Measuring a Company´s Performance: The Identification of Correlation between EVA and Selected Financial Indicators with Use of Genetic Algorithm

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Abstract: This paper deals with topic of measuring company´s performance using different concepts, tools and indicators. It defines the requirements on a concept or an indicator to reflect the real performance of a company, comparing value-based concepts and the traditional financial analysis indicators. The authors demonstrate their results of a survey on an extensive sample of companies in the Czech Republic, and conclude that the use of traditional financial indicators hugely prevails, despite the value based indicators demonstrate much stronger connection to the market value of companies. The authors inquire into a question whether some relationship between the value of selected value-based concept of Economic Value Added (EVA) and the selected indicators of traditional financial analysis may be found using genetic algorithms for clustering into different groups of performance. They show that, to a certain degree of probability, this relationship may be proved with selected parameters.

Key-words: Company performance, value-based management, indicators, financial analysis, EVA, pyramidal breakdown, genetic algorithm

1 Introduction

The performance of business activities relates to the rate of exploitation of the competitive advantages of every company. It is very difficult for a company, especially in the age of rapid development of business environment, to sustain these competitive advantages. Only the companies, which react to the changing business conditions and which monitor and continuously evaluate the level of performance and put efforts to constantly increase it, may further develop with success.

The choice of suitable concepts, tools or indicators for measuring company's performance is one of the most widely discussed areas in corporate management. This paper presents, in short, modern approaches to the measuring of performance based on value approach, and their strong and weak points. The economic value added is identified on the basis of defining the requirements for a quality and comprehensive indicator, which fulfils these requirements. At the same time, this paper points out the link between the EVA and traditional financial indicators within the framework of EVA pyramidal breakdown. On these grounds, the company's performance through different indicators is analysed – selected indicators of financial analysis and complex performance indicator represented by EVA; and their mutual relationship. EVA as a value-based measure could have a leading role in corporate management strategy, and the more traditional income measures could act as facilitators of providing supporting information.

Gathering of the input information for the EVA calculation does, however, face many obstacles in practice, and therefore managers tend to limit themselves to the results of ordinary financial analysis with evaluation of partial indicators. In order to evaluate the performance and financial health of a company, it is however necessary to assess wide range of financial indicators and their mutual influences. Particularly problematic may be the assessment of, for example, liquidity as a separate standpoint of management – high liquidity signalizes a solid capability to pay off debts, however it may also cause an uneconomic loss in circulating capital and therefore a decrease in profitability. A high rate of turnover in assets may be caused by a correct exploitation of equity, but also by its high amortization (a low degree of investments). The problem with traditional indicators of performance in the form of profitability (income) indicators is that they cannot work without extra information concerning primarily the line of liquidity, indebtedness, relationships between property and financial structures or the use of assets of the company [6].

The strong point of EVA (eventually including its pyramidal breakdown), is a complex measurement of the success of a company, which counters several blind spots of the traditional financial analysis. EVA may therefore be recommended, despite its relative difficulty, for analysis in those cases where the analyst may access the important inside information from the company. However, there are cases where there is no sufficient time or information for the adaptation of accounting data and thus such difficult adjustments may not be feasible. This paper deals with a question whether there may be a relationship between the EVA value and the values of selected parameters of financial analysis in order, even without the difficult EVA calculations, for a company to be categorized, with certain probability, into a specific performance group on the basis of financial analysis indicators. The authors of this paper have used for this purpose the genetic algorithms for clustering into groups of performance and tested whether a linear relationship between EVA indicator and selected financial analysis indicators may be proved (linearity has been proved on the 0.05 significance level). Conclusions of this research may be considered for an exploitation in the construction of creditworthiness and bankruptcy prediction models.

2 Measuring a Company´s Performance

The precondition for the increase in the level of performance of a company is its management based on repeating measuring. The measuring itself must stem from the identification of key factors that have impact on the performance of a company and the application of the optimal system of measurements, which reflects the mutual relationships between activities, the rate of successfulness of their execution and their impact on the overall performance. Only on the basis of an effective evaluation and management of performance, one may accomplish the set objectives and secure the successful development of a company. This, however, compels the companies to take into consideration and, at many instances, apply a wide range of innovative managerial philosophies, approaches, tools and techniques, which help to increase company's performance and strengthen the competitive advantages. It is therefore not surprising that, over the course of last decades, a wide range of criteria has been developed to reflect the performance of a company from the perspective of shareholders, and many of those are the results of diverse theoretical conceptions which deal with management of a company and its financial analysis; other criteria, on the other hand, stem from the conventions and pragmatic approaches to the business practice. A historical perspective on the measuring of performance reveals the evolution of thinking about this measuring and of the concepts of performance from the measuring of profit margins and the growth of profit for measurement of return on capital to modern concepts based on the creation of value for the shareholders and the value based management. There is nowadays a world-wide debate between specialist represented by consultancy firms, the universities and managers of companies on the choice of the best management and measuring of performance concept. The economics experts describe it often as a war of indicators between traditional measures (ROI, ROE, ROA, EPS, P/E,…) and modern measures based on the value based management (MVA, EVA, CFROI, Shareholder Value,...) [20], [5]. If a company wants to be successful, it is absolutely essential that the criteria of its performance and the ways to express and measure it are clearly defined. In the past, the main goal of a company was very often defined as maximization of profit. In the last decades, however, on the grounds of criticism of classic indicators, the tendency has been to accept the

criterion of the growth of value [1], [2], [4], [12], [16]. The value-related concept then becomes the way of finding a common denominator for all activities within the company interconnecting all levels of management. The business objectives are defined by a thesis – to do maximum in order to increase the value of input resources invested by the shareholders. The category of economic profit (excess, abnormal profit) is implemented to the indicators and opportunity costs are taking into account.

With regard to the fact, that the value based management has been considered to be the most important change in the financial management in recent years, an exceptional attention has and will be paid to it. With the modern value indicators, on the one hand stand the supporters of EVA (Economic Value Added)[1] and MVA (Market Value Added), and on the other hand mainly the supporters of CFROI concept (Cash Flow Return on Investment)[2]. The first concept was crafted by a consultancy firm Stern Steward & Co., the other in combination with the TBR concept (Total Business Return) is marketed by the expert consultancy firm The Boston Consulting Group. In addition to these concepts, existent and in business practice intensively utilized, there are traditional indicators of performance of a company like ROE (return on equity), ROI (return on investment), ROA (return on assets) etc.

The individual groups of indicators differ in whether they include only the costs of loan capital or even the equity-shareholders capital, whether they are measurable at the level of enterprises' units, whether they can be calculated with ease, eventually adjusted to the inflation. They also differ in whether they include the evaluation only of past or also future development.

The criticism of traditional measures for evaluation of performance of a company stems from the commercial barrier between the market estimations on a company (the market evaluates the performance) and the performance measure on the basis of accounting data. The bookkeeping methods do not always respect the economical perspectives on performance; they were created for different purposes [17]. The market evaluates the profitability of an investment on the basis of expected profits of the investment in future re-calculated to their current value by help of the costs on capital as a representative for the extent of risk and calculation of the value of money over time.

The measures of performance should demonstrate the closest relation to the shareholder value as possible, include the calculation of risk and, eventually, allow the use of as many information and data provided by bookkeeping as possible, including the indicators which are built upon the accounts data. Such a measure should allow a clear and transparent identification of its links to all levels of management and should support the value management.

Finding out the measure (indicator) of performance, which would meet all abovementioned requirements, is not an easy task. This, in practice, results in use of many different measures and concepts of performance management.

Market Value Added (MVA) measures the difference between the market value of a company and invested capital. One disadvantage of this indicator is that it is not always obvious and measurable, what actually is a result of work of managers and what are circumstances, which the managers cannot influence in any way. The next weak point of this indicator is that it doesn't show whether the value reached is in accord with the expectations of the investors.

Total Shareholder Return (TSR) is a function of dividends and the increase or decrease of the share price at the end of the period in contrast with the beginning of that period. In its percentage form it is an analogy of the Excess Return, which gives results in the absolute numbers. In its nature, it corresponds with the concept of the inside revenue percentage. The TSR and Excess Return in comparison with the MVA go further in the evaluation of performance – they take into consideration the demands of the investor for valorisation of his capital and all the contributions which belong to him from the title of maintaining the investment. In comparison with MVA, it is an uncontested advantage of these indicators. Otherwise they demonstrate the same disadvantages as the MVA.

Economic Value Added (EVA) is a widely used performance measure in Value Based Management. EVA is an indicator, which is considered by certain groups of experts to be unique with respect to the measurement of the performance of an enterprise and accepted as a management concept. Essentially, it shows what additional value is an enterprise capable to create by its activity in comparison to the use of capital for other investment opportunities with equal risk. EVA meets all the requirements on

[1] EVA® is a registered mark of Stern Stewart&Co.
[2] CFROI® is a registered mark of HOLT Value Associates, L.P.

the indicator of performance mentioned above. According proponents of EVA, EVA is better correlated with stock prices and returns than traditional measures, e.g. [3], [7], [11], [12], [19]. The EVA calculation includes the assessment of risk in the form of costs on capital. It uses the inputs from accounting, which are adjusted for the calculation later on.

There are several models, which can be used to calculate EVA. Here we are using the Stern & Stewart model [16]:

$$EVA = NOPAT - (C \times WACC) \quad (1)$$

where NOPAT - Net operating profit after tax, C - Invested capital, WACC - Weighted average cost of capital

From equation (1) it can be seen that EVA is expressed as an absolute value. In this form it complicates the possibility to compare the companies´ performance. However, after the modification of (1) and simple rearrangement we obtain the following equation:

$$EVA = (RONA - WACC) \times C \quad (2)$$

where RONA – Return-on-net assets

For a comparison between companies and evolution in time we may use the spread (RONA – WACC). Another possibility is to use ratios, for example EVA/Sales.

The use of EVA allows finding a link to all levels of management. Pyramidal breakdown of EVA (very short example of such breakdown is stated on Fig. 1) enables identification of the factors that could positively influence the performance of the enterprise and the growth of its market value.

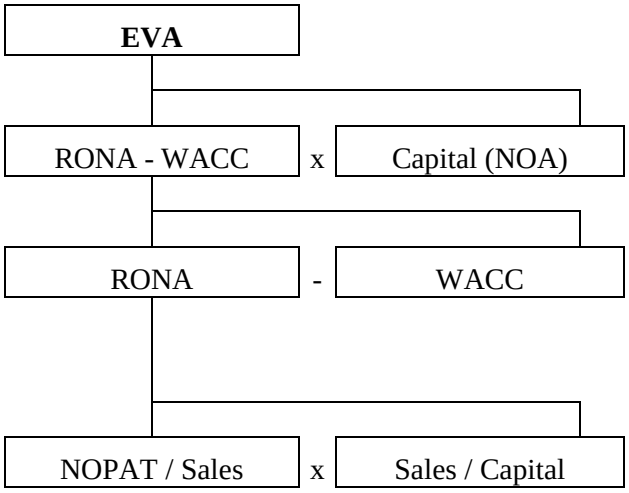

Fig. 1 Example of the breakdown of EVA (shortened version)

That is a great strong point of the EVA. On the basis of identification of factors, it is possible to not only monitor the performance of a company, but to manage it actively. The presented breakdown shows that these factors are, in a substantial degree, the indicators, which are used by the financial analysis for its purposes. Here, the possibilities of interconnections between the traditional indicators of profitability, liquidity, indebtedness, assets turnover and others with the EVA concepts based on the principles of Value Based Management. By interconnection of these approaches, their strong points may be exploited.

The calculation of EVA is quite simple, as long as the net operation profit and capital expenses are available. Here a problem can be encountered; Stewart [16] shows more than 160 possible modifications to evaluate net operation profit needed for the calculation of EVA. In the case of cost of capital the often occurring problem is with the calculation of cost of equity - none of the available models gives an unambiguous result. The critics of EVA are pointing out that adjustments for calculations are too difficult and discouraging managers from its use. Managers, on the other hand, prefer the traditional and simple financial analysis indicators. This conclusion is also supported by a survey on a sample of 402 Czech companies in 2010 [13]. Most frequently used tools are financial indicators based on the data from financial accounting, which are used on average by approx. 94 % of the companies participated in the survey in comparison with using EVA by 26 % of the companies (see Fig. 2).

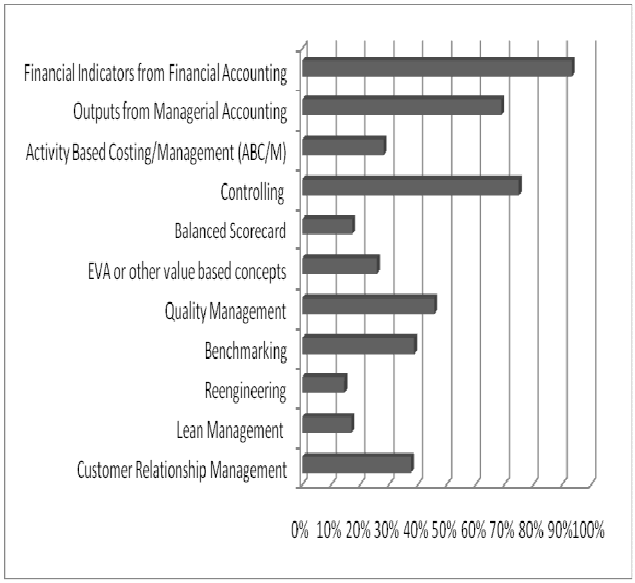

Fig. 2 Utilization of concepts and tools for measurement and management of performance in corporate practice in the Czech Republic. Source: [13]

The financial analysis is a traditional and well-known tool in business practice for measuring of financial position of a company and its financial condition. Results are used for evaluating the past processes, detecting trends and should be used even for the evaluation of profitability and feasibility of accomplishment of future plans in the development of companies. The financial analysis should play a role of a tool that may help with evaluation of financial performance of the company as a follow-up to the development in financial indicators. The financial analysis indicators measure particular areas of company management aimed at monitoring of profitability, liquidity, indebtedness and activities of an enterprise. The performance of the company generally encompasses all areas of business activity, which must be coordinated in order to get a functional and prosperous enterprise with a perspective of existence in the long run. To assess the performance and financial condition of the company, it is essential to consider all those groups of indicators. Some partial evaluations may be, however, contradictory – a big amount of cash is advantageous from the perspective of company's liquidity, but decreases its profitability; high indebtedness may lead to higher values in return on equity (and thereby to a positive evaluation in performance development), but decreases the ability to pay off debts, etc. One of the major problems with these indicators is the exclusion of risks from their calculations.

The EVA (eventually with its pyramidal breakdown), on the other hand, presents a complex measurement of successfulness of a company whereby eliminating the weak points of financial analysis; it is therefore highly beneficial to employ this concept for evaluation of performance (despite its relative difficulty) mainly in a case where an analyst has access to a bunch of important inside information on the company. Nevertheless, there may be cases where the arduous adjustments may not be feasible (due to insufficient time or lack of information for adjustment of accounting data). It would be therefore appropriate to analyse, whether there can be found a relationship between the EVA value and the values of selected parameters of financial analysis in order, even without the difficult EVA calculation, for a company to be categorized, with certain probability, into a specific performance group on the basis of financial analysis indicators. For this purpose, the authors use genetic algorithms for clustering into performance groups and test this hypothesis: *A linear relationship is proved between EVA and selected financial analysis indicators by means of clustering calculated with use of genetic algorithms.*

3 Methodology of research

During the research, the authors tested a sample of 258 companies from the plastic industry sector (CZ NACE 22) with following parameters measured:

- P00 = spread (RONA – WACC)
- P1 = return-on-assets (EBIT/assets)
- P2 = current ratio (current assets/short term liabilities)
- P3 = indebtedness (equity/assets)
- P4 = assets turnover (sales/assets)

The sample includes companies´ economic results achieved in 2007 (i.e. economic conditions before the start of financial and economic crisis). Companies with extreme figures in individual parameters had been excluded. The authors focused only on one sector of industry for reasons of a better compatibility in margins, property and financial structure, risk and business conditions.

These companies were grouped into clusters with use of genetic algorithms. Cluster analysis problems can be solved by means of genetic algorithms. The advantages of the use of genetic algorithms in economy were described by different authors, e.g. [8], [9], [14], [15], [18] and others.

The aim of a genetic algorithm as an optimization task is to divide a set of N existing objects into M groups. Each object is characterized by the values of K variables of a K-dimensional vector. The aim is to divide the objects into groups so that the variability inside those groups is minimized.

The sequence of steps is as follows:

a) Let $\{\mathbf{x}_i; i = 1, 2, \ldots, N\}$ be a set of N objects. Let x_{il} denote the value of the lth variable for the ith object. Let us define for $i = 1, 2, \ldots, N$ and $j = 1, 2, \ldots, M$ the weights:

$w_{ij} = 1$, if the ith object is a part of the jth group

$w_{ij} = 0$ otherwise

b) The matrix $W = [w_{ij}]$ has the following properties:

$$w_{ij} \in \{0;1\} \text{ and } \sum_{j=1}^{M} w_{ij} = 1$$

c) Let the centroid of the jth group $c_j = [c_{j1}, c_{j2}, \ldots, c_{jK}]$ be calculated so that each of its elements is the weighted arithmetic mean of relevant values, i.e.

$$c_{jl} = \frac{\sum_{i=1}^{N} w_{ij} x_{il}}{\sum_{i=1}^{N} w_{ij}} \quad (3)$$

d) The inner stability of the *j*th group is defined as

$$S^{(j)}(W) = \sum_{i=1}^{N} w_{ij} \sum_{l=1}^{K} (x_{il} - c_{jl})^2 \quad (4)$$

and its total inner group variance as

$$S(W) = \sum_{j=1}^{M} S^{(j)} = \sum_{j=1}^{M} \sum_{i=1}^{N} w_{ij} \sum_{l=1}^{K} (x_{il} - c_{jl})^2 \quad (5)$$

e) The distances between an object and a centroid can be calculated in this case by means of common Euclidean distances

$$D_E(\mathbf{x}_p, \mathbf{x}_q) = \sqrt{\sum_{l=1}^{K} (x_{pl} - x_{ql})^2} = \|\mathbf{x}_p - \mathbf{x}_q\| \quad (6)$$

f) The aim is to find a matrix $W^* = [w_{*ij}]$ that minimizes the sum of the squares of distances in groups from their centroids (over all *M* centroids), i.e.

$$S(W^*) = \min_W \{S(W)\} \quad (7)$$

The software MATLAB and its Global Optimization Toolbox are used for the software applications that can be utilized to solve these sorts of problems. The input data are represented by coordinates $x_1, x_2, \ldots, x_K$ that characterize the objects. It is possible to define any number of groups. The fitness function is the sum of squares of distances between the objects and centroids. The coordinates of centroids $c_{j1}, c_{j2}, \ldots, c_{jK}$ ($j = 1, 2, \ldots, M$) are changed. The calculation assigns the objects to their centroids. The whole process is repeated until the condition of optimum (minimum) fitness function is reached. The process of optimization ensures that the defined coordinates $x_{i1}, x_{i2}, \ldots, x_{iK}$ ($i = 1, 2, \ldots, N$) of objects and assigned coordinates $c_{j1}, c_{j2}, \ldots, c_{jK}$ of groups have the minimum distances. The fitness function is expressed by following formula:

$$f_{\min} = \sum_{i=1}^{N} \min_{j \in (1,2,\ldots,M)} \left(\sqrt{\sum_{l=1}^{K} (x_{il} - c_{jl})^2}\right), \quad (8)$$

where *N* is the number of objects, *M* the number of groups, and *K* the dimension. In the course of research, following parameters had been tested: N = 258, M = 3 a successively tested one-, two- and three-dimensional tasks.

The calculation of correlation was executed with help of Pearson correlation coefficient. The hypothesis on linear relationship was verified by a test on 0.05 significance level.

4 Results and discussion

By use of genetic algorithms, clusters of subjects were created according to the results of their financial performance parameters under:

1) EVA (spread RONA – WACC)
2) the results of financial analysis indicators in the form one-, two- and three-dimensional task. The examples in a graphic form are presented at Fig. 3 and 4 (with centroids highlighted).[3]

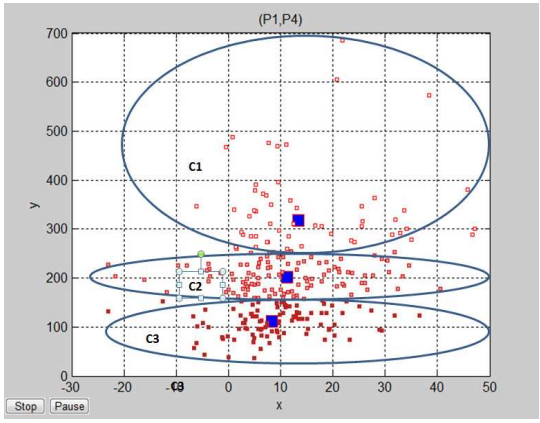

Fig. 3 Example of two-dimensional graph (P1,P4) for three clusters

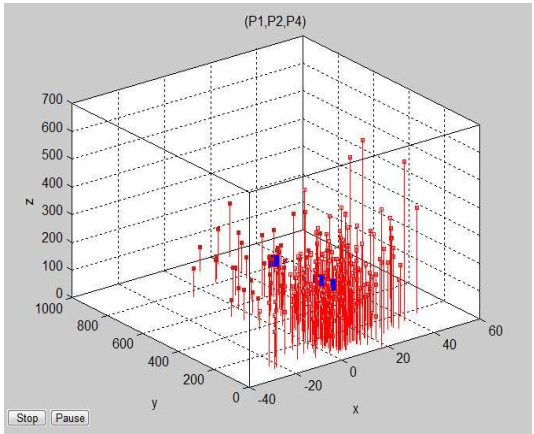

Fig. 4 Example of three-dimensional graph (P1,P2,P4) for three clusters

On the basis of linear relationship testing between EVA and selected financial analysis

[3] The aim of using genetic algorithm is to find a matrix that minimizes the sum of the squares of distances in groups from their centroids.

indicators with use of clustering on the basis of genetic algorithms it is possible to conclude that this relationship is proved on the 0.05 significance level for following parameters:

a) one-dimensional tasks (Table 1):
- return-on-assets (P1)
- assets turnover (P4)

Table 1 Results of testing of linear dependence of P(00) = f(Px)

3 clusters (P00)= f(PX)	Pearson coef.	t	Linearity
P(00) = f (P1)	0,1309	2,1120	Y
P(00) = f (P2)	-0,0761	-1,2211	N
P(00) = f (P3)	0,0811	-1,2211	N
P(00) = f (P4)	0,1678	2,7231	Y

b) two-dimensional tasks (Table 2):
- return-on-assets and current ratio (P1, P2)
- return-on-assets and assets turnover (P1, P4)
- current ratio and assets turnover (P2, P4)

Table 2 Results of testing of linear dependence of P(00) = f(Px,Py)

3 clusters, (P00)= f(PX, PY)	Pearson coef.	t	Linearity
P(00) = f (P1, P2)	-0,1223	-1,9720	Y
P(00) = f (P1, P3)	0,0748	1,2002	N
P(00) = f (P1, P4)	0,1678	2,7231	Y
P(00)A = f (P2, P3)	0,1066	1,7154	N
P(00) = f (P2, P4)	-0,1315	-2,1229	Y
P(00) = f (P3, P4)	0,0521	0,8353	N

c) three-dimensional tasks (Table 3):
- return-on-assets, current ratio and indebtedness (P1, P2, P3)
- return-on-assets, current ratio and assets turnover (P1, P2, P4),
- current ratio, indebtedness and assets turnover (P2, P3, P4).

Table 3 Results of testing of linear dependence of P(00) = f(Px,Py,Pz)

3 clusters, (P00)= f(PX, PY, PZ)	Pearson coef.	t	Linearity
P(00) = f(P1,P2,P3)	0,1651	2,6784	Y
P(00)= f(P1,P2,P4)	-0,1502	-2,4300	Y
P(00) = f(P1,P3,P4)	0,0908	1,4594	N
P(00) = f(P2,P3,P4)	-0,1865	-3,0366	Y

A group of relationships under scrutiny demonstrated the linear relationship and it is possible to utilize these parameters and their combinations for evaluation of performance of the companies. The most frequently represented parameters, which can be used for evaluation of the company performance proved to be return-on-assets (P1) and assets turnover (P4). It is also evident that indicator P3 (indebtedness expressed as equity share on capital) is not in correlation with EVA measured by spread. That is confirmed by a theoretical assumption that low indebtedness increases costs on capital in respect of the higher proportion of more costly shareholders capital and thus reduces the value of the spread. On the other hand, low indebtedness means lower risk and therefore lower value of costs of both loan and shareholders capital (see also [10]). Only in combination of P3 with the groups of indicators P1, P2 and P2, P4 the performance of a company correlation with the spread (EVA) development may be inferred. It is worth attention that the increase in the number of indicators (parameters) of financial analysis in fact does not cause an alteration of amount in dependency of the spread on these parameters.

The results of this research verify the hypothesis that finding indicators and their combinations, which in the framework of cluster groups demonstrate a linear relationship with the complex performance measure - EVA (calculated in a form of spread), is possible. These results may be used mainly when there is no sufficient input information indispensable for EVA calculation available, i.e. mainly by external evaluators (analysts), or eventually in the situation of a lack of will or room for implementation of EVA type of measures into the system of enterprise management. This solution is indeed simplified and substitutive, but it can yield better results than the partial evaluation of particular areas of management with no awareness of the mutual interconnections.

The weak spot of this research is a limited sample of companies under scrutiny, evidential quality and dependability of the reported data (in view of, for example, optimization of taxation).

5 Conclusion

The research dealt with measuring of performance of companies. Some traditional and modern concepts have been discussed and their strengths and weakness have been evaluated. It pointed out

the importance in use of complex measures such as for instance the EVA concept; and at the same time it showed that the business practice clearly lingers with popular traditional financial analysis indicators that provide partial evaluation of particular areas of management in the companies. This popularity stems from unsophisticated character of calculations and seemingly simple interpretation of the results. This simplicity in construction has been discussed in the first part of this paper – the results and evaluation of partial indicators are not always clearly connected. The results of this research moreover proved that even in spite of the disadvantageous use of partial indicators, it is possible to use those indicators for measurement of performance of a company and overcome the abovementioned weak spot of the analysis with the use of clustering on the basis of genetic algorithms. Output results then may be used in the business practice of companies in various evaluation processes, notably conducted by external entities. Furthermore, they also may be exploited in the construction of creditworthiness and bankruptcy prediction models.

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References:

[1] J.M. Bacidore, J.A. Boquist, T.T. Milbourn, A.V. Thakor, The Search for the Best Financial Performance Measure. *Financial Analyst Journal*, May/June 1997.

[2] D.Badau, A.Camarda, S.Serbanoiu, T.Virgil, D.Bondoc-Ionescu. Sport for all – implementation modern methods of performance management. *WSEAS Transactions on Business and Economics*, Issue 3, Vol. 7, 2010, pp. 191-200.

[3] B.H.Bao, D.H. Bao, Usefulness of Value Added and Abnormal Economic Earnings: An Empirical examination. *Journal of Business Finance and Accounting*, 25(1-2), pp. 251-265, 1998

[4] G.C. Biddle, R.M.Bowen and J.S.Wallace, Does EVA Beat Earnings? Evidence on Associations with Stock Returns and Firm Values. *Journal of Accounting and Economics*, 24:3. 1997.

[5] C.G.Bonaci, D.Matis and J.Strouhal. Crisis of Fair Value Measurement? Some Defense of the Best of All Bad Measurement Bases. *WSEAS Transactions on Business and Economics*, Issue 2, Vol. 7, 2010, pp. 114-125.

[6] P.Chandrapala, A.Knapkova, E.Kramna, Financial Performance of Selected Firms in the Czech Repu blic. In *Knowledge Management and Innovation: A Business Competitive Edge Perspective*, Vols 1-3. Cairo: Int Business Information Management Assoc, pp. 781-789, 2010

[7] S.Chen, J.L.Dodd, Economic Value Added (EVA): An Empirical Examination of a New Corporate Performance Measure. *Journal of Managerial Issues*, 9(3), pp. 318-333, 1997

[8] S.Chen, L.Jain and C.Tai, *Computational Economic: A Perspective from Computational Intelligence*, Idea Group Publishing, 2005, ISBN 1591406498.

[9] P.Dostál, *Advance Decision Making in Business and Public Services*. Brno: CERM, 2011. 168 p. ISBN: 978-80-7204-747-5

[10] M.Kaviani, S.Biabani, S.Azam, Study of and Explain the Relationship between the Financial Leverage and New Performance Metrics (EVA, MVA, REVA, SVA and CVA) Evidence from Automotive Industry Tehran Stock Exchange, *Journal of Risk and Diversification*, pp. 10-16, 2012.

[11] K.Lehn, A.K.Makhija, EVA, accounting profits, and CEO turnover: an empirical examination 1985-1994. *Journal of Applied Corporate* Finance, 10 (2), pp. 90-96, 1997

[12] P.Pálka, A.Knápková, Performance, Value and Penetration of Real Options into the Capital Budgeting Processes of Czech Companies using AMTs. *International Journal of Applied Mathematics and Informatics*, Issue 12, Vol. 6, 2009, pp. 620-629.

[13] D.Pavelková, A.Knápková, E.Jirčiková, Current Issues in Measuring and Managing the Performance of Companies. In: *Proceedings of the 5th Inter. Scientific Conference-Finance and the Performance of Firms in Science, Education and Practice.* TBU in Zlín, 2011, pp. 361-374. ISBN 978-80-7454-020-2.

[14] K.Safarzyńska, J.Bergh, Evolutionary models in economics: a survey of methods and building

blocks, *Journal of Evolutionary Economics*, Springer, vol. 20(3), pp. 329-373, June 2010

[15] K.S.Shin, Y.J.Lee, A genetic algoritm application in bankruptcy prediction modelling. *Expert Systems with Applications*, Vol. 23, pp. 321-328, 2002

[16] G. B. Stewart, EVA^{TM}: Fact and Fantasy. *Journal of Applied Corporate Finance*, Vol. 7, No. 2, pp. 71-84, 1993

[17] J.Strouhal, L.Müllerová, Z.Cardová, M.Paseková, National and International Financial Reporting Rules: Testing the Compatibility of Czech Reporting from the SMEs Perspective. *WSEAS Transactions on Business and Economics*, Issue 12, Vol. 6, 2009, pp. 620-629.

[18] S.Thawornwong, D.Enke, The adaptive selection of financial and economic variables for use with artificial neural networks, *Neurocomputing* 31, pp. 1–13, 2000

[19] A. Worthington, T.West, Australian Evidence Concerning the Information Content of Economic Value Added. *Australian Journal of Management*, 29(2), pp. 201-224, 2004

[20] S. D.Young, S. F. O´Byrne, *EVA and Value-Based Management: A Practical Guide to Implementation.* New York: McGraw-Hill, 2001. ISBN 0-07-136439-0.