

# FEATURES OF FORMATION AND USE OF METHODOLOGICAL APPROACH IN DETERMINING THE IMPACT OF BUSINESS ACTIVITY INDICATORS ON PROFITABILITY INDICATORS USING MATRIX APPROACH

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**Abstract.** In modern time conditions, the goal of any enterprise is to make a profit, to expand activities, to enter new markets. However, the results of enterprises are reflected at the level of profitability and constantly influenced by factors of internal and external environment, which accordingly affect the indicators of business activity, financial stability, profitability, solvency. This study focuses on business activity indicators and their impact on the level of profitability. A methodical approach to determining the impact of business activity indicators on profitability indicators using a matrix approach has been formed, which helps to maximize the results of activities. It is determined that the evaluation of the efficiency of the enterprise can be formed using a balanced system of indicators, which contributes to a comprehensive assessment of the financial and economic state. Enterprises need to form links with the external environment, which ensure the creation of an effective economic mechanism. To ensure the effectiveness of economic processes at the enterprise, it is advisable to reorganize the economic mechanism of managing the development of an industrial enterprise in sense of its efficiency.

**Keywords:** business activity, profitability, matrix approach, industrial enterprises.

**JEL Classification:** A10, C18, D29

**Formulas:** 4; **fig.:** 0; **tabl.:** 2; **bibl.:** 11

**Introduction.** In terms of the risk for negative impact of internal and external factors on the level of profitability of enterprises, efficiency indicators determination is necessary to done. The study represents evaluation of such impact through the assessment of relevant indicators. In the purpose to maximize performance indicators, improve the results of work, achieve strategic goals of activities. Therefore, there is a need to form a methodological approach to the implementation of such an assessment.

**Literature review.** The research of the issue of evaluating the effectiveness of activity, financial condition, profitability of enterprises is reflected in the publications: Bakuta A.V. [1], Balitska V.V. [2], Batrakova T.I. [3], Burkovska A.V. [4], Dykan V.L. [6], Zvirko G.P. [7], Zinchenko O.A. [8], Lebedeva A.M. [9], Mandzinovska O. [10], Shiyan A.A. [11].

**Aims.** The purpose of the article is to improve the methodological approach to determining the impact of indicators of business activity on profitability indicators using a matrix approach.

**Methods.** In the process of research the grouping method was used to carry out the processing of analytical information. In addition, the method of concretization, the method of formalization, the regression method were used to determine the impact of business activity indicators on profitability indicators using a matrix approach. The method of statistical data processing and generalization is also used to assess the efficiency of production activities and to form appropriate conclusions.

**Results.** A set of mathematical relations between the external and internal parameters of the system, which characterize the structure of the system and its functioning, forms a mathematical model of the system, which confirms its uncertainty. The basis is the fact that the efficiency of the system, that is, the level of its adaptability in solving the tasks set before it, is estimated by numerical values of the components of the vector of the target function.

The use of matrix analysis is one that meets the requirements and objectives of the procedure for determining the main performance indicators. After conducting studies of the components of the management system, in purpose of establishment of the parameters with a given degree of accuracy, it is proposed to build a model for determination of the level of the enterprise's profitability. Which allows to achieve the positive and satisfactory value of the enterprise profitability indicator, regarding the dynamics and general development of the economic mechanism. Taking into account the above, a methodical approach in determining the impact of business activity indicators on profitability indicators using a matrix approach has been formed.

Consequently, the enterprise management system has information about the state of the enterprise, which is especially necessary at all stages of analysis, in solving the problems or making managerial decisions. Quality indicators represent the stability of the enterprise, its ability to perform its functions in the specified parameters under the influence of external and internal factors (and under the influence of all structural changes).

The result of model's functioning is an absolute indicator that demonstrates how the state of the system at this moment differs from its state in the past and is directly related to the level of achieving the goals of business processes. Applying of the model for estimation of parameters of multifactorial linear regression by the method of the smallest squares performed using matrices.

In economic cybernetics [11] the linear model of regression through the matrix is written as follows:

$$Y = (Y_i), \quad (1)$$

where  $Y$  – vector of theoretical values of dependent variable  $i = 1.., n$ ;  $n$  – number of observations and number of unknown parameters.

The evaluation of the parameters of the model is performed by the method of the smallest squares. Under the conditions of this method, it is possible to achieve minimal deviations of the values of the observed effective variable  $Y_i$  from the values calculated by the  $Y_i^{(n)}$  model.

The unknown parameters of the linear model of regression on the matrix are calculated according to a linear formula:

$$Y_i = a_1X_1 + a_2X_2 + a_3X_3 + a_4X_4 + a_5X_5, \quad (2)$$

where  $Y_i$  – effective variable;  $x$  – matrix of values of independent variables;  $a$  – model parameter ratings vector,  $a = (a_i)$ .

In matrix form, this formula looks as follows:

$$X^T Y = \begin{bmatrix} \sum Y_i \\ \sum Y_i X_{i\bar{a}} \\ \sum Y_i X_{ai} \end{bmatrix}, \quad (3)$$

where  $Y_i$  – effective variable;  $x$  – matrix of values of independent variables;  $a$  – model parameter ratings vector,  $a=(a_i)$ .

Summarization made by the number of observations. On the basis of the regression analysis, the dependence of the company's profit (Y) on four indicators is established: the profitability ratio of the rotation of assets (x1); return on equity ratio (x2); profitability ratio of advance investments (x3); asset rotation factor (x4); profitability of investments in the enterprise (x5).

Evaluating the parameters of the model by the method of the smallest squares is possible using the data of the enterprise PJSC "ZERZ". The initial data for evaluating the parameters of the regression model is given in Table 1.

**Table 1. Initial data of PJSC "ZERZ" enterprise evaluation of regression model parameters**

Years	Y	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>
2015	-17835	-5,52	-10,34	-0,16	-5,53	-5,83
2016	-6722	-2,19	-4,05	-0,062	-2,19	-2,19
2017	-33326	-9,75	-25,11	-0,308	-9,75	-8,86
2018	1415	0,364	1,06	0,01	0,36	0,35
2019	228	0,058	0,25	0,002	0,058	0,06

Source: developed by the author on the basis of the source of [5]

Using numeric values, the regression model is presented as:

$$Y_j = 821,86x_{i1} - 2210,619 x_{i2} + 517,026 x_{i3} + 1558,16 x_{i4} - 1642,3 x_{i5}. \quad (4)$$

Moreover, for signs plus this model is characterized by the increase in the result with the increase in the corresponding indicators-factors, and vice versa, minus means a decrease in the effective indicator with the increase in the corresponding indicators.

Therefore, the increase in the profitability ratio of advance investments (Xi3); the ratio of rotation of assets (Xi4) cause the increase in the effective variable, while the growth of the return on equity ratio (Xi2) and the profitability of investments in the enterprise (Xi5) cause the decrease in the effective variable – annual profit. The nature of the impact on the annual profit of these two is inverse due to their nonlinear relationship with the effective indicator.

The scope for changing variables is presented as following:

$$\begin{aligned}
-9,75 &\leq X_{i1} \leq 0,364; \\
-25,11 &\leq X_{i2} \leq 1,06; \\
-0,308 &\leq X_{i3} \leq 0,01; \\
-9,75 &\leq X_{i4} \leq 0,36; \\
-8,86 &\leq X_{i5} \leq 0,35.
\end{aligned}$$

Changing the corresponding factor by one in the formula (4) changes the result by the value of each parameter. Thus, the increase in one percent of the net profit ratio should be fixed by the increase in profit for 0.821 thousand UAH, one percent growth for the profitability ratio of advance investments should be supported by 0.517 thousand UAH of the profit, as well as the increase of one percent of the asset rotation coefficient can be achieved by increasing profits by 1.558 thousand UAH.

Comparison of coefficients of this model is possible, due to their approximately the same fluctuations, and therefore the influence of factor variables takes place at the same direction.

According to the results of the study, the analysis method can be used as a process of step-by-step prioritization. Thus, in order to solve the problem of choosing the optimal direction of development, a decision-making method, the best ways to compare and evaluate efficiency should be identified. The criteria by which the evaluation of the efficiency of the enterprise meets the following requirements are presented: clarity of presentation of results; simplicity of calculations; adaptability to accounting and statistical documentation used at the enterprise; accuracy of the obtained results; availability of information sources; time.

Formation of a vector of positive dynamics of development in the economic mechanism of the enterprise is impossible without ensuring the effective activity of the enterprise. The need to evaluate the effective activity of the enterprise, the degree of reaction of the main indicators to changes that may arise during the management, focusing on improving the efficiency of the enterprise, meeting the needs of consumers and market requirements, rationalizing production, compliance with economic, technological changes – these conditions may require the detection and use of efficiency reserves, ensuring the activities of the enterprise without unpredictable and significant costs.

The evaluation of the efficiency of the enterprise can be formed using a balanced system of indicators, which make it possible to comprehensively assess the financial and economic state of the enterprise and the effectiveness of its activities, including various cost and relative indicators. Based on the above studies and the literature in question, it can be succinctly said that the effectiveness of production is a complex concept that characterizes the ratio of costs to income. Since we consider the effectiveness of the economic mechanism of the machine-building industry, we propose to investigate some profitability indicators.

The profitability indicators of the enterprise in certain categories of factors determine the directions of evaluation of the effectiveness of production activities, and is an extremely important aspect in the financial and economic analysis of the enterprise.

Profitability indicators for PJSC "ZERZ" are presented in the form of Table 2.

**Table 2. Partial indicators of the mechanism of evaluation of the efficiency of production activity of PJSC "ZERZ" for 2014-2019.**

Resource Performance Indicators	2014	2015	2016	2017	2018	2019
Asset profitability		-5,53	-2,19	-9,75	0,36	0,06
Return on equity	-5,56	-10,34	-4,05	-25,11	1,06	0,25
Return on invested capital	-3,1	-5,83	-2,19	-8,86	0,35	0,06
Profitability of products	-3,29	-5,28	-2,26	-7,06	-0,75	0,41
Profitability of operations	-0,03	-0,05	-0,02	-0,07	-0,007	0,004
Stock exchange		2,32	3,46	3,82	5,74	6,89

*Source: developed by the author on the basis of the source of [5]*

Analyzing the obtained indicators of the mechanism for evaluating the effectiveness of production activities of PJSC "ZERZ", the data indicates the existing problems of the enterprise in terms of asset profitability when in the period of (2015-2017) each invested hryvnia brought the loss of 2-10 kopecks.

In 2018-2019 the situation improved, but with a yield on assets of 0.3 – 0.05%, it is difficult to talk about the success of the company's functioning. The same applies to the return on equity with negative values in period of 2014-2017, when PJSC "ZERZ" worked unprofitable. During this period, a loss was set for each hryvnia of equity invested in the maximum amount – 25 kopecks for each hryvnia in 2017, and the smallest loss was recorded in 2016 with a value of 4 kopecks for each hryvnia invested from equity. In the next two years (2018-2019), there was a small profitability increase, which was noted in 1 kopeck for each invested hryvnia of equity in 2018, and respectively by 0.3 kopecks in 2019.

The same situation with unprofitableness and insignificant profitability in the last two years was in terms of return on invested capital. As in the case of preliminary indicators, the lowest return on invested capital was observed in 2017: losses were almost 10 kopecks for each hryvnia invested. This happened in 2017, when the company incurred the largest losses in the amount of 29,141 thousand UAH.

As for product profitability and operating performance, the loss phase stretched for these indicators even in 2018 according to the results of its operating activities.

All the negative trends described above in previous years occurred against the background of a fairly acceptable stock index, when each hryvnia used from fixed assets brought a profit of 2.3 UAH in 2015 and almost 7 UAH of profit in 2019.

So, in terms of the use of fixed assets, the company does not have problems. Analyzing the financial statements of PJSC "ZERZ" it's should be mentioned that the main problem of the enterprise is high level of the expenses exceeding the company's revenue. This is what causes the unprofitableness of the enterprise, which was observed in previous years.

A positive trend is the increase in revenues in 2019 to 698,369 thousand UAH along with unchanged from the previous 2018 expenditures of 636,132 UAH. This suggests that the company has found an opportunity to increase its production

capabilities without increasing costs. This is a positive trend. The dependence of the efficiency of production activities of the enterprise is carried out by analyzing the indicators of the effectiveness of the use of material resources and the effectiveness of the use of fixed assets.

When changing the factors of influence, certain effect that can improve profitability appears or vice versa worsen the financial and economic state of the enterprise. This allows to organize further forecasting work taking into account the most significant indicators of influence, which aims to increase the efficiency of the enterprise.

Due to the fact that the efficiency of the enterprise is a complex, multifactorial system of influential factors, this indicator should always be supervised, monitored, controlled by the management apparatus for an adequate, timely response to changes in factors. The quality of the primary data taken to calculate performance indicators must comply with the principles of correctness, due to the fact that they reflect the state of the management system and the production processes taking place at the enterprise.

Therefore, the mechanism for evaluating the effectiveness of production activities is appropriate to consider on the basis of influence factors. It should be making a rational, effective assessment of the effectiveness of the production activities of the enterprise.

For PJSC "ZERZ", the use of the analysis methodology based on determining the impact of partial indicators will contribute to improving the efficiency of the enterprise. The economic evaluation of production largely depends on the need to calculate the effectiveness of the manufacturer, since the process of harmonization of interests of the field of consumption and production is achieved, the efficiency of the reproducing process for society in general and the development of a separate enterprise is increased.

In addition, it is necessary to pay attention to one of the peculiarities of the influence of the external environment, namely, economic reforms in Ukraine, which have led Ukrainian society to the field of uncertainty. Therefore, it is necessary to take into account the mutual influence of subjects and objects of management in the functioning of the production infrastructure of the enterprise which are the main stages of building a mechanism for the effective use of the enterprise's potential, methods of system analysis, offering solutions to the problem of efficiency of using the potential of the enterprise in the Zaporizhzhya region.

It is determined that as a result of the ambiguity of environmental factors during the transformation of the Ukrainian economy, there is a significant shift in emphasis on the level of industrial enterprises. Therefore, as a result of the existence of the company's relations with the external environment, which become even more complex and diverse due to mutual agreement, constant improvement and dependence on the specifics of the enterprise itself, the dependence of the efficiency of functioning on the impact of changes in external conditions, the production process efficiency its profitability are the problems to be solved.

**Discussion.** To create effective economic mechanisms of enterprises that are able to meet such conditions, it is necessary to form a structure of optimal relations with the external environment for the enterprise, which will provide high-quality input data. It should be noted that the input is associated with the receipt of information from the market - about the capacity of the market, the needs of consumers, competitors, the possibility of crisis situations, their causes, prevention opportunities, the peculiarities of crisis management, as well as the provision of production with material, labor and financial resources. Output connections are determined by production volumes and sales mechanisms of finished products.

Consequently, the company interacts with the external environment on two levels: information and substance, which requires the creation of effective organizational forms and methods for ensuring the development and adaptation of industrial enterprises to the external environment. Due to the rather solid age of the enterprise PJSC "ZERZ", it is advisable to consider organizational and economic mechanisms through restructuring. This method of internal restructuring of the enterprise involves innovative approaches to the management systems of the organizational, technological, personnel component, which can ensure the effectiveness of the economic mechanism of the enterprise.

The necessary stage of restructuring is to establish a mission, which consists in determining its own, inherent only in a particular enterprise way of achieving competitiveness. On the basis of mission-defined goals and analysis of information, the appropriate restructuring model (technological or organizational) is selected and measured for its implementation in outlining. The technological restructuring model is a priority for PJSC "ZERZ", both for the enterprise with "moving" technologies based on multifunctional assets and "market" (further improvement of technologies is envisaged), and "ahead of" technologies that are able to implement leap-shaped changes in production processes.

The criteria for performance assessments have been shown to be many indicators, the choice of which depends on the specific interest of the party with a certain interest in profitability, innovation, sociality, environmental friendliness, timeliness, competitiveness, etc. As for the requirements for the construction of indicators and the organization of performance assessment, they should be simplicity, specificity, clarity, flexibility, direction, motivationality.

It was noted that the main thing for the adoption of management actions on restructuring is to assess its effectiveness. The effectiveness of the restructuring of the enterprise is considered as the ratio of the established goals to the needs or the result of activities relative to the intended goals, the result of activities to the costs (resources) necessary to achieve it.

Among the changes that ensure the effectiveness of economic processes at the enterprise can be considered restructuring in the structure of the organizational and economic mechanism of management of the development of an industrial enterprise. Structural elements of the organizational structure concentrate resources according to the goal, and unlike other types of systems, each element of it is active, that is, it decides on the organization of actions for development. The need to create the

effective associations should be taken into account as the influence of the component of the supersystem - the external environment on the development of the enterprise.

**Conclusions.** Methodical approach in determining the impact of business activity indicators on profitability indicators using a matrix approach has been formed, the implementation of which allows regulating profitability indicators as well as the level of profitability. It contributes to the growth of efficiency in industrial enterprises. It is determined that efficiency is an important indicator for enterprises and there is a need for its constant improvement, formation of promising directions of development.

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