

**REGRESSION ANALYSIS OF KEY EFFICIENCY INDICATORS
IN THE CONTEXT OF CORPORATE FINANCIAL
MANAGEMENT BASED ON THE INDICATOR OF THE
ECONOMIC VALUE ADDED (EVA)**Tatiana O. Zhukovets¹Eugeniia U. Strelnik²Diana S. Usanova³

Abstract: As a tool for strategic management, key performance indicators perform two main functions: serve as indicators of the achievement of the corporate development goal, are necessary to motivate staff. To achieve these goals, the system of indicators should reflect the specifics of the company's activities and be scientifically sound, i.e. not chaotic. In this article, we observed 145 Russian companies in the oil and gas sector of the economy for 3 years and studied key performance indicator systems that they apply. As a result, it turned out that the currently used KPI systems are not very effective at the moment, since the indicators are

chosen chaotically and are not linked to the general system of goals. We decided to test two practical management models based on interrelated indicators: the DuPont model and the EVA-based management model. As a result of testing the DuPont model, we obtained negative results. The multiple R was found to be only 0.15. The testing of the EVA model gave a positive result; we obtained a significant model (by the Fisher criterion) with a determination coefficient of 0.64. Therefore, we propose to develop KPI systems based on the EVA decomposition model.

Keywords: KPI, DuPont model, ROE,

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ROA, ROS, EVA, VBM, regression analysis

Thus, it is interesting to study the prerequisites for the formation of the EVA concept, as well as scientific researches in the field of performance management. This will allow us to use more structured approach to solve a number of issues of effective management based on the KPI system.

INTRODUCTION

At the present time, in the period of increasing financial crises and high competition in commodity and financial markets, the issue of improving the efficiency of resource management with the purpose of realizing the strategic potential is pressing before the Russian corporations. One of the modern approaches providing support for the entire range of problems associated with this is the set of management tools based on key performance indicators (KPIs).

THEORY

It should be noted that in the development of the management concept based on KPI, three basic stages can be clearly identified: formation, development, current state (Table 1).

Table 1: Stages of development of the management concept based on KPI

Period	Conception	Distinctive features
Formation (1930-1980)	J.L. Malo "Tableau de bord" [1]; P. Drucker «Management by Objectives» [2]	For the first time, the necessity of applying some indicators for performance management purposes, as a system of indicators for the top management is justified.
Development (from the beginning to the middle 20th century)	R. Kaplan, D. Norton "Balanced Scorecard" [3]; K. McNair, R. Lunch, K. Cross "The	All processes in the enterprise are interrelated, performance indicators are formed at each level of the hierarchy and include both financial and non-financial indicators.

	Pyramid of Efficiency" [4]; L. Meysel "Model of Strategic Maps" [5]; K. Adam, P. Roberts "EP2M" [6]	
Current state (end of the 20th - the beginning of the 21st century)	H. Rampersad "The concept of universal systems of indicators" [7]	Appear the goals of the individual, which are interrelated with the goals of the company. There is a need to define KPI for each individual.

The stage of formation is characterized by the emergence of the idea of managing the company on the basis of certain indicative indicators and the development the basic provisions of this management model. One of the earliest works related to the stage of the development of the KPI-based management concept is the work of J.L. Malo "Tableau de Bord", in which it is proposed to consider separate indicative indicators (the management business panel) as a tool for selecting, documenting and interpreting joint cause-effect relationships of financial and non-financial indicators [1]. The concept of Management by Objectives (MBO), developed in 1954 by Peter Drucker, in which he stressed the need to use the management business panel and

substantiated the main indicators of effectiveness evaluation, is also part of the development stage [2].

The management concept based on indicative indicators did not develop immediately, only in the 90s of the 20th century, when the real boom in the development of performance evaluation systems began in the United States, and many theories were proposed, such as the model of the strategic maps of Meisel, the "pyramid Efficiency" of C. McNair, R. Lance and K. Cross [4], [8] In 1993, in the magazine Manufacturing Europe, the EP2M (Effective Progress and Performance Measurement) model was proposed, which is also known as, the Adams and Roberts model [6]. The most famous was the Balanced Scorecard (BSC) concept developed in

1992 by Harvard University professor Robert Kaplan and management consultant David Norton, in which, according to some experts, an equilibrium is achieved between short-term and long-term goals of the company, financial and non-financial indicators, basic and auxiliary business processes, external and internal factors of activity, and as a result, a cause-and-effect sequence is being set up to implement the strategy [3].

The current stage is characterized by the formation of unified approaches to management based on key performance indicators. The universal system of indicators was described by Hubert K. Rampersad in 2003 [7].

Russian companies began to apply the concept of KPI relatively recently, nevertheless, quite widely - now the system of key performance indicators is implemented not only in the corporate structures of various activities, but also in educational institutions, health care, government agencies, etc.

METHOD

In our study, we decided to test a set of indicators that Russian companies

use in their activities as indicators. As it turned out, most companies use a chaotic set of indicators. In most cases, the top-level indicator is not allocated or the indicator of net profit or operating profit (EBIT) is taken as it. The most common financial indicators are liquidity ratios, the amount of net working capital or the maneuverability ratio, the asset turnover ratio, the gearing, as well as a number of profitability indicators (ROS, ROA, ROE, etc.).

We put forward the initial hypothesis that an unsystematic approach to the formation of a complex of indicators (KPI) does not allow to implement a comprehensive development strategy, since dependent variables have little effect on the dependent variable.

We observed 145 Russian corporations in the oil and gas production industry. For the purposes of analysis, the indicators were taken for 3 consecutive years (2013 - 2015). We get a total of 435 observations. Data for analysis was downloaded from the SPARK database. As a dependent variable, we took EBIT, ln; the most common financial indicators were used as independent variables, preliminarily

filtered for multicollinearity: x1 - absolute liquidity ratio; X2 – net working capital; X3 - gearing; X4 - turnover ratio; X5 - ROA (profitability of assets by net profit); X6 - management costs, ln; X7 -

net assets, ln.

As a result of constructing the regression model, the following results were obtained (Table 2).

Table 2: The results of testing the initial hypothesis

	<i>t Stat</i>	<i>P-value</i>	<i>F</i>	<i>F-Significance</i>	<i>R Square</i>
Intercept	-3,694128523	0,000254798	82,974	2,74E-71	0,609267
x1	1,344057894	0,179773725			
x2	-0,983716481	0,32591376			
x3	1,598749748	0,110751051			
x4	1,339268753	0,181325791			
x5	12,6824111	9,76857E-31			
x6	6,065887849	3,3138E-09			
x7	6,636947001	1,17567E-10			

As it can be seen from Table 2, only three of the seven selected indicators satisfy the Student's criterion and P-value: x5 - profitability of assets; X6 - management costs, ln; X7 - net assets, ln. The correlation coefficient indicates the existence of a link between the selected variables, but from the point of view of corporate finance management, the given set of indicators is clearly insufficient to justify the corporate KPI system.

In this regard, we decided to test two practical management models based on interrelated indicators: the DuPont model and the EVA-based management model. In order for the company's KPI system to be truly a system, rather than a chaotic set of indicators, it is necessary to use the decomposition of indicators. This decomposition assumes that the complex indicator forms a field of smaller indicators that are linked to it by means of appropriate formulas.

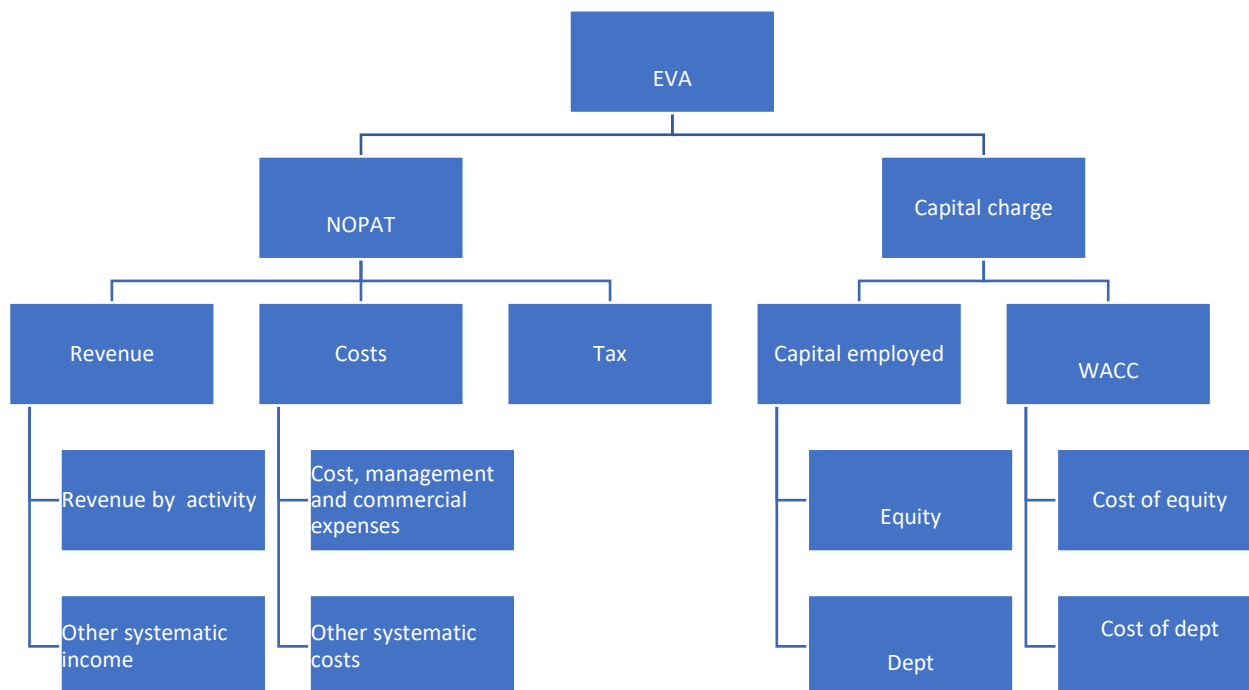
Sometimes for this, additional variables are introduced into the model, as is done in the DuPont model and in EVA decomposition.

The DuPont model was developed back in the 1920s for DuPont Company (which later became the model's name). There are several modifications of the model: two, three and five-factor models, which combine such indicators as return on assets (ROA), return on equity (ROE), asset turnover ratio, net profit, total assets, and in the five-factor model, also the tax burden and interest burden indicators are used. The model is still relevant, as evidenced by several recent publications

[9].

In modern corporate finance the economic added value (EVA) is one of the most important financial indicators. According to our opinion (hypothesis 2), economic added value is more suitable for the formation of the KPI corporation system, since it affects almost the entire range of private financial performance indicators in management of costs, sales, prices, profitability, and also has a significant relationship with market capitalization in a low-efficiency financial market [10].

The simple version of EVA decomposition is shown in the pic. 1.



Pic. 1. Example of the EVA indicator decomposition for the KPI corporation system

To test the second hypothesis, we made 2 regression models: the first one based on the indicators included in the DuPont model and the second one based on EVA decomposition indicators. For the DuPont model, the following variables are taken:

- Y (dependent variable) - return on equity (ROE);
- X1 - revenue, ln (natural logarithm);
- X2 - net profit, ln;
- X3 – total assets, ln;
- X4 - equity, ln;
- X5 - tax burden (coefficient);

- X6 – cost of dept (coefficient);
- X7 - asset turnover ratio;
- X8 - gearing.

For the EVA model, the following variables were taken:

- Y (dependent variable) - economic added value, EVA, ln (natural logarithm);
- X1 - revenue, ln;
- X2 – cost of sales, ln;
- X3 - management costs, ln;
- X 4- net profit, ln;
- X5 - equity, ln;
- X6 - dept, ln;

- X7 - tax burden (coefficient);
- X8 - cost of dept (coefficient);
- X9 – cost of equity (coefficient);
- X10 - asset turnover ratio;
- X11 - gearing.

RESULTS

As a result of testing the DuPont model, we obtained negative results. The multiple R was found to be only 0.15. Of the variables only X2 - net profit satisfies Student's criterion and P-value. Therefore, we will not give more detailed figures in this article.

The testing of the EVA model gave a positive result (see Table 3). During the initial debugging of the model, we obtained a significant model (by the Fisher criterion) with a determination coefficient of 0.64, which means that more than 60% of the influencing factors were taken into account in the model. Almost all variables passed tests (by Student's

criterion and P-value). Strangely enough, the exception was the indicator of the cost of dept (X8). Obviously, this fact is explained by the fact that current accounting legislation allows inclusion in the investment costs of the company interest on targeted loans when purchasing equipment and expenses for the acquisition of tangible assets within the level of materiality established by law and accounting policies of the company. In addition, under Russian law, leasing payments are included in the cost of the company and are reflected in the line "cost" when calculating the company's profit, are not reported separately. Therefore, not all sums of payment for the borrowed capital, we can see in the reporting. This distorts the original data for analysis. In this regard, we considered it undesirable to exclude this indicator from the model, despite the value of the critical values obtained.

Table 3: The results of testing the KPI model based on the economic added value

	Coefficients	t Stat	P-value	F	F-Significance
Intercept	22,04868979			29,89007	2,11E-43
x1	1,647011532	2,640491632	0,008583474		

x2	-0,730124755	-1,418909595	0,1566583 1		
x3	-0,792919361	-2,366194232	0,0184197 25		
x4	0,234362268	3,891444056	0,0001156 49		
x5	-0,181150326	-2,787876621	0,0055435 39		
x6	0,131272624	2,808381168	0,0052086 26		
x7	-2,199732082	-2,02675935	0,0433108 84		
x8	0,000352674	0,182786624	0,8550526 05		
x9	0,222970775	2,224706619	0,0266265 86		
x10	1,04484493	2,126649187	0,0340247 97		
x11	0,001078815	2,008448608	0,0452277 81		

As for the other variables of the model, we can conclude that they are significant by the Student's criterion and can be used to construct KPI systems based on the economic value added decomposition.

CONCLUSIONS

In general, the essence of the study is as follows: not every model of

the key indicators system of a company is effective.

In order to assert that the chosen system of indicators will really reflect the financial goals of the company, it is necessary to test the proposed model. We made three tests on the basis of 435 oil and gas companies in Russia. Based on the results of testing, we came to the conclusion that the system of chaotic

selection of variables used in most companies (represented by the sample) is ineffective. Only three indicators actually have a significant effect on the depending variable (although at a sufficiently high value of the coefficient of determination). In addition, there are theoretical objections against the use of any profit indicators at the top level of the KPI system due to the following: they reflect only the current financial result for the year, and not the financial strategy; do not take into account the costs of capital; very much depend on the accounting policy, which can change and distort the result.

In this regard, we decided to test two models that systematize the indicators for inclusion in the KPI system. As it turned out, as a result of calculations, the DuPont model is not applicable oil and gas companies in Russia.

The testing of the EVA model was positive. All indicators (with the cost of debt exception) can be used by Russian oil and gas companies to create a systematic structured model of key performance indicators.

DISCUSSION

The results of our research are similar to the results of researches in which the combination of BCS and EVA was analyzed and their effectiveness was empirically proven [11], [12], [13]. Thus, the general conclusion of our research is that a scientifically based approach to selecting a KPI system for companies should be based not only on theoretical positions. A decisive role should be assigned to applied research, based on an empirical analysis of the impact of indicators on the company's performance in the context of the value management concept (VBM), in particular, the indicator of economic value added.

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