

Model of Enterprise Financial Performance Measurement in Uncertain Market Environment of Central Europe

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Abstract

Currently, enterprises in continuing difficult conditions of the global economic and financial crisis, are trying to continually improve their competence on the market, maintain and achieve profits and maximize the enterprise market value. Therefore, they are looking for different ways to achieve these results by reduction, or elimination of business risk and then to measure its success. The world is at the time, when the information becomes an important tool in achieving these business objectives. In this paper, we present a newly-outlined model of measuring the financial performance of the enterprise. We construct complex synthetic indicator, which reflects the effect of comparative financial indicators of efficiency and difficulty. Calculated optimal intervals are verified on the financial results of selected enterprises and some are compared with the Altman Z-score. The paper aims to elucidate a creation and verification of the HGN model as model of enterprise financial performance measurement in uncertain market environment of Central Europe.

Keywords: efficiency indicators, synthetic indicator, newly-outlined model, performance model, financial indicators

1. Introduction

Recently, we encounter numerous methods and ways to measure enterprise performance. Connections and relationships between different methods are invisible on the first sight and are very complex. Methods focused on value creation are focused primarily on the financial performance and combine three main financial "characteristic features" of the company: produced operational cash flows, capital necessary for the generation of cash flows and cost on invested capital. Compared to the traditional indicators of profitability, as return on assets (ROA), return on equity (ROE), based on the core business, or economic activity, the return is valued in the context of capital costs and tries to avoid distortions in financial reporting. The main measure of success is the result of economization (profit/loss). It expresses the efficiency of the transformation of enterprise production factors (inputs) on company performance (outputs). Currently, there is a number of methods and approaches to the analysis of the financial performance of the company. Considering the main objective of business, they can be divided into two major groups - on approaches that would prefer to maximize profit (analysis of the financial performance using the classic indicators of profitability - ROE, ROA, ROI, etc.), and on (modern) approaches that favor increase of the market value of owners. Here we can include indicators, such as return on net assets (RONA) and gross assets (CROGA), cash flow return on investment (ROI CF), indicator EVA and its modifications and so on. These modern criteria for assessing of performance do not measure the successfulness of business by means of an accounting profit. Most of them have dynamic character (for example, CF ROI) and take into account the average cost of obtaining a binding external equity and interest-bearing loan capital of the company. In practice, often is used performance evaluation of enterprises using the scoring functions (Harumová, Janisová, 2014, 552).

2. Current Approaches of Measuring the Financial Performance of the Company

Specific methods for analysis of financial performance focus mainly on the identification and quantification of factors affecting the achieved level of profitability. We talk about the factor analysis of profitability. The aim of methods preferred

by the growth of the market value (for example, cash flow return on investment, an indicator of economic value added and its modifications, the yield of gross and net assets, etc.), is to find out the creation of additional value for business owners. They are thus based on comparison of revenues accruing from the capital invested and the cost of invested capital of the company.

The rate of return on net assets (RONA) is the same modification of "classic" return on assets (ROA). While return on assets confronts net profit (profit for the period after tax) of total assets, return on net assets taxed works with pure operational profit of the enterprise (NOPAT) and net worth (NA). Net taxed operating profit of the company is so-called result of basic entrepreneurship activity after tax. We cannot identify it with the result from operation activities.

Indicator of cash flow return on investment is able to determine the rate of value creation, regardless of enterprise size and industry. It is based on the internal rate of return. CFROI model uses life-cycle approach to estimate the rate of discount factor, and thus includes the company's competitive position and prospects for future investments (Madden, B. J, 1998). "The advantage of this indicator is that it enables to determine the future value of the business reflecting the time value of money, including the impact of inflation, eliminating any distortions of financial reporting, and thereby supporting inter-enterprise comparison. As a disadvantage can be considered difficult calculation, as well as high probability of great fluctuation between projected and real cash flows." (Nagy, 2011, p. 705).

Measurement of enterprise performance may be also implemented by means of indicator CVA (cash value added), which represents the capitalized net income adjusted for cost of capital (Harumová, 2011, 225).

The concept of economic value added (EVA) has recently become a commonly used method of assessing the economic efficiency of enterprises. Economic value added is used as a tool of financial analysis, financial management and business valuation. It is basically a performance indicator that tries to overcome shortcomings of conventional profitability indicators based on accounting income. According to Mařík (2011), the indicator EVA (economic value added) is the instrument of business management, which focuses on creating and increasing the market value of the company. EVA growth indicator may not lead to an increase in the market value of the company. Reducing the value and simultaneous increase of value of the EVA indicator may occur, according to Mařík (2011): if the current increase in the EVA indicator has been achieved at the expense of future over-profits; in the case, when EVA is increased, but there occurs increasing cost of capital, as a result of increased risk. By conversion onto present value, EVA may decrease and then also decreases the value of the company. The problem of EVA indicator is that its original form is absolute and is therefore influenced by enterprise size. Therefore, new relative indicators were created and are constructed on the basis of indicator EVA, which can also be used for comparison between companies. Likewise, the method can be used to determine the EVA performance of the debtor in determining of the value of the claim (Harumová, 2003, 461).

According to Lehne and Makhijia (1996), the indicator EVA, unlike traditional performance indicators, tries to measure the value that identifies, whether the business produces or destroys value, while capital expenditure is deducted from revenues that are generated from invested capital. EVA indicator, by the fact that it is based on accrual accounting, is more suitable for common financial analysis than free cash flows in the DCF method. This makes it possible to achieve greater interconnection of common analysis to enterprise valuation (Harumová et al., 2008, 394).

Refined economic value (REVA) provides an analytical framework for assessing the operating performance in the context of value creation for shareholders. For REVA indicator, the economic value added (EVA) has relatively good explanatory power, but REVA is theoretically a better indicator to assess, whether operating business performance is adequate in terms of risk compensation of owners or investors of the enterprise. According to conducted comprehensive statistical analysis in investigation the EVA and REVA, they are both able to anticipate the expectations of shareholders, but REVA has better explanatory power than EVA.

Erasmus, P.D. and Lambrechts, I.J. (2006) found that the EVA indicator is not always appropriate to assess financial performance. They also examined the relationship indicators of relative EVA and CFROI, which according to them provide very similar results.

Zahra (1993) examined the relationship between the external environment of enterprises and their financial performance. He examined data from 102 companies. His study highlighted the following proposals: the objective characteristics of the environment significantly affect business and the financial performance of the company.

The aim of the empirical investigation of Greenley (1995) was to assess the relationship between market orientation and performance. His results suggest that the impact of market orientation on performance depends on determinants of market environment. It suggests that market orientation may not be an appropriate choice for highly turbulent markets and also in conditions of poor performance of customers and technological changes.

Zéghal and Maaloul (2010) dealt with analyzing the role of added value as an indicator of value creation and its impact on economic and financial performance of the company. Their results show that the indicator has positive implications for economic and financial performance. They analyzed the impact of intellectual capital on business

performance. However, the relationship between intellectual capital and performance of share market is significant only for high-tech industry. Results also show that invested capital remains the major determinant of the performance of financial markets, even if it has a negative impact on economic performance.

According to Shahzad, M.A. and Sharfmana, M.P. (2015) the vast majority of the existing empirical researches examine the relationship between social performance and financial performance. Authors confirm on relatively large sample of UK businesses that there is a positive social impact on the performance of the financial performance of enterprises.

3. Database and Research Methods

For the need of performance modeling has been processed a database of 260 accounts of non-financial businesses of Slovak legal entities. It was based on accounts of double entry bookkeeping in 2011 and in some cases also for 2010 and 2012. From this database were excluded companies that have achieved negative economic result. The database is thus narrowed to 233 profitable enterprises. Examined sample of enterprises was before, during and after the global recession profitable, and profitability of enterprises recorded only slight year-on-year fluctuations. Enterprise samples were active in different sectors and regions of Slovakia.

Database of ratio indicators of profitable businesses for 2011 is derived from the database of absolute indicators of 233 companies that achieved in the examined financial year a positive result for the accounting period after taxation. In their financial statements prepared in accordance with Slovak accounting regulations, we have selected 55 absolute financial indicators. All businesses with unsatisfactory results (negative profit or loss, extreme levels of indebtedness of flow etc.) were excluded from the total database.

Database of financial indicators of Slovak profitable enterprises shall be considered a representative sample. From absolute financial indicators (balance sheet and profit and loss) were calculated 47 financial ratio indicators. At the same time, we determined the median, lower quartile, upper quartile and the average for the entire database. As they are creditworthy businesses that took profits after the financial crisis, the upper quartile of selected financial ratio indicators of the database should be close to the upper quartile of financial ratio indicators of all Slovak entrepreneurial ventures of Slovak republic, and also the lower quartile of selected financial ratio indicators of databases should be close to the lower quartile of all financial indicators of Slovak business enterprises. We have found that this condition is met. As an example we can mention the value in the lowest quartile of all enterprises of SR flow debt (debt-to-cash flow ratio) in 2011 and a database of enterprises. Lower quartile of flow debt of enterprises of SR in 2011 amounted to almost 2,52 year and lower quartile of flow debt (repayment period of external sources) of enterprises of the database by 2,25 years. The database indicators thus represent a model database, over which it is possible to execute qualified calculations using economic-mathematical methods.

There are many definitions of "business performance" and a significant number of financial-economic indicators, from which it is possible to compile other modifications and combinations thereof. The paper deals with performance measurement using ratio indicators that can be, as a ratio of input and output, expressed as follows:

- *output/input* - indicators of productivity, efficiency, as well as some indicators of profitability,
- *input/output* - indicators of difficulty, commitment, cost,
- *input/input* - indicators of amenities,
- *output/output* - indicators of profitability.

For indicators of effectiveness it is typical to achieve the highest possible values and for difficulty indicators the lowest. A *synthetic indicator* that maximizes contrast of totals efficiency indicators and difficulty indicators takes into account both of these requirements. It formally expresses the relationship:

$\sum_{i=1}^n \text{output}_i / \text{input}_i - \sum_{j=1}^m \text{input}_j / \text{output}_j$, and there may be three cases:

- *number of efficiency indicators is greater than the number of difficulty indicators ($n > m$)*
- *number of efficiency indicators is less than the number of difficulty indicators ($n < m$)*
- *number of selected indicators of efficiency and difficulty is equal ($n = m$).*

Definition and application of such created model, of which result in a synthetic indicator, we verify by use of linear optimization model. By calculations, we obtain the optimal interval for synthetic indicator and then we identify the lower limit of carrying capacity of the financial performance of the company.

4. The Synthetic Indicator Based on Ratio Indicators

We are dealing with the choice of indicators that make up the database of ratios of profitable enterprises for the year 2011 with the descriptive characteristics (e.g. the position, variability, skew, kurtosis, etc.) that characterize the data from another perspective. We refer to the characterization using five numbers (five-number summary) (Terek, M. 2013). It is characterizing of the distribution of largest value (MAX), the upper quartile (UQ), median (Me), lower quartile (LQ) and minimum value (MIN). Such characterization provides a comprehensive global view of the division.

In almost all series of data and hence in the study database of profitable enterprises, there are data that are so different from others that suggest the existence of some specific sources of error, which we did not take into account in the theoretical assumptions, and of which inclusion in considerations may cause only complications and incorrect alignment analysis. These data are called *outlying data* (outliers), and are defined as data that appear inconsistent with the other data in the data set. By determination of outlying data is important mainly the valuation of data set integrity. We use the method that is based on quartile range $RQ = UQ - LQ$. The value of the outfield when (Terek, M. 2013):

- is $\geq UQ + 1.5 RQ$.
- is $\leq LQ - 1.5 RQ$.

In specific analyses, the decision, about which data will be classified as outlying, depends on the analyst account. They tend to be referred to the so-called very distant outliers (far outliers), which means values separated by quartiles of more than 3 RQ.

We have created two groups of ratios; one group includes three indicators of effectiveness and the other one contains three indicators of difficulty. We will attempt to tie these indicators to each other, or synthesize them into one comprehensive model of performance, so that it will represent as objectively as possible the financial position of the company, its performance and will facilitate the comparative evaluation of the economic results of the company. The importance of the choice of indicators is emphasized also by authors Mihalíková, E., Sedláková, S., Guzyová, K. and Čisárik, P. (2011), stating that "every indicator reflects only a certain aspect of economic reality, and therefore there is such great number of them. The choice of which indicators in financial analysis we will use, will depend on the specific conditions and the purpose of executed analysis".

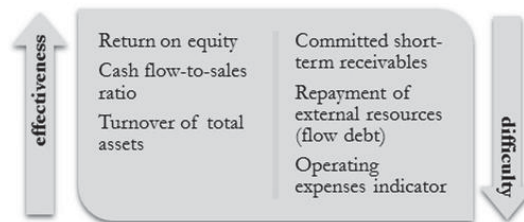


Figure 1. Input indicators for model creation

Efficacy indicators x_i :

1. Return on equity – x_1
2. Cash flow-to-sales ratio – x_2
3. Turnover of total assets – x_3

Difficulty indicators y_i :

1. Committed short-term receivables – y_1
2. The period of repayment of external resources (flow debt indicator)– y_2
3. Operating expense indicator – y_3

Adding up the values of indicators in individual groups we will obtain an aggregate indicator of the effectiveness x_i and aggregate indicator of difficulty y_i that will provide a partial picture of the enterprise in terms of efficiency and difficulty. We summarize homogeneous indicators that do not contradict each other and that are not mutually exclusive.

Aggregate indicator of effectiveness x_i :

$$\sum_{i=1}^3 x_i \quad (1)$$

provides a partial picture of the enterprise in terms of efficiency.

Aggregate indicator of difficulty y_i :

$$\sum_{i=1}^3 y_i \quad (2)$$

provides a partial picture of the enterprise in terms of difficulty.

Aggregate indicator of efficiency according to equation (1) and an aggregate indicator of difficulty according to equation (2) can be calculated for each enterprise from around 233 businesses of surveyed sample and from received values, we will calculate descriptive characteristics.

Since the variables x_i express the effectiveness and variables y_i express difficulty, it is desirable that the value of the variable x_i is the highest and the value of y_i will be the lowest possible. Aggregate indicators of efficiency and difficulty (x_i , y_i) individually provide only partial picture of the enterprise. If the aggregate indicator of effectiveness x_i will be cleaned from aggregate indicator of difficulty y_i , we will get newly-outlined synthetic indicator (SI), which will be influenced by the values of all six indicators. Based on the above, we define a synthetic indicator (by Hyránek, Grell, Nagy, 2014: 135):

$$SI = \sum_{i=1}^3 x_i - \sum_{i=1}^3 y_i \quad (3)$$

5. Verification of Identified Optimal Intervals of Synthetic Indicator

5.1 The method for identifying of SI optimal intervals

The results of exact calculation realized by means of tasks of linear programming, of which objective function value of optimal solution is a synthetic indicator, determined intervals for inclusion of profitable enterprises in the relevant category performance. The aim of the calculations is to determine the synthetic indicator, when changing the selected element of the right side of linear programming tasks, so that the base does not change the optimal solution. As part of these changes, we differentiate outlying and very remote outlying data that occurred mainly at the upper end of the structural border. The lower limit occurred in the variable operating cost and the actual synthetic indicator. It was also necessary to take into consideration the fact that the negative value of synthetic indicator shows up to 89% of companies, where the significant role has the indicator "Repayment period of external resources". We analyze the impact of changes in the components of vector b_i of the right side that represent upper and lower bounds of ranges of efficiency and difficulty indicators, efficiency indicators totals, totals difficulty indicators and assess the stability of solutions. We will monitor the calculated changes Δb (calculations are realized by software product QMwin) in the components of the vector b_i (other boundaries remain unchanged, $\Delta b_{j \neq i} = 0$). We will examine whether these changes are acceptable in terms of optimal base of initial task and what new solutions corresponding thereto. We will establish a tolerable interval of changes of b_i components, so that in the other unchanged conditions will preserve the base of optimal solution of task of linear programming. Although the base of the optimal solution remains unchanged, by introduced changes are changing values of underlying variables and objective function value (obtained in the optimum solution), and we obtain a new optimal solution. We calculate the optimal solution in the final simplex table by relationship

$$x = B^{-1}b \quad (4)$$

where the x is the vector of basic components of the optimal solution,

B^{-1} - optimal inverse matrix of optimal base,

b - original vector of the right side.

Any change in the components of the vector of right sides is reflected in the values of solution and objective function, which arises from relation (4):

$$B^{-1}(b + \Delta b) = B^{-1}b + B^{-1}\Delta b \geq 0$$

$$x + B^{-1}\Delta b \geq 0$$

(5)

From equation (5) we can calculate the lower (d) and upper (h) limit of changes $\Delta b_i \in \langle d, h \rangle$. We will calculate the lower ($D = b_i + d$) and upper ($H = b_i + h$) limit for changed right side. Particular values of a solution and of denoted function will be marked as x_D , x_H , and z_D , z_H . Intervals for synthetic indicator are expressed as: synthetic indicator $\epsilon < z_D$, $z_H >$.

As a result, there are optimal intervals for a synthetic indicator, which apply to all enterprises with exclusion of outlying data:

$$\leq -6,4547; -0,8423 \geq, \quad \leq 0,5189; 4,2659 \geq$$

Intervals for synthetic indicator correspond to permissible changes in the structural border within the optimal base. It can be expressed in words that the interval contains the optimal values; below the lower limit are weak and above the upper limit are good values of enterprise performance. In this context is interesting the formation of conditions, both of parameters and their sum. Further, it will be necessary to elaborate relationships between indicators, to distinguish groups of enterprises by activity, to monitor data of profitable businesses in the longer term and to deepen the analysis of outlying data.

From this arises that the value of synthetic indicator of underperforming businesses, despite making a profit, is outside the calculated range, e.g.:

- below -6.4547,
- from -0.8423 to 0.5189,
- above 4.2659.

5.2 Optimal intervals verification SI of selected enterprises

Let us suppose that in these companies can be assumed various financial problems. Do these intervals correspond to the actual level of performance of businesses? We will continue to verify calculated intervals on real results of specific businesses. For this purpose, we have chosen the examination of known major joint-stock companies operating for several years in Slovakia, so businesses: Slovnaft, a. s. (further as "Slovnaft"), Orange Slovensko, a. s. (further as "Orange Slovensko"), and Slovak Telekom, a. s. (further as "Slovak Telekom").

Table 1. Results of indicators for Slovnaft for the period 2010-2013

Indicator	2010	2011	2012	2013
x_1 Return on equity	0,0267	0,001	0,0574	0,0061
x_2 Cash flow-to-sales ratio	0,0416	0,0212	0,0385	0,0254
x_3 Turnover of total assets	1,7181	2,1617	2,0149	2,0443
y_1 Committed short-term receivables	0,0669	0,0718	0,0785	0,0795
y_2 Repayment period of external resources (flow debt)	3,7377	7,6146	4,575	8,0814
y_3 Operating expenses indicator	0,9893	0,9992	0,9801	0,9993
x_i The sum of parameters x_1 to x_3	1,7864	2,1839	2,1108	2,0758
y_i The sum of parameters y_1 to y_3	4,7940	8,6856	5,6336	9,1602
x_i, y_i Synthetic indicator	-3,0076	-6,5017	-3,5228	-7,0843

Synthetic indicator indicates that the level of performance of the company Slovnaft was in evaluated four-year period significantly precarious. The financial results of the company Slovnaft found through newly-outlined patterns signals a negative future development, if no precautions will be adopted. From the above it appears that the calculated interval of lower limit -6.4547 is not acknowledged as optimal and seems to be too tolerant.

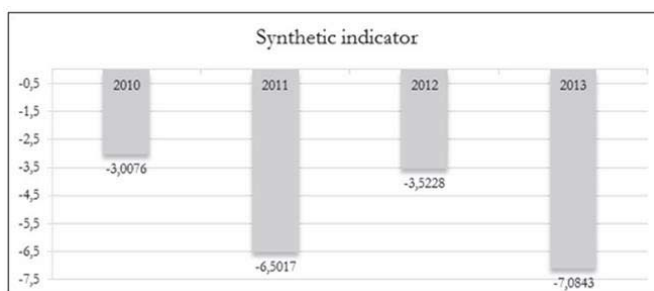


Figure 2. Development of synthetic indicator for Slovnaft for years 2010 to 2013

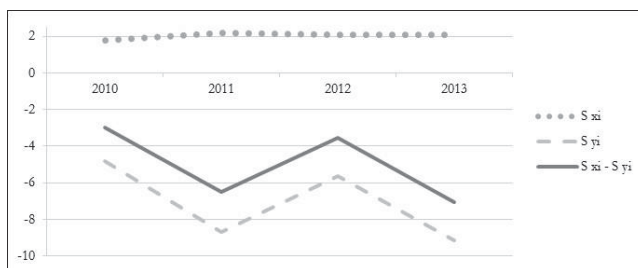


Figure 3. Development of aggregated indicators $xi yi$ and synthetic indicator for Slovnaft

The following chart compares the development of individual ratios x_i and y_i .

Repayment period of external resources has adversely affected variables y_i , which had a negative impact on the synthetic indicator. Let's look deeper into the development and impact of characteristics for synthetic indicator. From the following graphs depicting the various indicators over time (2010-2013) arises that the worst tendency in the development of results has indicators affected by net profit.

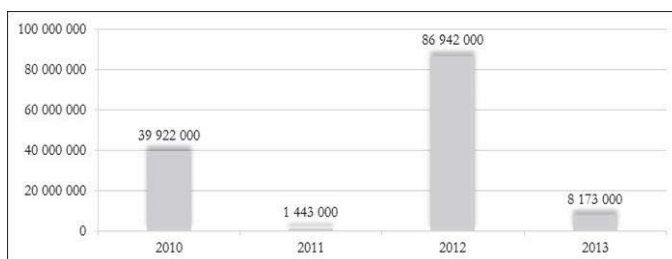


Figure 4. Slovnaft net profit for years 2010-2013 in EUR

According to results of synthetic indicators in years 2010 and 2012, the company Slovnaft is rated well. Can we conclude this fact, as some indicators are very unfavorable, especially when compared with other companies? Several indicators generally do not reach the recommended values. On the other hand, noted should be relatively low indebtedness, which has been gradually deteriorating.

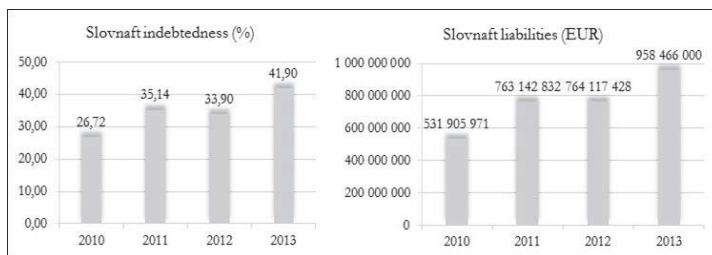


Figure 5. Indebtedness and liabilities of the company Slovnaft for the years 2010 to 2013

Identification of impacts of absolute indicators will be useful in the development of financial plan, when using a synthetic indicator and its components (individual indicators) it is possible to look for reserves and possibilities for improvement.

A more detailed analysis of results of certain businesses from the database showed that the lower limit of the synthetic indicator, i.e. limit, after which the company is still in good condition and performance of - 6.4547 is too low and therefore very benevolent. Clearly, this is confirmed by the financial results of the company Slovnaft. Let us value the company Slovnaft in terms of Altman Z-score and compare the synthetic indicator.

Table 2. Rating of Slovnaft according to the Altman Z-score

	2010	2011	2012	2013
Altman Z-score	2,4198	2,6001	3,2994	2,4401
	Grey zone of ambivalent results	Grey zone of ambivalent results	Good financial situation	Grey zone of ambivalent results

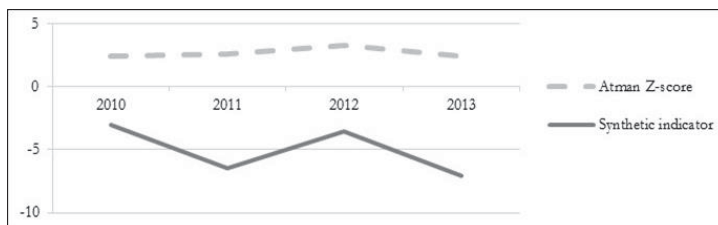


Figure 6. Comparison of financial situation of the company Slovnaft by evaluation of Altman Z-score and synthetic indicator.

The effect of different levels of profit taking is transparent in the synthetic indicator, while the Altman Z-score is less pronounced. Based on both evaluations, results are more favorable for 2012. In accordance with the newly-outlined model, the company is in 2011 and 2013 in the grey zone (for comparison with the Altman Z-score), when the synthetic indicator reached a value of -6.5017 and -7.0843 only. The lower limit, after which the company should be successful, is -6.4547. If the company reaches the higher result than that limit, it should be according to previous calculations assessed as having good or at least bearable financial situation.

Let us test the application of newly-outlined model also on the company with much better results and of completely different character – telecommunication operator Orange Slovensko, and let us compare it with other companies.

Table 3. Results of indicators for Orange Slovensko for the period 2010-2013

Indicator	2010	2011	2012	2013
x_1 Return on equity	0,5021	0,4931	0,3278	0,3662
x_2 Cash flow-to-sales ratio	0,3896	0,3773	0,3296	0,3715
x_3 Turnover of total assets	1,3482	1,2439	1,0952	1,1437
y_1 Committed short-term receivables	0,0798	0,0948	0,0876	0,1005
y_2 Repayment period of external resources (flow debt)	0,658	0,8974	0,8457	0,8433
y_3 Operating expenses indicator	0,6954	0,714	0,7441	0,7263
x_i The sum of parameters x_1 to x_3	2,24	2,1143	1,7526	1,8814
y_i The sum of parameters y_1 to y_3	1,4332	1,7063	1,6774	1,6701
$x_i \cdot y_i$ Synthetic indicator	0,8068	0,4079	0,0751	0,2113

Orange Slovensko achieved in each year better results in several financial indicators, compared with Slovnaft. By inclusion in the calculated optimum interval in 2012, Slovnaft had better financial performance, than Orange Slovensko. Is such statement at this stage of the research correct? By more detailed analysis of individual financial ratios and absolute data drawn from the accounts of the enterprise we will find that Orange Slovensko in 2012 in financial indicators achieved much better results than Slovnaft.

Let us look also on results of the company Slovak Telekom, which has a similar focus of activities as Orange Slovensko.

Table 4. Results of indicators for Slovak Telekom for the period 2010-2013

Indicator	2010	2011	2012	2013
x_1 Return on equity	0,0725	0,0693	0,0383	0,0308
x_2 Cash flow-to-sales ratio	0,3913	0,3988	0,3634	0,3612
x_3 Turnover of total assets	0,4563	0,4353	0,4102	0,3863

Indicator		2010	2011	2012	2013
y_1	Committed short-term receivables	0,1256	0,1204	0,011	0,0117
y_2	Repayment period of external resources (flow debt)	0,5383	1,0089	1,2323	1,5524
y_3	Operating expenses indicator	0,8411	0,9254	0,8663	0,9153
x_i	The sum of parameters x_1 to x_3	0,9201	0,9034	0,8118	0,7783
y_i	The sum of parameters y_1 to y_3	1,5051	2,0547	2,1095	2,4794
$x_i \cdot y_i$	Synthetic indicator	-0,5849	-1,1513	-1,2977	-1,7011

Both companies (Orange Slovensko and Slovak Telekom) carry out a similar line of business. Financial results evaluated by the synthetic indicator are divided. Differences over results of individual parameters are appropriate. The trend of synthetic indicator values of the company Slovak Telekom is deteriorating.

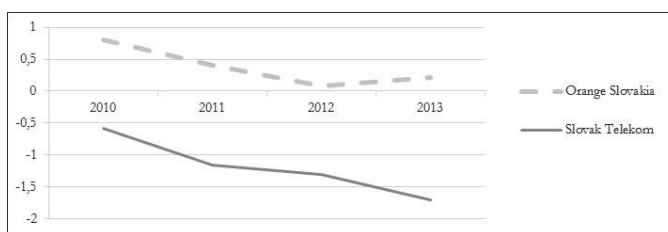


Figure 7. Comparison of synthetic indicator Orange Slovensko and Slovak Telekom

Let us evaluate the trend of individual indicators entering into a synthetic indicator for the company Orange Slovensko by means of graphical analysis.

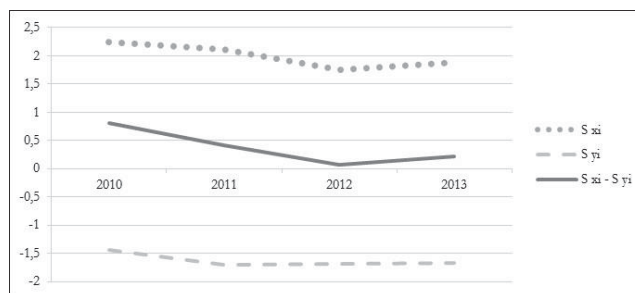


Figure 8. Development of aggregated indicators $x_i y_i$ and synthetic indicator for Orange Slovensko

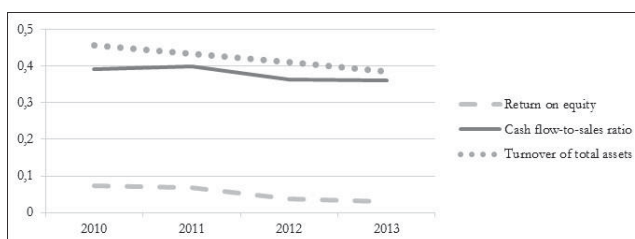


Figure 9. Development of individual efficiency indicators x_i entering the synthetic indicator for Slovak Telekom

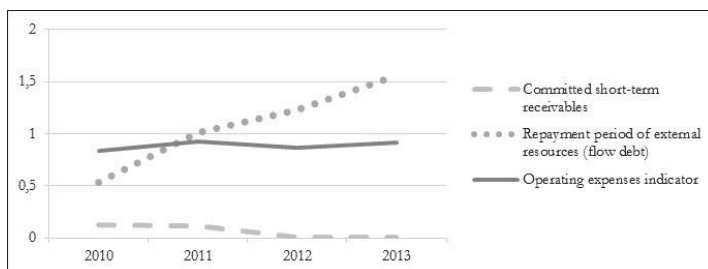


Figure 10. Development of individual difficulty indicators y_i entering the synthetic indicator for Slovak Telekom

Further, we will classify rated companies (Slovnaft, Orange Slovensko and Slovak Telekom) to the calculated optimal time. For inclusion beyond the optimal interval label we use grey zone.

Table 5. Inclusion of the company Slovnaft in calculated intervals

Slovnaft	2010	2011	2012	2013
Synthetic indicator	-3,0076	-6,5017	-3,5228	-7,0843
	The optimal interval	Outside the interval - Grey Zone	The optimal interval	Outside the interval - Grey Zone

Table 6. Inclusion of the company Orange Slovensko in calculated intervals

Orange Slovensko	2010	2011	2012	2013
Synthetic indicator	0,8068	0,4079	0,0751	0,2113
	The optimal interval	Outside the interval - Grey Zone	Outside the interval - Grey Zone	Outside the interval - Grey Zone

Table 7. Inclusion of the company Slovak Telekom in calculated intervals

Slovak Telekom	2010	2011	2012	2013
Synthetic indicator	-0,5849	-1,1513	-1,2977	-1,7011
	Outside the interval - Grey Zone	The optimal interval	The optimal interval	The optimal interval

6. Evaluation of Results from the Application of Optimization Model

A more detailed analysis of individual financial ratio and absolute indicators affecting the synthetic indicator confirmed on specific real data that some results are not in calculated intervals adequately taken into account. It is the result of setting of input conditions of the task of linear programming. It is therefore necessary to determine the optimal time, or limit of financial performance.

Determination of outlying data in the linear programming was too tolerant. Such tolerance had an adverse impact and the calculation by means of tasks of linear programming pushed the lower limit too low. The upper limit -0.8423 also proved to be too restrictive. As it was already mentioned, determination of conditions for setting of outlying data is not generally and strictly given. It depends on the type of data file, and considerations of the analyst, who carries out the calculation.

6.1 Optimal intervals of SI with accepting of some outlying data

For this reason, it was necessary to revise the determination of conditions and to carry out recalculation of optimal ranges under changed conditions. The resulting solution of various types of linear programming is the unification interval $<-2.6608; 1.3568> \vee <3.0603; 12.6333>$.

These changes are not occurring simultaneously and independently. The nature of limitations of linear programming implies that some values are given quite accurately and therefore sensitivity analyzes may be of limited value. It is interesting to observe the changes in the sum of variables efficacy (positive impact on the value of the

synthetic indicator) and difficulty indicators (negative effect on the value of the synthetic indicator). Wide area for analyzing creates exclusion, or acceptance of outlying/very remote data, when creating the limit of tasks of linear programming.

By testing of application of synthetic indicator for the selected companies it was gradually revealed that originally determined optimal intervals were not suitable for the assessment and financial decision-making. It was therefore necessary to modify the conditions for the solution of the tasks of linear programming. The results were three specified intervals for optimum performance for synthetic indicator, by which unification we have received one interval from 12.6333 to -2.6608. The highest actual result of the synthetic indicator in the examined group of 233 companies was the value of 8.4232. The increase of originally calculated lower limit from -6.4547 to -2.6608 was determined by modified terms for the calculation. The new performance threshold, below which the synthetic indicator did not fall, is about 3.7939 points higher, than by the original calculation defined by more benevolent conditions. The number of enterprises in surveyed sample that have reached the synthetic indicator under the original lower limit (-6.4547) was 72. By the calculation with changed conditions, is below the limit -2.6608 up to 141 businesses, i.e. almost 61%. Based on these two lower limits, we create three new zones of performance, to which we will include businesses from the surveyed sample.

The synthetic indicator highlights through indicator y_2 *Repayment of external resources* the proportion of company's debt problems. The foregoing creates the consequence that the lower is the synthetic indicator value, the greater is the likelihood of increased financial problems. The value of synthetic indicator below -6.4547 indicates significant debt problems, and in such case the company should take immediate action to improve performance by making a detailed analysis for finding of specific causes of the unfavorable situation in order to minimize risks.

To the zone above the synthetic indicator of -2.6608 were included 92 enterprises (39%). These companies have good financial results and their performance measured by synthetic indicator is good. These enterprises at unchanged sales conditions are at no risk of adverse financial conditions.

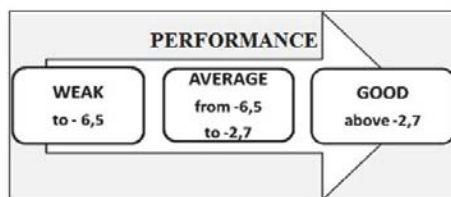


Figure 11. Zones of performance based on the value of the synthetic indicator

In Table 8 are classified into zones of performance three large companies - SPP, a.s., SE, a.s. and Slovnaft. All three businesses in 2013 got into the adverse zone of performance.

Table 8. The inclusion of selected large enterprises in zones of performance

Company	2010	2011	2012	2013
SPP	-3,6533	-1,8937	-3,7132	-7,3023
	average	good	average	weak
SE	-	-7,5628	-6,3103	-7,5716
	-	average	average	weak
Slovnaft	-3,0076	-6,5017	-3,5228	-7,0843
	average	weak	average	weak

In SPP, the volume of receivables in 2013, compared to 2012, doubled; the volume of liabilities increased by $\frac{1}{4}$; and the volume of sales and net profits dropped significantly by year-on-year basis. These results had a negative effect on the value of the synthetic indicator.

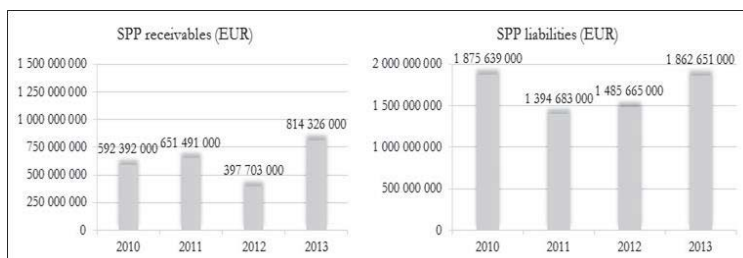


Figure 12. Receivables and liabilities of the company SPP

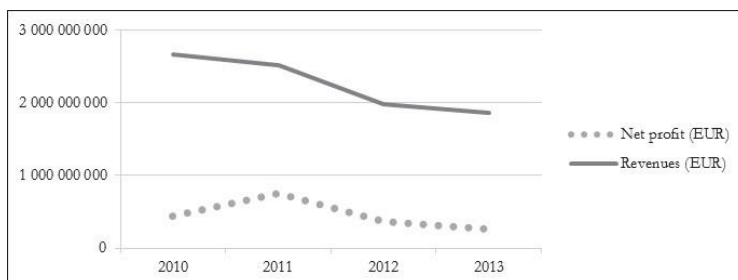


Figure 13. Development of revenues and net profits of the company SPP

Unfavorable results recorded also SE company. On the deterioration of the synthetic indicator in 2013 participated mainly the decline in sales of about 20%. Consequently, the company ranked in the zone of poor levels of financial performance. The decline in sales is likely to be signed by growing competition in electricity supply. In the event that the company will not be able to increase sales and take further action, development forecast will be negative.

The following table shows the inclusion of large machinery factory of automotive industry Volkswagen Slovakia, a.s. (Data for 2013 were not available).

Table 9. Inclusion of Volkswagen Slovakia into zones of performance

Company	2010	2011	2012	2013
Volkswagen Slovakia	-2,0611	-1,3223	-2,4043	-
	Good	Good	Good	-

Unofficially, we have created for enterprises three zones of performance (Fig. 11) without taking into account the legal form, orientation, size of the enterprise, and so on. The inclusion of selected enterprises in established zones corresponds to the level of performance of enterprises arising from the implementation of financial analysis. We have analyzed the relative and absolute indicators; we have compared year-on-year development and change of individual parameters affecting the calculation of the synthetic indicator.

7. Conclusion

This paper aimed to present a new, easy-to-use model of performance measuring, usable in financial decision-making.

Selected three indicators of efficiency and difficulty reflect three significant requirements imposed on business performance, and are in accordance with generally given strategic business objectives. By the sum of all three selected indicators of efficiency we have created an aggregate indicator of the effectiveness and by the sum of three difficulty indicators we have compiled an aggregate indicator of difficulty. We have created a comprehensive indicator in the way that the value of aggregate indicator of efficiency was reduced by the value of the aggregate difficulty indicator and so we have received a synthetic indicator implying the effect of all six ratios.

By creation of complex synthetic indicator, we have created the basis for testing of newly-outlined model using linear programming tasks, with the use of the database of indicators of examined set of enterprises. Results of calculation identified two intervals of performance of synthetic indicator, ranging from -6.4547 to -0.8423 and from 0.5189 to 4.2659, which we have verified on financial results of selected enterprises and compared with the Altman Z-score. By specification of conditions, more objective intervals of optimal values of the synthetic indicator were achieved, from which we can determined the following performance range: to -6.5 poor performance, from -6.5 to -2.7 average performance and over -2.7 good performance. Introduced zones have been established for all types of businesses without considering the nature of the business, i.e. manufacturing and service businesses and commercial enterprises.

For needs of performance measurement or evaluation of financial prediction of the enterprise, we had an effort to take into consideration in *financial indicators of the model the effectiveness and the difficulty of transformation process*. This requirement we were able to implant by incorporation of efficiency and difficulty indicators in the synthetic indicator. We have created a new model of performance measurement with the possibility of using it for predictive purposes. Verification of the model on real data of selected companies confirmed the correctness of the choice of ratios of efficiency and difficulty, the method of their aggregation and interconnection into a single synthetic indicator.

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