Scientific Annals of Economics and Business
67 (3), 2020, 311-331

Capital Maintenance Evolution using Outputs from Accounting System

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Abstract

Decision making based on information provided by an enterprise accounting information system, is essential for sustainable development and enterprises growth. Besides widely used prediction models for an assessment of the financial distress, there is also a useful indicator of a capital maintenance evolution, that provides a deeper view to the enterprise growth or decline compared to traditional performance measures. The aim of the contribution is to develop a model for assessment of a capital maintenance evolution using available accounting outputs. Our constructed model and coefficient for a capital maintenance evolution CMEOPNN has been developed using the multi-layer (triple) artificial neural network with a feedforward signal transmission by a backpropagation method and an activation function is a sigmoid function. For construction our model we used 663 Slovak enterprises sample out of 5 most frequented industry sectors with a unified structure of the provided information in the financial statements for 2014-2017.

Keywords: evaluation of capital maintenance; business performance; financial statements; decision-making; information system.

JEL classification: M21; M41; G30.

1. INTRODUCTION

Sustainable development and adaptability in the increased globalization of the economy is decisive in setting goals and making decisions not only about everyday issues but also on the future direction of the businesses. Strategic management includes activities the aim of which is to provide resources to meet the enterprises' strategy. A business strategy can be focused on the growth and development of an enterprise, transition to diversification, stabilization, growth, downturn or revitalization of the enterprise. The study of Sebestova and Nowakova (2013) provides an analysis of theoretical literature sources in the area of strategy evaluation and possible measurement of success of enterprises. The success of an enterprise in the long run is the result of past decisions and the ability to

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maintain competitiveness in a rapidly changing environment (Melecky and Stanickova, 2017). In this, the maintenance of assets and capital is very important (Markovic *et al.*, 2013; Tumpach and Baštincová, 2014). Mostly, the goal of any business is to make profit, but sometimes it is a counterproductive indicator. (Lovciova, 2018) At first, the strategy of management identifies long-term goals including profit goal, procedures for the implementation of activities and the allocation of resource to enable the enterprise to achieve its objectives. It is also appropriate to apply the SMART approach elements to the creation and implementation of business and management strategies (Turečková and Nevima, 2018). A precondition for the good time evaluation of the situational development of enterprises is their comparability of financial indicators, which has to interpreted correctly for proper financial decision making. (Arsad *et al.*, 2017)

The financial situation also significantly affects other functional areas of strategic management, whose growth and development require financially demanding investments. This implies that the financial strategy penetrates the whole enterprise and has a cross-sectional character. Indicators of financial situation for accurate comparison in time and economic space have to be expressed in the same measurement units. Well-founded corporate decision-making requires adequate information (Fenyves *et al.*, 2019) provided by comprehensive system of accounting and reporting expressed in monetary units. "Careful study of financial statements permits to disclose both the secrets of successful and effective company's performance, and the reasons for failures and insolvency. Moreover, it helps to identify factors that adversely affect the company's performance". (Osadchy *et al.*, 2018). To assess financial performance and to predict future developments the sources are financial statements (Lovciova, 2017; Kosovska *et al.*, 2017) providing information for executives and financial management of enterprise, which is a priority role of accounting system (Bastincova, 2017). Executives and financial management are considered as internal users of information with an access to comprehensive data beyond the published information required by law (MacGregor Pelikanova, 2019). External users, shareholders and creditors make their decisions only based on published documents, such as annual reports and financial statements. Due to some market participants have more information than others and individuals remain only partly informed (Tumpach and Baštincová, 2014). In any case, managers in decision making should use the information asymmetry to maintain competitiveness (MacGregor Pelikanova, 2017). Development of information and communication technologies and the application of optimization methods for solving problems ensure greater business efficiency, more flexible performance of organizations in the market, accelerating transactional operations, reducing logistics costs and increasing profits (Mijailović *et al.*, 2015). The aim of the contribution is to develop model for assessment capital maintenance evolution, which provide deeper view to growth or decline of enterprise than traditional performance measures, using publicly available outputs from accounting system. To achieve the aim of the contribution firstly are defined capital maintenance, outputs from accounting system and financial health assessment by prediction models. Subsequently are characterized used methods and data based on which led to results and discussion part. In conclusion are summarized main findings in relation with investigated issue.

1.1 Capital maintenance as a relevant indicator of sustainability of enterprise

The focus of managers and owners is on the performance of enterprise, mostly measured by profit after tax or by distributed dividends. However, concepts relating to the capital maintenance are significant because they reflect economic reality of business environment in which the enterprise performs its business activity (Jianu *et al.*, 2017). If an enterprise distributes profit in extent that the resources left in enterprise does not cover restoration of non-current assets and input purchases, it can lead to inability to maintain capital or productive capacity in short term and causes bankruptcy in long term (Jianu *et al.*, 2011; Paksiova, 2017). Capital maintenance is observed from two points of view: financial and physical, that are defined in Conceptual Framework for Financial Reporting (IASB, 2018) issued by International Accounting Standards Board (IASB). Under the financial capital maintenance concept, the profit is recognized when "the net assets at the end of the period exceeds the financial amount of net assets at the beginning of the period". (IASB, 2018, 8.3) There is a need for excluding any contributions or distributions from owners during the investigated period. Units of constant purchasing power and nominal monetary units are also suitable for financial capital maintenance measurement. Under the physical capital maintenance "profit is earned only if the physical productive capacity (or operating capability) of the enterprise at the end of the period exceed the physical productive capacity at the beginning of the period, after excluding any distributions to, and contributions from owners during the period". (IASB, 2018, 8.3) The main differences between these concepts arise from dealing with price changes of assets and liabilities. Under financial concept profit is indicated by the increase of nominal monetary capital over the period. More fair view is provided by financial capital maintenance measured in constant purchasing power units. In case of physical capital maintenance, it is required to apply current cost measurement, and arising price changes are treated not as profit or loss but as capital maintenance adjustments. Thus, these capital maintenance adjustments cannot be distributed as dividends. That is why it has positive impact on the financial capital maintenance or productive capability. Nowadays, fast technological development requires more attention to be devoted to the increase of economic effectiveness by maintaining the latest equipment and other technical achievements. Due to restoration of non-current assets and creation of funds for their financing as the basis for capital maintenance is key factor for sustainable development of the enterprise.

For a sustainable business development, a relevant tool is a retention of the proceeds in an enterprise by a sustainable and growing capital in financial (monetary) understanding and physical (material) understanding as well. Needs of financial statements for information users should be decisive in choosing the concept of understanding of the capital maintenance. Consequently, from this concept a way of evaluation is derived to see if there was a preservation, growth or erosion of the capital maintenance and connected performance decline. Only after this evaluation of the development it can be determined, if the profit was generated, followed by its quantification and distribution. Capital concept (financial understanding) of the capital maintenance should be chosen when users of financial statements information are oriented on a nominal capital value and its protection in nominal terms. If, however users are oriented on the preservation and growth of operational capacities of an enterprise, the concept of the physical understanding of the capital maintenance should be chosen, i.e. in a specific form of capital maintenance, preservation of

the enterprise performance or of the achieved enterprise income. The division of the profit should then depend on the requirement to preserve the capital maintenance in the chosen way of understanding. The distribution of the reported business profit in the financial accountancy agreed by the owners (investors) is mostly connected with their requirement for the maximisation of the share on profit paid to them each year. This, however, may make it harder for the management to manage and develop their enterprise, especially when it comes to the profit distribution without rational realised property in time of share payments (Kubaščíková and Pakšiová, 2014).

It is also necessary to point out the relation of assets and equity based on the balance sheet equation. The balance sheet equation is derived from the balance sheet principle, based on which the enterprise's assets are viewed from two perspectives. Firstly, according to the form of assets and secondly, according to the resources from which the assets are financed.

ASSETS = RESOURCES

We distinguish two modifications of the basic balance sheet equation, given that the assets are financed from equity and liabilities. It follows that the modification of the balance sheet equation equals the assets and the sum of equity and liabilities. The subsequent modification of the balance equation refers to equity as a difference quantity as it represents the difference between assets and liabilities.

ASSETS - LIABILITIES = EQUITY

Equity, that is, the amount of an asset less the value of the enterprise's liabilities, is treated as that part of the capital whose maintenance is important assuming continuity of business. It follows from the modification of the balance sheet equation that the equity value is equal to the equity in the financial understanding.

Net assets are the difference between the amount of assets and liabilities that show that they are equal to own resources. The retention of assets may be considered to be the preservation of equity by virtue of the close link between the assets, expressed as net assets, and the owners' claims to the enterprise's assets, determined on the basis of their share of equity.

Information required for capital maintenance assessment are included in accounting system of an enterprise, which is subject of next part, where we will pay attention to outputs of accounting system. Outputs of accounting system are widely used in enterprise's financial health assessment by tools of financial analysis or prediction model. Our aim was to design a model for capital maintenance evolution assessment as we are convinced that capital maintenance is crucial for future existence and growth of an enterprise.

1.2 Accounting system as a baseline database of financial information

Accounting system is significant part of enterprise's information system and provides information, which are baseline in decision making on all levels of management. Slosarova *et al.* (2016) defines the purpose of accounting as following: the aim is to provide information through financial statements about financial situation, financial performance and changes in financial situation of enterprise for a period in monetary units to different users, who based on this information are making decision. In the beginning accounting system used methodology called "single-entry" bookkeeping. Nowadays application of "single-entry" bookkeeping is Slovak Republic is limited to entrepreneurs, which are not doing business as any trading company such as limited liability company, joint stock company, public company or limited partnership. Single-entry bookkeeping focuses on recognising transactions of cash and cash equivalents. The outputs of recording these transactions are cash balance and the sum of cash inflows and the sum of cash outflows which are divided to inflows and outflows with and without impact on income tax base. On the other hand, "double-entry" bookkeeping provides information required by present needs of management decision making. Main advantages of "double-entry" bookkeeping are that the balancing methods detect mathematical errors and facilitate detection of other errors and misstatements. According to Slosarova *et al.* (2016) accounting as system of quantified information about economic activities of enterprise fulfil several functions as seen in Figure no. 1.

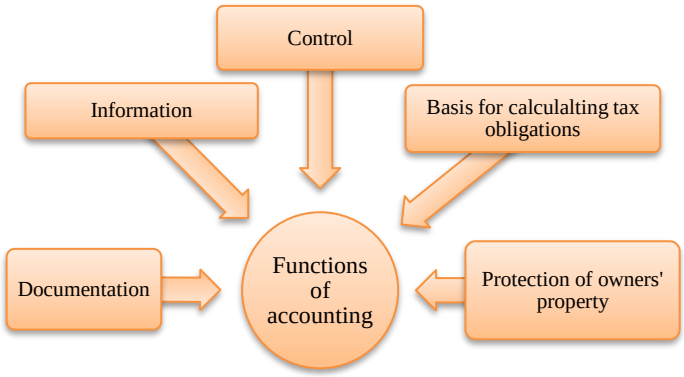

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Figure no. 1 – Functions of accounting

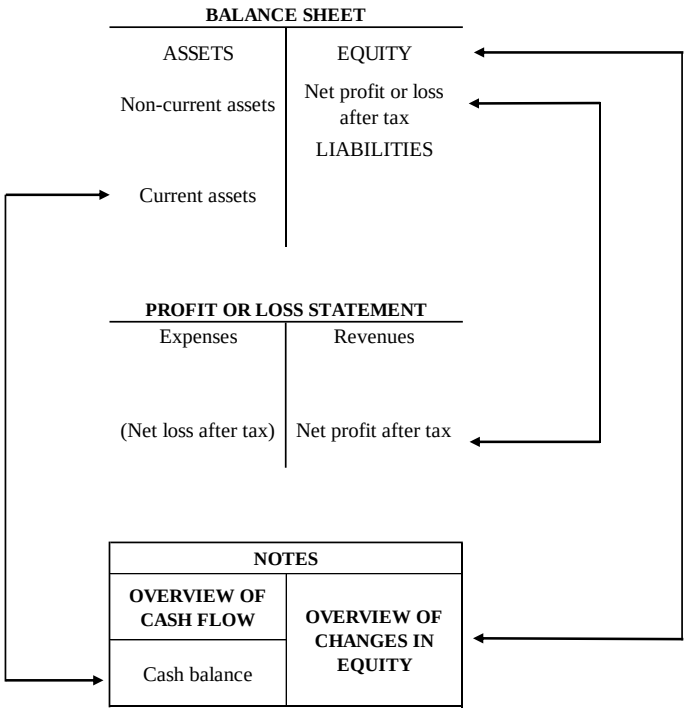
These functions are applied to meet information requirements of wide variety of users of information. Accounting is considered a "language of business" as it is a means communication of financial information to users with direct or indirect financial interest and in some cases without financial interest. One of the basic tasks of accounting is to provide useful information to business executives, who are users with direct financial interest. In addition, accounting also provides information to other users to assess the enterprise's financial performance and condition. Bases in decision-making process or financial performance assessment are databases of financial information provided by outputs from accounting system. Accounting data are important indicators to monitor enterprise's

operations and identify signs of the financial distress. Various outputs may differ in characteristics of availability for public considered as external users. For internal users as managers on various levels and top managers are in disposition databases with wider range of financial information. Information presented in outputs of accounting are results of mutual communication between different divisions of enterprise, different levels of managements and managerial accounting. Main outputs for internal users are journal, general ledger interim financial statements, monthly or weekly reports, materials from meetings. External users in decision making process have to rely on published financial statements and annual reports.

For our goal to achieve the creation of capital maintenance evolution model generally applicable for enterprises the most relevant source of information are financial statements, which are publicly available and has defined structure useful for processing large amount of data. For capital maintenance assessment the structure and the extent of information disclosed in financial statements is crucial. Capital maintenance is key topic not only for enterprise reporting under International Financial Reporting Standards ("IFRS"), but also for small and medium sized enterprise which fall under particularly national legislation. In the European Union significant convergence efforts exist for the harmonization of information reported in financial statements. Harmonization of information reported in financial statements is ensured by step by step convergence of accounting and reporting legislation on international and national level. The financial statements are fundamental and baseline inputs of the financial analysis. This contribution focuses on financial statements prepared under Slovak legislation of accounting, first of all Act No. 431/2002 on Accounting, as in effect ("Act on Accounting"). Act on accounting defines financial statements and their components, which are balance sheet, profit or loss statement and notes (Act on Accounting, 2019). The balance sheet shows information on the assets and liabilities of the accounting enterprise and the difference between them, to a date to which the financial statements are prepared and to the date to which the financial statements are prepared for the immediately preceding accounting period. The profit and loss statement present expenses, revenues and profit or loss for the accounting period and for the immediately preceding accounting period. The notes contain information explaining and supplementing the information contained in the balance sheet and the profit or loss statement and/or other explanatory and supplementary statements and information. The notes of large and public interest enterprises include overview of changes in equity and overview of cash flow for the period. Due to harmonization of accounting legislation in member states of European Union the enterprises have to classify to one of three size groups: large and public interest enterprises, small enterprises and micro enterprises. Theses categorization of enterprises decreases administrative burden and the extent of disclosed information for micro and small enterprises. Further, only large and public interest enterprises are the subject of contribution, who disclose the widest extent of financial and non-financial information.

For correct understanding and interpretation of financial situation and financial performance assessment is conditional by reflection to relations between parts of financial statements (Figure no. 2). Basis for links between components of financial statements is balance sheet equation presented by assets, equity and liabilities in balance sheet. The other two components are explaining and supplementing information in balance sheet. The second most important component of financial statements is profit or loss statement, which explains how the profit or loss was created. Profit or loss statements provide a structured presentation of

sum and nature of revenues and expenses, which contributed in profit or loss creation. Relation, where profit or loss from profit or loss statement is linked to equity, is the most significant compared to other links. Equity is linked not only to profit or loss statement, but to overview of changes in equity, which provide detailed information of changes in different reserves, profit or loss for period and accumulated profit or loss from previous periods. From the point of view of capital maintenance, the composition of equity and the amount of distributed profit, respectively the amount of loss are the most important financial information. In capital maintenance evolution model is a determinative ratio created to reflect changes in equity calculated on the bases of balance sheet information. The information was not drawn from notes, because overview of changes in equity's structure is not unified.



Source: own processing

Figure no. 2 – Links between components of financial statements

The notes besides overview of changes in equity include overview of cash flow, the result of which is linked to balance sheet's current assets. The assets presented in balance sheet provide information of production capacity. Current assets including working capital is relevant in assessment of fulfilment of everyday operational activities. Afrifa and Padachi (2016) entitled working capital as the lifeblood of any enterprise because it affects enterprise's profitability and risk. One of the main objectives of working capital is to ensure enough cash flow to continue operations in a way when risk of inability to pay payables is minimized. According to these facts, the link between cash flow statement and balance sheet

is not less relevant than other two links between balance sheet and other components of financial statements. Assessment of capital maintenance requires devoting attention not only to current assets but also on non-current assets that are also significant mainly in production enterprises. Restoration of properties, plants and equipment is financially demanding, but for retention of productive capacity and sustainability of production is essential.

Presented information and they interconnection makes financial statements a relevant basis for financial health prediction by bankruptcy models and created model for capital maintenance evolution.

1.3 Financial situation assessment and the prediction of enterprises' future development

The most important in the decision-making process is the ability to predict the impact of the decision on the future situation of the enterprise. Comparison of the different decision-making variants can bring the greatest effect in the area of limited financial, labour, social, environmental and time resources. Rational and maximally effective and cost-efficient use of resources is a prerequisite for a successful entrepreneur in a competitive struggle within market economy conditions.

In the spotlight of interest of various users of information from financial statements, such as entrepreneurs, banks, suppliers, shareholders, there are a detection of financial distress and oncoming bankruptcy. A government usually sets financial indicators (SIMU system) which could be used for financial health evaluation, but only few of them are obligatory (Šebestová *et al.*, 2018). Basis for enterprise financial distress identification and financial stability assessment is information drawn from accounting, which should provide correct and understandable information for the needs of financial analysis (Kubaščíková and Juhászová, 2016; Prochazka and Pelak, 2016). Widespread evaluation tool for financial situation and financial performance assessment is financial analysis through various financial indicators. Investigation of economic processes or phenomena is considered as financial analysis by Slosarova and Blahusiakova (2017). Assessment of a debtor's credit worthiness by lenders was the aim of the financial analysis in the beginning. (Beaver *et al.*, 2010) Nowadays, numerous ratios and indicators are important for analysing stock prices and an opportunity for investing for a wide variety of users (Stavárek, 2004). Focus of many researches and papers are financial analysis indicators, which asses and predict future development of enterprises for variety of users. Financial health, financial distress, financial crisis and bankruptcy are defined as four qualitative conditions of an enterprise financial situation according to Mihalovič (2017). Consequences of upcoming bankruptcy or financial situation deterioration called as financial distress are often discussed topics with aim to map opportunities for restitution. The inability to pay the obligations on time known as insolvency is one of the signs of financial distress. (Beaver *et al.*, 2010; Kravec, 2014) When negative net assets exceed the operating cash flow is also a sign of financial distress says Geng *et al.* (2015). Financial distress according to Hassan *et al.* (2017) is a situation of default, insolvency, bankruptcy or failure. Due to legal framework, accounting rules and procedures bankruptcy and financial distress definition differs in every country. Problems in enterprises must not have financial reasons, but most of them will be eventually reflected in a deteriorated financial situation and cause a weakening of profitability and growth of the enterprise (Geng *et al.*, 2015; Mihalovič, 2017).

The most well-known prediction models were created to predict the development of financial situation by mathematical-statistical methods such as logistic regression and multivariate discriminant analysis. The result of mathematical-statistical methods is exact and not affected by experts' experiences and subjective views, what we can consider as their advantage. (Jenčová, 2014) Mathematical-statistical methods were the basis for numerous models, for example Springate model, Taffler model, CH-index, Fulmer model, Beerman model, Altman model, Ohlson model, Zmijewski model and Index IN05. A brief overview of selected prediction models, Altman model (Altman *et al.*, 2016), Ohlson model (Ohlson, 1980), Zmijewski model (Zmijewski, 1984) and Index IN05 (Neumaier and Neumaierova, 2005), is included in Table no. 1, listing the used statistical methods, the examined period and the most significant advantages and disadvantages of selected models.

Besides statistical-mathematical methods, scoring methods and neural networks in financial situation prediction have also their practical application. The principle of scoring methods is that financial health of enterprise is evaluated based on numerical scale, but first selected financial indicators are assigned scores. The most used scoring methods are the following: balance analysis of Doucha, Argenti model, Tamari risk index and quick test. (Sofrankova, 2014)

The latest prediction models use neural networks which are a kind of artificial intelligent techniques, imitate the capabilities of neurons of the human brain's ability to model the course of dependencies between individual indicators and results. (Tumpach and Stankova, 2016) Neural networks are useful in modelling non-linear relationships between explanatory variables and a dependent variable. (Du Jardin, 2009) Dependent variable is influenced by explanatory variables, which in case of prediction models are various factors or indicators. Classification of enterprise financial situation as appropriate or deteriorated is based on dependent variable. Tumpach and Stankova (2016), Kubascikova (2018) says that the neural networks are more accurate in prediction of bankruptcy than mathematical-statistical methods based on numerous studies.

Table no. 1 – Comparison of selected accounting-based bankruptcy models

Bankruptcy model	Study period	Statistical method	Advantages	Disadvantages
Altman (1968)	1946-1965	Z-score model, multivariate discriminant analysis	Most common method Easily applicable	Many assumptions
Ohlson (1980)	1970-1976	Logit model	Uses value (0 to 1) Less restrictive assumptions compared to Altman 1960	Bias
Zmijewski (1984)	1972-1978	Probit model	External factors are included	Variables are highly correlated
Index IN05 (2005)	2004	Multivariate discriminant analysis	Easily applicable Does not require market value of equity	Best fit for Czech and Slovak conditions

Source: own processing

At present, the performance of enterprises is measured not only in terms of the isolated enterprise but also in the context of sustainable development. In addition to the financial

impact of the enterprise, the impact of business activity on the environment is also at the forefront of the environmental and social aspects. An approach that evaluates several aspects of business activity supports the need to assess capital maintenance. To fulfil the aim of the contribution our attention will be devoted mainly to publicly available outputs of accounting which are financial statements and annual reports. For data analyses financial statements prepared in a uniform format are the best solution. In field of a financial analysis, financial situation assessment and prediction are widespread characterized prediction models. For the purpose of strategic planning and sustainable development it is not sufficient to determine if enterprise will be facing bankruptcy in near future. There is a need for determination of other indicators, which reflect the extent and direction of the last and future development. For this reason, assessment of capital maintenance evolution results in supportive information not only about oncoming bankruptcy, but also about ability to maintain a sustainable existence.

2. DATA AND METHODS

Assessment of capital maintenance enables formula for capital maintenance evolution. Formula for capital maintenance evolution was created by using neural networks, which have received a great attention in the last two decades. The characteristics of artificial neural networks such as efficiency, robustness and adaptability make them a valuable tool for classification, decision support and financial analysis. Artificial neural networks are computational structures designed to approximate the functions of the biological central nervous system. (Tkac and Verner, 2016) The anatomy of the human nervous system was the starting point for the creation of artificial neural networks. In this paper we used a multilayer artificial neural network consisting of three layers: the input, hidden and output layers. (Terek *et al.*, 2010) In this paper, we used a feedforward neural network from the point of view of topology. Neuron activities are expressed by activation functions, from which a sigmoid function was used for our model. Another relevant characteristic of the neural network is the way of learning: supervised or unsupervised. In our case, it was a supervised learning, as the desired neural network output was known in advance. The most common method used to train feedforward neural networks is the backpropagation method. The aim of the method is to minimize the network error by setting the weights. Minimization of network is realized by the backward propagation of the error signal recurrently against the direction of propagation of the information in the neural network. By connection weights method the coefficients of the individual components of the capital maintenance development were determined. Connection weights method has been designed for neural network with one hidden layer and one output neuron. (O'Donoghue *et al.*, 2017; De Ona and Garrido, 2014)

Neural network was trained on the sample of Slovak enterprises from SK NACE section C Industrial production, their financial information for 2014-2017. Generally, for the model construction on sample of accounting units dealing with production activities an important factor is that production machinery, facilities, building, inventories of semi products and own products are an important part of assets. The sample consists of enterprises, which in the financial year 2017 had minimum 50 employees, data was available for year 2017 and they were not cancelled. Accounting units set from Section C consisted of 1,320 accounting units. We selected five most intensive (frequented) SK NACE based on subtotals. Out of the sample consisting of 1,320 enterprises, 731 enterprises from five divisions with the largest number of enterprises were chosen.

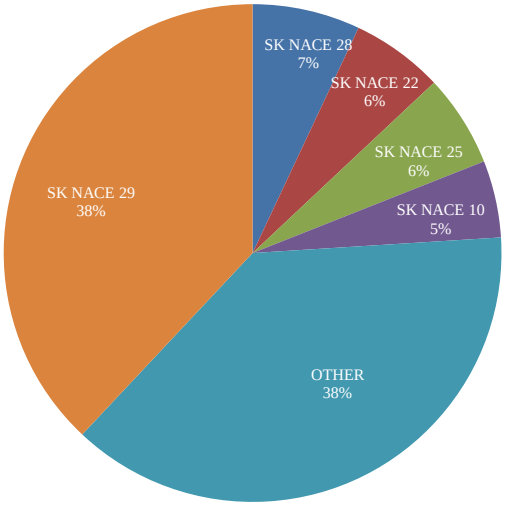
The selected five divisions and number of enterprises are shown in Table no. 2.

Table no. 2 – The list of selected divisions with number of enterprises

SK NACE division	Number of enterprises
SK NACE 28 Manufacture of machinery and equipment	123
SK NACE 29 Manufacture of motor vehicles, trailers and trailers	129
SK NACE 10 Food production	131
SK NACE 22 Manufacture of rubber and plastic products	133
SK NACE 25 Manufacture of metal structures, except machinery and equipment	215
Total number of enterprises from selected SK NACE divisions	**731**

Source: own processing

In 2017 up to 61.75% of own performance and goods revenues for Section C of the industrial production was produced by the selected sectors (Figure no. 3), namely SK NACE 29 (38% of the total revenues), SK NACE 28 (7% of the total revenues), SK NACE 22 (6% of the total revenues), SK NACE 25 (6% of the total revenues), SK NACE 10 (5% of the total revenues). Based on these facts we can say the sample is made of relevant industrial production sector (Ministry of Economy of the Slovak Republic, 2019).



Source: own processing according to the Ministry of Economy of the Slovak Republic (2019)

Figure no. 3 – Share of SK NACE divisions industry in sales of own services and goods in industrial production

The final sample consisted of 663 enterprises because 68 enterprises were excluded from the number of enterprises (731) included in five SK NACE divisions. Excluded were enterprises with not suitable data for analysis, for example enterprises with financial statements prepared according to IFRS (37 enterprises) whose financial statements do not have uniform format as financial statements prepared according to Slovak accounting legislation. Second reason for excluding some enterprises (2 enterprises) was the fact that the criteria for selection were applied to year 2017. Basic year for analysis was 2014, so

enterprises set up in 2015 and later were also excluded (29 enterprises). The subjects of analysis were accounting periods 2014, 2015, 2016 and 2017. The advantage of selected analysed periods is that a uniformity of reporting is guaranteed. The financial statements were prepared according to the new structure incorporating the requirements of the "Directive 2013/34/EU of the European Parliament and of the Council of 26 June 2013 on the annual financial statements consolidated financial statements and related reports of certain types of undertakings, amending Directive 2006/43/EC of the European Parliament and of the Council and repeating council Directives 78/660/EEC and 83/449/EEC," and were first applied in Slovakia for the accounting period ending on 31 December 2014.

A short descriptive characteristics of the companies included in the final sample can be found in Table no. 3.

Table no. 3 – Descriptive statistics of the companies from the sample for 2017

Statistics	Total Assets (EUR)	Net Turnover (EUR)	Equity (EUR)	Current Total Assets (EUR)	Short-term Liabilities (EUR)	EBIT (EUR)
Average	17,465,200.99	26,295,177.06	7,132,042.66	9,312,328.59	8,015,509.18	1,106,791.36
Median	7,415,274	10,819,650	2,465,838	4,239,645	3,222,829	380,932
Minimum	225,147	378,440	-17,805,110	101,438	86,820	-22,672,049
Maximum	301,929,000	644,122,235	179,556,000	182,005,000	191,282,331	25,174,000

Source: own processing

Financial data on sampled enterprises necessary for selection, analysis and model creation are gathered from the freely available Registry of Financial Statements maintained by the Ministry of Finance of the Slovak Republic (Register FS SR, 2019), where Slovak accounting units obligatory publish their financial statements and profit and loss statements.

3. RESULTS AND DISCUSSION

In Slovak Republic, the financial capital concept is supported by legislation that is the reason why the formula for capital maintenance evolution is based on financial understanding. The basis for model design was prediction model IN05, the disadvantage of which on the international level is that it is a best fit for Czech and Slovak business environment as stated in Table no. 1. The original model IN05 (1) considers five indicators: Total assets/Liabilities (TA/L), EBIT/ Interest expense (EBIT/IE), EBIT/Total assets (EBIT/TA), Total revenues/Total assets (TR/TA) and the last one is Current total assets/Short-term liabilities (CTA/SL). Four categories of financial indicators reflecting financial health and performance such as liquidity, leverage, profitability and efficiency (Arsad *et al.*, 2017; Hajek and Henriques, 2017; Sofrankova *et al.*, 2017) are included in capital maintenance evolution model.

Total assets/Liabilities expressed how many units of assets accounts for one unit of liabilities. The management of the resource structure can also be assessed in terms of funding rules such as the gold funding rule or the gold balancing rule. The gold balancing rule is based on the assumption that non-current assets should be financed by long-term sources of financing, especially by equity and long-term external resources (Parajka, 2015). The gold funding rule claims that the lifetime of an asset should match the time the resources of assets is available. Ultimately, neither of these rules recommends financing non-current assets with short-term assets. (Kubascikova, 2018) We should not underestimate

the liabilities in the assessment of capital maintenance, as debts and liabilities represent the enterprise's future obligations. Capital structure decisions about internal and external resources of financing are extremely important to maintain operations and make new investment (Kiraci and Aydin, 2018). High indebtedness is an obstacle to finding new creditors in the future, eventually makes new foreign sources more expensive. A higher level of liabilities leads to a reduction of investments into fixed assets and ultimately reduces the value of the enterprise. (Kim, 2016)

EBIT/Total assets ratio is modification of the indicator return on assets, which basic form uses net profit after tax. ROA shows to what extent an enterprise is able to generate profits by its assets. (Adedeji, 2014) The EBIT indicator makes it possible to compare the indicators derived therefrom, irrespective of the income tax burden and the interest and other expenses resulting from the debt. (Schmidlin, 2014) Subject of many researches were DuPont analysis, which decomposes profitability indicators to three or five components. These decompositions are very useful for financial health prediction of the enterprise, because they detect, which component has significant influence on profitability. According to Weidman *et al.* (2019) the most important profitability determinant is a profit margin that is why this indicator with profit in numerator is relevant for our model.

Total revenues/Total Assets is an indicator of asset utilization as it represents how many units of revenues accounts for one unit of assets. The asset turnover ratio is highly dependent on the industry in which the enterprise operates, because in the manufacturing industries, enterprises have a large asset base and achieve lower values in this indicator compared to those ones where services dominate without the need for a high proportion of assets such as production halls, material and reserves of own production. For this reason, asset turnover ratio is not a suitable indicator for comparing accounting enterprises from diametrically different sectors. In case of our model, this disadvantage is not relevant as our database is made up from industrial production enterprises.

Current total assets/Short-term liabilities is an indicator of working capital and expresses how many units of current assets accounts for one unit of short-term liability. The total liquidity indicator is a balancing indicator between the most relevant indicators of financial performance, namely liquidity and profitability. (Schmidlin, 2014) Effective working capital management is one of the most common reasons for an enterprise's success. (Samiloglu and Akgun, 2016; Botoc and Anton, 2017; Yusoff *et al.*, 2018)

$$IN05 = 0{,}13 * \frac{\mathrm{TA}}{\mathrm{L}} + 0{,}04 * \frac{\mathrm{EBIT}}{\mathrm{IE}} + 3{,}97 * \frac{\mathrm{EBIT}}{\mathrm{TA}} + 0{,}21 * \frac{\mathrm{TR}}{\mathrm{TA}} + 0{,}09 * \frac{\mathrm{CTA}}{\mathrm{SL}} \quad (1)$$

In constructing capital maintenance evolution model for quantification of the capital maintenance according to the financial concept of capital, we proceeded from the IN05 (1) with the difference that we replaced the variable with the smallest weight, EBIT/interest expense with the variable taking into account the changes in the equity items caused by the distribution of profit or arrangement the loss of the previous accounting period. The new variable is labelled as ratio of selected equity items (RSEI) (2), where indexes 0 and 1 refer to the current and the next accounting period.

$$RSEI = \frac{[(SC_1 - SC_0) + (LRF_1 - LRF_0) + (\mathrm{OFP}_1 - \mathrm{OFP}_0) + (NPLPY_1 - NPLPY_0)]}{NPL_0} \quad (2)$$

We have included this indicator in the model because we have not noted any indicator regarding the impact of retained earnings on the enterprise's equity at the level of the current state of knowledge. We have included equity items in the indicator numerator, which may be affected by sources accumulated from undistributed profits. The selected equity items are share capital (SC), legal reserve funds (LRF), other funds created from profit (OFP) and net profit/loss of previous years (NPLPY).

We were interested in the share of the amount of changes in selected equity items in the amount of the net profit or loss for accounting period after tax (NPL). The reason that the calculated ratio of selected equity items is less than 0 or greater than 1 may be due to the inflows from or outflows to owners or change in equity items not taken into account in the formula.

For needs of quantification model, we designed ratio of capital maintenance development (RCMD) to categorize the enterprises. One group consists of enterprises in which the capital maintenance grew or was retained, and the enterprises in which the capital maintenance were eroded were included in the second group. This categorical variable is the ratio of the amount of change in the equity of the second (E_1) and fourth accounting periods (E_3), less the profit after taxation of the fourth accounting period (NPL_3) and the amount of the net profit or loss for accounting period after tax for the first three accounting periods (NPL_2, NPL_1, NPL_0) (3). Numbers in subscript refers to different accounting periods as following: 0 means accounting period 2014, 1 means 2015, 2 means 2016 and the last one labelled 3 refers to 2017. The indicator shows how many percent of the equity difference over the three accounting periods following the current accounting period less the net profit or loss for accounting period after tax of the last year on the amount of net profit or loss for accounting period after tax of the three financial years, starting with the current accounting period. We set the indicator value in two phases. In the first phase, we assigned a negative sign, in the case of enterprises in which the numerator, denominator or both values were negative. In the second phase, we calculated the value of the indicator as the ratio of the absolute value of the numerator and the absolute value of the denominator. The determination of the value of the indicator in two phases was done in order to avoid the fact that by dividing the two negative values we do not overlook the fact that the cumulative result of after tax result is a loss or erosion of equity during the analysed period.

$$RCMD = |(E_3 - NPL_3 - E_1)| / \ |(NPL_2 + NPL_1 + NPL_0)| \quad (3)$$

We divided the results of the ratio capital maintenance development into two groups according to whether the values were negative or positive. A negative value indicates either the loss as a cumulative result of financial performance during the three reference periods, either a decrease in equity or both. In the case of a positive value of the indicator, the closer is the result to one, the greater proportion of profit was transferred to equity items. Although the increase in equity was not due to retained earnings, but to other own sources of financing, the capital maintenance was retained. With a positive value of the indicator approaching zero, the increase in equity occurred at a much lower amount than the amount of net profit or loss for accounting period after tax in the analysed periods, which indicates the erosion of capital maintenance. With a positive value of the indicator high above 1, the growth of the assets was caused by the owners' inflows and not only by the internal source of retained earnings. For the purposes of modelling, we have divided the enterprises according to the positive or negative result of the previously defined indicator of the ratio of

capital maintenance development. We did not strictly define the retention criteria. For the erosion of the capital maintenance for the needs of the model, we consider the negative values of the ratio of capital maintenance development to be achieved. As a retention of capital maintenance, we see situations where the value of the indicator is greater than 0. In the group of enterprises in which the capital maintenance was retained, it would be possible to identify a subset of enterprises with an increase in capital maintenance. The number of enterprises broken down by division with retention and erosion of capital maintenance based on ratio capital maintenance development is shown in Table no. 4.

Table no. 4 – Retention and erosion of capital maintenance in terms of abundance in absolute and relative terms

SK NACE division	Retention of capital maintenance		Erosion of capital maintenance	
	Number of enterprises	Percentage	Number of enterprises	Percentage
SK NACE 10 Food production	56	16.97%	69	20.72%
SK NACE 22 Manufacture of rubber and plastic products	65	19.70%	59	17.72%
SK NACE 25 Manufacture of metal structures, except machinery and equipment	98	29.70%	103	30.93%
SK NACE 28 Manufacture of machinery and equipment	62	18.79%	50	15.01%
SK NACE 29 Manufacture of motor vehicles, semitrailers and trailers	49	14.84%	52	15.62%
Total number of enterprises from selected SK NACE divisions	**330**	**100%**	**333**	**100 %**

Source: own processing

In the next stage of the investigation, we removed 15-15 enterprises from the sample (663 enterprises) with the highest and lowest value of the ratio capital maintenance development. That is, a sample of enterprise utilized by an artificial neural network consisted of data of 633 enterprises (Table no. 5).

Table no. 5 – Retention or erosion of capital maintenance in terms of the abundance of all divisions in absolute and relative terms

Number of enterprises with retention of capital maintenance	315	49.76,%
Number of enterprises with erosion of capital maintenance	318	50.24,%
Number of enterprises included in model	**633**	**100%**

Source: own processing

From a sample of enterprises, 50-50 enterprises were randomly selected with the retention and erosion of the capital maintenance used to test the model. Learning the neural network took place on the rest of the sample, consisting of 533 accounting units. The model consists of five input neurons, five hidden neurons and one output neuron. Using the connection weights method, which was designed for one hidden layer with one neural network output neuron (O'Donoghue *et al.*, 2017; De Ona and Garrido, 2014), the

coefficients for capital maintenance evolution Orisko, Paksiova Neural Network (CMEOPNN) were determined (4).

$$CMEOPNN = 0{,}0092 * \frac{\text{TA}}{\text{L}} + (-0{,}8783) * \frac{\text{EBIT}}{\text{TA}} + 0{,}0072 * \frac{\text{TR}}{\text{TA}} + (-0{,}2501) * \frac{\text{CTA}}{\text{SL}} + 2{,}1120 * RSEI \quad (4)$$

Indicator with the most significant influence on the preservation of capital is the ratio of selected equity items (RSEI), which is not because of the similarity of the input quantities unexpected phenomenon. The more modest impact on capital maintenance development has indicators Total revenues/Total assets (TR/TA) and Total assets/Liabilities (TA/L). Unexpected coefficients are the negative coefficients of indicators: EBIT/Total assets (EBIT/TA) and Current total assets/ Short-term liabilities (CTA/SL). These two indicators indicate the enterprise's financial performance and the effectiveness of working capital management, which is often identified as a key factor in the enterprise's success. Negative coefficients can be explained by the fact that enterprise with effective working capital management achieve a higher profit (Botoc and Anton, 2017; Kowsari and Reza Shorvarzi, 2017), which is one of the prerequisites for paying dividends and profit shares. Dividend and shareholder entitlements are higher in large and successful enterprises, which can be considered a risk factor in terms of capital maintenance retention, as confirmed by the model created. It is possible to consider that in successful enterprises that invest more, it may have a slight negative impact on the profit. These enterprises are more committed to not distributing the entire net profit after tax and preference is given to the creation of an internal source of funding in the form of retained earnings or other funds from profit.

Table no. 6 – Correctly and incorrectly classified enterprises based on neural network coefficients in terms of abundance in absolute and relative terms

SK NACE division	Correctly classified enterprises		Incorrectly classified enterprises	
	Number of enterprises	Percentage	Number of enterprises	Percentage
SK NACE 10 Food production	69	15.37%	45	24.46%
SK NACE 22 Manufacture of rubber and plastic products	87	19.38%	33	17.94%
SK NACE 25 Manufacture of metal structures, except machinery and equipment	143	31.85%	50	27.17%
SK NACE 28 Manufacture of machinery and equipment	86	19.15%	21	11.41%
SK NACE 29 Manufacture of motor vehicles, semitrailers and trailers	64	14.25%	35	19.02%
Total number of enterprises from selected SK NACE divisions	**449**	**100%**	**184**	**100 %**

Source: own processing

Adequacy of the model was verified by the subsequent fitting of the coefficients to the starting sample, where we delivered 71% reliability. Out of the sample of 633 enterprises, we identified 315 (49%) enterprises showing positive values, designated as enterprises in

which the capital was maintained, by capital maintenance evolution indicator. Erosion of capital occurred in 318 (51%) enterprises. In the subsequent verification of the threshold value of the capital maintenance evolution indicator for the classification of accounting units, we determined 1.3. The value of the capital maintenance evolution indicator is 1.3 or higher, predicting capital maintenance according to the financial understanding, while the value lower than 1.3 indicates the erosion of the capital. While the results were verified by artificial neural network coefficients, we identified 365 (58%) of enterprises with maintained capital, while capital erosion occurred in 269 (42%). Taking into account the expectation of the unreliability of the model, we determined the number of accounting units that were incorrectly classified. Thus, 184 (29%) of accounting units were incorrectly classified in the subsequent verification of the model. The number of correctly and incorrectly classified enterprises divided into individual divisions is shown in Table 6. The highest percentage of correctly classified enterprises is in divisions SK NACE 25 and SK NACE 22, while the highest percentage of incorrectly classified enterprises was identified in divisions SK NACE 25 and SK NACE 24. It should be realized that Division SK NACE 25 was the largest division in the selected sample of enterprises of Section C Industrial production.

4. CONCLUSION

The most significant potential of accounting outputs can be seen as their ability to identify business performance factors that positively influence the development of the capital maintenance as a production performance potential of an enterprise, or vice versa, cause multiple, its regular reduction over several consecutive periods with fatal consequences resulting in the disappearance of the enterprise. Aspects of the optimal status and business development model must be geared to both financial and non-financial indicators that signal the development of a company's assets as a tool for its sustainable development. Individual financial indicators as well as predictive models work with accounting information and for the correct evaluation of results, it is most important to understand how to obtain and generate accounting outputs as key components of an enterprise information system in the decision-making processes. The analysis of sustainable development indicators in the broader context of the impacts of differentiated factors operating in the economic concept and their interaction with the impact on the potential of capitalization of invested capital, the outputs from accounting are also used in predicting the critical situations threatening financial health of the enterprise. The generated model can be used to predict capital maintenance evolution, whether it is expected to be maintained or erosion, based on data reported in the financial statements. Quantification of capital maintenance will allow users of information to assess the development of the enterprise in the short and long term both financially and in terms of production. By comparing the quantified capital maintenance evolution, it is possible to assess the preservation, growth or erosion of the capital, which is useful information for users applicable in professional practice.

The designed model has some limitations and the reliability rate provides space for improvement. The reasons for limiting the reliability of the model may be different, but we consider the shortage of the analysed period as the main factors, the selection of only large enterprises in terms of the average recalculated number of employees. Enterprises were selected from only five industrial sectors. Also, financial statements prepared under IFRS

have been excluded from the analysed sample. The most relevant results of the model are expected under the conditions that an enterprise operates in one of the selected industrial manufacturing sectors, with a recalculated number of employees of at least 50. Elimination of relatively large inflows or outflows to owners would also be considered as a factor improving the reliability of the model predicting growth, preservation or erosion of the capital. Subject of further research could be elimination of the model´s limitation and improvement of the model reliability.

Acknowledgements

This research was supported by the APVV, grant number APVV-16-0602.

An earlier version of this paper has been presented at the International conference on Decision making for Small and Medium-Sized Enterprises (DEMSME 2019).

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