represented only 58%. The French market also in 2015 had the largest share in EU market, but it constituted about 33%. The significant share in SRI market in European Union was also characteristic for capital markets in Germany, Great Britain and the Netherlands.

The individual countries are also varied in terms of rate of growth of socially responsible investments. The greatest growth rate can be observed in Austria. In 2009, the value of SRI market in this country was estimated

at about EUR 2 billion. While in 2015, its value was EUR 52 billion, which means an increase of over 2400%. An increase of over 500% is characteristic for Poland. The value of socially responsible investments amounted to EUR 1,1 billion in 2009, and to EUR 6 billion in 2015. It should also be emphasized that Poland is the only country in Central and Eastern European that are covered by statistic on socially responsible investing. It is also the country characterized by intense development of these investments.

A characteristic feature of socially responsible investing in the European Union's capital markets is also differentiation in terms of strategies that are being used in this process (figure 1).

When analysing data for each year, it can be noticed that investors base their decisions mainly on four strategies i.e. Exclusions, Engagement and Voting, ESG integration, as well as Norms-based screening. However, the changes in preferences for socially responsible investing, can be observed. In 2009 and 2011, investors had been making decision in particular on the basis of ESG integration. In 2011, their value ammouned to approximately 3173 EUR billion. However, since 2013 the largest share in the market have investments made on the basis of exclusions from investment portgolio those companies whose activity is disadvantageous from an ethical or social point of view. Investments based on this strategy reached EUR 8066 billion in 2017, which means an increase of nearly 600%.

Engagement and Voting strategy has attracted great interest among investors. During the analysed period, it was the second, in terms of value, strategy used by investors. Except for 2015, in which, despite the increase of value of investments, this strategy was in third position

Also Norms-based screening had an important role in investment decision-making process. In 2009-2015, an increase in value of investments based on this strategy was around 800%. In 2017, the decrease in value of these investments, was recorded (to EUR 3078 billion). Within this strategy, the principles of UN Global Compact and OECD Guidelines for Multinational Enterprises were the most commonly used criteria for selection of companies to investment portfolio.

The great interest in in investing on the basis of ESG integration, should be also noted. In 2009, approximately EUR 2778 billion were invested using this strategy, while in 2017 this value amounted to over EUR 4161 billion. ESG integration played a particularly important role in 2009 and 2011, in which it was the most commonly used strategy by investors in selected European Union countries.

By contrast, the strategies such as: Best-in-Class, Sustainability Themed, as well as Impact Investing were the least used by investors. However, in 2011-2017 an increase in the area of Impact Investing, can be observed (of over 500%).

It should be also emphasized the socially responsible market in European Union is not homogenous. It is characterized by large diversification between countries in terms of SRI strategies (figure 2).

Among the European Union countries, the ones that are characterized by both lower and higher level of diversification in terms of strategies used by investors, can be distinguished. The first group undoubtedly includes Germany in which Exclusions play a dominant role. In 2011-2015, over 90% of investments were made on the basis of this strategy. In 2017, this share was around 86%.

A similar situation occurs in Spain. In 2009-2015, the share of investments based on Exclusions amounted over 70%. Whereas, in 2017, it was about 59%. This was accompanied with significant increase the share of investments made on the basis of ESG integration (about 23%).

The lowest level of diversification during the analysed period, can be observed in Austria. In 2009, assets were almost equally managed with the use of strategies such as: Exclusions, Norms-based Screening, Best-In-Class, as well as Engagement and Voting. In subsequent years, there was an increase in the share of investments based on Exclusions (to 50% in 2011, and to around 65% in 2013-2017).

A similar direction of changes in socially responsible investing can also be observed in Denmark. In 2009-2015, the value of investments made on the basis of Exclusions and Norms-based Screening was at a similar level of around 35% of the total value of socially responsible investments. In 2017 there was a significant increase in share of Exclusions (to around 70%).

Over analysed time period, significant changes in terms of SRI strategies that are being used by investors, have occurred in France. In 2009, the overwhelming value of assets (95%) was managed with the use of ESG integration. In subsequent years, a gradual decrease in this share with the simultaneous increase the importance of investments made on the basis of Norms-based Screening, have been observed. In 2015 and 2017, their share was around 65% and 48%. It should be also noted the low interest in investing on the basis of Exclusions.

Also in Great Britain, exclusions those companies whose activity is disadvantageous from an ethical or social point of view are not a main criterion in the process of socially responsible investing. The share of this strategy in the total value of socially responsible investments ranged from around

5% in 2009 to around 30% in 2015-2017. Investors from Great Britain most often base their investment decisions on Engagement and Voting, with a fairly large share of ESG integration.

When analysing individual SRI markets in the European Union, a small change over time can be observed in the Netherlands. Investors made decisions mainly on the basis of strategies such as: Exclusions, Norms-based Screening, ESG integration, as well as Engagement and Voting. The relatively similar share of investing with the use of these strategies in particular years, should be also emphasized.

A definitely different situation can be observed in Poland. The short history of socially responsible investing causes a need to develop a uniform nationwide criteria for selection of companies to investment portfolio. They are currently based on investors' individual preferences regarding investments strategy. This is reflected in high level of diversification in terms of strategies used by investors. In 2009-2011 almost all SRI investments were made on the basis of Exclusions (over 95%). In subsequent years, there was a significant diversification of implemented investments strategies, of which Norms-based Screening played the most important role. It should also be notet that in 2015 investors were interested in investing with the use of strategies such as: Best-In-Class and Sustainability Themed. While in 2017, there was a complete lack of interest in these strategies with the simultaneous interest in investing on the basis of Engagement and Voting and ESG integration.

Conclusions

Socially responsible investing plays an increasingly important role in the European Union's financial markets. However, it should be emphasized that SRI market is characterized by diversification between countries in terms of rate of growth as well as preferences regarding investments strategy.

Therefore, attempt to explain the reasons for this diversification is an important direction of research in the field of socially responsible investing. Undoubtedly, they are related three areas i.e. efficiency of investments, legal determinants and social determinants. A particularly interesting are the last two areas, within which activities that will allow to increase the level of socially responsible investing, should be undertaken. This requires the use of systemic solutions that allow accurate identification of social and law barriers to development of SRI market, and create instruments to overcome these barriers. Such instruments include:

− undertaking effective actions to promote CSR; which is important due
the fact that an insufficient knowledge in this field is a barrier to devel-
opment of socially responsible investing,
− promotion of transparency and credibility of ESG data and principles for
socially responsible investing,
− developing guidelines for financial institutions in terms of broader con-
sideration of ESG risk in investments strategies,
− training for investment advisors in the field of socially responsible in-
vesting,
− developing a tool for investors to evaluation of socially responsible in-
vesting,
− strengthening cooperation for socially responsible investing, within SRI
funds operating in Europe,
− introducing legal regulations concerning fiscal solutions that would
encourage investors to take into account criteria of corporate social re-
sponsibility in the process of create an investment portfolio.

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Annex

Table 1. Socially responsible investments in European Union countries[*] between 2009 and 2015[**]

Country	2009		2011		2013		2015	
	in EUR billion	%	in EUR billion	%	in EUR billion	%	in EUR billion	%
Austria	2,1	0,05	8,3	0,15	27	0,36	52,2	0,55
Belgium	193,7	4,42	96,9	1,69	226	3,00	315,9	3,32
Denmark	242,2	5,53	244,2	4,25	N/D	N/D	118,4	1,24
Finland	89,4	2,05	107,6	1,88	131,5	1,75	68	0,71
France	1 850,70	42,27	1 884,00	32,78	1 728,90	22,99	3 121,10	32,79
Spain	33,3	0,76	57,1	0,99	93,2	1,24	95,3	1,00
Netherlands	396	9,04	666,2	11,59	1 244,60	16,54	991,4	10,43
Germany	12,9	0,29	621	10,80	897,9	11,93	1 786,40	18,77
Poland	1,1	0,03	1,2	0,02	1,1	0,01	6	0,06
Sweden	305,5	6,98	378,3	6,58	649	8,63	791,7	8,32
Great Britain	938,9	21,44	1 235,00	21,49	1 973,10	26,22	1 555,30	16,34
Italy	312,4	7,14	447,6	7,78	551,9	7,33	616,2	6,47

Note: [*] The analysis included the European Union countries, for which data of at least three years, were available. [**]The table does not include data for 2017 due to the lack of data comparability with previous periods. This data present only a total value of each individual strategy per country. Due the fact that investors can use more than one strategy in their investment process, aggregation of these data would lead to an overestimation of real value of investments made in the individual SRI markets within the EU.
Source: own elaboration on the basis of: (Eurosif, 2010, pp. 11-58; Eurosif, 2012, p. 63; Eurosif, 2014, p. 21; Eurosif, 2016, p. 57).

Figure 1. The value of socially responsible investments in the European Union countries between 2009-2017, by strategies (in EUR billion)
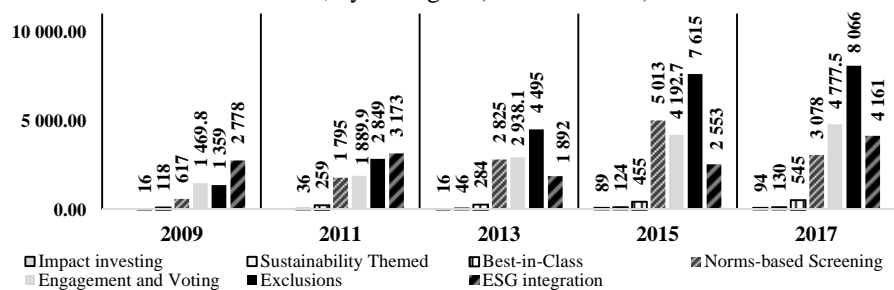
Source: own elaboration on the basis of: (Eurosif, 2010, pp. 11-58; Eurosif, 2012, p. 63; Eurosif, 2014, p. 21; Eurosif, 2016, p. 57; Eurosif, 2018, p. 83).

Figure 2. Socially responsible investing strategies in individual European Union countries between 2009 and 2017
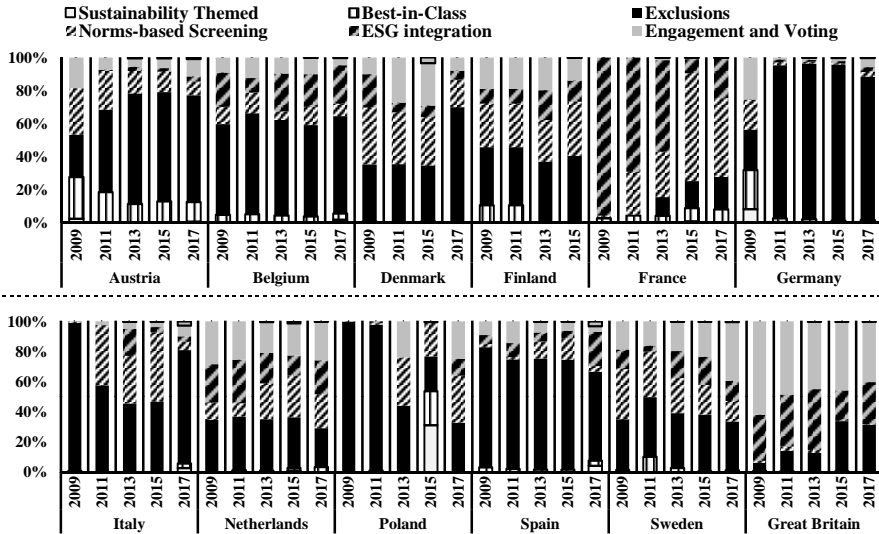
Source: own elaboration on the basis of: (Eurosif, 2010, pp. 11-58; Eurosif, 2012, p. 63; Eurosif, 2014, p. 21; Eurosif, 2016, p. 57; Eurosif, 2018, p. 83).

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Diverse dividend policy of the companies listed on the Warsaw Stock Exchange

JEL Classification: *G10; G30; G35*

Keywords: *dividend policy; dividend determinants; the WSE; investment attractiveness, TOPSIS*

Abstract

Research background: The dividend policy has been a subject of many scientific studies. However, there is still a research gap concerning the lack of comprehensive research on the differences between companies conducting different types of dividend policy. Furthermore, no attempt has been made to indicate which of them could be considered as more attractive for stock market investor that invests in dividend stocks.

Purpose of the article: The aim of this paper is to carry out a comparative analysis of companies with different dividend policy from the point of view of their investment attractiveness. To achieve this objective, I posit the hypothesis that companies conducting diverse dividend policy differ significantly in terms of many characteristics.

Methods: The research is conducted among the regular dividend payers listed on the Warsaw Stock Exchange in the years 2001-2017. The main calculations are carried out using the technique for order of preference by similarity to ideal solution (TOPSIS), descriptive statistics and one-way analysis of variance ANOVA with Fisher's LSD test. The data for analysis is collected from Notoria Service and Stock Market Yearbooks.

Findings & Value added: The crucial conclusion is that companies conducting diverse dividend policy differ in terms of many characteristics, so their investment attractiveness can be perceived differently. The value added of this paper is a holistic approach to comparison of companies conducting different dividend policy.

Introduction

The aim of the study is to carry out a comparative analysis of companies with different dividend policy from the point of view of their investment attractiveness. The study aims to answer two research questions:
1) what are the differences between the companies implementing different dividend policy?
2) which dividend policy is the most attractive for investors investing for dividends?

Finding the answers to above questions is not only significant from the point of view of clientele effect, but it is also important for investors looking for the best investment opportunity. If they invest for dividends, they can be paid regular dividend in a form of:
a) constant dividend per share policy – paying out a fixed dividend per share regardless of the level of net profit;
b) growing dividend per share policy – is an adaptation of above policy to the market situation (i.e. inflation);
c) constant payout ratio policy – paying out a fixed part of net profit;
d) extreme dividend policy – transferring 100% of net profit to the shareholders;
e) residual dividend policy – paying out dividend after financing the company's investment projects (Baker and Smith, 2006, p. 2);
f) hybrid dividend policy – a combination of at least two different types of dividend policy.

The literature on dividend policy focus mainly on its determinants (Jensen *et al.*, 1992, p. 247; La Porta *et al.*, 2000, p. 34; DeAngelo *et al.*, 2006, p. 227; Eije & Megginson, 2008, p. 347). It has been shown that the probability of dividend payment increases in case of higher profitability and liquidity, lower indebtedness and lower uncertainty about the future financial standing of company. Moreover, mature companies pay dividend more often, which is connected with their investment opportunities, while small and young companies pay dividend less frequently. Furthermore, dividend is paid more often by the companies with strongly concentrated ownership. However, according to the author's knowledge, there is no academic research regarding the comparison of companies implementing different types of dividend policy.

Research methodology

The study has been conducted among the regular dividend payers listed on the Warsaw Stock Exchange in the years 2001-2017. The adopted criteria have been met by 81 companies.

To answer the research questions, I posit the hypothesis that companies conducting diverse dividend policy differ significantly in terms of many characteristics. Then, I carry out the study in a few stages.

First, I categorize the companies against six types of dividend policy.

Second, I choose 18 variables that describe 8 main areas of dividend determinants and can be taken under consideration when investment decisions are made, i.e.: liquidity, profitability, indebtedness, investment opportunities, market ratios, company's size, company's age, ownership structure.

Third, I investigate whether there are any differences between the companies conducting diverse dividend policy. To do this, I use the descriptive statistics and one-way analysis of variance with Fisher's Least Significant Difference (LSD) test (Lynne & Abdi, 2010, pp. 1-6).

Forth, I use the classical technique for order of preference by similarity to ideal solution (TOPSIS) to rank different types of dividend policy and find out which dividend policy can be treated by stock market investors as this one with the greatest investment attractiveness. In order to eliminate strongly correlated variables (r at 0.7), I use the Pearson correlation coefficient. As a result, some variables must be excluded from further research. Next, I divide the remaining 10 variables into stimulants (DY, ROE, CR, MR, LnTA, Age, Share) and destimulants (P/E, DR, LTI/TA).

Classical TOPSIS method, introduced by Hwang and Yoon (1981), is a widely used approach for multiple criteria decision making. The strength of this method is its simplicity and practicality (Wang *et al.*, 2015, p. 1), but the weakness is that the use of the Euclidean distance does not include the correlation between attributes (Velasquez & Hester, 2015, p. 62). The basic principle of this approach is that the best decision should be the closest to the ideal solution and the farthest from the non-ideal one (Wang *et al.*, 2015, p. 3). The decision-making process based on this method consists of the following steps (Wang *et al.*, 2015, p. 3):

1) Normalization of decision matrix:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{k=1}^{m} x_{kj}^2}}, (i = 1,2,...,m; j = 1,2,...,n) \tag{1}$$

where r_{ij} stands for the normalized value of jth criteria for the ith alternative;

2) Calculation of the weighted normalized decision matrix:

$$v_{ij} = w_j r_{ij}, (i = 1,2,...,m; j = 1,2,...n; \sum_{j=1}^{n} w_j = 1) \tag{2}$$

where w_j is the weight of the jth criteria.

3) Determination of positive and negative ideal solutions:

$$a^+ = (a_1^+, a_2^+,..., a_n^+) := \{\max_{i=1,...,m} v_{ij} | j \in J_S), (\min_{i=1,...,m} v_{ij} | j \in J_D)\} \tag{3}$$

$$a^- = (a_1^-, a_2^-,..., a_n^-) := \{\min_{i=1,...,m} v_{ij} | j \in J_S), (\max_{i=1,...,m} v_{ij} | j \in J_D)\} \tag{4}$$

where J_S is a set of stimulants and J_D is a set of destimulants;

4) Calculation of the Euclidean distance from the positive ideal solution and the negative ideal solution:

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - a_j^+)^2}, (i = 1,2,...,m; j = 1,2,...,n) \tag{5}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - a_j^-)^2}, (i = 1,2,...,m; j = 1,2,...,n) \tag{6}$$

where $S_i^+ (S_i^-)$ denotes the distance between the ith alternative and the positive (negative) ideal solution;

5) Calculate the relative closeness to the ideal solution:

$$R_i = \frac{S_i^-}{S_i^+ + S_i^-}, (i = 1,2,...,m) \tag{7}$$

where $0 \le R_i \le 1$. The highest value of R_i indicates the best solution (object) in considered problem of linear ordering.

To weight the attributes and keep the consistency of judgment, I use three ways to determine weights, i.e. method of equal weights (in the study all weights are equal to 0.1), method based on the coefficient of variation, entropy method for determination of weight that consists of the following steps (Zhang, 2015, p. 196).

The data for analysis comes from Notoria Service and Stock Market Yearbooks. To conduct the research, I use statistical software Statistica 12.

Results

The research shows that on the WSE dominate those companies that do not pay out dividend. Analyzing the research sample in terms of the type of dividend policy, it should be noted that the majority of companies conduct so-called stable dividend policy, i.e. constant dividend per share policy and growing dividend per share policy (see Figure 1).

Table 1 provides some characteristics of companies regularly paying out dividend. It should be stated that the greatest average payouts from net profit and reserved capitals are made in case of extreme dividend policy, which is positively seen by the capital market and results in a high P/BV ratio. Furthermore, dividend yield is the highest. This type of dividend policy is implemented in highly profitable and liquid companies with low indebtedness and average level of long-term, which allows them to pay out the entire net profit.

It should be noticed that average dividend payout ratios for companies conducting constant and growing dividend per share policy are similar are relatively high comparing to results for other types of dividend policy. Moreover, they are profitable, liquid and not excessively indebted. Comparing those two types of dividend policy, it is seen that companies with growing dividend per share policy are more profitable that companies with constant dividend per share policy. What is more, those companies are of similar liquidity, level of debt, fixed capital, company's size, age and ownership structure.

Companies conducting constant payout ratio policy are the lowest priced in relation to the companies implementing other types of dividend policy. What is more, this type of dividend policy is characterized by relatively lower amount of net profit which is transferred to the shareholders as a dividend, and the return on investment measured by dividend yield is the lowest. Those companies are profitable and liquid. Their indebtedness is the lowest in the research group, long-term investments are relatively low, they are listed the longest, and the share of notified investors in the ownership structure is relatively high.

In residual dividend policy, free cash is primarily invested, which results in the lowest dividend payout and the highest market valuation. Those companies are profitable and liquid, however, the financial liquidity is relatively lower than in case of the companies implementing other types of

dividend policy, and due to the implementation of long-term investments, there is relatively higher indebtedness.

Considering hybrid dividend policy, one can notice that most of studied ratios are at the average level. Moreover, the companies implementing this dividend policy invest relatively the least, are the largest, and ownership concentration is the highest. An in-depth analysis has showed that the surveyed group of companies is not homogeneous in terms of dividend policy, therefore the obtained research results should not be generalized.

The comparison of significance of differences in mean of ratios characterizing six groups of companies conducting different types of dividend policy has showed the existence of statistically significant differences in case of six ratios, i.e. DPR, P/BV, P/E, DY, ROE i LTI/TA. The Fisher's LSD test shows the details of differences between different types of dividend policy (see Table 2).

In order to use TOPSIS, I exclude those variables for which there is a strong correlation ($r = 0.7$; $\alpha = 0.05$) (see Table 3). Then, the synthetic indicators used to assess the attractiveness of investment in dividend shares have been calculated. Table 4 presents the results of TOPSIS, i.e. arranging different types of dividend policy in order (Rank). The values of synthetic indicators show that different weights assigned to particular variables do not affect the ordering of individual objects in case of three types of dividend policy, i.e. extreme dividend policy, constant dividend per share policy and residual dividend policy. In all cases, the highest value of the synthetic indicator of investment attractiveness of dividend shares has been obtained for extreme dividend policy, while the lowest one has been received for companies with residual dividend policy.

Conclusions

Among the companies that regularly pay out dividend dominate those that conduct constant and growing dividend per share policy. This policy is particularly attractive for long-term investors that expect both the regular financial benefits in form of dividend and the capital gains in the future. Companies conducting different types of dividend policy differ in many respects, but the most significant differences are observed in case of extreme and residual dividend policy. The first policy should be of particular interest to investors investing for dividends, while the second one should be attractive to investors that invest for capital growth.

The research results can be useful in the process of making investment decisions and creating the best investment portfolio. However, there are

some limitations. The results should not be generalized since the study has been carried out only among the companies from the WSE, assuming that regular dividend is that one which paid for at least 5 consecutive years. Therefore, the research ought to be extended to other capital markets, consider different analytical periods and sub-periods and take into account other dividend determinants.

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Annex

Table 1. Average values of ratios calculated for different types of dividend policy (N = 81)

Dividend policy	DPR	P/BV	P/E	DY	ROA	ROE	ROS	CR	QR	MR	DR	D/E	LTD/E	FC/TA	LTI/TA	lnTA	Age	Share
Constant DPS	0.63	1.71	17.27	3.36	0.07	0.07	0.07	1.64	1.19	0.25	0.37	0.64	0.18	0.10	0.27	12.63	121	0.71
Growing DPS	0.61	1.82	11.31	4.48	0.09	0.16	0.10	1.63	1.25	0.37	0.36	0.62	0.23	0.10	0.19	12.71	154	0.67
Constant DPR	0.42	1.15	12.30	2.62	0.06	0.11	0.10	1.74	1.44	0.13	0.28	0.45	0.14	0.06	0.10	12.87	183	0.77
Extrame -100%	1.36	2.49	14.91	6.36	0.11	0.23	0.13	2.08	1.56	0.53	0.33	0.55	0.19	0.10	0.26	12.77	131	0.71
Residual	0.19	3.77	25.63	1.13	0.10	0.17	0.12	1.54	0.80	0.26	0.45	0.84	0.39	0.20	0.42	13.32	104	0.72
Hybrid	0.55	1.60	15.18	2.90	0.07	0.09	0.06	2.16	1.04	0.11	0.42	0.91	0.33	0.16	0.05	14.16	163	0.82

Source: own calculations based on data from Notoria Serwis and Stock Market Yearbooks.

Table 2. The results of ANOVA and *p*-value of Fisher's Least Significant Difference test (N = 81)

Spec.	DPR	P/BV	P/E	DY	ROA	ROE	ROS	CR	QR	MR	DR	D/E	LTD/E	FC/TA	LTI/TA	LnTA	Age	Share
F-ratio	5.48	2.73	2.55	5.89	1.40	3.33	1.09	0.89	0.92	1.83	0.73	0.96	1.10	1.61	3.02	1.12	1.49	1.18
p-value	0.00	0.03	0.04	0.00	0.24	0.01	0.37	0.50	0.47	0.12	0.60	0.45	0.37	0.17	0.02	0.36	0.20	0.33
GR$_1$ vs. GR$_2$	0.85	0.76	0.14	0.06	0.09	0.01	0.22	0.98	0.80	0.26	0.75	0.88	0.36	0.93	0.13	0.86	0.10	0.42
GR$_1$ vs. GR$_3$	0.31	0.33	0.37	0.45	0.83	0.40	0.52	0.78	0.43	0.45	0.20	0.32	0.67	0.35	0.04	0.74	0.03	0.30
GR$_1$ vs. GR$_4$	0.00	0.09	0.62	0.00	0.04	0.00	0.05	0.14	0.14	0.03	0.46	0.58	0.81	0.75	0.88	0.81	0.68	0.88
GR$_1$ vs. GR$_5$	0.13	0.01	0.29	0.08	0.34	0.13	0.31	0.85	0.36	0.97	0.45	0.42	0.10	0.06	0.13	0.50	0.73	0.87
GR$_1$ vs. GR$_6$	0.69	0.83	0.04	0.62	0.79	0.75	0.79	0.17	0.65	0.38	0.57	0.17	0.15	0.12	0.01	0.03	0.13	0.11
GR$_2$ vs. GR$_3$	0.38	0.24	0.86	0.04	0.18	0.38	0.83	0.77	0.54	0.15	0.29	0.38	0.32	0.33	0.26	0.83	0.30	0.12
GR$_2$ vs. GR$_4$	0.00	0.15	0.44	0.01	0.43	0.08	0.32	0.14	0.22	0.20	0.63	0.68	0.62	0.70	0.30	0.92	0.32	0.42
GR$_2$ vs. GR$_5$	0.16	0.01	0.07	0.01	0.88	0.80	0.68	0.86	0.30	0.61	0.37	0.39	0.23	0.07	0.03	0.56	0.30	0.59
GR$_2$ vs. GR$_6$	0.79	0.66	0.00	0.06	0.46	0.26	0.32	0.17	0.55	0.12	0.45	0.15	0.37	0.14	0.10	0.04	0.73	0.04
GR$_3$ vs. GR$_4$	0.00	0.04	0.67	0.00	0.07	0.04	0.35	0.41	0.73	0.03	0.55	0.63	0.58	0.52	0.08	0.90	0.10	0.41
GR$_3$ vs. GR$_5$	0.48	0.00	0.13	0.29	0.33	0.43	0.62	0.73	0.19	0.59	0.14	0.18	0.09	0.03	0.01	0.70	0.14	0.62
GR$_3$ vs. GR$_6$	0.61	0.50	0.02	0.79	0.70	0.73	0.49	0.38	0.34	0.93	0.15	0.06	0.14	0.06	0.60	0.14	0.56	0.60
GR$_4$ vs. GR$_5$	0.00	0.10	0.19	0.00	0.75	0.44	0.86	0.31	0.09	0.22	0.27	0.29	0.15	0.05	0.14	0.62	0.59	0.94
GR$_4$ vs. GR$_6$	0.00	0.13	0.02	0.00	0.23	0.03	0.11	0.86	0.16	0.02	0.30	0.11	0.24	0.11	0.03	0.08	0.29	0.17
GR$_5$ vs. GR$_6$	0.27	0.01	0.65	0.19	0.54	0.31	0.31	0.29	0.64	0.53	0.78	0.80	0.68	0.48	0.00	0.46	0.26	0.37

Symbols: GR$_1$ – companies with constant dividend per share policy, GR$_2$ – companies with growing dividend per share policy, GR$_3$ – companies with constant payout ratio policy, GR$_4$ – companies with extreme dividend policy, GR$_5$ – companies with residual dividend policy, GR$_6$ – companies with hybrid dividend policy.

Source: own calculations based on data from Notoria Serwis and Stock Market Yearbooks.

Table 3. Correlation matrix (N = 6)

Spec.	DPR	P/BV	P/E	DY	ROA	ROE	ROS	CR	QR	MR	DR	D/E	LTD/E	FC/TA	LTI/TA	lnTA	Age
DPR	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
P/BV	-0.11	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
P/E	-0.40	**0.85**	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.	.
DY	**0.95**	-0.23	-0.59	1.00	.	.	.	.	.	.	.	.	.	.	.	.	.
ROA	0.47	0.72	0.27	0.45	1.00	.	.	.	.	.	.	.	.	.	.	.	.
ROE	0.51	0.60	0.14	0.49	**0.92**	1.00	.	.	.	.	.	.	.	.	.	.	.
ROS	0.32	0.66	0.27	0.29	**0.81**	**0.94**	1.00	.	.	.	.	.	.	.	.	.	.
CR	0.61	-0.28	-0.35	0.49	0.10	0.11	-0.17	1.00	.	.	.	.	.	.	.	.	.
QR	0.74	-0.54	-0.74	0.78	0.01	0.27	0.21	0.36	1.00	.	.	.	.	.	.	.	.
MR	0.76	0.39	-0.05	0.78	**0.83**	0.81	0.73	0.07	0.44	1.00	.	.	.	.	.	.	.
DR	-0.41	0.64	0.75	-0.49	0.25	-0.07	-0.12	-0.12	**-0.91**	-0.15	1.00	.	.	.	.	.	.
D/E	-0.38	0.43	0.57	-0.47	0.11	-0.19	-0.31	0.16	**-0.85**	-0.33	**0.94**	1.00	.	.	.	.	.
LTD/E	-0.44	0.70	0.71	-0.51	0.37	0.13	0.07	-0.06	**-0.87**	-0.16	**0.92**	**0.91**	1.00	.	.	.	.
FC/TA	-0.47	0.73	0.80	-0.57	0.31	0.06	0.03	-0.09	**-0.91**	-0.19	**0.96**	**0.92**	**0.98**	1.00	.	.	.
LTI/TA	-0.07	**0.87**	0.77	-0.16	0.56	0.47	0.64	-0.58	-0.37	0.48	0.47	0.10	0.35	0.43	1.00	.	.
lnTA	-0.32	0.08	0.25	-0.42	-0.11	-0.25	-0.41	0.51	-0.56	-0.56	0.58	**0.82**	0.70	0.65	-0.36	1.00	.
Age	-0.03	**-0.83**	-0.81	0.10	-0.59	-0.32	-0.40	0.35	0.46	-0.45	-0.62	-0.35	-0.45	-0.56	**-0.92**	0.16	1.00
Share	-0.21	-0.33	-0.04	-0.36	-0.50	-0.42	-0.51	0.60	-0.12	-0.72	0.04	0.35	0.17	0.15	-0.64	0.79	0.51

Symbols: **bold** – statistical significance at the level of 0.05.
Source: own calculations based on data from Notoria Serwis and Stock Market Yearbooks.

Table 4. Relative closeness to the ideal solution for different types of dividend policy

Dividend policy	R(I)	Rank	R(II)	Rank	R(III)	Rank
Constant DPS	0.443	5	0.500	5	0.538	5
Growing DPS	0.714	2	0.664	4	0.759	2
Constant DPR	0.580	3	0.686	3	0.647	4
Extreme - 100%	0.902	1	0.762	1	0.874	1
Residual	0.332	6	0.436	6	0.338	6
Hybrid	0.578	4	0.695	2	0.684	3

Symbols: R – synthetic indicator computed using method of equal weights (I), method based on the variation coefficient (II) and entropy method (III).
Source: own calculations based on data from Notoria Serwis and Stock Market Yearbooks.

Figure 1. Types of dividend policy implemented in the companies from the research sample
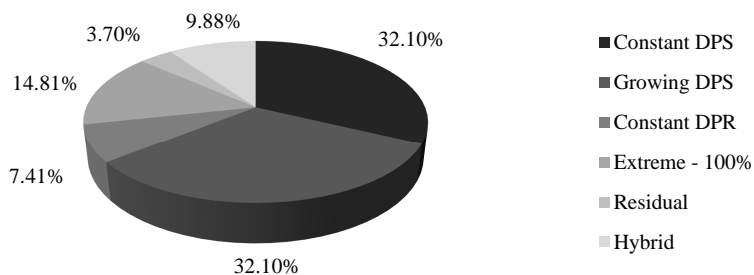
Source: own calculations based on data from Notoria Serwis and Stock Market Yearbooks.

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Financialization processes of non-financial enterprises in Poland - sectoral analysis

Abstract

Research background: Financialization is connected with the phenomenon of dominance of the financial sphere in relation to the real sphere. Financialization, when applied to non-financial entities, means the increase of importance of financial motives in the decision-making processes of enterprises. Changes result from transformations of the system of economic incentives and development patterns, both in the economy and among economic entities, which are focused on fast earning. Shareholders (owners) expect constant and dynamic increase of company revenues thanks to the stock market. Enterprises try to meet the shareholders expectations. For that purpose, they use leverage and financial instruments to generate profit, limiting the operational and investment activity.
Purpose of the article: The goal of this paper is an attempt to assess, whether financialization processes had an equal impact on the non-financial enterprises of individual industries in Poland.
Methods: The research was conducted using the method of analysis of indicators identifying financialization of management, investment activity (assets), financial sources (liabilities) and income. For this purpose, the financial statements of non-financial enterprises published by the Statistics Poland (GUS) for the years 2010-2018 were used, considering the classification of data according to the industry.
Findings & Value added: The originality of the paper is associated with the analysis of the increase of importance of financial motives in the business activity of companies by sectors. Taking into account the variability of business activities, it should be reflected in the financialization level of particular group of business entities in Poland.

Introduction

Financialization is an interdisciplinary phenomenon, covering such areas as economy, sociology, politology, psychology and ethics. What the presented areas have in common is a particular and growing role of the financial sphere and the financial criteria in the functioning of economy and in the economic and social life

When referring the issue of financialization to the activity of business entities, it is associated with the importance of financial motives in the decision-making processes of enterprises. The growing role of the financial sector in the economy has led to transformations in the sphere of management and ownership(Stockhammer 2004, p. 719-741).. The companies obtaining their capital from financial markets as stock-listed companies are assessed from the investors' (shareholders) point of view. That is because the shareholders become their owners via the financial market. Moreover, with the growing role of the financial institutions, the importance of institutional investors is also growing. Owners-shareholders from the financial sphere treat their investments as one of periodical and alternative forms of funds allocation (Rydzewska, 2016, p. 55). The ownership status necessitates changes in the enterprise management. And so, companies management is entrusted to managers, the position and remuneration of which depend on short-term results. Their assessment is linked with the assessment of enterprises, given by the financial markets. Therefore, managers leave these positions, that assume long-term stability of development of a given undertaking, as return on investment takes place in a long run. They focus on short periods of time, on the dividend and shares rates.

Taking into account the above phenomena associated with financialization, the activity of the enterprises, including non-manufacturing companies, is directed towards short-term financial result. Using the conditions of financialization, the companies look for sources that can ensure quick profits. For that purpose, they use leverage and financial instruments to generate profit, limiting the operational and investment activity.

The goal of this paper is an attempt to assess, whether financialization processes had an equal impact on the non-financial enterprises of individual industries in Poland.

The research was conducted using the method of analysis of indicators identifying financialization. For this purpose, the financial statements of non-financial enterprises published by the Statistics Poland (GUS) for the years 2010-2018 were used, considering the classification of data according to the industry.

Literature review

In the literature of the subject, the issue of financialization is analyzed from the macro-economic point of view, in the assessment of changes between the financial and non-financial sectors. Narrowing down the analysis of publications to the issue of financialization of non-financial sector entities, the researches focus on the use of econometric models for the assessment of changes between the financial macro-economic data and non-financial enterprises. And so, at first the research covered developed countries. On the basis of economies of the USA, Great Britain and France, a negative influence of financialization on the accumulation was indicated (Stock-hammer [2004, pp. 719-741]). On the other hand, O. Orhangazi (Orhangazi, 2008, pp. 863-886) carried out a research that verifies the influence of financialization on the accumulation of capital in the United States, using for that purpose data from non-financial entities for the years 1973-2003. On the basis of econometric model, L. Riccetti, A. Russo, M. Gallegati (Riccetti, Russo, Gallegati, 2016, pp. 162-172) were able to prove that financialization by way of payments policy influences the instability and distribution of revenues, which has significant consequences for the macro-economic dynamics.

The subsequent part of the research concerned the financialization of non-financial entities in particular countries. And so, the research carried out in India (Sunanda, Dasgupta, 2018, pp. 96-113) indicated that financial assets are relatively more attractive for non-financial entities, as compared with other investments in terms of rates of return and capital gains. In turn, on the basis of the analysis of 41 companies listed on the stock exchange in Istanbul it was indicated that these enterprises moved their working capital funds from the production activity to the purchase of high-yield interest-bearing assets (Akkemik, Ozen, 2014, pp. 71-98).

H. J. Seo, H. S. Kim, Y. Ch Kim (Seo, Kim, Kim, 2012, pp. 35-49) covered with their research Korean non-financial corporations (NFCs). The research results indicated that the increased payments of dividends and share purchase had negative impact on investment in research and development.

With regard to Polish non-financial entities, the issue of financialization is the subject of research of P. Szczepankowski. In his publications, he analyzes Polish non-financial entities in terms of their susceptibility to financialization processes. The research carried out on the basis of econometric model of the Generalized Method of Moments covered the companies listed on the Warsaw Stock Exchange in the years 2000-2015 (Szczepankowski, 2017, pp. 155-172). The results indicated a positive rela-

tionship between higher financial benefits and value migration. The increase of firm value was born, most strikingly, by increasing financial investment and financial profits, or decreasing corporate leverage.

Apart from econometric modeling, to assess the level of enterprises financialization, the financial statements analysis is used. Based on the financial data, sourced from balance sheets of non-financial entities in the United States, L. E. Davis (Davis, 2016, pp. 115-141) analyzed the behaviors of non-financial entities after 1980. The activities associated with financialization were manifested in the financial statements of companies, by way of an increased share of financial assets in NFCs portfolios, increasing indebtedness and equity repurchases among large firms, and deleveraging among smaller firms.

Research methodology

In this paper, for the assessment of financialization influence on the non-manufacturing enterprises' activity in Poland, the verification of the following research hypothesis was assumed: if the financialization processes covered, at the same level, the non-financial enterprises of particular sectors, according to the Polish Classification of Business Activity (PKD).

The analysis of indicators identifying the financialization of enterprises was used as a research method. According to the literature of the subject, four symptoms of financialization were indicated: management financialization, investment (asset) activity financialization, sources of financing financialization, income financialization (Orhangazi, 2008, pp. 863-886, Stockhammer, 2004, pp. [719-741]).

Management financialization is associated with transformations of enterprise management process, that is subordinated to the concept of management in the interest of the owners, the so-called *shareholder perspective.* The assessment of quality of management of enterprises, being the stock-listed companies, takes place via financial markets. Information coming from these markets is a basis for investments directions profitability comparison. One of the most frequently used indicators is the ROE indicator. Its formula is as presented in Formula 1.

$$\text{ROE} = \frac{net\ financial\ result}{equity} * 100\% \tag{1}$$

This indicator demonstrates the profitability of equity, i.e. how much net income each unit brings by engaging in equity of a given enterprise. In

general, the higher the ratio, the higher the profit value for the owners (shareholders).

The second symptom is the financialization of investment operations, meaning the assets. Managers, to gain quick profit, allocate the capital in financial assets that result in relatively high rates of return. They can be associated with the purchase of profitable financial instruments. In addition, non-financial enterprises can also allocate in financial assets, through the acquisition or expansion of financial subsidiaries.

For the assessment of financialization of assets, what was used was the indicator of financial assets (instruments) share in the company's assets. This indicator takes on the formula in accordance with Formula 2.

$$IAFI = \frac{financial\ instruments\ (assets)}{total\ assets} *100\% \qquad (2)$$

This indicator represents the share of active financial instruments in the total assets. The growth of the indicator indicates the increase of financial assets' significance in the company's assets, meaning greater engagement of available funds in the financial investments.

The third sign of financialization of business activity is the financialization of financing sources. It entails an increase in the importance of various forms of debt as a source of financing of the company. In the era of financialization, external sources of financing are complemented by internal sources, not the other way around. The enterprises, by using the foreign (debt) capital and leverage effect, minimize the need to own capital to increase the level of ROE without changing the level of profit.

For the assessment of the importance of foreign sources of financing in the enterprise, the indicator of passive financial instruments' share in the total liabilities was used. The formula for this indicator presents Formula 3.

$$IPFI = \frac{financial\ instruments\ (liabilities)}{total\ liabilities} *100\% \qquad (3)$$

This indicator illustrates what share do the passive financial instruments represent, as sources of financing in an enterprise. The growth of this indicator means an increase of financial instruments' significance in financing the company's activities.

The fourth sign is financialization of income. According to the traditional approach, the purpose of non-financial enterprises is to generate long-term profit (income) from operational and investment activities. A situation when managers, due to financialization, limit their operational

activities, and, in particular, long-term investment activities, in favor of short-term financial activities is a problem.

To assess the financialization of income, the indicator between the relation of gross profit (before tax) and operating profit was used. The formula is presented in Formula 4.

$$\text{GP/OP} = \frac{gross\ profit\ (before\ tax)}{operating\ profit} \tag{4}$$

This indicator shows the extent to which financial activities affected the operating activities of the enterprise. The indicator greater than 1 means that the enterprise generates profit from financial activities, which increases the operating result. The indicator lower than 1 shows that the result on financial operations is negative and absorbs profits generated from operating activities.

To calculate the indicators, the data from financial statements and other financial information of non-financial enterprises were used, published by Statistics Poland for the years 2010-2017 within the study of Financial instruments of non-financial enterprises in Poland (*Financial instruments…*). The time period of the research results from the availability of data for the presented period.

The results of the calculations are presented in tables found in the Annex.

Results

The indicators presented in the part concerning research methodology present the companies' engagement in financial activity. In general, the higher the indicators, the greater the financialization of enterprise's activities.

When carrying out sectoral analysis, the industries where the ROE indicator (Table 1) had the highest value were "Administrative and support service activities", "Manufacturing" and "Wholesale and retail trade; repair of motor vehicles and motorcycles" sectors. In the first industry, the ROE indicator ranged from 8.34% (2017) to 13.37% (2015). In the next one, it ranged from 6.84% (2012) to 13.3% (2017). In the industrial sector, the value of the indicator ranged from 8.76% (2012) to 13.28% (2016), except for 2014 when the value decreased to 5.34%. The industry where the enterprises generated the lowest ROE is "Transport and storage". In the period of the analysis, that is 2013-2015, it had a negative value (1.93%, -1.82%, -

0.05%). In the remaining period, it was positive, while never exceeding 5.6%.

When analyzing the value of the indicator of the share of active financial assets in the total assets, with regard to non-financial enterprises, on the basis of data found in Table 2, it can be noticed that the sectors that had the indicators of the share of active financial instruments at a level similar to enterprises in total were "Manufacturing" and "Wholesale and retail trade; repair of motor vehicles and motorcycles" sectors. Slightly higher levels could be found in "Construction" (values from 9.91% in 2011 to 33.46% in 2015) and "Electricity, gas, steam, hot water and air conditioning production and supply" (values from 10.79% in 2011 to 38.4% in 2016) sectors. Low level of investments in financial assets was characteristic for "Information and communication" (in 2017, maximum level was 14.19%) and "Water supply; sewerage, waste management and remediation activities" (in 2017, the highest value amounted to 17.19%) sectors. Significant fluctuations of the indicator of share of active financial instruments could be observed in "Real estate activities" industry. The size of the indicator in the years 2014 and 2016 increased to the level of more than 70%. It was associated with the increase of engagement of financial resources and shares of foreign companies and loans granted with the simultaneous decrease of value of tangible assets.

Taking into account the liabilities financialization indicator (Table 3), the sectors that were characterized by similar tendencies when it comes to the share of foreign financial instruments as in enterprises in total were "Manufacturing" and "Electricity, gas, steam, hot water and air conditioning production and supply". The lowest level of engagement of foreign sources in the enterprise financing could be observed in "Transport and storage" (the highest level of indicator amounted to 17.53% in 2015). "Administrative and support service activities" and "Information and communication" sectors were characterized by significant fluctuations of the analyzed indicator. Their level in the years 2010, 2015 and 2017 exceeded 60%. It resulted from a significant increase of credits and loans as financing sources.

When analyzing the level of financialization of income in sectoral perspective (Table 4), in majority of industries the relation between the gross profit and operational profit was lower than 1. The "Real estate activities" sector is worth paying attention to, as the financialization indicator in the years 2016 and 2017 reached value above 3. The operational activity of the industry covers, among others, the trade, renting own property and agency services in the trade or management of real estate. In this case, by combining the analysis with the indicators of assets and liabilities financialization,

that in the discussed period indicated an upward trend, it is possible to indicate financialization symptoms of the business activity of enterprises of the discussed industry. It must be noted, however, that this tendency occurred in the last two years of the analysis, thus requires further observations.

Conclusions

Carried out empirical research gave grounds to verify the research hypothesis present in the paper.

On the basis of analysis, it can be stated that particular sectors were characterized by different levels of financialization of management, investment activity, financing sources and revenue. The industry, where the level of indicators demonstrated the most coincident level of financialization of activity with enterprises in general was "Manufacturing". On the basis of indicators of investment activity and sources of financing financialization, one can notice the increase of engagement of Polish non-financial enterprises in the financial activity. It must be emphasized, however, that this increase does not translate into the profitability and efficiency of management. The "Real estate activities" sector is characterized by the greatest fluctuations in the financialization of assets, liabilities and revenue. For the past two years, they have been indicating the increase of the financialization of these enterprises.

The research carried out concerns the period of seven years. Financialization is a developing idea, therefore, one must continue the research over the discussed issue. Moreover, subsequent research can make use of wider analysis of financial statements, adding yet another financialization indicators, for example share of cash flows on financial activity in total cash flow, share of derivative instruments in company's business.

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Annex

Table 1. ROE (return on equity) by sector in %

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
In general	10.16	12.73	7.60	6.93	5.91	2.47	7.46	9.42
Manufacturing	9.69	9.60	8.76	8.98	5.31	10.96	13.28	12.23
Electricity, gas, steam, hot water and air conditioning production and supply	8.59	7.90	8.09	7.23	8.07	-3.86	6.09	6.98
Water supply; sewerage, waste management and remediation activities	3.26	1.66	6.17	16.83	5.63	4.89	4.52	3.94
Construction	12.63	5.47	2.39	6.21	9.36	12.89	10.80	5.96
Wholesale and retail trade; repair of motor vehicles and motorcycles	9.89	14.51	6.84	8.53	12.42	10.81	11.03	13.30
Transport and storage	4.53	5.02	1.39	-1.93	-1.82	-0.05	1.58	5.59
Information and communication	7.97	12.45	10.66	4.13	4.74	6.82	1.66	3.31
Real estate activities	6.86	7.03	6.89	2.82	3.74	5.01	9.66	6.60
Professional, scientific and technical activities	5.98	15.80	18.44	-4.05	-6.98	1.01	1.64	5.30
Administrative and support service activities	8.92	10.91	9.11	11.21	12.65	13.37	9.56	8.34

Source: Own study based on *Financial instruments of non-financial enterprises,* Statistics Poland, the years 2010-2017.

Table 2. Share of active financial instruments in assets total by sector (%)

	2010	2011	2012	2013	2014	2015	2016	2017
In general	13.84	8.98	11.76	20.58	20.98	19.85	21.57	23.29
Manufacturing	10.64	11.46	11.75	19.22	19.84	18.22	20.84	21.49
Electricity, gas, steam, hot water and air conditioning production and supply	18.10	10.79	11.32	32.23	31.42	26.67	38.40	30.10
Water supply; sewerage, waste management and remediation activities	2.97	4.17	1.90	10.24	9.72	8.63	9.02	17.19
Construction	19.60	9.91	12.53	23.73	25.35	33.46	30.50	27.93
Wholesale and retail trade; repair of motor vehicles and motorcycles	12.45	10.74	9.38	19.19	20.92	15.77	19.45	19.19
Transport and storage	12.19	12.50	8.58	6.30	6.40	9.67	11.63	15.57
Information and communication	5.98	7.86	5.32	10.61	no data	11.01	9.47	14.19
Real estate activities	17.42	19.90	29.23	34.91	73.20	14.15	75.01	46.21
Professional, scientific and technical activities	3.90	4.64	10.92	no data	28.89	48.49	24.93	60.11
Administrative and support service activities	7.18	5.02	5.87	no data	11.79	56.14	7.90	46.60

Source: Own study based on *Financial instruments of non-financial enterprises,* Statistics Poland, the years 2010-2017.

Table 3. Share of passive financial instruments in total liabilities by sector (%)

	2010	2011	2012	2013	2014	2015	2016	2017
In general	14.16	10.23	14.12	13.67	19.32	21.79	22.35	22.1
Manufacturing	10.68	14.73	12.78	14.56	19.82	20.18	19.82	19.33
Electricity, gas, steam, hot water and air conditioning production and supply	16.17	14.84	16.86	13.01	16.03	20.02	29.75	21.74
Water supply; sewerage, waste management and remediation activities	24.20	21.77	16.12	no data	16.02	17.40	12.02	12.52
Construction	7.37	7.15	8.87	14.34	20.36	15.47	17.35	16.64
Wholesale and retail trade; repair of motor vehicles and motorcycles	14.79	6.94	11.47	10.81	18.48	18.36	19.22	18.89
Transport and storage	10.00	12.71	16.23	6.94	16.65	17.53	15.27	17.11
Information and communication	34.98	14.15	15.77	35.42	no data	44.45	51.56	67.92
Real estate activities	no data	no data	6.57	no data	18.63	28.28	41.85	25.91
Professional, scientific and technical activities	14.63	9.64	9.69	39.60	52.56	34.13	8.85	13.75
Administrative and support service activities	67.74	43.64	13.10	18.01	19.57	61.18	51.72	66.10

Source: Own study based on *Financial instruments of non-financial enterprises,* Statistics Poland, the years 2010-2017.

Table 4. Gross profit / operational profit by sector

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
In general	0.92	0.89	0.84	0.59	0.75	0.52	0.85	0.95
Manufacturing	0.88	0.81	0.94	0.84	0.70	0.88	0.95	0.96
Electricity, gas, steam, hot water and air conditioning production and supply	1.02	1.02	0.82	0.44	0.96	1.34	0.82	0.94
Water supply; sewerage, waste management and remediation activities	0.89	0.40	0.94	0.91	0.94	0.93	0.90	1.16
Construction	0.90	0.49	1.01	0.73	0.87	0.87	1.10	0.93
Wholesale and retail trade; repair of motor vehicles and motorcycles	0.84	0.95	0.74	0.84	0.87	0.87	0.87	0.89
Transport and storage	0.92	0.48	1.13	9.32	-0.60	0.32	0.55	1.01
Information and communication	0.77	0.77	0.84	0.38	0.36	0.48	0.42	0.61
Real estate activities	0.95	1.42	1.70	1.33	1.50	0.87	3.78	3.16
Professional, scientific and technical activities	2.53	2.22	1.06	-0.36	-1.10	0.09	0.49	1.34
Administrative and support service activities	0.48	0.50	0.65	0.83	0.84	0.57	0.60	0.53

Source: Own study based on *Financial instruments of non-financial enterprises,* Statistics Poland, the years 2010-2017.

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Relationship between comprehensive income and executive compensation: evidence from Polish listed companies

JEL Classification: *G21; G34; M41; M48*

Keywords: *executive compensation; comprehensive income; profitability ratios; firm performance; corporate governance*

Abstract

Research background: One of the areas of corporate governance that allows better assessment of the management quality by shareholders is the transparency of the executive compensation, especially in the context of firm performance. In literature there is no general consensus on the relationship between the executive pay and firm performance. The empirical studies reported both a positive and negative correlation. In this paper a original result of discussion on relationships between executive compensation and comprehensive income was showed, which are not presented in Polish and foreign literature.

Purpose of the article: The major purpose of this study is to examine the character and strength of the relationship between the executive compensation and profitability ratios (RoS, RoA, RoE), which are based on the comprehensive income and net income. The general research hypothesis was formulated, which assumes that there is a stronger positive correlation between the executive compensation and comprehensive income than net income.

Methods: The empirical studies were carried out on the group of companies listed on the WSE from the industry sector (the period from 2009 to 2017). The empirical research is structured in three parts. The first part includes key descriptive statistics of variables. The second part contains the results of correlations between the net profit and comprehensive income and profitability ratios (conducted by means of Pearson's correlation coefficient). The third part presents the results of three regression models in two versions.

Findings & Value added: One can notice a significant positive relationship between executive compensation and RoA and can observe a bit stronger relationship

between these variables if the comprehensive income was used in this ratio. On the other hand the regression analysis shows that the relationship between executive compensation and others profitability ratios was both positive (RoE) and negative (RoS), but statistically insignificant.

Introduction

The question of how to manage the executive compensation and the extent of pay-for-performance belongs to both the theory and practice of the corporate governance in companies, in which issues concerning the relationship between the level of executive compensation and firm performance play a significant role and have considerable importance. This question has been one of the most widely studied problems in the corporate governance literature (Jensen & Murphy, 1990, pp. 225-264). The theoretical reference adopted by most of the works is the agency theory. According to this theory, the executive compensation policy is seen as a governance mechanism acting to resolve conflicts of interest between managers (agents) and shareholders (principals) and improve business performance. The executive compensation, as well as other financial and non-financial indicators, is a very important subject to assessment by shareholders whose interests often stay in contradiction to the interests of managers.

It must be emphasised that in the last few decades there has been no general consensus in literature on the relationship between the executive compensation and firm performance, particularly regarding the accounting measures. Several studies have found a positive relationship between these categories (e.g. Jensen & Murphy, 1990, pp. 225-264; Kato & Kubo, 2006, pp.1-19), others have found no relationship (e.g. Brick *et al.*, 2006, pp. 403-423; Core *et al.*, 1999; Dogan & Smyth 2002, pp. 319-347). However, the financial crisis of 2007-2009 radically exposed the weakness of corporate governance systems, particularly in the scope of the executive compensation policy.

The major purpose of this study is to examine the character and strength of the relationship between the executive compensation and profitability ratios (RoS, RoA, RoE), which are based on the comprehensive income and net income. The sample concerns stock companies from the industry sector listed on the Warsaw Stock Exchange (WSE). In order to accomplish that aim, a general research hypothesis was formulated, which assumes that there is a stronger positive correlation between the executive compensation and comprehensive income than net income. The scope of the comprehensive income, presented in the statement of the comprehensive income, has a

much wider capacity than the net profit and contains many important elements which affect the companies' future profitability and are omitted in the traditional income statement (Kanagaretman *et al.*, 2009, p. 352). Moreover, the publication of other comprehensive income components is necessary for shareholders (principals) who, on the basis of this information, can assess some of the managerial activities more accurately and are able to recognize the managers' (agents') engagement in both earnings management (Chambers *et al.*, 2007, p. 561) and the manipulation of executive compensations. The above supposition results from the conjecture that the disclosure of other comprehensive income components with their changes, some of which are omitted when only the net profit (loss) is calculated, enables shareholders to examine the external and internal determinants of the company's profitability more completely and accurately.

It is worth emphasizing that the comprehensive income (CI) is comprised of the net income (NI) and other comprehensive income (OCI), which consists of profits or losses not included in the net earnings but in the equity. The insightful characterization of all OCI components allows stating that all of them are characterized by the lack of durability over time, and almost all are beyond the control of managers, which hinders the manipulation and active earnings management (Rees & Shane, 2012 , pp. 796-797). However, the practical application of the comprehensive income in the studying profitability of enterprises and performance-based compensation system creates a range of difficulties and proves to be highly controversial. In literature, one can find a number of arguments to justify both the greater and trifling role of the comprehensive income in comparison to the net income (Kanagaretnam *et al.*, 2009, pp. 349-365; Chambers *et al.*, 2007, pp. 557-593).

Research methodology

The empirical studies were carried out on the group of companies listed on the Warsaw Stock Exchange from the industry sector[1] (4XX in the sectoral classification of WSE) which presents their financial statements in accordance with IFRS (for 10th November, 2018). The study period is from 2009 to 2017, because since 2009 Polish public companies have been required to present a statement of the comprehensive income. Thorough analysis cov-

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[1] Industrial companies are the most represented ones on the WSE. What is more, this type of limitation enables us to avoid the issue of sample heterogeneity when assessing the relation between executive compensation and firm profitability.

ered annual financial statements of companies, or, if necessary, management reports and reports on corporate governance. The empirical data was taken from the EMIS database and from the websites of companies. From among 113 industrial companies all samples, which did not present the information about the comprehensive income were excluded. The final sample consists of 86 firms with 719 year observations[2].

The presented research problem was realized on the basis of the evaluation of profitability of the analysed companies by means of the traditional three ratio analysis – return on sales (RoS), return on assets (RoA) and return on equity (RoE), based on two different accounting measures – the comprehensive income (CI) and net income (NI). The total amount of the executive compensation is understood as including all short-term factors and long-term compensation that were disclosed in annual reports.

The empirical research is structured in three parts. The first part includes key descriptive statistics of variables. The second part contains the results of correlations between the net profit and comprehensive income and profitability ratios (conducted by means of Pearson's correlation coefficient). The third part presents the results of three regression models (with RoS, RoA and RoE) in two versions (influence of CI and NI on EC)[3] (see table 1).

The main variables of the author's interest are the three ratios of profitability (RoS, RoA, RoE), calculated as a value of the comprehensive income and net profit, standardized accordingly by the value of sales, average value of total assets and equity. In accordance with the hypothesis, coefficient α_1 on the ratios of profitability was analysed and its more positive and statistically significant value is expected, which is based on the comprehensive income rather than net income. In line with suggestions of the prior research (Zhou, 2000), another very important factor exerting on the executive compensation was also controlled. Specifically, the natural logarithm of total assets as a proxy of the firm size (SIZE) was used. A positive and statistically significant value of coefficient α_2 is also expected. Additionally, the dummy variable and the multiplicative interaction term controls for the timelier recognition of losses in comparison to gains were used, which is often referred to as conditional conservatism.

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[2] Due to the quantitative approach to the lack of data, these deficiencies in the analysis were removed in pairs. In addition, due to the small scale of extreme values, they were not excluded from the research sample.

[3] Panel Least Square (unbalanced) model using year fixed-effects regression was employed.

Results

The key descriptive statistics of the variables used in the analyses (executive compensation, profitability ratios, firm size) are presented in Table 2.

Sample firms represent the broad spectrum of universe in terms of their executive compensation, because the level of EC is significantly varied and ranges from 3.18 to 8.05, with the mean of 5.93, median of 5.99 and standard deviation of 0.70. As it can be seen, the industrial companies have both the positive and negative value of RoS, which are calculated using the comprehensive income and net income. The level of this variable ranges from -9.84 to 9.72 (for RoS_CI) and from -9.84 to 8.76 (for RoS_NI) with the median of 0.04. The descriptive statistics show the mean of RoA_CI, RoA_NI and RoE_CI, RoE_NI are 0.01 and 0.03 respectively. It is worth emphasizing that the averages of returns on assets and returns on equity are positive, in contrast to returns on sales. However, the dispersion of RoS is absolutely greater than RoA or RoE. Generally, one cannot observe a slight different between ratios calculated with the comprehensive income and net income. The average SIZE is about 12.24 and it varies from 7.35 to 15.56, with a median of 12.20.

Table 3 presents the correlation matrix reporting pairwise correlation coefficients between the variables. Calculated Pearson's coefficient generally indicates a positive character of dependencies between executive compensation and other variables.

However, there is little evidence of strong connection between EC and profitability ratios, because the correlations among them are very weak, but, except RoS, statistically significant. The important fact is there are a bit stronger correlations between EC and RoA calculated with the comprehensive income than net income, in contrast to RoE. It can report a moderate uphill relationship between EC and SIZE and additionally this is statistically significant.

So as to confirm or refute the hypothesis of the relation between executive compensation and profitability ratios, a regression analysis is carried out, the results of which are shown in Table 4. The three models fit the report adjusted R-squared of 0.27 (M1A and M1B), 0.29 (M2A), 0.28 (M2B, M3A and M3B). The F-statistic is in all version statistically significant.

The regression analysis results show that there is a strong positive relationship between executive compensation and firm performance when the measurement is done by taking EC as a dependent variable and RoA as an independent variable. It is important there is a bit stronger relationship between EC and RoA calculated with the comprehensive income (with the

coefficient on RoA_CI of 0.587) than net income (0.490). The t-statistics was significant at the 0.05 critical alpha level in both cases.

However, for both RoE_CI and RoE_NI the t-statistics was not significant at the 0.05 critical alpha level. One can observe a negative relationship between EC and RoS, but the t-statistics was not significant either. It is observed that SIZE positively influences the executive compensation irrespectively of all model specifications and estimators (it is worth pointing out they were statistically significant). With respect to control variable DNeg, all coefficients, except for DNeg_CI in the M2A model, are negative, but rather statistically insignificant.

Conclusions

The system of remuneration and motivation, in particular of managers, may be recognised as a key factor of the success or failure of a company. However, in practice, one can notice plenty of cases that CEOs receive low remunerations for high performances or excessively high pays for rather indifferent achievements, especially when they have brought enterprises to a crisis situation (e.g. in Enron company in 2001). Therefore, for more than a decade the CEO's pay has attracted an unfavorable attention from practitioners, academics and media that have focused on the large amount of the pay received by CEOs.

Based on the 86 samples of industrial listed companies on the WSE from 2009 till 2017, one can notice a significant positive relationship between executive compensation and return on assets. The significant amount that was presented in correlation and regression analysis shows the same results, which is consistent with the findings that were done by previous studies (Core *et al.*, 1999; Kato and Kubo, 2006). One can observe a bit stronger relationship between these variables if the comprehensive income was used in this ratio. Therefore, in this case, the hypothesis can be partially confirmed. On the other hand, the regression analysis shows that the relationship between EC and RoE was positive, but the regression coefficients were statistically insignificant. The relationship between EC and RoS was the most surprising, because it was both negative and statistically insignificant. This result is totally different in relation to similar studies by Nulla (2012), who showed a slight positive relationship between these two variables. Noteworthy is the fact that the significant positive relationship between the size of the firm and profitability ratios was shown in the correlation and regression analysis. The same was reported by Zhou (2000) (from the US market).

On the basis of these results and findings, one cannot clearly confirm the hypothesis that there is a stronger positive correlation between executive compensation and the comprehensive income than net income. Perhaps it results from the fact that the spread between the comprehensive income and net income is not significant in the industry sector. The analysis with different sectors, especially finance or banking, could reveal more interesting results. Additionally, many other variables that might affect pay-performance relationships, which are not included in this research, could be more relevant for future research. For example, the corporate government policy, the structure and age of managers, risk, stock return and any other.

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Annex

Table 1. Analytical forms of applied single equation models

Model version	Analytical form
M1A	$EC_t = \alpha_0 + \alpha_1\ RoS\_CI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_CI_t + \mu_t$
M1B	$EC_t = \alpha_0 + \alpha_1\ RoS\_NI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_NI_t + \mu_t$
M2A	$EC_t = \alpha_0 + \alpha_1\ RoA\_CI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_CI_t + \mu_t$
M2B	$EC_t = \alpha_0 + \alpha_1\ RoA\_NI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_NI_t + \mu_t$
M3A	$EC_t = \alpha_0 + \alpha_1\ RoE\_CI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_CI_t + \mu_t$
M3B	$EC_t = \alpha_0 + \alpha_1\ RoE\_NI_t + \alpha_2\ SIZE_t + \alpha_3\ DNeg\_NI_t + \mu_t$

Marks: EC_t – natural logarithm of executive compensation, RoS_CI_t, RoS_NI_t – return on sales (accordingly based on CI or NI), RoA_CI_t, RoA_NI_t – return on assets (accordingly based on CI or NI), RoE_CI_t, RoE_NI_t – return on equity (accordingly based on CI or NI), $SIZE_t$ – firm size (natural logarithm of total assets), $DNeg\_CI_t$, $DNeg\_NI_t$, – dummy variables taking the value "1" when CI is negative or NI is negative, respectively, and "0" otherwise.
Source: own study.

Table 2. Descriptive statistics

Specification	Mean	Median	Max	Min	Std. Dev.
EC	5.927	5.986	8.051	3.178	0.703
RoS_CI	-0.004	0.040	9.715	-9.844	0.944
RoS_NI	-0.006	0.038	8.758	-9.844	0.896
RoA_CI	0.014	0.033	1.231	-1.480	0.169
RoA_NI	0.012	0.031	1.231	-2.369	0.182
RoE_CI	0.034	0.061	7.056	-3.195	0.445
RoE_NI	0.029	0.058	7.053	-5.990	0.476
SIZE	12.243	12.196	15.562	7.355	1.126

Source: own calculations.

Table 3. Correlation matrix

Specification	EC	RoS_CI	RoS_NI	RoA_CI	RoA_NI	RoE_CI	RoE_NI	SIZE
EC	1.000							
RoS_CI	0.034	1.000						
RoS_NI	0.024	0.974***	1.000					
RoA_CI	0.193***	0.469***	0.459***	1.000				
RoA_NI	0.186***	0.412***	0.431***	0.963***	1.000			
RoE_CI	0.091**	0.109***	0.097***	0.151***	0.181***	1.000		
RoE_NI	0.095**	0.094**	0.098***	0.184***	0.273***	0.970***	1.000	
SIZE	0.513***	0.024	0.021	0.112***	0.116***	0.058	0.066*	1.000

*, ** and *** represent statistical significance at the 0.1, 0.05, and 0.01 levels.
Source: own calculations.

Table 4. Results of panel least squares regression

Specification	Coefficient	t-Statistic	Prob. (t-Statistic)	Adjusted R-squared	F-Statistic	Prob (F-Statistic)
			M1A			
Intercept	1.902	7.293	0.000			
RoS_CI	-0.003	-0.134	0.894	0.269	87.634	0.000
SIZE	0.330	15.687	0.000			
DNeg_CI	-0.130	-2.148	0.032			
			M1B			
Intercept	1.896	7.278	0.000			
RoS_NI	-0.010	-0.387	0.699	0.269	87.515	0.000
SIZE	0.330	15.724	0.000			
DNeg_NI	-0.130	-2.155	0.032			
			M2A			
Intercept	1.829	7.001	0.000			
RoA_CI	0.587	3.691	0.000	0.287	96.391	0.000
SIZE	0.333	15.757	0.000			
DNeg_CI	0.003	0.039	0.969			
			M2B			
Intercept	1.834	7.013	0.000			
RoA_NI	0.490	3.412	0.001	0.284	95.300	0.000
SIZE	0.333	15.739	0.000			
DNeg_NI	-0.014	-0.214	0.830			
			M3A			
Intercept	1.808	6.866	0.000			
RoE_CI	0.073	1.367	0.172	0.275	91.001	0.000
SIZE	0.337	15.844	0.000			
DNeg_CI	-0.110	-1.854	0.064			
			M3B			
Intercept	1.805	6.860	0.000			
RoE_NI	0.069	1.394	0.164	0.275	90.855	0.000
SIZE	0.337	15.862	0.000			
DNeg_NI	-0.106	-1.797	0.073			

Source: own calculations.

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Evaluating of the environmental, social and governance equity indices in terms of risk and return

Key words*: ESG equity indices, risk, return, Sortino ratio, bootstrap*

Abstract

Research background: Interest in environmental, social, and governance (ESG) factors is expanding at a rapid pace among institutional and retail investors around the world. In this paper, is made an overview of the sustainable investment landscape, including private investor adoption and implementation tools.

Purpose of the article: The aim of this article is to present the results of research associated with the risk and return measurement for ESG equty indices.

Methods: A statistical techniques and a computationally-intensive method for the most widely used ESG equity indices will be performed in this paper, and the main differences among them is described too. There is analyzing the return/risk profile and some other important characteristics (e.g. Sharpe ratio, Sortino ration) of used ESG equity indices comparing to global equity index MSCI ACWI.

Findings & Value added: Findings from this paper indicates that investing in some ESG equity indices may bring a lower risk to the investor at the same return as the capitalization-weighted index (e.g. global equity index MSCI ACWI) or a higher return at the same risk level.

Introduction

In 2003 UNEP Finance Initiative (UNEP FI) formed an Asset Managemennt Workong Group and commissioned 11 reports from 9 mainstram research institution (due in 2004) to study the financial matearility of Environmental, Social and Governance (ESG) issues to securities valuation – a key finding being "agreement (among analysts) that environmental, social and corporate governance issues affects long-term shareholder value…

(and) in some cases those effects may be profound"[1]. Two years later, in Aprl 2006, the UN Secretary General Kofi Annan launched the Priciples for Responsible Investing, which mainstreamed Social Responsible Investing (SRI), coined a new term for risk and return-driven investors ("Responsible Investor"), and refined the definition as those investors who incorporate ESG factors into heit investment process. In recent years, adoption of ESG investing and asset growth has accelerated[2],

The ESG investing can take on many forms. It can be as simple as screening out companies from an investor's universe that rank poorly on ESG criteria. Or the ESG atitude can take on a much more rigorous approach where investors incorporate specific ESG data towards companies or industries as an integral component of their investment analysis and decision process.

ESG or SRI is not a new investment philosophy albeit ESG investing has gained increasingly popularity from investment managers during the past five years. This is undoubtedly due to the multitude of governance issues faced by the financial industry as a result of the financial crisis. In fact, the origins of the ESG philosophy date back to the 17th century. During this time, the roots of ESG were primarily religiously motivated. Interestingly, back in the 17th century, a religious movement known as the Quakers or Friends preached the basic tenants of ESG. The Quakers were known for their refusal to participate in war, opposition to slavery, and the opposition to alcohol. Some Quakers went on to form institutions exemplifying such principles.

The first investment funds focusing on SRI were established in the US at the end of the 60s, on the back of several socio-political movements. By contrast in Europe, despite the first European SRI Fund being technically launched in 1965 in Sweden (Aktie Ansvar Myrberg) and a couple of other moves in the 80s (especially in the UK) and the 90s (continental Europe), the European SRI Industry really started to develop in the early 2000s. In 2002, Eurosif, the European Sustainable and Responsible Investment Forum, was established followed by the launch, in 2006, of the United Nations-backed Principles for Responsible Investments (PRI).

Socially Responsible Investment (SRI) is a generic term that includes ethical investing, responsible investing, sustainable investing, and any other investment practices that combine financial goals of investors with their

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[1] „The mateariality of Social, Environmental and Corporate Governance Issues to Equity Pricing, UNEP FI, June 2004.

[2] https://www.ussif.org/files/SIF_Trends_16_Executive_Summary%281%29.pdf, US SIF "2016 Report on US Sustainable, Responsible and Impact Investing Trends.

commitment in the environmental, social and corporate governance (ESG) issues. SRI is a way of investing, which can be either a part of the corporate social responsibility strategy of individual companies, or a part of specific individual decisions by individual investors (Trnková, 2004).

There is no one exhaustive list of ESG issues. ESG issues are often interlinked, and it can be challenging to classify an ESG issue as only an environmental, social, or governance issue, as Table 1 shows. These ESG issues can often be measured (e.g., what is the employee turnover for a company?), but it can be difficult to assign them a monetary value (e.g., what is the cost of employee turnover for a company?).

To date the literature on ESG has largely focused on the impact of ESG exposures on returns and little has been done to directly assess the impact on risk. If we consider risk as any form of uncertainty, and further recognize that ESG by its very nature is dealing with the impact of corporate activities on stakeholders, then it stands to reason that there is a direct link between management on the dimensions of E, S and G and the range of potential impacts on the stakeholders of a corporation. It is logical to postulate that companies neglecting to manage their ESG exposures may be exposed to higher risk (a wider range of potential outcomes) than their more ESG focused counterparts.

A number of different methods have been applied to examine the relationship between ESG performance and financial performance. One of the key challenges within the research field has been to determine the proper method and data to use. McWilliams et al. (2006) point to a number of problems with ESG performance research; inconsistencies in defining ESG, measuring financial performance, selecting samples, as well as research design and misspecification of the models. As a result, a lot of research on ESG performance is not comparable.

Previous research has primarily focused on the US and UK markets where there historically has been relatively more data available (Wagner, 2001). The studies employ a variety of benchmarks and methods. The question of the appropriate benchmark is often raised and is still a problem within the ESG fund performance field (Bauer et al., 2005). Most research applies some type of index benchmark in combination with a regular fund benchmark.

Data and methods

For the purpose of research, we used ESG indices from the most wide-spread/major equity index providers, namely:
− MSCI ACWI ESG Universal Index
− S&P Global 1200 ESG Factor Weighted Index
− STOXX® Global ESG Leaders

The most widely used equity index (MSCI ACWI) was selected for comparison purposes.

MSCI ACWI ESG Universal Index

The MSCI ACWI ESG Universal Index is based on the MSCI ACWI Index, its parent index, and includes large and mid-cap securities across 23 Developed Markets and 23 Emerging Markets countries. The index is designed to reflect the performance of an investment strategy that, by tilting away from free-float market cap weights, seeks to gain exposure to those companies demonstrating both a robust ESG profile as well as a positive trend in improving that profile, using minimal exclusions from the MSCI ACWI Index (MSCI ACWI ESG Universal Index Fact Sheet).

The MSCI ESG Universal Indexes are constructed in following steps. First, the stocks with the weakest ESG profile from an MSCI Index (the 'Parent Index') are excluded. Second, ESG re-weighting factor is defined that reflects an assessment of both the current ESG profile (based on the current MSCI ESG Rating) as well as the trend in that profile (based on the MSCI ESG Rating Trend). Finally, the securities are re-weighted from the free-float market cap weights of the Parent Index using the combined ESG score to construct the MSCI ESG Universal Index. The index is reviewed in February, May, August and November, coinciding with the quarterly and semiannually index reviews of MSCI Global Investable Market Indexes (MSCI ESG Ratings Methodology).

S&P Global 1200 ESG Factor Weighted Index

The S&P Global 1200 ESG Factor Weighted Index is designed to measure the performance of the constituent companies within the S&P Global 1200, with a weighting scheme that accounts for each company's ESG Factor Score, as assessed by RobecoSAM (S&P ESG Factor Weighted Index Fact Sheet).

RobecoSAM generates a fully neutralized ESG Factor Score for each constituent of the underlying index. These ESG Factor Scores are then used

as inputs for the S&P ESG Factor Weighted Index Series. RobecoSAM identifies 59 industries within its research universe. Approximately 50% of RobecoSAM's questions are industry specific. The remaining questions are more general in nature. All questions underpin one of the three dimensions of Environmental, Social, and Governance.

Not all companies choose to respond to the questionnaire. For all companies in the underlying index that do not respond to the questionnaires, RobecoSAM completes the questionnaire, to the extent possible, based only on publically available information.

This process forms the basis of the DJSI scoring methodology (Classic Scores). However, to arrive at the ESG Factor Scores required for the S&P ESG Factor Weighted Index Series, the Classic Scores are subjected to the following:

1. ESG Factor Scores are tilted towards financial materiality.
2. ESG Factor Scores are neutralized with respect to factors such as GICS industries, sub-industries, and countries; traditional quantitative equity factors such as momentum, value, and size are also neutralized (S&P ESG Factor Weighted Index Series – Methodology).

STOXX® Global ESG Leaders

The STOXX Global ESG Leaders index offers a representation of the leading global companies in terms of environmental, social and governance criteria, based on ESG indicators provided by Sustainalytics. The index is weighted according normalized ESG ratings.

The indices provide access to global sustainability leaders through quantitative selection. The sustainability data in environmental, social and governance areas is provided by Sustainalytics. The indices follow a bottom-up approach and are based on company sustainability ratings.

Key facts
− Rating methodology looks at each company individually and makes clear differentiations between different types of companies.
− Key performance indicators (KPI) for every company are made known to index licensees and the weighting and computation metrics are fully disclosed in guides.
− Specialized indices - STOXX Global ESG Environmental Leaders, Social Leaders and Governance Leaders - are also available separately and may be combined in all variations.
− DVFA/EFFAS, as independent and neutral professional associations of investors and financial analysts, created the KPI for standard ESG 3.0, to which the index model has been mapped

− Methodology allows a detailed attribution of sustainability performance
for index components and non-components (The STOXX Global ESG
Leaders Facts Sheet).

The universe consists of all stocks in the STOXX Global 1800 Index.
Companies involved in controversial weapons or which do not comply with
the UN Global Compact Compliance Principles are excluded. Companies
passing the initial selection criteria are ranked by STOXX according to a
transparent evaluation system consisting of 134 relevant key performance
indicators (KPIs) provided by Sustainalytics. The system ranges from 0 to
100 points and is applied for each category: environmental, social and gov-
ernance. To be included in one of the specialized indices, e.g. the STOXX
Global ESG Social Leaders Index, companies must receive a rating of at
least 75 in that category and at least 50 in the other two (governance, envi-
ronmental). Index components are weighted according to their ESG ratings
(The STOXX Global ESG Index Methodology Guide).

MSCI ACWI

The MSCI ACWI captures large and mid cap representation across 23
Developed Markets and 23 Emerging Markets countries. With 2,476 con-
stituents, the index covers approximately 85% of the global investable equi-
ty opportunity set. The index is free-float market cap weights (MSCI
ACWI Fact Sheet).

Risk measurement and Sortino ratio

In 1952, two authors published ultimate papers for financial industry the
first was H. Markowitz (1952) who identified risk as related to the varying
financial outcomes and adopted the standard deviation of the residual assets
as the tool for measurement of risk. The second one was A. Roy (1952)
who introduced the "Safety First" criterion, which meant introduction of a
downside risk measurement principle.

A few years later, Markowitz (1959) gave a generalized discussion on
risk, and introduced alternative measurements tools as semi-variance, ex-
pected value of loss, expected absolute deviation, probability of loss and
the maximum loss. Markowitz introduced also his idea of downside-risk.
Downside-risk means a semivariance computed below-target semivariance
(SV_t). This metric computes a variance using only the returns under a target
return (SV_t). Markowitz called these measures partial or semi-variances,
because only a subset of the return distribution is used (Nawrocki, 1999).

Below-target semivariance (SV$_t$) is calculated:

$$SVt = \frac{1}{K} \sum_{T=1}^{K} max[0, (t - R_T)]^2, \qquad (1)$$

where R_T is an asset return during time period *T*, *K* is the number of observations, *t* is the target rate of return of the asset's return. A maximizing function denoted as max, indicates that the formula will square the larger of two values i.e. 0 and (t – R$_T$).

For the measurement of risk-adjusted return of ESG indices was used a Sortino ratio (Sortino and Van der Meer, 1991). It is a modification of the Sharpe ratio but penalizes only those returns falling below a specified target (a positive outliers should be regarded as a bonus and not as a risk), while the Sharpe ratio penalizes both upside and downside volatility equally. It is thus a measure of risk-adjusted returns that treats risk more realistically than the Sharpe ratio.

Sotino ratio is calculated:

$$Sortino = \frac{R_T - t}{SVt}, \qquad (2)$$

To quantify below-target semivariance (SVt) and Sortino ratio is necessary to use computationally-intensive methods (eg. bootstrap).

The bootstrap method was originally proposed by Efron (1979) and it is a computationally-intensive method for estimating the distribution. To use the bootstrap or any other statistical methodology effectively, one has to be aware of its limitations. The bootstrap is of a value in any situation in which the sample can serve as a surrogate for the population. If the sample is not representative of the population because the sample is too small, biased, or not selected in a random way, or its constituents are not independent, then the bootstrap based techniques fail. Canty et al. (2000) also list data outliers, inconsistency of the bootstrap method, incorrect resampling of a model, wrong or inappropriate choice of statistics, non-pivotal test statistics, nonlinearity of the test statistics, and discreteness of the resample statistic as potential sources of error. The pitfall of using the bootstrap method also shows the Terpstra and McKean (2005) and Salibian-Barrera M, and Zamar R.H. (2002).

Results

Table 3 reports summary statistics of the ESG indexes over a period
1q2009 – 1q2017. There were obtained 29 quarterly data per each index.
Based on the partial results of exploratory data analysis proceeded to robust
methods and indicators, specifically trimmed mean and interquartile range.

Perret-Gentil and Victoria-Feser (2005) used robust estimates for mean
and the covariance matrix in the mean-variance portfolio selection problem.
They showed that the robust portfolio outperforms the classical one, as the
outlying observations (that account for 12.5 % of the dataset) can have
serious influence on portfolio selection under the classical approach, due
the small number of data we have used 15%. The same purposes, i.e. the
presence of skewed distributions and extreme values, led to use the
interquartile range (by practitioner's hint for a normal distribution is
approximately equal to 1,35*standard deviation).

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

The graphical results of central tendency (and position indicators), scat-
tering and extreme values of the indices are shown in Box-and-Whiskers
Plot, see Figure 1.

Based on the results of Table 3 and Graph 1 it can be stated that:

− All equity indices are asymmetric with extreme values. This will have a
  significant impact on the quantification of risk (how is measured). The
  lowest value (and the largest negative extreme value) is reached by the
  STOXX Global ESG Leader Index.

− There are differences between median and mean values among all indi-
  ces. The highest difference is for index STOXX Global ESG Leader In-
  dex, where the median is higher more then twice than mean value. This
  will have an impact on the quantification of return too.

A Spearman rank correlation was used to compare returns over time
among equity indices, see table 3. A Spearman rank correlation is a bit
robust than Pearson product-moment correlation. A Spearman rank correla-
tion is less sensitive to non-normality in distributions. There is a strong
correlation among all of indices according results. STOXX Global ESG
Leaders index reaches the lowest correlation to two other ESG indices, the

relatively smallest correlation is between MSCI ACWI and STOXX Global ESG Leaders. This finding may indicate a diversification potential in particular in relation to the capitalization weighted indexes provided by MSCI.

The previous findings and the relatively short time series have made us to use computationally-intensive methods (bootstrap) and robust statistics to quantify the return and risk of equity indices.

Equity indices statistics have been calculated using the bootstrap method there were done 10 times 10000 bootstrap samples of each index. It means that each index statistics were estimated 10 times and for a "final" enumerating was used trimmean (20%) and values were rounded. Annualized statistics and characteristic were obtained from the quarterly data, which were simulated partial withdrawals made up of four random quarterly values. And these annual values (return p.a.) entered to the bootstrap procedure (see Table 5).

Discussion

Based on sectoral comparisons and country representation in ESG indices, it can be stated:

STOXX Global ESG Leaders index is more equally spred over different countries, comparing to another two ESG indices, where is a huge domination of USA (more than 50%). This difference in country representation is a partial cause of the different development of the STOXX Global ESG Leaders Index comparing to others.

Both the MSCI ACWI ESG Universal Index and S&P Global 1200 ESG Factor Weighted Index have a very similar industry composition. Typically, the most represented sectors are: Information Technology, Financials and Consumer Discretionary. These three sectors account for about 45% of the weight in the MSCI ACWI ESG Universal Index and S&P Global 1200 ESG Factor Weighted Index (nearly the sameweights as for MSCI ACWI). The STOXX Global ESG Leaders index with its composition differs from both, the index is more evenly covered by individual sectors. This is one more of the cause for the of the different development of the STOXX Global ESG Leaders index comparing to others.

STOXX Global ESG Leaders index reaches the lowest correlation to two other ESG indices, the relatively smallest correlation is between MSCI ACWI and STOXX Global ESG Leaders.

Based on the results of descriptive statistics, there are differences between median and mean values among all equity indices. Results of indicates that the development of the all equity indices is affected by extreme

values (negative values). This has an impact on the quantification of return and risk too. Such extreme values make it difficult to use the standard deviation indicator as a risk metric for investor. On the basis of this research, we tend to use the below-target semivariance as a risk indicator in such cases (heavily skewed time series) and trimmed mean for return indicator.

On the results of the below-target semivariance value, we can say that the most risky ESG index is STOXX Global ESG Leaders index.

The MSCI ACWI ESG and SaP Global 1200 ESG indices have almost equal below-target semivariance value.

For a measurement of excess return per unit of risk is used a below-target semi-variance, instead of total risk (the standard deviation) used by the Sharpe ratio. Since the Sortino ratio takes into account only the downside size and frequency of returns, it measures the return to negative volatility trade-off.

This is particularly useful in cases where the returns of a equity indices are not normally distributed. In these cases, a better measure than standard deviation for an investment's risk is its below-target semivariance. The highest value of Sortino ratio is reached by SaP Global 1200 ESG index and this value is almost 33% higher than the Sortino ratio for MSCI ACWI index. This finding is crucial and it is worth exploring whether this performance is a characteristic feature of this ESG index and if can be counted in the future.

Conlusions

In this paper, we present the results of research associated with the risk and return measurement for ESG equty indices and describe the main differences among them. There were explored the selected return and risk characteristics of important ESG equity indices using mainly, robust statistical techniques and computationally-intensive methods. The results show differences among ESG equity indices in the term of risk and return.

These differences are the result of a different methodology for the classification of ESG indicators by individual index providers. This is reflected both in the representation of individual countries in each ESG indices, as well as the different representation of individual economic sectors and, last but not least, by the number of companies covered by index.

We sugest to use the below-target semivariance as a risk indicator for this type of time series – equity indices due their heavily skewed probability distribution. This risk indicator computes a variance using only the returns under a target return.

For a measurement of excess return per unit of risk was used a below-target semi-variance, instead of total risk (the standard deviation) used by the Sharpe ratio. Since the Sortino ratio takes into account only the downside size and frequency of returns, it measures the return to negative volatility trade-off.

According Sortino ratio is the best equity index SaP Global 1200 ESG index, which has bit less risk (expressed via below-target semi-variance) as well known MSCI ACWI index but the return is higher more than 20%. This finding is crucial and it is worth exploring whether this performance is a characteristic feature of this ESG index and if can be counted in the future.

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Annex

Table 1. Examples of ESG Issues

Environmental Issues	Social Issues	Governance Issues
Climate change and carbon emission	Customer satisfaction	Board composition
Air and water pollution	Data protection and privacy	Audit committee structure
Biodiversity	Gender and diversity	Bribery and corruption
Deforestation	Employee engagement	Executive compensation
Energy efficiency	Community relations	Lobbying
Waste management	Human rights	Political contributions
Water scarity	Labor standards	Whistblower schemes

Source: CFA Institute.

Table 2. Key characteristics of the ESG indices and MSCI ACWI index

	MSCI ACWI	MSCI ACWI ESG Universal Index	S&P Global 1200 ESG Factor Weighted Index	STOXX® Global ESG Leaders
Nr. of Companies	2476	2398	1200	340
Nr. of Countries	46	46	34	31
Sectors TOP 5	Financials 19% Information Technology 17% Consumer Discretionary 12,5% Health Care 11.0% Industrials 10,5%	Information Technology 19% Financials 17% Industrials 12% Consumer Discretionary 11% Consumer Staples 10,5%	Financials 18% Information Technology 16,5% Health Care 12,5% Consumer Discretionary 11,5% Industrials 11%	Industrial goods and services 12% Banks 9,5% Real Estates 9% Technology 7,5% Personal and Household Goods 7%
Countries TOP 5:	United States 52,5% Japan 7,5% United Kingdom 6,0% France 3,5% Germany 3,0%	United States 50% Japan 7,5% United Kingdom 6,5% France 4,5% Germany 4,0%	United States 57% Japan 7.5% United Kingdom 6.5% Canada 3,5% Germany 3,0%	France 15% United Kingdom 13% USA 11,5% Germany 8,0% Japan 6,5%

Source: ACWI ESG Universal Index Fact Sheet, S&P ESG Factor Weighted Index Fact Sheet, The STOXX Global ESG Leaders Facts Sheet, MSCI ACWI Fact Sheet.

Table 3. Quarterly summary statistics of equity ESG indices

	MSCI ACWI	MSCI ACWI ESG	SaP Global 1200 ESG	STOXX Global ESG Leaders
Count	29	29	29	29
Average	2,16	2,19	2,58	2,14
Median	2,9	2,6	4,1	4,7
15% Trimmed mean	3,09	3,13	3,64	3,22
Standard deviation	6,79	6,69	7,16	8,64
Minimum	-17,4	-16,6	-18,7	-22,8
Maximum	14,3	14,1	14,6	17,8
Lower quartile	0,2	0,4	0,7	-1,6
Upper quartile	6,8	7,0	7,4	8,3
Interquartile range	6,6	6,6	6,7	9,9
Stnd. skewness	-2,35	-2,34	-2,59	-2,04
Stnd. kurtosis	1,96	1,84	2,10	1,41

Source: Author's calculation.

Table 4. Spearman rank correlation of equity ESG indices

	MSCI ACWI	MSCI ACWI ESG	SaP Global 1200 ESG	STOXX Global ESG Leaders
MSCI ACWI		0,9905	0,9726	0,8808
MSCI ACWI ESG	0,9905		0,9789	0,8780
SaP Global 1200 ESG	0,9726	0,9789		0,8850
STOXX Global ESG Leaders	0,8808	0,8780	0,8850	

Source: Author's calculation.

Table 5. Equity ESG indices results based on the bootstrap technique

	MSCI ACWI	MSCI ACWI ESG	SaP Global 1200 ESG	STOXX Global ESG Leaders
Return	8,25	8,45	9,9	8,5
Median	9,3	9,45	11,1	9,65
Standard Deviation	12,9	12,65	13,5	16,35
Down Side Risk (T=2,5%)	6,25	6,05	6,00	8,45
Prct5%	-11,15	-10,7	-10,65	-16,2
Prct25%	-0,15	0,15	1,05	-2,25
Prct75%	17,4	17,4	19,5	20,1
Prct95%	24,95	24,8	27,25	29,8
Sharpe (2,5%)	0,45	0,47	0,55	0,37
Sortino (T=2,5%)	0,92	0,98	1,23	0,71

All values are annualised; Target return and risk free rate are set 2,5%
Source: Author's calculation.

Figure 1. Quarterly Box-and-Whiskers Plot of equity ESG indices
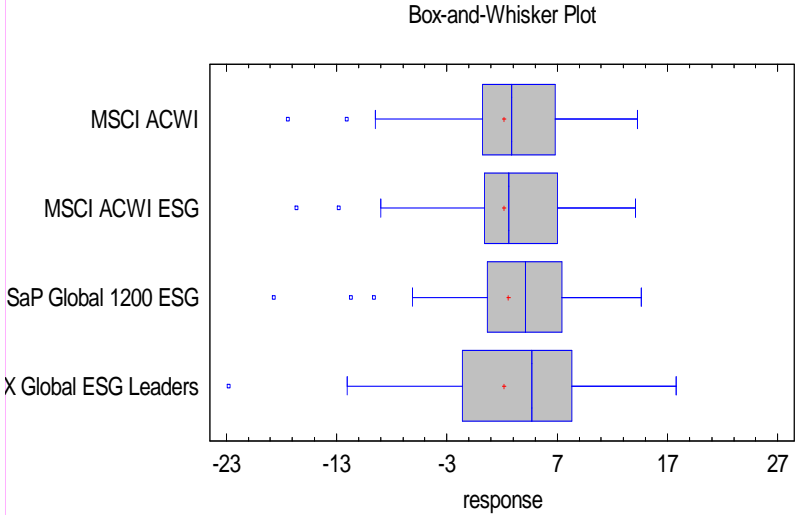
Source: Author's calculation.

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Credibility of earnings reported by new stock companies: accrual and real earnings management

JEL Classification: *G34; G32; G23*

Keywords: *Initial Public Offering, Real earnings management, Discretionary accruals, Listing status*

Abstract

Research background: The initial public offering creates an excellent opportunity for researching the impact of changes in the institutional environment of companies, especially in the field of corporate governance, on the trustworthiness of the information disclosed in the financial statement around the corporate events.
Purpose of the article: The main aim of the study is to analyze the use of intentional actions in the form of both accrual and real earnings management to inflate earnings around the going public event. Therefore, this paper contributes to the stream of study on the quality of financial reporting of new stock companies.
Methods: There are two main approaches reflecting the use of various types of earnings management activities, i.e. discretionary accruals and real earnings management. In both cases, it was necessary to use proper models to identify the normal level of categories affecting the results reported in the financial statements.
Findings & Value added: Using a sample of 183 IPOs from Warsaw Stock Exchange between 2005 and 2015 I find that, generally, managers of the new listed companies actively use discretionary accruals, reduction of production costs and certain discretionary expenses, abnormal cash flows from operations – being all my proxies of earnings management – in the periods around the IPO. In the period prior to the IPO, managers more often introduce techniques typical for the real sphere of the company's operations, in particular the deliberate modeling of certain discretionary costs. In turn, the role of discretionary accruals increase after the IPO.

Introduction

The knowledge that the reported earnings is an economic category suscep-tible to manipulation is quite common (Graham et al., 2005, pp. 3-73). Managers are able to bias it in a specified direction bringing to bear various types of activities in the real sphere of the company's operations or using discretionary accruals. Considering management actions that deviate from typical business practices, undertaken with the major objective of altering current period earnings (Li, 2019), three basic types of such activities are analyzed with a particular attention, i.e. activities aimed at reducing the production costs, deliberate limitation of certain discretionary expenditures and intentional influence on the level of operating cash flows (Roychow-dhury, 2006, pp. 335-370). In turn, the accruals earnings management is achieved by the managerial discretion over the accrual component of earn-ings (Haga et al., 2018, p. 421).

There is an intensive discussion in literature on the use of earnings man-agement in IPOs. Initial studies suggest that managers intensively manipu-late reported financial results in order to obtain a higher valuation of shares in the first public sale (Teoh *et al.*, 1998, pp. 1935-1974; Ducharme *et al.*, 2004, pp. 27-49), taking advantage of the information asymmetry present in the IPO (Sletten *et al.*, 2018, p. 872). Although the existence of the incen-tive to manage earnings upwards before the IPO is not generally ques-tioned, Roosenboom *et al.* (2003, pp. 243-266), Venkataraman *et al.* (2008, pp. 1315-1345), Ball & Shivakumar (2008, pp. 324-349) point out that going public companies tend to use conservative rather aggressive pre-IPO reporting, anticipating the high adverse costs and negative market con-sequences. Moreover, most researchers focus on the discretionary accruals (e.g. Armstrong *et al.*, 2016, pp. 1316-1338) and current findings directly point to the need for a comprehensive approach to this issue and inclusion a wider range of forms of earnings management in the analysis (Li, 2019). Such a scientific buzz, both theoretical and empirical, inspires further re-search on this topic and this study is motived by it.

The main aim of the study is to analyse the link between the fact of ob-taining the status of the public company and the use of intentional man-agement actions focused on inflating earnings. Therefore, the goal of the study refers to the issue of the quality of financial reporting and its quanti-tative attributes as well as the informational value of the reported financial results in ensuring the information needs of stakeholders. In this paper, then, I address a major question on how changes in the institutional market environment resulting from the fact that the company obtains the status of the public company affect the scale of managerial activity in the earnings

management. The reliability of financial reporting is in the centre of interest of a wide range of investors, as well as information intermediaries on the financial market.

There is a number of reasons why companies choose to engage in earnings management. The perspective of the business environment in which they operate plays a significant role here (Hope *et al.*, 2013, pp. 1715-1742). Due to a substantial information asymmetry in the IPO process, the incentive to manage the reported earnings becomes even more intense. Thus, issuers may be prone to inflate earnings as they contribute appreciably to the initial firm value by boosting the offering price (Gao *et al.*, 2017, p. 90). Nevertheless, the extensive scrutiny of financial information in the process of transformation from private to public ownership constitutes a considerable barrier to aggressive earnings management (Venkataraman *et al.*, pp. 1315-1345). Considering the practical possibilities of identifying the use of particular forms of earnings management, discretionary accruals are more prone to be detected in the pre-investment analysis process. Issuers are aware of the wide range of costs implied by being caught exploiting such practices heavily (Gao *et al.*, 2017, pp. 90-108). However, management activities aimed towards the intentional structuring of business transactions and deliberate reduction of certain discretionary expenditures can bring notable results in the form of a short-term increase in the reported financial results and are difficult to detect. Based on the above discussion, I posit the following hypothesis:

H1: *Before the IPO firms are more likely to engage in real earnings management rather than in accrual-based earnings management.*

The realities of the capital market, including the constant expectations of investors concerning the improvement of the financial results, exert enormous pressure on the stock listed companies (Graham *et al.*, 2005, pp. 3-73). This pressure accumulates especially at the moment of the IPO and then stabilizes at a relatively certain level. After the IPO, the possibility of using discretionary accruals for upwards earnings management remains relatively unchanged. The financial reporting of companies is covered by a wide range of information intermediaries who ensure the identification of practices that may have a negative impact on the wealth of shareholders (Ball & Shivakumar, 2008, pp. 324-349, Haga *et al.*, 2018, p. 421). On the other hand, profit transfer from one reporting period to another in the form of real earnings management faces particular constraints. Since business activity of the company is a subject of constant interest of the capital market players, the managers are aware of the fact that such borrowing of prof-

its diminishes the reported financial results in other periods. Moreover, the excessive use of real earnings management destroys the potential to generate the company's value in the long term (Haga et al., 2018, pp. 420-435). It can be expected that the system of corporate governance may limit, at least to a certain extent, the use of such practice. Hence, I posit that:

H2: *In financial reporting after the IPO accrual-based earning management gains importance with respect to real earnings management.*

Research methodology

The study aims at answering the question what effect the changes in the institutional environment of the company transforming from private to public ownership have on the purposeful action of managers to alter reported earnings in a particular way. I analyze the financial results disclosed in the annual reports of 183 companies, which went public on the main market of the Warsaw Stock Exchange between 2005 and 2015 and implemented the IPO in the form of the primary or secondary shares sale. In order to assess the quality of the reported earnings before and after the IPO, I investigate the financial information for two full reporting periods of the company's operation under the conditions of a different institutional framework for corporate governance, i.e. private (T_{preIPO}) and public ($T_{postIPO}$) shareholders supervision (see Figure 1).

According to literature (Roychowdhury, 2006, pp. 335-370), the abnormal values of production costs (*PROD*), discretionary expenditures (*DISC_EXP*) and operating cash flows (*CFO*) are the measures of real earnings management activity. Therefore, consistent with earlier studies I estimate the normal level of these figures for each company in the sample as a linear function of sales (*SALES*) and changes in sales (*ΔSALES*) in particular periods and the residuals from following equations describe the scale of real earnings management in individual IPOs:

$$\frac{CFO_t}{TA_{t-1}} = \beta_1 \left(\frac{1}{TA_{t-1}} \right) + \beta_2 \left(\frac{SALES_t}{TA_{t-1}} \right) + \beta_3 \left(\frac{\Delta SALES_t}{TA_{t-1}} \right) + \varepsilon_t$$

$$\frac{DISC\_EXP_t}{TA_{t-1}} = \beta_0 + \beta_1 \left(\frac{1}{TA_{t-1}} \right) + \beta_2 \left(\frac{SALES_{t-1}}{TA_{t-1}} \right) + \varepsilon_t$$

$$\frac{PROD_t}{TA_{t-1}} = \beta_0 + \beta_1 \left(\frac{1}{TA_{t-1}} \right) + \beta_2 \left(\frac{SALES_t}{TA_{t-1}} \right) + \beta_3 \left(\frac{\Delta SALES_t}{TA_{t-1}} \right) + \beta_4 \left(\frac{\Delta SALES_{t-1}}{TA_{t-1}} \right) + \varepsilon_t$$

For the discretionary-based approach I follow Larcker & Richardson (2004, pp. 634) and I identify the discretionary portion of accruals (DACC) for a given IPO firm as a residual from the following OLS model:

$$\frac{TACC_t}{TA_{t-1}} = \beta_0 \left(\frac{1}{TA_{t-1}} \right) + \beta_1 \left(\frac{\Delta SALES_t - \Delta AR_t}{TA_{t-1}} \right) + \beta_2 \left(\frac{PPE_t}{TA_{t-1}} \right) + \beta_3 \left(\frac{BV_t}{MV_t} \right) + \beta_4 \left(\frac{CFO_t}{TA_{t-1}} \right) + \varepsilon_t$$

where ΔAR is the difference in accounts receivable during the year, PPE is gross property, plant, and equipment at the end of year. The ratio of the book-to-market value of common equity (BV/MV) and CFO is added as control variables because it is likely that motivation to manage earnings changes in response to the growth opportunities and current operating performance(Larcker & Richardson 2004, pp. 634-635).

To avoid the IPO companies' heterogeneity I estimate each coefficient in the four models outlined above according to the size of the firm i.e. lagged total assets (Ecker *et al.*, 2013, pp. 190-211). Hence, the study sample has been divided into 10 separate groups of a similar size, and then I estimate models separately in the cross-section for each decile group. Furthermore, in order to eliminate the issue of heteroscedasticity in the error term, I also deflated variables in the models by the lagged total assets (TA_{t-1}) (Tucker & Zarowin, 2006, pp. 251-270).

Results

Table 1 reports the descriptive statistics of residuals from models 1-4, describing real and accrual based earnings management in years around the IPO. Figures 2 and 3 additionally emphasize the scope of earnings management in the years around IPO, using confidence intervals for mean and quartiles, respectively. Basically, before the IPO, earnings management activity is very diverse among the whole sample. Based on my three measures of real earnings management, on an average, it varies between 0.0012 and -0.0139, Discretionary expenditures measure takes the highest values for mean, as well as standard deviation and amounts to -0.0139 and 0.4515, respectively, with a median of -0.0472. The average (median) discretionary portion of accruals amounts to 0,0029 (-0.0205). It varies between -1.4690 and 3,0318, with a standard deviation of 0.3380. Although the average and median values are rather low, all measures of earnings management differ widely across companies. In the year following the IPO

several interesting facts emerge. First, in spite of the fact that the means and medians for all earnings management proxies are still close to 0, the differentiation across the companies decreased significantly. Second, taking into account all measures of the real earnings management, the operating cash flows proxy has the highest average that amount to 0.0035. However, when the median is considered, again, the abnormal discretionary expenditures takes the first place. Third, the average discretionary accruals amount to 0.0106 and is the highest in comparison to mean values reported for real earnings management measures.

I present a summary of the comparisons between earnings management activity in the year before and after the IPO in Table 2 with respect to each of its form. After the IPO one can see a noticeable decrease in both the average and the median for almost all forms of earnings management investigated in the study. An exception is the production costs measure, where the average remains unchanged and amounts to 0.0000. Nevertheless, almost all of the observed changes are not statistically significant. Only the difference in median of the abnormal discretionary expenditure is significant at 10%.

An additional outcome of my research is the assessment of the relationship between the use of particular forms of earnings management. Table 3 provides the Pearson correlation estimates among the different proxies of earnings management used in the study with their statistical significances. Regardless of whether before or after the IPO, negative and significant correlations exist between the abnormal production cost and other types of real earnings management. In particular, this relation is extremely strong especially between discretionary expenses and extraordinary production costs in the year prior to the IPO (-72.17%, Pearson, p-value<0,01). This negative correlation can be explained by the fact that managers may use both forms of real earnings management interchangeably to achieve a particular goal.

Conclusions

In this paper, I investigate relations between the changes in the company's institutional market environment around the IPO and the scale of managerial activity towards inflating earnings. I consider both accrual and real earnings management.

The empirical analysis of 183 Polish IPOs shows that before and after obtaining the status of a stock listed company, there are no statistically significant differences in mean values of particular methods of earnings

management. However, the scope of intentional influence of managers on the reported financial result is significantly smaller after the IPO. Prior to the first listing of the company's shares on the stock exchange managers more often employed activities typical of the real sphere of the company's business operations, in particular intentional modeling of discretionary expenditures. In turn, after the stock exchange debut, the use of discretionary accruals is relatively more often put into action.

The analysis of the earnings management around the IPO presented in this paper has its limitations, which creates a great potential for further research. My study is limited to assessing the use of specific methods of earnings management and its measurement. The methodological approach I use relates to the scale of the development of the Polish stock exchange. The use of alternative solutions may reveal other aspects of the use of such management practices during the transformation from private to public ownership. Furthermore, qualitative studies assessing managers' willingness to manage earnings before and after the IPO could be of particular interest.

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Annex

Table 1. Summary statistics for particular methods of earnings management analysed in the study

Specification	Mean	Median	Std. dev.	Min	Q1	Q3	Max	N
				Tpre-IPO				
CFO	0.0012	–0.0038	0.2036	–1.0692	–0.0890	0.1036	0.9687	183
DISC_EXP	–0.0139	–0.0472	0.4515	–1.2936	–0.1399	0.0675	4.4966	183
PROD	0.0000	0.0051	0.3946	–3.5683	–0.0971	0.1318	1.1552	183
TACC	0.0029	–0.0205	0.3380	–1.4690	–0.0748	0.0533	3.0318	183
				Tpost-IPO				
CFO	0.0035	–0.0030	0.1428	–0.4893	–0.0781	0.0729	0.9962	183
DISC_EXP	0.0000	–0.0184	0.2216	–0.7049	–0.0827	0.0525	1.9632	183
PROD	0.0000	0.0228	0.2533	–2.0028	–0.0625	0.1064	0.6606	183
TACC	0.0106	0.0050	0.3022	–0.9326	–0.0683	0.0571	3.2880	183

Source: own calculations.

Table 2. Comparison of differences in mean and median of real and discretionary earnings management

Specification	*Tpre-IPO*		*Tpost-IPO*		Difference		N
	Mean	Median	Mean	Median	Mean	Median	
CFO	0.0012	–0.0038	0.0035	–0.0030	–0.0024	–0.0008	183
					(–0.1225)	(0.0836)	183
DISC_EXP	–0.0139	–0.0472	0.0000	–0.0184	–0.0139	–0.0288	183
					(–0.3775)	(1.7880*)	183
PROD	0.0000	0.0051	0.0000	0.0228	0.0000	–0.0176	183
					(0.0000)	(0.1965)	183
DACC	0.0029	–0.0205	0.0106	0.0050	–0.0077	–0.0256	183
					(–0.2167)	(0.7484)	183

t-statistics (t-test of difference in means) and z-statistics (Wilcoxon rank-sum test of difference in medians) in parentheses
*, **, and *** represent statistical significance at 10%, 5%, and 1% levels, respectively.
Source: own calculations.

Table 3. Correlation matrix: Pearson correlation coefficients

Specification	CFO	DISC_EXP	PROD	TACC
CFO	1.0000	0.0832	–0.3654***	0.0033
DISC_EXP	–0.0960	1.0000	–0.2481***	0.0042
PROD	–0.1970***	–0.7217***	1.0000	–0.1480**
TACC	–0.0251	–0.0114	–0.0336	1.0000

The upper-triangular part reports the correlation coefficients for a period of one year after the IPO and the bottom-triangular part reports the correlation coefficients for a period of one year before the IPO
Source: own calculations.

Figure 1. Timeline of the corporate governance perspectives around the period of the IPO
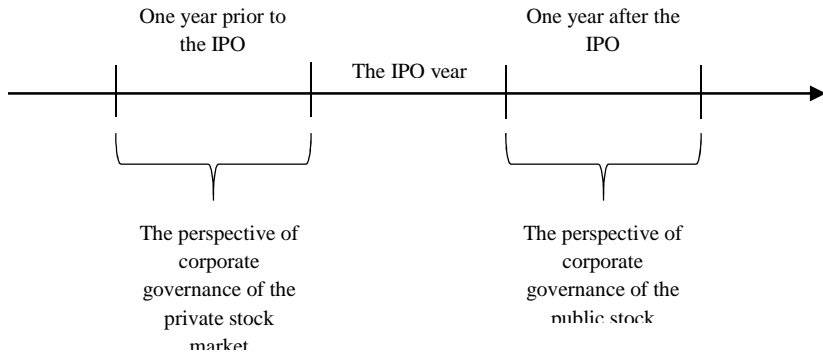
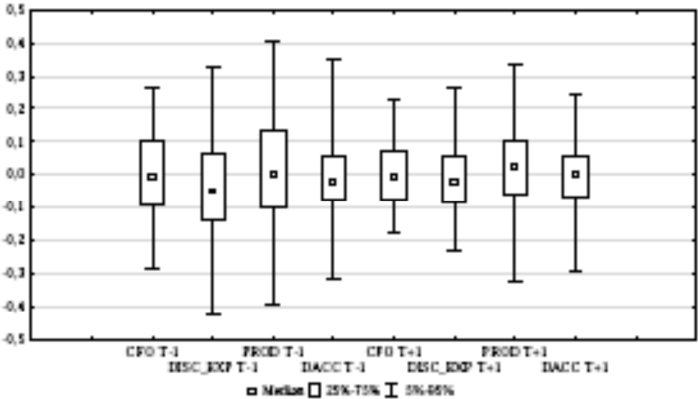Source: own presentation.

Figure 2. The scope of using earnings management techniques prior to the IPO (T-1) and after (T+1): confidence intervals
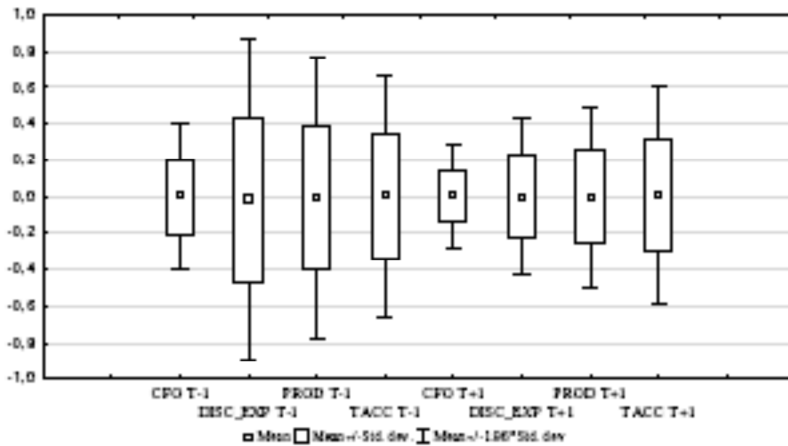
Source: own calculations.

Figure 3. The scope of using earnings management techniques prior to the IPO (T-1) and after (T+1): quartiles

Source: own calculations.

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Being an outlier - a company non-prosperity sign?

JEL Classification: *C38; G33*

Keywords: *Bankruptcy prediction models; Financial ratios; Failure prediction; Financial distress; Correlation analysis*

Abstract

Research background: State of financial distress or imminent bankruptcy is for every company a very difficult situation that the management of the company wants to avoid. If a company manager was aware of the impending difficulties in advance, he would have to make some necessary arrangements. For these reasons, prediction of company bankruptcy, or financial distress, is in recent years in a focus of economists and scientists in many countries over the world.
Purpose of the article: For the purpose of financial distress prediction, various financial indicators of the company, mostly financial ratios, are usually used. In order to create a strongly predictive model and a statistically significant prediction of bankruptcy is advisable to use a deep statistical analysis of the data used. In this paper we analyze the real financial ratios of Slovak companies. In the phase of data preparation for further analysis we have checked the existence of outliers in the data and have found that there are some companies that are multivariate outliers because are significantly different from other companies in the database. So we deeply focused on these outlier companies and analyzed whether to be an outlier is a sign that the company is in the state of financial distress.
Methods: We analyzed whether in the set of outlier companies there are much more non-prosperous companies and their financial indicators are significantly

different from that of the prosperous companies. For these analysis we used testing of the statistical hypotheses, such as test for equality of means and chi-square test. **ngs & Value added:** The ratio of non-prosperous companies between the outliers are significantly higher than 50 % and the attributes of non-prosperity and being an outlier are dependent. The means of almost all financial ratios of prosperous and non-prosperous companies between outliers are significantly different.

Introduction

Identification of the impending financial problems of the company can be important not only for company owners or managers, but also for business partners, potential or existing creditors or for employees (Kral *et al*., 2018, pp. 282-294). This is why the issue of prediction of financial distress was important in recent decades and nowadays still is. For early detection of impending problems in the analysed company, prediction models are usually used (Siekelova *et al*., 2017, pp. 3-10). Their task is to evaluate financial health of the company on the basis of selected financial indicators or characteristics of the company. Subsequently, the company should identify imminent financial troubles or even bankruptcy in advance (Kral *et al*., 2016, pp. 224-231). In these prediction models, financial indicators of the companies are usually used. The most used ones are financial ratios (Zvarikova *et al*., 2017, pp. 143-155). In order to create a functioning prediction model with high predictive ability it is important to undergo the data preparation phase and deeper statistical analysis of these prediction variables first. For this reason, we deeply focus on the financial ratios of the companies to check the existence of potential outlying or extreme values. These outliers can significantly influence the results of statistical analyses and tests. It is therefore appropriate to consider exclusion of such extreme values from further analyses in order to not distort the values of statistical characteristics, test results and resulting prediction models. But on the other hand, extreme or outlying values of some financial indicators of the company may be important in identifying its financial difficulties. Therefore, the main aim of this study is to focus deeply on the companies that have been marked as potential multivariate outlier with respect to the values of all financial ratios of all companies in the dataset. The objective of this study is to make a deeper analysis in order to discover whether there exists any connection between being an outlier and being non-prosperous company. Multivariate outliers were detected using Mahalanobis distance according to Tabachnick & Fidell (2012). To identify the dependence between the features "to be an outlier" and "to be non-prosperous company", standard

Pearson chi-square independence test is used (Benhamou & Melot, 2018). The difference between the proportions of non-prosperous companies in a dataset of potential outliers and in a dataset of non-outliers is tested by the test of equality of the proportions (Eberhardt & Flinger, 1977, pp. 151-155). Finally, mean values of financial ratios for prosperous and non-prosperous companies in the set of outlying companies are compared by t-test (Wilks, 1946, pp. 257-281).

In the area of bankruptcy prediction models, authors mostly focus on either checking the suitability of older established models for specified country or companies, or correcting the parameters of these models, or creating new models using various methods. Since in this study we have focused on the deeper analysis of data used for bankruptcy prediction modelling, we consider this study to be a pioneer in this area. Its contribution is the innovative approach to the analysis of outliers in relation to the prosperity of the company.

This article is divided into six parts. The introduction briefly identifies the importance of the topic and the main aim of the study. Literature review summarizes the current status of publications in the field of bankruptcy prediction models and highlights the place of the study in this field. The third chapter describes used data, set hypotheses and methods of their verification. The fourth part presents the results and their interpretation. The discussion evaluates and summarizes the results. The last part, conclusion, contains a general summary of the article and its results, research limitations and suggestions for the future direction of research.

Literature review

The creation of bankruptcy prediction models has been the subject of analysis for many authors in different countries over the last years. The first prediction models were created at the end of the 1960s by well-known authors such as Beaver (1966), Altman (1968), and then in 1980s by Ohlson (1980), Zmijewski (1984), and others. There are currently hundreds of prediction models developed in the different countries over the world. Many of them are used in economic practice. The models were created based on real data about financial indicators of selected companies by various methods, whether historically known discriminant analysis and logistic regression (for example Jing & Fang, 2017, pp. 235-256; Barkar, 2017, pp. 658-672; Szetela *et al*., 2016, pp. 839-856; Lohk & Siimann, 2016, pp. 297-306) or even more modern methods of neural networks (Dima & Vasilache, 2016, pp. 127-143), genetic algorithms, classification trees (Brozyna *et al*., 2016,

pp. 93-114), and random forests (Jabeur & Fahmi, 2017, pp. 1173-1186). Several prediction models have also been created in Slovakia. In addition to already known models of Chrastinova developed in 1998 and Gurcik developed in 2002, several Slovak authors have tried to create a prediction model with the best classification power, such as Gavliak (2006, pp. 65-69); Bielikova et al. (2014, pp. 48-56); Harumova & Janisova (2014, pp. 522-539); Mihalovic (2016, pp. 101-118); Kovacova and Kliestik (2017, pp. 775-791); Gavurova *et al*. (2017, pp. 370-383). Researchers from Slovakia also deal with the application of existing models to predict the financial difficulties of companies in Slovakia (Delina & Packova, 2013, pp. 101-112; Adamko & Svabova, 2016, pp. 64-71; Valaskova *et al*., 2017, pp. 30-38).

Several authors have also dealt with the occurrence of outliers in data used for bankruptcy prediction models in recent years. However, they mostly examined the impact of outliers on the resulting prediction power of the models created. For example, Tsai and Cheng (2012, pp. 333-342) studied bankruptcy prediction performance achieved after removal of different outlier volumes from datasets. Linares-Mustaros *et al*. (2018, pp. 1-10) dealt with problems occurring in financial ratios, such as the occurrence of outliers, in using cluster analysis to classify firms according to their financial structures. Alrawashdeh *et al*. (2018, pp. 284-298) wanted to eliminate the problem of high sensitivity of linear discriminant analysis to outliers in data and to improve the classification ability of created models also in bankruptcy prediction. Figini *et al*. (2017, pp. 91-97) in their study describes novel approaches to predict default for SMEs by detecting multivariate outliers. Pawelek *et al*. (2015, pp. 164-173) made an empirical study about the influence of detecting and eliminating outliers on the effectiveness of the bankruptcy prediction logit model for Polish companies. In this study and also in their subsequent studies (Kostrzewska *et al*., 2016, pp. 72-81; Pawelek *et al*., 2017, pp. 29-42) the authors considered both univariate and multivariate methods for detecting outliers in the dataset. All the mentioned authors, but also others, in their studies dealt mostly with the impact of outliers on the resulting bankruptcy prediction model. In our study, we focus on a deeper analysis of the outliers to determine whether being an outlier can be for a company a sign of its non-prosperity. In this respect, therefore, our study in this field innovative.

Research methodology

In our analysis we focused on the data about Slovak companies. We describe the data file below in more detail. Since primary data showed a high number of extreme values, we have applied two approaches to mark them for future analysis. First, we focused on the values of all variables (financial ratios) and second, we analysed the existence of multidimensional outlying observations. For each individual variable, we marked as potential outliers the values of the variable lying outside the 2.2-multiple of the quartile range (IQR). Usually, 1.5-multiple of IQR is used, but as shown in Hoaglin & Iglewicz (1987, pp. 1147-1149), this value can sometimes mark as outliers also those values of variables that really are not outliers. Therefore, according to these authors, to use 2.2-multiple of IQR is prefereable. To identify multivariate outliers, the Mahalanobis distance is a suitable metric. The procedure of detecting multidimensional extreme values is according to Tabachnick & Fidell (2012). To verify that some measurement is multivariate outlier, we create a variable P_{MD} defined

$$P_{MD} = 1 - CDF_{Chisq}(MD, Df), \tag{1}$$

where CDF_{Chisq} is the cumulative distribution function of the random variable with χ^2-distribution, Df is the number of financial ratios in the analysis, and MD is the Mahalanobis distance for i-th observation. The P_{MD} variable is used to identify multivariate outliers. If it holds

$$P_{MD} < 0.001, \tag{2}$$

this indicates that the unit is a multivariate outlier. A value of 0.001 is recommended by Tabachnick & Fidell (2012).

In our analysis we suppose, that the fact that a company is potential outlier may be related to being non-prosperous. We therefore focused on the dependence of these two features. By using the statistical procedures we need to check whether there exist a statistically significant dependence between the fact whether the company is potential outlier or not and the fact that the company is prosperous or not. To identify the dependence, we use the standard Pearson chi-square independence test with the null hypothesis about independence of the attributes "being an outlier" and "being prosperous". The test variable and critical area of the test is counted according to (Benhamou & Melot, 2018). Rejection of the null hypothesis means

that there exist a statistically significant association between being a potential outlier and company's non-prosperity.

Another point of view we have focused on in a dataset of potential outliers was whether or not there are significantly more non-prosperous companies among outliers than among non-outliers. So, we compared the proportion of non-prosperous companies of outliers and non-outliers by the test of equality of proportions in two independent samples. Zero hypothesis of this test is that the proportion of non-prosperous companies is the same, i.e. there are just as much non-prosperous companies among outliers as among non-outliers. The test variable and critical area of this test is counted according to (Eberhardt & Flinger, 1977, pp. 151-155). Rejecting a zero hypothesis will mean that among outliers, there are much more companies that are non-prosperous than prosperous ones. Therefore, we need to think well whether it is appropriate to exclude these companies from the database in order to avoid loss of information that could be useful in constructing a bankruptcy prediction model.

Finally, we focused on the values of financial ratios of outlying companies. We compared the mean values for prosperous and non-prosperous companies by using a standard t-test according to Wilks (1946, pp. 257-281). Zero hypothesis is that the mean values of the ratios are the same for prosperous and non-prosperous companies. Rejecting a zero hypothesis will mean that among outliers, the average value of that financial ratio is significantly different for prosperous and non-prosperous companies.

Data

Similarly as authors in other studies in Slovakia, we decided to choose the predictors that are the most frequently used in the prediction models worldwide (Valaskova *et al.*, 2017, pp. 30-38). We used financial ratios of real Slovak companies from the Amadeus database from the year 2017. After thoroughly checking data in terms of correctness and completeness, we chose the most commonly used ratios, given in Table 1. These variables, which will be the predictors in the prediction model of financial health of Slovak companies, have subsequently been checked for outliers based on the quartile margins and multivariate outliers using (1) and (2). After this checking, the dataset of 62,932 companies was divided into 256 outliers and 62,676 non-outliers.

Than, the prosperity of the company was checked according to the current amendment to Act no. 513/1991 Coll. Commercial Code, where the institute of "the company or the firm in crisis" was established from January 1st, 2016 (Valaskova *et al.*, 2017, pp. 30-38). In the Table 2, there are

counts and the percentages of companies in a set of potential outliers and in the set of non-outliers divided into prosperous and non-prosperous companies. As we can see in the Table 2, there is a much larger proportion of non-prosperous companies among outliers (nearly 40%), while only 15 % of non-prosperous companies are non-outliers.

Further we will verify three hypotheses. First hypothesis says that mean values of financial ratios of outliers and of non-outliers are for non-prosperous companies significantly different. This will be verified by standard t-test for equality of means of two independent samples (Ahmad et al., 2018, 3060). The second hypothesis says that the proportions of non-prosperous companies among outliers is higher than among non-outliers. This will be verified by the test of equality of proportions in two independent samples. And the third hypothesis says that the fact that company belong to the set of outliers is dependent with the fact that company is non-prosperous. This will be verified by the test of independence in the contingency table.

The weakness of this approach is the fact that in case of using another way to identify outliers the results might be different. However, the strength of the study are three different points of view to verify the relationship between the features of the companies "to be outlier" and "to be non-prosperous company".

Results

Differences between outliers and non-outliers companies

Table 3 shows the basic statistical characteristics of all financial ratios mentioned above. The characteristics are presented separately prosperous and non-prosperous companies. Moreover, each group is divided into companies that have been marked as outliers and for those that have not. As was supposed, the means are different for outliers and non-outliers. For prosperous companies, the values of financial ratios of outliers is on average much higher than for non-outliers, which could be the reason of consideration to exclude them from the dataset. For non-prosperous companies, the situation is similar than in case of prosperous companies. The means of profitability ratios, debt and capital structure ratios and ratios of activity are higher for outlying companies than for non-outlying ones. In case of liquidity ratios the situation is opposite. Except of L4, liquidity of outliers is lower than of non-outliers. Comparing the variability of outliers and non-outliers we can see that the variability of outliers is much higher than of

non-outliers. This also could be the reason for consideration of their exclusion from the database of Slovak companies. We have to consider this step in the process of bankruptcy prediction model creation.

As it is visible in Table 3, there are also differences between means of financial ratios of prosperous and non-prosperous companies among outliers. So we performed a test of differences of these mean values to analyse, whether they are statistically significant. Due to the huge ranges of samples we can use a standard independent two-sample t-test (Wilks, 1946, pp. 257-281). The test results are summarized in Table 4. Equivalence of variances was confirmed by statistical test only for the ratios R3 and A2. The p-values of the tests show that using the significance level 0.05 the null hypothesis about the equivalence of mean values were rejected only for ratios R1, R2, L1, Z4, A1. All other ratios do not have significantly different mean values for prosperous and for non-prosperous companies in the set of outliers. This could mean, that this five ratios could be considered as suitable predictors of company non-prosperity. However, the current ratio $L3$ is often used for this identification. Therefore we can say that even for this reason it could be considered to exclude these outlying companies from the database, which will be further used to derive the prediction model for identification of company failure.

Relationship between being and outlier and being non-prosperous

Now we focus on the set of outlying companies and analyse whether there exists some relationship between the fact, that the company is outlier and the fact that the company is non-prosperous. The count and percentage of the prosperous and non-prosperous companies between outlying and non-outlying companies is given in contingency Table 5. It shows that there is a larger proportion of non-prosperous companies among outliers than among non-outliers. This indicates a statistically significant association between "being an outlying company" and "being a non-prosperous company". This hypothesis is tested by the Pearson chi-square independence test (Bengamou & Melot, 2018). The results of this test and other tests of independency are in Table 6. Since the p-value (Asymp. Sig.) of all tests is less than any commonly used significance level, we reject the null hypothesis about independence between the variables. So we can claim that there exists significant association between the non-prosperity of company and the fact whether or not the company is outlier. The intensity of this association is measured by Phi and Cramer's V in Table 7. According to these results, the association between the features "to be outlier" and "to be non-prosperous" is weak but nevertheless is statistically significant.

Proportions of non-prosperous companies in the sets of outliers and non-outliers

As already mentioned, almost 40% of companies among the outliers and 15% among non-outliers are non-prosperous. By testing of the equality of the proportions (Eberhardt & Flinger, 1977, pp. 151-155) we test whether this difference is statistically significant. Result of the test is in Table 8. According to the value of significance level, the null hypothesis about equal proportion of non-prosperous companies between outliers and non-outliers is rejected. That means, the proportion of non-prosperous companies is significantly higher in the set of outlier companies than in non-outlier one.

Discussion

Companies may be multivariate outliers with respect to other companies because they are in financial distress and therefore the value of their financial ratios differ extremely from those of other companies. It is therefore necessary to make deep preparation of the database for creation of bankruptcy prediction model with respect to these identified facts, so that we do not lose the information that might be needed to create the bankruptcy prediction model. Since similar studies by the authors that focus on these aspects of database preparation for creating bankruptcy prediction models are unknown, we consider this study to be a pioneer in this field.

Conclusions

In this paper, we focused on analysis of a database of Slovak companies and their financial ratios. In the database preparation phase, we have checked the dataset for existence of potential outlying values, not only one-dimensional, but also as multivariate outliers according to Tabachnick & Fidell (2012). On one hand it could be appropriate to exclude these companies from the database because the values of outliers could cause changes in the results of statistical tests and procedures in the subsequent creation of the company bankruptcy prediction model. Moreover, looking at the mean values of the financial ratios of the outliers, we found that it was problematic to identify prosperous and non-prosperous companies between them as they did not differ significantly in the mean values of financial ratios. For this reason, it could be indeed appropriate to exclude these companies from

the database. But on the other hand, we have found that the fact that the company is an outlier is somewhat interconnected with the fact that it is in a state of financial distress. As was shown in this paper, there exist an association between being an outlier and being non-prosperous company. Although this association is not very strong, it is statistically significant. It was also shown that among outliers there is significantly higher proportion of non-prosperous companies than the prosperous ones. All findings obtained in this study should be taken into account when developing a database for further creation of bankruptcy prediction model with a strong prediction ability. The limitation of this study is that both multivariate and one-dimensional outliers have been investigated in the database in one way only. Therefore, it would be appropriate to further study to apply different methods of identifying outliers in data files and to compare the results obtained. It would also be useful to create a prediction model and compare its prediction ability in the case of outliers being removed from the database and without it.

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Acknowledgments

Annex

Table 1. Financial ratios used in analysis

Ratio name	Group	Method for calculation	Ratio name	Group	Method for calculation
R1	ratios of profitability	ROA EAT (net return / assets)	*Z1*	ratios of debt and capital structure	coverage ratio of total assets / retained earnings
R2		ROA EBT (gross return / assets)	*Z2*		total debts ratio
R3		net return / total incomes	*Z3*		current debts ratio
L1	ratios of liquidity	cash ratio	*Z4*		loan / assets ratio
L2		quick ratio	*Z5*		equity / debt
L3		current ratio	*A1*	ratios of activity	total incomes / assets
L4		net working capital ratio	*A2*		total incomes / current assets

Source: own elaboration.

Table 2. Cross-table of variables "being an outlying company" and "being a non-prosperous company"

	Prosperous	Non-prosperous	Total
Non-outlier	53 189	9 487	62 676
	84.86%	15.14%	100.00%
Outlier	154	102	256
	60.16%	39.84%	100.00%
Total	53 343	9 589	62 932
	84.76%	15.24%	100.00%

Source: own elaboration.

Table 3. Statistical characteristics of prosperous and non-prosperous sets of outliers and non-outliers

	Variable	Outliers		Non-outliers	
		Mean	Std Dev	Mean	Std Dev
Prosperous	R1	38.06	299.07	0.086	43678.00
	R2	45.24	315.95	0.131	41275.00
	R3	-71937.00	929 240.49	-14.8	512.91
	L1	454.00	1 068.33	43710.00	21490.00
	L2	2 662.19	24 412.92	30042.00	24.73
	L3	2 766.02	24 405.80	5.221	24.95
	L4	-232.52	1 921.27	0.09	31107.00
	Z1	-383.39	2 478.74	-0.21	16558.00
	Z2	288.56	2 042.15	0.73	35125.00
	Z3	233.21	1 921.30	0.62	31107.00
	Z4	42736.00	14062.00	0.08	0.31
	Z5	3 961.32	24 950.8	43529.00	32.19
	A1	1476223.00	6 127 126.36	446.73	15 105.44
	A2	138776.00	723 068.2	147.37	3 783.91

Table 4. Continued

Variable		Outliers		Non-outliers	
		Mean	**Std Dev**	**Mean**	**Std Dev**
Non-prosperous	R1	-424.78	2 085.86	-1.1	6.816
	R2	-408.91	2 054.66	-0.99	24624.00
	R3	-19754.00	89 257.82	-163.79	3 282.03
	L1	0.04	0.11	0.12	0.17
	L2	0.09	0.2	0.31	0.27
	L3	0.12	0.26	0.41	0.3
	L4	-1 515.5	6 570.94	-3.43	18.35
	Z1	-1 473.2	5 876.81	-3.42	18.82
	Z2	1 561.51	6 575.34	12510.00	18.94
	Z3	1 516.21	6 571.04	43620.00	18.39
	Z4	27.81	123.61	0.24	43497.00
	Z5	-0.79	0.38	-0.37	0.31
	A1	431871.00	1416639.00	1 828.65	33 744.57
	A2	115523.00	380 569.38	366.97	5 487.10

Source: own elaboration.

Table 5. t-test for equality of means between prosperous and non-prosperous companies among outliers

Variable	Equal variances	T	Sig. (2-tailed)
R1	not assumed	2.226	0.028
R2	not assumed	2.215	0.029
R3	assumed	-0.565	0.573
L1	not assumed	5.273	0.000
L2	not assumed	1.353	0.178
L3	not assumed	1.406	0.162
L4	not assumed	1.918	0.058
Z1	not assumed	1.771	0.079
Z2	not assumed	-1.896	0.061
Z3	not assumed	-1.918	0.058
Z4	not assumed	-2.174	0.032
Z5	not assumed	1.971	0.051
A1	not assumed	2.035	0.043
A2	assumed	0.298	0.766

Source: own elaboration.

Table 6. Contingency table of prosperous and non-prosperous companies among outliers and non-outliers

outlier * prosperity Cross-table			prosperous	non-prosperous	Total
outlier	No	Count	53189	9487	62676
		% within outlier	84.86%	15.14%	100.00%
	Yes	Count	154	102	256
		% within outlier	60.16%	39.84%	100.00%
Total		Count	53343	9589	62932
		% within outlier	84.76%	15.24%	100.00%

Source: own elaboration.

Table 7. Test of independence of variables "being an outlier" and "being a non-prosperous company"

Chi-Square Tests	Value	Asymp. Sig.
Pearson Chi-Square	120.506	0.000
Continuity Correction	118.600	0.000
Likelihood Ratio	90.966	0.000

Source: own elaboration.

Table 8. Correlation measures of variables "being an outlier" and "being a non-prosperous company"

Correlation Measures	Value	Approx. Sig.
Phi	0.044	0.000
Cramer's V	0.044	0.000

Source: own elaboration.

Table 9. Test of equality of proportions of non-prosperous companies among outliers and non-outliers

Test	Value	Asymp. Sig.
Proportions equality test	10.978	0.000

Source: own elaboration.

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Impact of the e-commerce on distribution channels of insurance services

JEL Classification: *G22, L81*

Keywords: *insurance distribution, online sale of insurance services, internetization, e-commerce, distribution channels*

Abstract

Research background: The development of modern technologies has changed the awareness of insurance services buyers. On the one hand, the Internet has increased customer access to information about products as well as to insurance services directly. On the other hand, modern technologies, that make possible a quick and efficient comparison of propositions, have increased the requirements for insurance products. The internetization of society plays a key role in the insurance distribution environment development.
Purpose of the article: Changes in the legal sphere allowed to conduct online market transactions to a greater or lesser extent, which strongly influenced the structure of distribution channels. The aim of this study is the analysis of the factors and barriers of insurance services digitisation in the Visegrad countries in comparison to the EU.
Methods: The methods of statistical analysis of structure, dynamics and correlation were used in the study. A one-way analysis of the variance and logistic regression were used to compare EU countries. The calculations were performed using IBM SPSS Statistics. Eurostat data was used for the study. An analysis of legal regulations in the sphere of online insurance distribution was conducted.

Findings & Value added: The difference of this research is in the assessment of the consumers' percentage which buying services, including insurance, via the Internet, but not in the gross premiums earned on the sale through this distribution channel. The study allowed to assess the structure of the countries of both the Visegrad Group and the EU in terms of the purchase of an insurance service via the Internet. The main factor of not using of this distribution channel is the habit, trust in the agent and loyalty to the insurer, and fear for the security of the transaction, but not access to the Internet, as expected. A significant barrier is a fear concerning the possibility of the contract termination. These factors are correlated with legal regulations.

Introduction

With the fast-growing E-commerce via the Internet, several risks which may impede not only the consumers' interests but also insurers' operation has been caused (Wang, 2016).

It is evident that insurance undertakings can sell directly and, in particular, over the Internet some simple insurance products with low premium more easily than other, less simple products.

In some countries, insurance undertakings increase direct sales via e-commerce more than insurance intermediaries, probably because insurance undertakings are more eager to adopt and promote online sales since, in that way, they not only facilitate their business but also may cover the intermediation business more efficiently.

Internetization of society is becoming a secondary factor influencing the development of e-commerce and online insurance distribution (Szymańska, 2018). The crucial factors are legal regulations and people's trust, but no longer to the insurance service or the insurance company, but the sales channel, or rather to the guarantee of the effectiveness and security of the transaction and the possibility of resigning from the purchase. These expectations are mostly related to the implementation of EU regulations. Changes in the legal sphere have allowed concluding online market transactions to a greater or lesser extent, which strongly influenced the structure of distribution channels. The aim of this study is the analysis of the factors and barriers of insurance services digitisation in the Visegrad countries in comparison to the EU.

Customers are becoming more and more aware of their expectations and demand for higher service standards because technology allows them to compare products and services very quickly and accurately. In this context, already the mental barriers and the e-commerce security system is an essential element of a much more complex online insurance distribution system.

Moreover, according to Dionne and Harrington (2017), insurance markets show a wide range of distribution methods and insurance institutions are more active in e-commerce distribution from classical insurance intermediaries (ŠIRÁ, 2017).

Numerous articles on the development of e-commerce present descriptive market features of individual countries (Srinivasan, 2002; Gefen, 2000; Chiu, 2014). In the same time, some papers describe the dependence of e-commerce on certain physiological or cultural factors (Zhao, 2018; Hallikainen, & Laukkanen 2018).

Research methodology

The paper focuses on the assessment of the e-commerce impact on the insurance services sale and the identification of barriers that limit internet insurance sales in the Visegrad Group countries on the EU background. Eurostat data was used for the study. The difference between these studies is based on the assessment of the percentage of consumers buying goods and services, including insurance, via the Internet, but not the gross premiums earned on sales through this distribution channel. In most EU countries, the premium written by the non-life insurance department increases and the share of premiums from online sales increases. The questions are whether in relative terms more consumers buy online insurance and what are the main barriers to using this distribution channel. Eurostat data on the purchase of an insurance service via the Internet is available for the years 2016-2018, the latest research on the type of barriers covers 2017.

The study uses statistical methods of structure analysis, dynamics and correlation. The calculations were performed using IBM SPSS Statistics. The number of EU countries did not allow the use of variance analysis and logistic regression (lack of statistical significance of results). Obtained results indirectly indicated the importance of legal regulations while using this distribution channel. The elements of these regulations in the Visegrad Group countries, which are important for this study, were briefly discussed.

Foundation of the e-commerce regulation

While issues related to e-commerce in insurance essentially focused on consumer protection and market behaviour, the operational risk caused by e-commerce should also be emphasised in the regulatory system, as is the case in Hungary. At the EU level, attention was drawn to the operational

risk of e-commerce since 2000. However, as the study of the legal norms of the V4 countries shows, the implementation of these standards in the national legislation was quite long. Its implementation cannot be considered successful in all countries.

The primary directives created for regulations harmonisation in different Member States are the E-commerce Directive (2000/31/EC on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market) and the Electronic Signature Directive (1999/93/EC on a Community framework for electronic signatures). Following these main directives applied to general E-Commerce activities, the Distance Marketing of Consumer Financial Services Directive (2002/65/EC concerning the distance marketing of consumer financial services and amending Council Directive 90/619/EEC and Directives 97/7/EC and 98/27/EC) deals explicitly with financial services, including insurance. The European Parliament adopted the IDD (Insurance Distribution Directive).

The art. 19 of this document points on the need to provide all forms of remuneration and property benefits in order to ensure transparency and avoid any conflict of interest (for investment products this obligation has even been extended in subsequent articles). Art. 20 sets the obligation to comprehensively prepare a short, transparent document containing detailed information about the insurance product, strives to simplify it. Article 28 imposes on the Member States, among other things, obligations to ensure that intermediaries and insurers take all steps to identify and resolve conflicts of interest. The relations of employees, members of management and persons who have even indirect connections and mutual relations of clients arising during the conduct of any insurance distribution activity, are indicated. The directive also introduces, in addition to direct and indirect sellers, the concept of an intermediary offering supplementary insurance (Insurance Distribution Directive).

The Insurance Distribution Directive was adopted in 2016, and the EU member countries had two years for its implementation. For this purpose, each of the Visegrad Four states should have changed its law. In Poland, the Act of December 15, 2017, on insurance distribution was adopted, in the Czech Republic - Zákon č. 170/2018 Sb. Zákon o distribuci pojištění a zajištění, which started to act on August 16, 2018. In Slovakia, the regulations were implemented on February 23, 2018. Amendment to the Act "186/2009 Coll. on Financial Intermediation and Financial Advisory Services and the Amendment and Supplementation of Certain Acts as amended" and to "39/2015 Coll. on Insurance and the Amendment and Supplementation of Certain Acts as amended".

In Hungary, legal regulations regarding insurance are distinguished in the new Civil Code 2013, but they are quite general, for example, they do not provide the possibility for terminating the contract during the term of its validity. The implementation of EU directives in Hungary was quite formalised in connection to the Executive act (Act amending certain laws on legal harmonization of insurance and payment transactions, Act CXLV of 2017). In 2017, the Hungarian National Bank also adopted a Decree (i.e. Decree MNB 35/2017 (XII.14) on the management of payment transactions, which creates the possibility of additional identification (e.g. telephone number or tax identification number) of the consumer. This Decree will come into force gradually until July 1, 2019.

The results of empirical research

According to the results of Eurostat research, 60% of persons in the EU aged between 16 and 74 used the Internet in 2018 for ordering goods or services. This percentage in the EU ranged from 20% in Romania to 84% in Denmark. EU countries were moderately differentiated within this percentage (coefficient of volatility around 33%). The data is presented in Figure 1.

The results of the trend function analysis presented in Fig. 1 shows that the percentage of consumers purchasing goods and services in the EU over the Internet in 2007-2018 was increasing on 2.7% from year to year, but in the Visegrad Group countries, it increased by 3.3% on average.

The percentage of consumers buying insurance services via the Internet depends on the percentage of people buying goods and services using this tool. The Pearson linear correlation coefficient[1] is, on average, 0.64 in the analysed years 2016-2017, that indicates a strong positive correlation in the positive direction. The result is statistically significant (p-value 0.0002).

The question arises about the reason for a small number of people bought insurance over the Internet. What are the barriers? The analysis was based on Eurostat data on barriers to the purchase of goods and services via the Internet. Eurostat's research was conducted for a group of individuals aged 16-74 who did not buy in the last 12 months or general services via the Internet. The data presented the percentage of consumers which did not buy the service via the Internet due to various reasons, such as: preferring direct sales, lack of skills, concerns about long waiting times and problems with receiving, safety concerns, complaints or refunds, lack of payment

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[1] The calculations were made in IBM SPSS Statistics.

card and other. For each of the reasons, the percentage of consumers in a given country was determined. Tables 1 and 2 show summary statistics of the analysed variables for the EU and the Visegrad Group respectively.

Results of the data analysis presented in Tables 1 and 2 show that the most frequently mentioned reason (69% EU, 61.5% Visegrad Group) not buying a service (including insurance) over the Internet is preferring direct contact with the seller (agent), loyalty to the store (insurer) and habit. It should be emphasised that the countries of the Visegrad Group compared with the EU are more strongly diversified in terms of this variable. Both in the EU and in the Visegrad Group, the percentage of individuals aged 16-74 which have not purchased a service via the Internet due to preferring direct contact, loyalty and habit, is the smallest in Poland (only 6%). In other countries of the Group, it is over 75%, up to 84% in Hungary and over 56% in EU countries. These testify to the level of habituation and confidence in an insurance agent.

The next most common reason for refusal to buying online services is a concern with security (25% in the EU, 16.25% in the Visegrad Group). In Poland, consumers do not have such concerns (0%). Consumers in Hungary (27%) and Finland (23%) are most concerned about security. It should be emphasised that in the majority of EU countries, the percentage of consumers who do not buy services due to security concerns is low (below 10%). It does not exceed 2% in the countries of the Visegrad Group except Hungary. We believe that such a high level of trust in Poland takes place on the basis of legal regulations corresponding to the challenges of making transactions on the Internet. Lack of trust in Hungary is explained by the lack of legal that will come into force gradually until July 1, 2019.

The next mentioned reason, due to which consumers refuse the purchase of the service via the Internet, is the lack of sufficient skills (19% in the EU, on average 16.5% in the Visegrad Group). The smallest percentage of such consumers is in Poland (2%), the largest in Malta (43%), Portugal (42%) and Spain (40%). The consumers' disinterest in technologies can explain the lack of skills in such extending countries for tourism because of the traditional lifestyle based on tourism.

An important reason for not buying online is the fear of problems with a complaint or refund (16% in the EU, 15% on average in the Visegrad Group). The smallest percentage is identified in Poland (0%), the largest in Portugal (68%), Finland (66%) and Spain (50%).

A relatively often as a reason for purchasing refusal of online services reported the lack of a payment card (12% in the EU, 9.5% in the Visegrad Group). This percentage is small (0-5%) in the countries of the Group except Hungary (29%). In the EU, the most significant part of such consum-

ers are the inhabitants of Cyprus (41%). Other countries showed a percentage below 29%.

From the analysed barriers, the fear of a long waiting time for delivery and problems with receiving (6% in the EU and 5% in the Visegrad Group) also can be mentioned.

Among the Visegrad Group countries, the majority of consumers who do not purchase services including insurance via the Internet due to the analysed barriers are in Hungary. The least is in Poland (see Figure 2).

Conclusions

The main determinants limiting the purchase of services, including insurance via the Internet are cultural and technological factors. It is worth noting that the primary barrier is not a lack of Internet access. Legal factors connected with the implementation of EU directive are also not mentioned, although they are undoubtedly correlated with concerns about complaints or returns and transaction security. Most likely, the lack of appropriate regulations is a cause for concern about the safety of buying over the Internet by 27% of Hungarian citizens and concerns about the possibility of complaint or withdrawal from the insurance contract in 38% of Hungarians.

According to the study, the most important factor determining the purchase of the service via the Internet is the consumer's habituation and trust in the insurance intermediary, loyalty to the insurance company. The countries of the Visegrad Group are strongly differentiated in terms of this factor. For example, the part of such consumers is 84% in Hungary. Simultaneously, there are only 6% of such consumers in Poland, which results from more transparent legal regulations regarding the distribution of insurance via the Internet.

In the same time, the analysis of the trend function has shown that in the EU the percentage of consumers purchasing goods and services over the Internet in 2016-2018 increased each year by an average of 2.7%, while in the Visegrad Group countries an average of 3.3%.

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Annex

Table 1. Summary statistics of analysed variables for EU countries in 2017 [%]

Statistics	Variables						
	Preferring direct sales	Lack of skills	Long waiting times, problems with receiving	Safety concerns	Fear of problems with complaints	No payment card	Other
	X1	X2	X3	X4	X5	X6	X7
Percentage in EU	69	19	6	25	16	12	16
Average	74,61	20,96	6,82	26,25	17,71	11,71	16,96
Coefficient of differentiation	20,14	50,52	97,40	66,21	71,16	73,68	79,73
Min	6	2	0	0	0	0	0
Max	86	43	27	68	48	41	68

Percentage of individuals aged 16 to 74 who ordered goods or services, over the internet, for private use, more than a year ago or who never did:

X1- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because they prefer to shop in person, they like to see product, loyalty to shops or force of habit;

X2- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because they lack the necessary skills;

X3- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because of too long delivery times or because of the problematic to receive the ordered goods at home;

X4- Individuals who, in the last 12 months, haven't bought / ordered goods or services over the internet for their own private use, because: Payment security concerns;

wX5- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because of trust concerns about receiving or returning goods, complaint / redress concerns;

X6- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because they don't have a payment card;

X7- Individuals who, in the last 12 months, haven't ordered goods or services over the internet, because of other reasons.
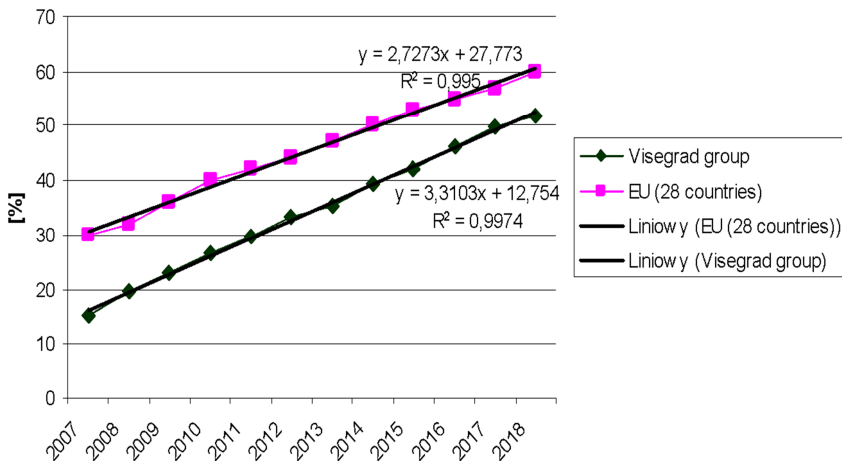
Source: own work based on Eurostat data.

Table 2. Summary statistics of the analyzed variables for the Visegrad Group countries in 2017 [%]

| Statistics	Variables						
	Preferring direct sales	Lack of skills	Long waiting times, problems with receiving	Safety concerns	Fear of problems with complaints	No payment card	Other
	X1	X2	X3	X4	X5	X6	X7
Average	61,5	16,5	7,5	16,25	15	9,5	10
Coefficient of differentiation	52,37	60,68	150,41	106,62	95,34	120,13	61,64
Min	6	2	0	0	0	0	0
Max	84	30	27	45	38	29	16

Source: own work based on Eurostat data.

Figure 1. The percentage of people aged 16-74 in the EU and the Visegrad Group, which ordered goods and services on the Internet in 2007-2018 and the trend function (Individuals using the Internet for ordering goods or services) [%]

Figure 2. Percentage of consumers in the Visegrad Group countries aged 16-74 which refused to buy of the service over the Internet in the last 12 months or not at all according to the reason in 2017 [%]
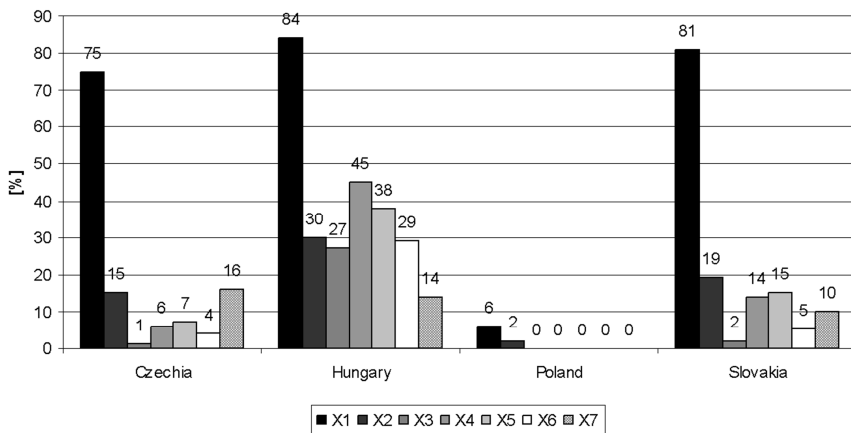
Source: own work based on Eurostat data.

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The sustainability of the existing cost management system with an emphasis on the public sector

JEL Classification: *M21; M40*

Keywords: *Activity-based analysis, Activity-based costing, Cost management, Private sector, Public sector*

Abstract

Research background: The basic condition of the financial management of all types of organizational units, both public and private, is undoubtedly the knowledge of costs. Any entity offering its services and products for a fee must be able to evaluate its performance correctly, which, of course, is not possible without the knowledge of costs.
Purpose of the article: The purpose of this paper is to compare the cost management approaches in the public and private sectors, with emphasis on the public sector.
Methods: We analysed data collected in 2017 from 201 respondents, from both the public and private sectors in the Czech Republic. We focused on the attitude of public sector units (63 respondents) towards the use of Activity-based costing (ABC) and the consequences for financial management in comparison with private sector units (138 respondents). As the statistical analysis, we used methods of descriptive statistics and Pearson statistics (Chi-Square Test, P-value).

Findings & Value added: The main results of this paper are that most respondents do not use ABC and that there are statistically significant differences between the public and private sectors. Furthermore, private sector units calculate the full cost of their activities significantly more than public sector units. Despite this, the results showed that most entities, both public and private, charge costs in such a way so as to be able to determine the total costs of their activities at any time. Statistically, many more private entities do not manage public resources, while significantly more public sector entities are aware of the costs of all their activities, including those financed from public sources. Most of the respondents in both groups surveyed make important financial decisions based on knowledge of the full costs of their activities. The conclusion follows that, although the majority of entities surveyed do not use the ABC method, it was at least partly applied in sub-areas of financial management.

Introduction

A basic condition for the financial management of all types of organisational units, i.e. both private and public, is undoubtedly the knowledge of costs. Every subject which offers its services and products in return for payment must be able to correctly value its outputs, which, of course, is not possible without the knowledge of costs. At the same time, it is not important whether the subject is operating in the public or private sector. However, it is necessary to emphasise that not every economic subject is able to apply modern cost management methods in its governance.

The basic hypotheses can be defined by the following series of questions:

− In what extent must costs be monitored and classified so that this so-called input information, necessary for financial management, is adequate?
− How do the sources of financing enter this cost analysis?
− To what extent are costs and their sources monitored in Czech organisational units?
− How do approaches to cost management differ between the private and public sector?
− Is the Activity Based Costing method also suitable for cost management in the public sector?
− Does the cost management method have an impact on strategic financial decision-making?

This paper aims to answer these questions gradually.

Cost management can be approached using traditional calculation methods, or using modern cost management methods which include Activity Based Costing or Time – Driven Activity Based Costing.

These calculation methods assigning the full cost to products, services and activities are described in detail in the literature related to common management accounting – e.g., Al Omiri & Drury (2007), Baird (2007), Drury (2015), Garrison et al. (2014), Henttu-Aho (2016) and many other authors. These classical approaches of the above-mentioned authors are generally known and therefore will not be presented here (also due to a limited range of the paper).

Despite the above-mentioned facts, the authors studied publications that partially concern the issue. The issue of allocating costs to activities in the public sector was worked out by, e.g., Slavici et al. (2011) and Cretu et al. (2010). The funding of universities is partly addressed in publications by Hunt et al. (2019), Lowry (2001), Parson et al. (2014), Talpos et al. (2010), Tanberg (2010) and Zámečník & Výstupová (2014).

The paper is thus concerned with the issue that is relatively new. For example, the possibility of using the Full Cost method in the public sector has been discussed in the last ten years only.

Literature review

At first sight, the approach to financial and cost management by public sector subjects appears completely different from that of private sector subjects. It is given by the fact that subjects operating in the private sector must "look after" their sources. Therefore, private sector subjects enter the market with the objective of maximising their profit. The objective of profit maximisation is one of the basic differences between the approaches of private and public sector subjects to cost management. Therefore, even at first sight, private sector subjects must manage their costs very effectively. Public sector subjects usually do not enter the market with the priority objective of profit maximisation. In many cases, they are not even allowed to achieve profit during their activities, as it is prohibited by legislation; their main objective is the satisfaction of public needs. In certain cases, the achievement of profit may be possible and desirable, if it involves so-called supplementary activities by public sector subjects. However, legislation states that these supplementary public sector activities must not be loss-making, and must not be performed to the detriment of the main activity, which is the activity for which the given subject was established. If these conditions are met, then the achievement of profit by public sector subjects

is also possible from a legal aspect. However, as their legal title implies, these are supplementary activities, which is why it is assumed that the priority of public sector subjects is not the achievement of profit; moreover, funds are assigned to these subjects from public budgets, so the effort to manage costs appears to be less important. However, such a difference between approaches to cost management is merely illusory. Baird et al. (2004) state that the application of Activity Based Management (in the sense of Activity Analysis, Activity Cost Analysis and Activity Based Costing) is equally important for the private and public sectors. Nevertheless, according to the results of performed research regarding a comparison of the utilisation of a higher level of cost allocation, i.e. cost allocation linked to activities and calculation with regard to operations, utilisation by public subjects in Australia is less frequent than in the private sector. The authors also discovered that the utilisation of Activity Based Management is very beneficial for the public sector, in several aspects. It can make information regarding actual costs more realistic, but it can also contribute to making the drawing of costs more efficient. This is also confirmed by Hammer (2011); on the other hand however, he admits that cost management in the public sector, specifically organisational state units, is still connected with a high level of inefficiency. At the same time, however, he adds that, in the private sector, application practice in the Czech Republic is still undeveloped, and usually limited to foreign-owned organisations.

Therefore, from the afore-mentioned, it follows that despite the differing reasons for the existence of the given subject, the knowledge of actual costs is important for both the private and public sector.

The ascertaining of costs can be approached in various ways. Costs can be ascertained using so-called traditional calculation methods, or using the Activity Based Costing method. A comparison of the approaches of these so-called traditional calculation methods and the ABC method was also made by Altawati et al. (2018), who state that, as a consequence of a competitive environment, companies were forced to switch from traditional calculation methods to a method known as Activity Based Costing. In their research, they also demonstrated that the ABC method is better than the traditional calculation methods, due to the fact that it provides a competitive advantage in the form of the identification of actual costs per subject product.

Research methodology

The data was obtained by research done in the year 2017 in the Czech Republic, within the scope of a project at the Tomas Bata University in Zlín. The data collection took place via a questionnaire which companies were invited to fill in by e-mail and telephone, and using agents-students. After the completed questionnaires were collected, a sample of approximately 30% of the questionnaires was verified in order to ascertain whether they were filled in by a responsible person within the company, via the students contacting the companies by telephone. The structure of the sample, in relation to the size and nature of the subject, is evident from Table 1. For the purposes of this article, the companies were divided into profit-making and non-profit public sector subjects. Overall, data was successfully obtained from 201 respondents, of which 138 were subjects from the private profit-making business sector, and 63 were subjects from the public non-profit sector.

Given the objective of this article, and with an emphasis on the public sector and its comparison with the private sector, the following seven research questions were selected from the questionnaire. Due to the limited range of the paper, only the results of the first three research questions are listed below.

Question 1 (Q1): *Do you use the ABC (Activity Based Costing) method within the scope of financial management?*

Question 2 (Q2): *Do you account for costs in such a way that the total costs of the given activity can be ascertained at any time?*

Question 3 (Q3): *Do you use calculations at the full cost level in financial management?*

The associations in contingency tables were analysed by methods of descriptive and Pearson statistics for counting of data. The P-value has been compared to standard 5% confidence level. The Cramer coefficient of contingency was quantified to assess the dependence force. The P-value that is lower than the confidence level leads to rejection of the null hypothesis. The null claims there is no association between variables. The calculations have been performed using statistical software. Statistically significant differences in particular responses were examined through the Z-score.

Results

In accordance with the objective of the article and the stipulated methods, the following results of the comparison of public and private sector subjects were ascertained in selected questions.

Table 2 presents the evaluation results of question Q1, aimed at ascertaining whether the examined subjects use the Activity Based Costing (ABC) method.

The results in Table 2 show that most of the subjects in both the private (94%) and public non-profit (97%) sectors do not use the ABC method during cost management and record-keeping. The values of the tested criteria confirmed statistically significant differences in the overall structure of the answers (Cramer V 0.12; P-value 0.00186) between public and private profit-making sector subjects. Within individual groups (affirmative and negative answers), no statistically significant differences were discovered.

Table 3 lists the resulting values of the tested criteria in relation to question Q2, aimed at ascertaining the answers in relation to whether the subjects account for costs in such a way that the total costs for the given activity can be ascertained at any time. Most of the evaluated subjects in both the public (83%) and private (79%) sectors account for costs in such a way that they are able to ascertain the costs for the given activity at any time. The resulting Cramer V and Chi-quadrat values, and the P-value show that there are no statistically significant differences in either the overall structure of the answers, or within the evaluated groups.

Table 4 sets out an overview of statistical results in relation to question Q3, of whether the subjects use calculations at the full cost level in their financial management. The results show that while 49% of private sector subjects use calculations at the full cost level, only 40% of public non-profit sector subjects responded affirmatively. The values of the tested criteria (Cramer V 0.177; Chi-quadrat 6.2733; P-value 0.0123) demonstrated statistically significant differences in the overall structure of the answers within both affirmative and negative responses, which means that private profit-making subjects utilise calculations at the full cost level during their management statistically and significantly more frequently.

Discussion

The ascertained values of the P-value and Z-Score statistical criteria used led to the finding that most of the examined subjects in both the private and public sectors do not use the ABC method in their cost management and

record-keeping, having statistically significant differences between the two groups (P-value = 0.00186). On the other hand, 83% of public sector subjects and 79% of private sector subjects account for costs in a manner which enables them to ascertain the total costs for a certain activity. Furthermore, it has been discovered that the examined subjects in both sectors investigate how individual activities affect the company's total costs. On the basis of these findings, we can conclude that although most of the examined subjects do not apply the ABC method when managing and keeping records of their costs comprehensively to all costs or all activities, they try and are able to ascertain the full costs of individual activities from existing records, for example for the purposes of strategic financial management and decision-making, or to evaluate the effect of the costs of selected activities on the company's total costs. Therefore, public sector subjects are statistically and significantly more involved in activities financed from public sources, which corresponds to the principle of financing of most of their activities. One of the reasons may be the difficulty as well as related financial demands regarding the application of the ABC method to all of the company's costs.

We can state that the afore-mentioned results correspond to the findings resulting from research done within the scope of this issue in the Czech Republic in recent years – e.g. Hammer (2011), Otrusinová (2016) and Máče (2018).

Conclusions

The primal aim of this paper is to analyse the cost management approaches in the public and private sectors, having emphasis on the public sector. The fulfilment of this objective is declared in previous chapters (Results and Discussion).

The basic research limitations of the study are as follows:
- The regional character of the research (using only a sample of companies in the Czech Republic).
- The use of basic mathematical-statistical methods.
- An unequal representation of subjects within the scope of individual groups in the research aggregate, particularly in the case of public administration subjects.

We are planning to concentrate on the following topics when working on another research in the near future:
- Determination of full costs using the Activity Based Costing method, while taking into consideration the specifics of multi-source financing.

− Comparison of approaches to cost management in public sectors in V4 countries (Czech Republic, Slovakia, Poland, Hungary).
− Focus on selected spheres of the public sector, particularly on public universities.

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Annex

Table 1. Respondent sample structure

	Profit-making subjects	Non-profit subjects	Total
Micro	36	30	66
Small	38	16	54
Small	46	13	59
Large	18	4	22
Total	**138**	**63**	**201**

Source: own calculation.

Table 2. Statistical evaluation of question Q1

Possibilities	Absolute number		Relative number		P-value
	SS	VS	SS	VS	Z-score
Yes	8	2	6%	3%	0.4295
No	130	61	94%	97%	0.4295
Cramer V	0.12				
Chi-quadrat	0.6292				
P-value	0.00186 < 0.05				

Notes: SS: private profit-making subjects; VS: public non-profit subjects
Source: own calculation.

Table 3. Statistical evaluation of question Q2

Possibilities	Absolute number		Relative number		P-value
	SS	VS	SS	VS	Z-score
Yes	109	52	79%	83%	0.5552
No	29	11	21%	17%	0.5552
Cramer V	0.041				
Chi-quadrat	0.3428				
P-value	0.5582 > 0.05				

Notes: SS: private profit-making subjects; VS: public non-profit subjects
Source: own calculation.

Table 4. Statistical evaluation of question Q3

Possibilities	Absolute number		Relative number		P-value
	SS	VS	SS	VS	Z-score
Yes	81	25	59%	40%	0.0124
No	57	38	41%	60%	0.0124
Cramer V	0.177				
Chi-quadrat	6.2733				
P-value	0.0123 < 0.05				

Notes: SS: private profit-making subjects; VS: public non-profit subjects
Source: own calculation.

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