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## **COTROLLING AS A TOOL FOR INCREASING BUSINESS PERFORMANCE – PERFORMANCE CONTROLLING**

### **CONTROLLING AKO NÁSTROJ ZVYŠOVANIA VÝKONNOSTI PODNIKU – CONTROLLING VÝKONNOSTI**

**Abstract:** *The aim of this paper was to point out the importance of performance controlling and its tools in increasing the performance of enterprises and keeping them on the market in a given business environment. The aim of the research was to point out the importance and benefits of the Data Envelopment Analysis (DEA) method for the performance controlling of enterprises. The DEA method has been applied as a tool to increase the performance of enterprises in several domestic and foreign studies. A sample of 292 heat management enterprises in Slovakia was used to meet the above objective. These are enterprises that have performance problems, as a result of which they are not competitive and might go bankrupt in a given business environment. It has been confirmed that the DEA is an important tool in performance controlling, as it provides performance-weak enterprises with target values of selected key performance indicators. The paper uses the DEA model in the field of performance controlling. As a result, DEA became an important tool in the issue of performance controlling.*

**Keywords:** *business, controlling, Data Envelopment Analysis, Economic Value Added, performance.*

**Kľúčové slová:** *podnik, controlling, obálková analýza dát, ekonomická pridaná hodnota, výkonnosť.*

**JEL classification:** C38, C53, C67, G32, L25

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#### **Introduction**

In a dynamic and ever-changing business environment, every business requires an effective management system. To ensure the success of the enterprise, the most effective management system proved to be controlling. This system plays an important role in managing and guiding the enterprise on the path to profit, as well as in preventing the enterprise's financial failure and even its possible bankruptcy.

The controlling system has been developing over a long period of time, and it is still improving. The idea of controlling originated at the time of the industrial revolution in the USA, when due to the concentration of capital and the increase of fixed costs, the function of "controller" was introduced. The task of the controller was to perform financial and economic supervision of the enterprise. Over time, controlling became an important part of business. Therefore, in 1931 the "Controller's Institute of America" was established (it was renamed into the "Financial Executive Institute" in 1962). The last official definition of controlling issued by this institute

in 1962 defines controlling as a set of tasks: planning, reporting on deviations from the plan, consulting for all planning sites, tax matters, reporting to state authorities, internal controls, audits and insurance matters, economic analysis, social and societal development. In the 1970s and 1980s, top management became more interested in the performance and productivity of all business departments, including accounting. In this regard, controllers were under the pressure to find new ways of managing their departments in order to increase performance. Many controllers have no longer been able to hold this position, as it was not enough to perform only accounting functions, but they had to focus on budgeting and finding ways to improve performance [1].

Recently, new directions of controlling and new applications of controlling tools have appeared in the content definition of corporate controlling. In the theory and practice of business management, business controlling now focuses on risks controlling, performance controlling, value-based controlling, controlling of processes, personal controlling and others. This new direction of controlling is given by a dynamic and variable environment, but also by the effort of business management to increase the performance and value of enterprises. Measuring and increasing the performance of enterprises is also a necessary prerequisite for ensuring business success, competitiveness and maintaining the enterprise's position in the market in the constantly changing conditions of the global market environment. The aim of the paper was to evaluate the performance of a selected sample of enterprises with the application of selected controlling methods and tools, to reveal key performance indicators and to propose measures to improve performance.

The paper deals with the issue of controlling and performance controlling. The theoretical part of the paper defines the concept of controlling, performance controlling, opinions on controlling of several foreign and domestic authors who have addressed the issue of controlling and are currently working on it. This chapter also describes the system of performance measurement tools. In the chapter Material and Methods, a sample of analyzed enterprises is described and selected controlling tools are defined. These tools were also used in fulfilling the goal of the research. Significant performance controlling tools used in the research include selected financial indicators, the Economic Value Added (EVA) indicator, as well as the DEA method. The chapter Results and Discussion is devoted to the assessment of the performance of the analyzed sample of enterprises in terms of the results of selected methods, as well as the design of a solution in increasing the performance of the analyzed sample of enterprises. The chapter Summary outlines the ideas for improving performance measurement and increasing performance, research limits and future direction of research in the field of performance improvement with the application of controlling tools.

## **Literature review**

When defining the term controlling, we come across two important facts. The first is the fact that controlling is a practical rather than a theoretical discipline. Due to its nature, it was difficult to deal with controlling in the academic environment. It can even be stated that there was no set of academic knowledge on which scientists could build when defining controlling [2]. The second fact is the understanding of controlling, which is different in Anglo-Saxon countries and different in German-speaking countries.

There are several important definitions of controlling in the available literature, and this term has several meanings and different connotations [3]. According to Freiberg [4], controlling is understood as management, control and is considered a specific concept of corporate governance, based on a comprehensive information system, the organizational connection of the planning and control process. According to the author, controlling conceived in this way is

based on the application of controlling information systems, on systemic communication between organizational units and on a change in attitudes and ways of thinking. Controlling is the result of the complex function of economic management, coordination of planning, control and information security.

Mann and Mayer [5] define controlling as a process, which oversees the execution of a plan, analyzes deviations from the plan, creates operational plans and budgets. Controlling is a set of rules to achieve goals, serves to maintain the desired state and to manage profits.

"Controlling facilitates coordination in management, improves the management of the enterprise, its tools facilitate control in various areas of responsibility" [6, p. 110].

According to Vollmuth [7], controlling serves to maintain the desired state. It is a project that allows the plan to be compared with reality at regular intervals to determine whether management interventions are needed to achieve or maintain the desired state. The desired state in the enterprise is outlined in the business plan, the actual state is known from ongoing reporting. According to the author, the comparison of the planned state with the real one is the "heart" of controlling.

Eschenbach et al. [8] defined the term controlling as a set of rules, resp. a subsystem of the management system, which should help achieve the enterprise's objectives, prevent surprises and give an early signal to eliminate the danger.

Controlling is very often compared to oversight. However, it must be stated that controlling is a broader concept than control. It is a result-oriented management concept that transcends functional boundaries and coordinates planning, oversight and information flows [9, p. 5].

At present, it is possible to talk about the third level of controlling, which closes the circle of controlling aimed at supporting the management of the enterprise. We talk about comprehensive controlling of management through planning, oversight, evaluation and corrective information. Therefore, a well-functioning information system becomes an essential part of controlling [10, p. 48].

It follows from the above definitions of controlling that controlling is a management tool whose main function is to coordinate the planning, control and provision of the information base with the intention of improving business results in the future.

Slovak authors who have dealt with controlling in their works, as well as defined the term controlling, include: Foltínová and Kalafutová [11], Král et al [12], Kislingerová et al. [13], Gurčík [14], Baran [15], Mikovcová [16], Synek et al. [17], Horváthová and Gallo [18]. These authors pointed out the great importance of the information security function within the controlling application, as well as the need not to identify controlling with management. They pointed out that it is a management system that is focused on achieving goals. The result of the theorists' interest in controlling, as well as their interest in its implementation in practice, is the independent discipline of business economics - controlling.

In this paper, we focused on controlling, which is aimed at measuring and managing business performance. Laval [19] is one of the authors who deal with performance controlling and the determination of controlling key performance indicators. In his article, the author points out three categories of key performance indicators and emphasizes the need to apply controlling as an important tool in increasing performance. Vuko and Ojvan [20] show that controlling is a very important tool for increasing business performance. In their study, the authors stated that up to 74% of Croatian enterprises have an independent controlling department. They confirmed

a significant dependence between the existence of the controlling department and the profitability of the enterprise.

In relation to performance controlling, it is necessary to mention the system of performance measurement tools - Performance measurement systems (PMS). PMS research became an important research challenge for scientists and practitioners as early as the late 1980s, when Johnson and Kaplan [21] published their key book, *Relevance Lost - The Rise and Fall of Management Accounting*. In 1999, Neely found that more than 3,600 articles on performance measurement had been published between 1994 and 1996. Moreover, he coined the phrase "performance measurement revolution" [22].

In the initial period of performance measurement development, the most frequently applied approach to performance measurement was the traditional approach based on calculation and accounting systems. This approach was based on financial performance indicators [23, 24]. Within this system, the "ratio analysis" was the first to be applied, which is still the central tool of controlling. In the late 1980s and early 1990s, the scope of PMS research began to expand and led to the recognition of performance measurement as a multidimensional domain [25]. At that time, a large number of frameworks for PMS appeared. These frameworks have focused on non-financial indicators, external indicators and forward-looking indicators [23, 24, 26, 27, 28]. These authors pointed out that classical performance measures are static and fail to adapt to the changing effects of the external environment, are limited to collect and process data and, what can be considered the biggest negative, are not a commitment to implementation for top managers.

The DEA method was a step forward in measuring and improving business performance. The initial goal of this method was to eliminate and exclude subjectivity in the evaluation of the effectiveness of enterprises by measuring outputs in relation to inputs. Later, the application of this multicriteria benchmarking method proved to be beneficial in the field of measuring the financial health of enterprise, performance as well as the prediction of possible bankruptcy of the enterprise [29].

Recently, the attention in performance evaluation and measurement has focused on the application of such performance measurement methods, which contain not only financial indicators but also non-financial ones. These are measures that support the enterprise's strategy and allow performance to be measured for individual levels of management. Such methods include, for example, the Balanced Scorecard, EFQM Excellence Model, measurement techniques for organizational management - e.g. CMM (Capability Maturity Matrices), Performance Pyramid, EP2M (Effective Progress and Performance Measurement), process performance management by Sink and Tuttle [30], who argue that business performance is a complex relationship between seven performance criteria: efficiency, effectiveness, quality, productivity, quality of working life, innovation, profitability. These seven performance criteria are very similar to the BSC method of Kaplan and Norton [31]. Taylor and Taylor [32] examined the significance of performance factors in terms of increased performance. They pointed out the fact that technical factors have a much higher impact on performance than the so-called softer factors.

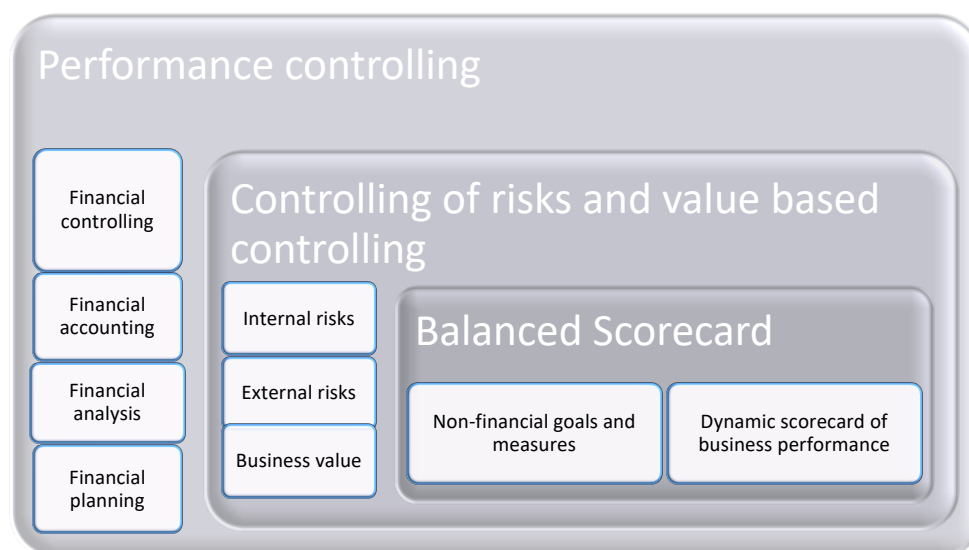
Modern management techniques and performance measurement also include methods: Total Quality Management, Six Sigma, Benchmarking, Kaizen, process reengineering and others. However, the Balanced Scorecard is the greatest achievement in the field of the performance measurement revolution as anticipated by Sink [33], Eccles [34] and Neely [35] In: [22] during the 1990s.

Most frameworks and performance models today focus on the structure of PMS rather than on the process of developing and updating new PMS [36]. Today, performance measurement and management practices are common in all industries and businesses, including the public sector. Despite the large amount of research in the field of PMS, there are gaps in this area. That is why the future research should target this field [28].

In Slovak enterprises, performance evaluation takes place in three basic ways [37]: evaluation by a set of indicators usually from five areas of evaluation of financial health and performance of enterprises, evaluation by a set of indicators arranged in pyramidal decompositions the top of which is a highly synthetic indicator and evaluation using one aggregate indicator, which is a synthesis of partial indicators and other statistical data into one unit, which is one of the prediction models. When measuring the enterprise's performance in Slovakia, there was a requirement to supplement the financial indicators with other more dynamic and promising ones, which are adapted to specific competitive conditions, i.e. focus on monitoring and comparing the implementation results characterizing performance with the planned level of performance, monitoring the direction of strategies in their implementation, identifying accompanying problems of fundamental importance and making the necessary changes and adjustments [38].

The development of modern indicators for evaluating the performance of enterprises in Slovakia but also in the Czech Republic was focused on the processing and design of such indicators, which would show the closest possible link to the value of shares, allow the use of as much information and accounting data, including indicators based on accounting data and risk calculation and take into account the extent of the fixed capital and, last but not least, would allow performance evaluation as well as valuation of enterprises [39].

The model, which is based on all the above findings, is shown in Figure 1. In addition to financial indicators, this model incorporates the indicator drivers, which are of strategic importance and create a dynamic scorecard of business performance. This model suggests that there must be a clear top-level criterion for measuring and managing business performance, and it is important that there is a system of appropriate measures. The manager must manage profitability and the risk associated with it as a whole. Not only financial indicators, but also non-financial indicators are needed, as well as the interrelationships between them. Based on the above facts, a modern dynamic controlling model of enterprise performance was designed.



**Fig. 1: Modern dynamic performance Scorecard.**

Source: authors based on scientific literature

A dynamic system of measuring and increasing performance must be multi-criteria and must contain indicators from all functional areas of the enterprise, from the internal as well as from the external environment of the enterprise. The DEA method seems to be a very suitable tool for measuring and increasing the enterprise's performance. This method allows the measurement of performance with the application of multiple criteria, while offering target values of financial key performance indicators of the enterprise. This makes DEA a significant contribution to business performance. If the DEA results are supplemented by non-financial indicators, it is possible to create a dynamic scorecard of the enterprise.

## Material and Methods

The input database of the empirical study was created from the data of 292 enterprises that do business in Slovakia in the field of heat supply. The financial statements for 2016, which were the source of data for the analysis, were provided by the Slovak analytical agency CRIF - Slovak Credit Bureau, s.r.o. [40]. According to the branch classification of economic activities SK NACE Rev. 2, the analyzed sample of enterprises falls under section D: "Electricity, gas, steam and air conditioning supply".

The overall character and structure of enterprises in the field of heat supply, as well as the method of heat and hot water supply, are determined by various factors, including climate and territorial division, historical development, demographic conditions and territorial division, housing, commercial and industrial construction, economic activity or the availability of fuel sources for heat production. Each larger city or municipality has a different structure and system of heat supply. Each specific system also consists of its own system of thermal equipment [41].

These facts are a prerequisite for the existence of external risk factors that affect the financial health and performance of the analyzed enterprises from the outside. For this reason, it is necessary to pay more attention to them in risk controlling and performance controlling.

The initial analysis of performance controlling was focused on the analysis of the financial situation and performance of a selected sample of enterprises. For this analysis, financial indicators were selected from all areas of evaluation of financial health and performance of the enterprise. The list of applied financial indicators is given in Table 1.

**Tab. 1: Selected financial indicators.**

<i>Indicator</i>	<i>Indicators` description</i>	<i>Method of calculation</i>
<i>TL</i>	Total liquidity	<i>short – term assets/short – term liabilities</i>
<i>CR</i>	Current ratio	<i>(current receivables + financial assets)/short – term liabilities</i>
<i>ACP</i>	Average collection period	<i>current receivables/sales × 360</i>
<i>IT</i>	Inventory turnover	<i>inventory/sales × 360</i>
<i>CPP</i>	Creditors payment period	<i>current liabilities/sales × 360</i>
<i>ROA</i>	Return on assets	<i>EBIT/assets × 100</i>
<i>ROE</i>	Return on equity	<i>EAT/equity × 100</i>
<i>ROS</i>	Return on sales	<i>EAT/sales × 100</i>
<i>ROC</i>	Return on costs	<i>EAT/costs × 100</i>
<i>ER</i>	Equity ratio	<i>equity/assets × 100</i>
<i>TDTA</i>	Total debt to total assets	<i>debt/assets × 100</i>
<i>EDR</i>	Equity to debt ratio	<i>equity/debt</i>
<i>DER</i>	Debt to equity ratio	<i>debt/equity</i>
<i>ICR</i>	Interest coverage ratio	<i>EBIT/interest expense</i>
<i>DSCR</i>	Debt-service coverage ratio	<i>interest expense/EBIT × 100</i>

Source: authors

As part of performance controlling, internal (corporate, non-systematic) and external (market, systematic) risks were also monitored, as these were necessary for calculating the performance of the analyzed sample of enterprises. These risks were identified in relation to the Capital assets pricing model (CAPM) and the Build-up model INFA (BU INFA) in the valuation of equity when calculating the EVA indicator.

Pavelková and Knápková [42] state that CAPM is one of the most frequently used models for determining the cost of equity, but it is used mainly in developed capital markets. This model divides risk into *systematic and unsystematic*, while in connection with the estimation of the expected return on equity, only market (systematic) risk is important (according to this model). Systematic capital market risk means the risk affecting all assets in this market. It includes unexpected changes in GDP, inflation, foreign trade and other factors. According to Petřík [43], the starting point of the CAPM model is the division of total risk into unsystematic risk and systematic risk. Horváthová and Mokrišová [44] state that this model only accepts external - systematic risks. An overview of the analyzed risks is given in Table 2.

**Tab. 2: Business performance risks.**

<i>Risk</i>	<i>Indicator's description</i>	<i>Internal/External risk</i>
<i>ERP</i>	Equity Risk Premium	<i>External risk</i>
<i>CRP</i>	Country Risk Premium	<i>External risk</i>
$\beta$	Systematic risk	<i>External risk</i>
$r_{SL}$	Risk premium for lower stocks liquidity in the market – determined by the value of equity	<i>Internal risk</i>
$r_{fin}$	Risk premium for financial risk – determined by the indicator current ratio	<i>Internal risk</i>
$r_{business}$	Risk premium for business risk – determined by the indicator return on assets	<i>Internal risk</i>
$r_{capital\ structure}$	Risk premium for capital structure risk – determined by the capital structure and the indicator interest coverage ratio	<i>Internal risk</i>

Source: authors

As part of the analysis of the performance of the analyzed sample of enterprises, it was necessary to calculate the EVA indicator.

Although the Entity method is considered to be the most accurate method of calculating the EVA indicator, in the conditions of Slovak legislation, the Equity method seems to be a more suitable because it does not require adjustments in accounting [44, 45, 46].

We can calculate EVA indicator according to EVA Equity formula (1) [46, 47]:

$$EVA = (ROE - r_e) \times E \quad (1)$$

where *ROE* is Return on Equity, *r<sub>e</sub>* is Cost of Equity and *E* is Equity or EVA Entity formula (2) [48]:

$$EVA = (NOPAT - NOA) \times WACC \quad (2)$$

where *NOPAT* is Net Operating Profit after Tax, *NOA* is Net Operating Assets and *WACC* is Weighted Average Cost of Capital.

In addition to the calculation of financial indicators and the EVA indicator, the CCR DEA model was applied. An input-oriented CCR DEA model was chosen. Using the CCR DEA

model it is possible to calculate target values of selected performance indicators. Reaching these values makes the enterprise more efficient.

Dual input-oriented CCR DEA model can be written as follows (3):

$$\begin{aligned}
& \text{Min } \theta_o - \varepsilon(\sum_{i=1}^m s_i^- + \sum_{k=1}^s s_k^+) \\
& \sum_{j=1}^n x_{ij}\lambda_j + s_i^- = \theta_o x_{io}, \quad i = 1, 2, \dots, m, \\
& \sum_{j=1}^n y_{kj}\lambda_j - s_k^+ = y_{ko}, \quad k = 1, 2, \dots, s, \\
& \lambda_j \geq 0, s_i^- \geq 0, s_k^+ \geq 0.
\end{aligned} \tag{3}$$

Slacks  $s_i^-$  and  $s_k^+$  can be calculated according to formulas (4):

$$\begin{aligned}
s_i^- &= \theta_o x_{io} - \sum_{j=1}^n x_{ij}\lambda_j, \\
s_k^+ &= \sum_{j=1}^n y_{kj}\lambda_j - y_{ko}.
\end{aligned} \tag{4}$$

Slacks indicate the distance of decision making unit ( $DMU_o$ ) from the efficiency frontier.  $s_i^-$  expresses input excess,  $s_k^+$  expresses output shortfalls. In the case of the unit that is efficient in the CCR model, the value of objective function  $\theta_o = 1$  and the values of slacks  $s_i^-$  and  $s_k^+$  equal to zero.

Considering that  $s_k^+$ ,  $k = 1, 2, \dots, r$  and  $s_i^-$ ,  $i = 1, 2, \dots, m$  are additional variables under the model's constraints and  $\varepsilon$  is the non-Archimedean infinitesimal value, this model can be written as follows (5):

$$\begin{aligned}
& \text{Min } \theta_o \\
& \sum_{j=1}^n x_{ij}\lambda_j \leq \theta_o x_{io}, \quad i = 1, 2, \dots, m, \\
& \sum_{j=1}^n y_{kj}\lambda_j \geq y_{ko}, \quad k = 1, 2, \dots, s, \\
& \lambda_j \geq 0, \quad j = 1, 2, \dots, n.
\end{aligned} \tag{5}$$

The components of the vector  $\lambda = (\lambda_1, \lambda_2, \dots, \lambda_n)$ ,  $\lambda \geq 0$  are interpreted as weights (or coefficients of linear combination) assigned to the individual units. The aim in the model is to find a linear combination of inputs and outputs of all units so that the inputs and outputs of this combination are not worse (not higher in the case of inputs and not lower in the case of outputs) than the inputs and outputs of the evaluated unit  $DMU_o$ . As follows from the link to the primary model, the variable  $\theta_o$  is an efficiency measure for  $DMU_o$ .

Target values of inputs and outputs can be calculated in two ways according to formulas (6, 7):

$$\begin{aligned}
x'_{io} &= \sum_{j=1}^n x_{ij}\lambda_j^*, \quad i = 1, 2, \dots, m, \\
y'_{ko} &= \sum_{j=1}^n y_{kj}\lambda_j^*, \quad k = 1, 2, \dots, s.
\end{aligned} \tag{6}$$

$$\begin{aligned}
x'_{io} &= \theta_o^* x_{io} - s_i^{*-}, \quad i = 1, 2, \dots, m, \\
y'_{ko} &= y_{ko} + s_k^{*+}, \quad k = 1, 2, \dots, s.
\end{aligned} \tag{7}$$

By reaching the target values, it is possible to increase the efficiency and performance of production units whose efficiency is low.

## Results and Discussion



At the beginning of our research, we focused on the initial controlling analysis of enterprises. Descriptive statistics on selected financial indicators are given in Table 3. The selection of the analyzed sector was conditioned by the fact that in this sector a larger number of enterprises go bankrupt every year more frequently than in other sectors. We were interested in the financial health of these enterprises and their performance. The achieved values of selected financial indicators are confronted with the average values of financial indicators of the given sector. Table 3 also shows variances from mean values of the analyzed industry.

**Tab. 3: Comparison of values of financial indicators with their mean values.**

Indicators	Comparison with industry			Mean value of the industry	Variance from mean values
	Mean	Median	Standard deviation		
TL	1.417	0.811	2.459	0.98	0.169
CR	1.349	0.732	2.443	0.95	0.218
ACP	155.88	57.24	1.441	42.90	14.34
IT	27	3.6	0.355	0.04	3.56
CPP	710.64	225.72	5.957	298.03	72.31
ROA	4.5	4.4	0.089	2.3	2.1
ROE	15.4	12.6	1.401	7.79	4.81
ROS	-12	3.8	2.565	6.59	2.79
ROC	6.7	3.8	0.347	5.58	1.78
ER	0.160	0.145	0.333	0.21	0.056
TDTA	0.840	0.856	0.333	0.79	0.066
EDR	0.672	0.170	3.578	0.27	0.10
DER	1.48	5.88	0.333	3.7	2.18
ICR	2.530	1.851	6.075	2.70	0.849
DSCR	-0.750	0.54	22.021	0.37	0.17

Legend:

Negative development

Positive development

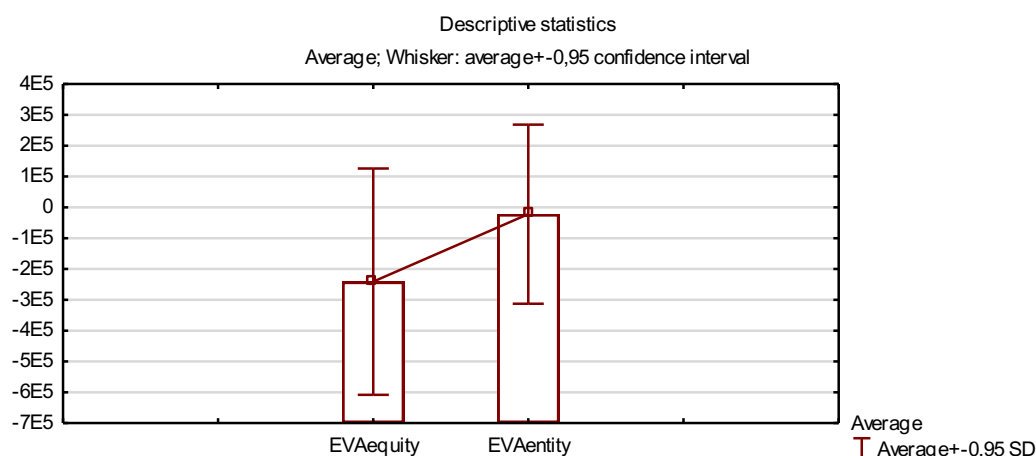
Source: authors

After analyzing the results, it was found that negative deviations arose in the case of 12 analyzed indicators while only 3 indicators could be evaluated positively, which represent the area of profitability of enterprises and the creditors payment period. Heat management enterprises show a liquidity problem. The median of total liquidity is 0.81, in the case of current ratio it is 0.73. The values of these liquidities show that these enterprises work with minimum stocks, as evidenced by the inventory turnover, the average value of which is 27 days.

These enterprises struggle with long creditors payment period, as a result of which they achieve a negative cash-to-cash. The median of creditors payment period is 226 days, which we can evaluate highly negatively, especially in relation to the suppliers of these enterprises. However, it is possible to see a positive development in relation to the average value of the industry. In assessing profitability, we focused on four profitability indicators, namely the ROA indicator, which averages 4.5%, with a median of 4.4%, so it can be assumed that half of the analyzed sample of enterprises reaches a ROA of about 4.4%. ROE averages 15.4%, which we rate highly positively. The median of the ROS and ROC indicators is equally 3.8%. The analyzed sample of enterprises shows a positive state in relation to the mean values of the ROA and ROE indicators.

The capital structure of these enterprises is 16%: 84%, in favor of debt, which may be the reason for lower stability of these enterprises. Compared to the average value, which is expressed by a ratio of 21%:79%, this is a slightly less favorable composition of capital in terms of its ownership.

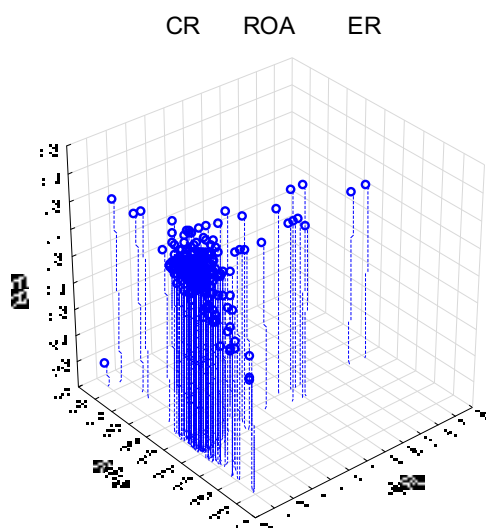
The results of the performance analysis using the EVA Equity and EVA Entity indicators are shown in Figure 2. The analysis of the EVA indicator shows that 163 enterprises achieved a positive EVA Equity value. These businesses are efficient. When the EVA Entity indicator was applied, there were up to 217 enterprises that are not expected to go bankrupt and are efficient. The more favorable values of the EVA Entity, from the point of view of performance evaluation, are given by the fact that the evaluation includes both equity and debt, but also the profit and loss of the enterprise, which was obtained using both sources of financing.



**Fig. 2: Boxplot of the EVA indicator.**

Source: authors, processed in Statistica

The evaluation of the financial position of the analyzed sample of enterprises in terms of three important indicators of financial health assessment (liquidity, profitability and stability - LPS) is shown in Figure 3.



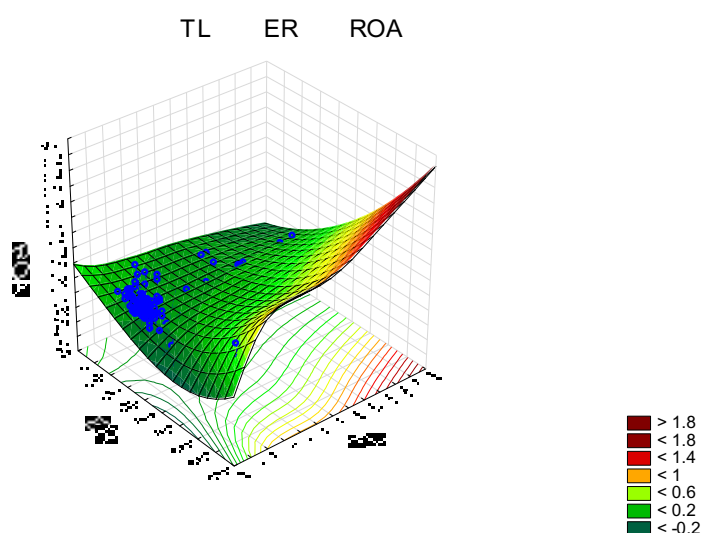
**Fig. 3: Financial position of businesses – 3D view of LPS.**

Source: authors, processed in Statistica

The enterprise's liquidity is expressed by the CR, which is the bearer of financial risk. Profitability is expressed by the ROA indicator, which is the bearer of business risk. The last indicator is the stability indicator of the enterprise, which is expressed by ER. It is clear from

Figure 3 that a cluster of enterprises was formed at the coordinates (1; 0.1; 0.1). These coordinates represent the position of enterprises in space, in terms of the main objectives of financial management.

The 3D view represents a 3D surface figure (Figure 4). This figure consists of the three most important indicators of corporate financial health, namely TL, ER and ROA.



**Fig. 4: Financial position of businesses – 3D Surface view of LPS.**

Source: authors, processed in Statistica

The risks to which attention was paid in performance controlling were classified as external and internal risks. External risks are listed in Table 4. Risks were analyzed not only in the year of measuring businesses' performance, but also in their development over time.

**Tab. 4: Development of external risks (%).**

Year	2015	2016	2017	2018	2019
ERP	6.25	5.69	5.08	5.96	5.2
CRP	1.33	1.21	0.98	1.18	0.84
B	0.67	1.08	1.01	0.73	0.68

Source: authors

The analysis of external risks shows that their development fluctuates slightly, but does not show significant deviations in a given period of time. 2016 (the year of analysis of a selected sample of enterprises) was the least favorable year in the area of systematic risks, and also in this year, except for 2015, the highest value of country risk premium was achieved. External risks in 2019 reached favorable values. In the analysis of internal risks, it is necessary to point out the high financial risk ( $r_{fin}$ ), due to the fact that enterprises do not reach the required value of current ratio. They also do not reach the required capital structure and the value of interest coverage. Therefore, they achieve high risk premium for capital structure risk ( $r_{capstr}$ ) and risk premium for lower stocks liquidity in the market ( $r_{SL}$ ). Due to the required ROA values, the analyzed sample of enterprises do not achieve high business risk ( $r_{podnik}$ ).

Finally, the DEA analysis was performed within the performance controlling. The CCR DEA model was input-oriented as well as output-oriented. Since the results of the models were the same, only the results of one of the models are presented. Table 5 shows the enterprises that

achieve an efficiency equal to 1. Thus, in the case of these enterprises, it can be assumed that they are on the financial health frontier and belong to the most efficient enterprises.

**Tab. 5: Businesses with the best performance.**

<i>Input-oriented model</i>				
		<i>CCR DEA</i>		
<i>Business No.</i>	<i>DMU</i>	<i>Efficiency, performance</i>	<i>Development of returns to scale</i>	<i>Peer-units</i>
1	TP1	1.00000	constant	TP1
2	TP22	1.00000	constant	TP22
3	TP37	1.00000	constant	TP37
4	TP60	1.00000	constant	TP60
5	TP84	1.00000	constant	TP84
6	TP89	1.00000	constant	TP89
7	TP94	1.00000	constant	TP94
8	TP98	1.00000	constant	TP98
9	TP135	1.00000	constant	TP135
10	TP181	1.00000	constant	TP181
11	TP267	1.00000	constant	TP267
12	TP268	1.00000	constant	TP268
13	TP275	1.00000	constant	TP275
14	TP279	1.00000	constant	TP279
15	TP282	1.00000	constant	TP282
16	TP341	1.00000	constant	TP341

*Legend: DMU – Decision Making Unit*

Source: authors, processed in DEA Frontier, [49]

Table 6 shows the worst enterprises from the analyzed sample of enterprises. These businesses achieve the worst performance, they lie on inefficiency frontier.

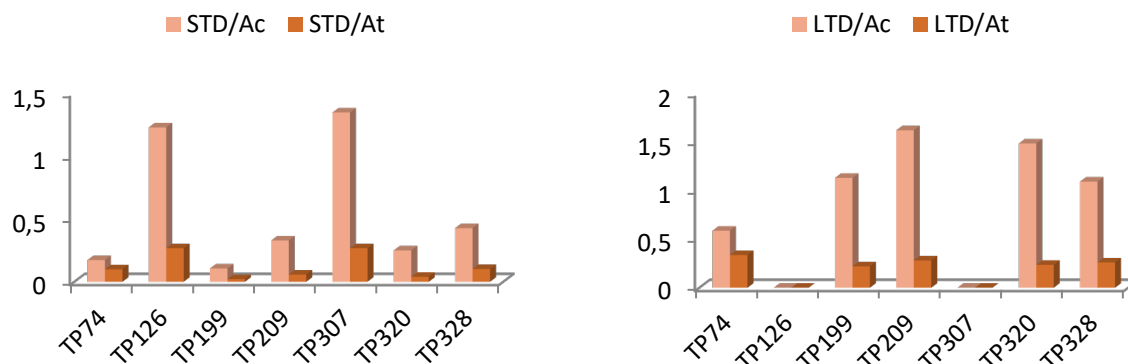
**Tab. 6: Businesses with the worst performance.**

<i>Input-oriented model</i>			
		<i>CCR DEA</i>	
<i>Business No.</i>	<i>DMU</i>	<i>Inefficiency, worst performance</i>	<i>Development of returns to scale</i>
1	TP74	1.00000	constant
2	TP199	1.00000	constant
3	TP209	1.00000	constant
4	TP307	1.00000	constant
5	TP320	1.00000	constant
6	TP328	1.00000	constant

*Legend: DMU – Decision Making Unit*

Source: authors, processed in DEA Frontier, [49]

As the analyzed sample of enterprises has an unstable capital structure, it was necessary to calculate the target values of capital structure indicators (LTD/A – long-term debt/assets, STD/A – short-term debt/assets, c – current, t- target). A comparison of current and target values is shown in the following Figure 5.



**Fig. 5: Comparison of current and target values of selected CCR DEA model outputs for inefficient businesses.**

Source: authors, processed in Statistica

## Summary

The performance of an enterprise is a prerequisite for its success and competitiveness. Therefore, an increased attention needs to be paid to the analysis and performance measurement. To ensure this task, it is necessary to use appropriate tools that will provide managers with all the necessary information. In this regard, it is necessary to highlight performance controlling and its tools and methods. In order to determine the real financial condition and performance of the enterprise, it is necessary to apply adequate methods and tools. Our research used a wide range of tools, from the simplest to those most sophisticated. Such a tool is the EVA and DEA method. By calculating the EVA indicator, the analyzed sample of enterprises was divided into two groups, namely efficient and non-efficient. Subsequently, DEA not only ranked companies according to their performance, but also calculated the target values of key performance indicators, which are a prerequisite for business performance growth. This knowledge will be useful not only in theory but also in the practice of business performance management. It offers managers a great tool in their efforts to maintain the enterprise and ensure its growth. Performance controlling thus becomes an important practical system of performance management. Moreover, it also opens up new possibilities of future research.

## Súhrn

Výkonnosť podniku je predpokladom jeho úspešnosti a konkurencieschopnosti. Analýze a meraniu výkonnosti, je preto potrebné venovať zvýšenú pozornosť. Pre zabezpečenie tejto úlohy je nevyhnutné využívať vhodné nástroje, ktoré poskytnú manažérom všetky potrebné informácie. V tomto smere je nevyhnutné vyzdvihnúť controlling výkonnosti a jeho nástroje a metódy. V záujme zistenia reálneho finančného stavu a výkonnosti podniku je potrebné aplikovať adekvátne metódy a nástroje. V našom výskume boli aplikované nástroje od tých najjednoduchších až po tie, ktoré sú vedecké a vysoko sofistikované. Takýmto nástrojom je metóda EVA a DEA. Výpočtom ukazovateľa EVA sa analyzovaná vzorka podnikov rozdelila do dvoch skupín, a to na výkonné a nevýkonné. Následným využitím DEA bolo identifikované nielen poradie podnikov v oblasti výkonnosti, ale aj cieľové hodnoty kľúčových indikátorov výkonnosti, ktoré sú predpokladom rastu výkonnosti podnikov. Toto poznanie je veľmi významným prínosom nielen v teórii, ale aj v praxi riadenia výkonnosti podnikov. Ponúka manažérom veľmi vhodnú pomôcku v ich zápase o udržanie podniku, prípadne jeho rast. Controlling výkonnosti sa tak stáva významným praktickým systémom riadenia výkonnosti, avšak vytvára množstvo príležitostí pre štúdium a skúmanie aj v oblasti teoretického výskumu, v oblasti jeho možných budúcich smerovaní.

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