ЕКОНОМІКА ТА УПРАВЛІННЯ ПІДПРИЄМСТВАМИ

UDC 338

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METHODICAL APPROACHES TO EVALUATION OF FIXED ASSETS IN ECONOMIC EFFICIENCY OF FORMATION AND USE

МЕТОДИЧНІ ПІДХОДИ ДО ОЦІНКИ ЕКОНОМІЧНОЇ ЕФЕКТИВНОСТІ ФОРМУВАННЯ ТА ВИКОРИСТАННЯ ОСНОВНИХ ЗАСОБІВ

The article summarizes the methods of analyzing the effectiveness of fixed assets in terms of the content of the stages of their implementation and the choice of performance indicators. It is noted that the approach to assessing economic efficiency should be based on the essential characteristics of fixed assets as an element of the enterprise's capital. Formulas are proposed for assessing the effectiveness of fixed assets at the stage of their formation and production use. On the basis of information published by one of the leading enterprises in the chemical industry, a factor analysis of the criterion indicator was carried out. According to the results of the analysis, the most significant impact on reducing the efficiency of using the fixed assets of the enterprise led to a decrease in the average hourly productivity of the active part and a decrease in product profitability.
Key words: efficiency, fixed assets, profitability index, profitability, analysis, formation, use, criterion indicator.

У статті узагальнені методики аналізу ефективності основних засобів з точки зору змісту етапів їх реалізації та вибору показників ефективності. Наголошено, що підхід до оцінки економічної ефективності основних засобів повинен базуватися на сутнісних характеристиках основних засобів як елементу капіталу підприємства. Запропоновані формули для перевірки на стадії формування основних засобів двох вимог: інвестований у основні засоби капітал має бути повністю відшкодованим, але з певним приростом його вартості. Із усієї сукупності показників ефективності реальних інвестиційних проектів виділено індекс рентабельності інвестицій, який не тільки характеризує рівень їх прибутковості, а й динаміку простого та розширеного відтворювального процесу. Зроблено висновок відносно того, що підхід до вибору креитіального показника ефективності основних засобів повинен бути однаково спрямованим та взаємообумовленим на різних стадіях їх руху. Запропоновано на стадії формування основних засобів аналізувати не тільки рівень прибутковості та можливість повного відшкодування інвестованого у основні засоби капіталу, а також здійснювати порівняння розрахункового індексу рентабельності інвестицій із фактичним рівнем фондорентабельності основних засобів підприємства. До реалізації необхідно прийняти тільки ті інвестиційні проекти, які у майбутньому дозволять підвищити фактичний рівень ефективності використання основних засобів підприємства. На наступній стадії виробничого використання показник фондорентабельності дозволяє охарактеризувати ефективність використання основних засобів не тільки з точки їх продуктивності, а й

витратомісткості та рівня прибутковості. Вираження фондорентабельності як добутку фондовіддачі та коефіцієнту рентабельності товарної продукції дає можливість використання наявного методичного інструментарію аналізу показника фондовіддачі. На підставі інформації, оприлюдненої одним із провідних підприємств хімічної промисловості, було здійснено факторний аналіз критеріального показника. За результатами аналізу найбільш суттєвий вплив на зменшення ефективності використання основних засобів підприємства спричинило зниження середньогодинної продуктивності їх активної частини та зниження рентабельності продукції.

Ключові слова: ефективність, основні засоби, індекс рентабельності, фондорентабельність, аналіз, формування, використання, критеріальний показник.

Formulation of the problem. Ensuring the efficiency of production as a whole necessitates the efficient use of each production resource separately. First of all, this applies to the most estimated resource – fixed assets (FA). Decisions to ensure the effective use of FA should be based on the results of the analysis. The proposals presented in the economic literature on the methodology of analysis of the economic efficiency of FA need to be generalized and developed in the direction of substantiating the choice of efficiency criteria at different stages of the FA movement.

Analysis of recent research and publications. The analysis showed that scientists have a slightly different approach to the content of the methodology of analysis of FA and the choice of indicators of their effectiveness. For example, Gnatenko E. presented the algorithm of the analysis of industrial FA of the enterprise in the following sequence: the analysis of structure and structure of FA; analysis of the company's capacity, compliance with its production program of the enterprise; analysis of technical condition of FA; analysis of the movement of production FA; analysis of economic efficiency of FA functioning; factor analysis of the effectiveness of FA use; preparation of conclusions and draft decisions of management to increase production and return on assets. In this case, to assess the effectiveness of the use of FA as a whole and their active part, the author uses the following indicators: return on assets, capital intensity, profitability [1, p. 101]. Selivanova N., Tkachenko Yu., Popko Ya. identify the following stages of the analysis of FA: collection of information on all available at the enterprise FA; analytical research FA; processing of analytical data and generalization of the obtained results; development of measures to increase the efficiency of FA use; control over the implementation of management decisions. The authors argue that the effectiveness of the use of FA is characterized by indicators of return on assets, capital intensity, capital adequacy. [2, p.99-100]. Bagriy K. as a generalizing indicator of the FA efficiency of the enterprise considers capital efficiency and allocates the following stages of the analysis: the factor analysis of capital efficiency; analysis of intensive and extensive use of production equipment; analysis of the efficiency of production areas [3, p. 198]. Yelkin A. also investigates the factors influencing the level of return on assets [4, p. 43-44].

It should be noted that in practice, the dynamics of efficiency indicators of the FA use, as a rule, has a multidirectional nature. Thus, at the same time the company may see an increase in production and a decrease in profitability, including FA profitability. In order to eliminate this shortcoming Yurchyshen L. and Volynets S. propose the use of complex (integrated) indicators, which are determined by extracting the square root of the product of return on assets, profitability and the level of efficiency of the use of FA for employment (the ratio of productivity and average annual cost of FA) [5].

Thus, the proposals presented in the economic literature on the method of analysis of the effectiveness of the use of FA enterprises relate mainly to the separation of the stages of analysis and the content of its implementation. In this case, the methods are based on different performance indicators. In our opinion, the importance of ensuring the effectiveness of the use of FA as an element of capital of the enterprise proves the need for further research to substantiate the criterion of the FA efficiency at different stages of their movement.

Formulation of the goals of the article. The article discusses the choice of the FA efficiency criterion indicator at the stages of their formation and production use.

Presentation of the main research material. The mechanism for managing the process of FA production use provides for the mandatory presence of a criterion and a criterion indicator. In the economic literature, the criterion is considered as a property, a feature, a measure, on the basis of which the assessment is made [6]. The criterion should be based on the main property of the object of evaluation. From the point of view of the considered question, FA is a component of the general capital of the enterprise. That is why the justification of the choice of the criterion indicator should be carried out taking into account the main properties of such category as "capital", namely: 1) the capital invested in FA is constantly in motion; 2) the capital invested in FA must be fully reimbursed; 3) the capital invested in FA must be reimbursed with a certain increase in value, i.e. profit.

The capital invested in FA goes through several stages, of which we distinguish the stages of formation and production use. In this case, the evaluation of the effectiveness of FA is carried out at each stage. Consider the question in more detail.

Stage of formation of. At this stage, the effectiveness of real investment projects is analyzed using a system of the following indicators: net present value *(NPV),* investment profitability index *(PI),* internal rate of return *(IRR),* payback period of the investment *(PP)*. It should be noted that in order to prove the effectiveness of the practical implementation of investments in FA, as a rule, the whole set of these indicators is calculated. From the point of view of the issue under consideration, preference should be given to PI.

In general, PI is the ratio of discounted input and output cash flows. So important components of the incoming cash flow of a real investment project are the cumulative discounted profit ($\sum_{t-1}^{T}\frac{P_t}{(1+i)^t}$), received for the entire period of the project (*T*), and the cumulative amount of discounted depreciation deductions ($\sum_{t-1}^{T}\frac{A_t}{(1+i)^t}$). The initial cash flow is an investment in the formation of the FA of the enterprise (IC_O). The project is considered effective if $PI \succ 1$.

In our opinion, the content of the methodology for evaluating the effectiveness of FA at the stage of their formation should be expanded in the direction of testing two more conditions.

„Condition 1" - capital invested in FA must be fully reimbursed. In this case, to enable the characterization of the reproduction process IP should be presented as the addition to the profitability ratio (K_P) and the rate of return on initial investment in FA (K_{IC_O}):

$$PI = K_P + K_{IC_o},\qquad(1)$$

The separated components can be used as characteristics of the reproduction process: K_{IC_O} - simple, K_P - extended. In this case, the "time factor" affects the dynamics of the components of PI in different ways. At the same time, it leads to an increase in additional profit and to the loss of part of the value of cumulative depreciation deductions (Fig. 1).

Thus, in order to avoid possible financial losses of capital value in the process of real investment already at the stage of formation of FA it is necessary to carry out mandatory verification of „Conditions 1" and accept the project for implementation if:

$$\frac{\sum_{t=1}^{T}\frac{P_t}{(1+i)^t}}{IC_O} + \left[1 - \frac{\sum_{t}^{T}\frac{A_t}{(1+i)^t}}{IC_O}\right] \succ 1,\qquad(2)$$
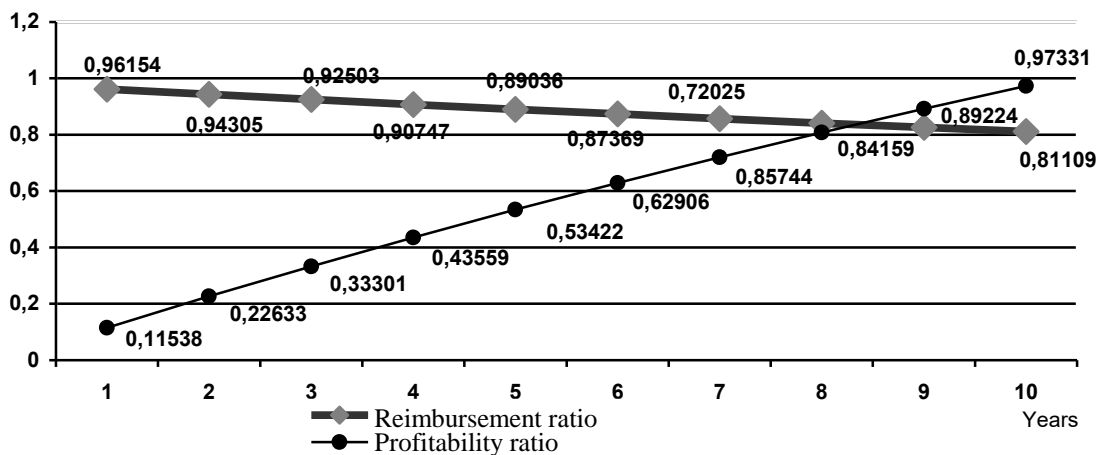
Fig. 1 Influence of time factor on the dynamics of PI components

„Conditions 2" - capital invested in FA must be reimbursed with a certain increase in value. In our opinion, to answer the question " How much should this increase in value be?" it is necessary to compare the estimated value with the actual level of profitability of the FA of the enterprise, i.e. the actual level of return on equity (*ROE*). The project is accepted for implementation if:

$$\frac{\sum_{t=1}^{T}\frac{P_t}{(1+i)^t}}{IC_O}+\left[1-\frac{\sum_{t}^{T}\frac{A_t}{(1+i)^t}}{IC_O}\right]-1\geq ROE\,, \qquad (3)$$

It should be noted that the comparison by formula (3) makes sense only when *ROE* of the enterprise has a positive value (otherwise „Conditions 1" is not met).

Thus, at the stage of formation of FA as a criterion of efficiency it is necessary to accept *IP* , a component of which is the coefficient of profitability. This will allow you to analyze both the level of return on investment in FA and the dynamics of the reproduction process.

Stage of production use of FA. At this stage, the effectiveness of the use of existing FA at the enterprise is analyzed. It should be noted that the existing methodological support for the analysis of the FA use effectiveness is mostly based on the indicator of „return on assets" (*ROA*). Dynamics of *ROA* as a characteristic of the efficiency of FA in general in Ukraine and in industry is shown in Fig.2.

Declining dynamics of *RAO* corresponds to the dynamics of production volumes. So, in December 2019 against December 2018. the index of industrial production, adjusted for the effect of calendar days, was 91.7%. For comparison, the indices of industrial production are shown in Fig.3.

It should be noted that the formation of the methodology for assessing of he FA cost-effectiveness should be based on a systematic approach. This makes it possible to explore the issue comprehensively.

Thus, the use of *ROE* as a criterion for the effectiveness of FA at the stage of their production use makes it possible to ensure compliance with the approaches to determining the effectiveness at different stages (Fig. 4). It is important that *ROE* characterizes the efficiency of FA use not only in terms of their productivity, but also taking into account the cost of production and the level of

profitability. At the same time, the expression of ROE as a product of ROA and the coefficient of profitability of marketable products (K_{PMP}) allows the use of existing methodological tools for the analysis of ROA, primarily factor analysis.
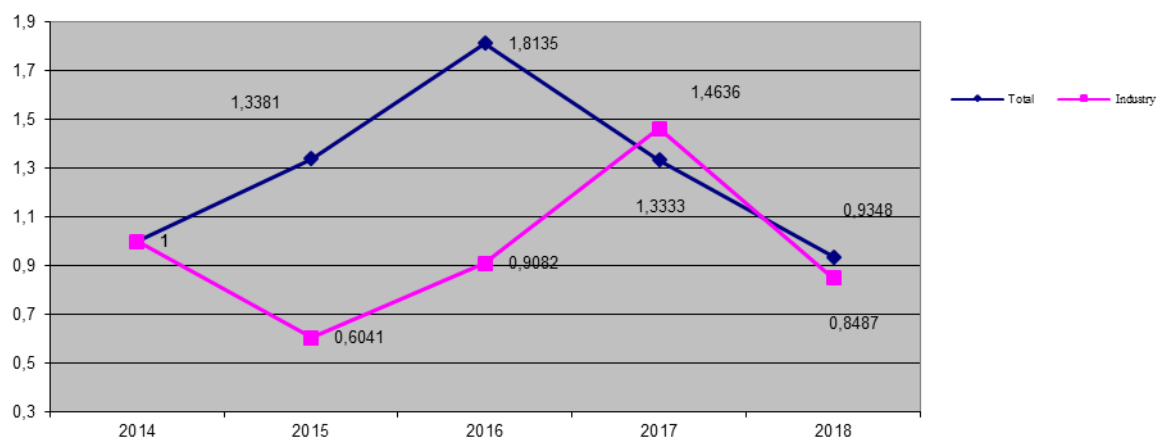

Fig. 2 Dynamics of return on assets (chain indices)*

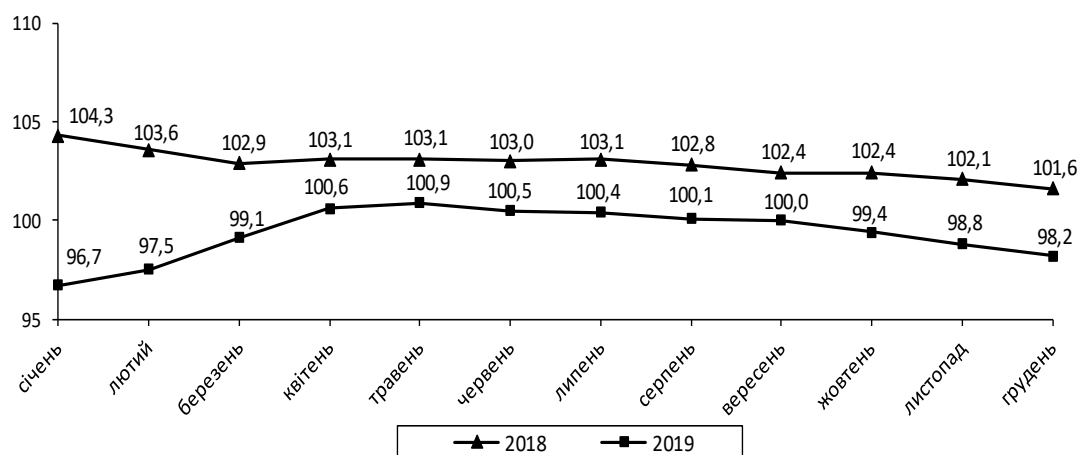*Source: built by the author according to the Main Department of Statistics of Ukraine[7]*

Fig.3. Indices of industrial production (in% to the previous year, cumulative total) [7]

We conducted a factor analysis of the FA efficiency index of PJSC "DniproAzot". It is important that the problem of formation of competitive advantages at the expense of a technical component is especially actual for the enterprises of the chemical industry [8].

PJSC "DniproAzot" is one of the ten leading enterprises of the chemical industry of Ukraine in terms of growth of marketable products, profit and growth of gross income.
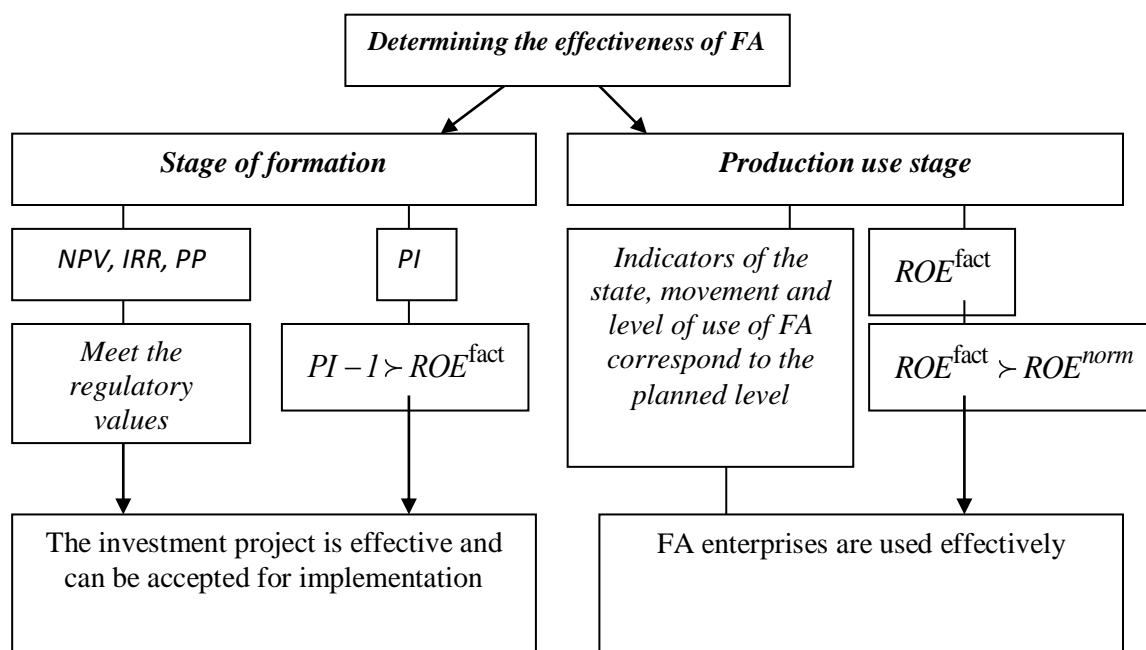
Fig.4. ROE in the system of efficiency indicators FA

The company ranks 2nd in terms of share in the totalvolume of sold chemical products in Ukraine (8.8%) and in terms of the share in the volume of sold main chemical products, fertilizers and nitrogen compounds (14.5%) [9, p.35]. Thus, according to the results of the analysis, the most influential factors of change were the decrease in the average hourly productivity of the active part of FA and the decrease in product profitability (Table 1).

Table 1. The results of factor analysis of *ROE*

Forming factors of *ROE*	Factor change index	Influence of a factor on change of *ROE*
Average hourly productivity of the active part of FA	0,516927	-0,3320
The proportion of the active part of the FA	1,016414	0,0113
Product profitability	0,625502	-0,2574

Source: calculated by the author according to the data [10]

FA enterprises are also characterized by a high level of wear. For example, the wear of the active part is 77.4%. On the positive side, the company's reproduction policy meets the needs of improving the technical condition and reducing the level of wear and tear of FA. So, the input ratio of the FA of the enterprise (5.85%) significantly exceeds the disposal rate (0.36%).

Conclusions. Thus, in modern economic conditions, the problem of ensuring the efficiency of each type of resources, including FA, becomes especially relevant. The offered methodical approaches to the substantiation of a choice of criterion indicators of the FA efficiency as an important element of the capital of the enterprise allow to carry out logical combination of the maintenance of the analysis of the FA efficiency at stages of their formation and industrial use. The results of the study allow to improve the management mechanism of FA at the enterprise level and can be used in the real practice of project analysis, as well as in the educational process of training higher education in economic specialties..

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