

## METHODICAL ASPECTS OF ASSESSING POTENTIAL AREAS OF BUSINESS RISKS OF ENTERPRISES IN THE OIL AND GAS INDUSTRY OF UKRAINE

**Olha Komelina**

Doctor of Economics, Professor  
National University "Yuri Kondratyuk Poltava Polytechnic" (Poltava, Ukraine)  
ORCID: 0000-0001-9297-4985  
komelinaolha@gmail.com

**Svetlana Shcherbinina**

PhD in Economics  
National University "Yuri Kondratyuk Poltava Polytechnic" (Poltava, Ukraine)  
ORCID: 0000-0002-1034-3619  
scherbininasveta@gmail.com

**Vitalii Krainiev**

postgraduate  
National University "Yuri Kondratyuk Poltava Polytechnic" (Poltava, Ukraine)  
ORCID: 0000-0002-8961-9058

*The evaluation of the management efficiency of oil and gas industry enterprises requires the study of the probability of occurrence of risk situations that may threaten their economic activity. Taking risk into account in the process of making managerial decisions reduces the probability of underpayment (loss) of income or profit, occurrence of a crisis situation or bankruptcy of the enterprise. Determination of risk limits, in turn, makes it possible to differentiate identified risks into acceptable, critical and catastrophic, and risk management is the lever with which enterprises have the opportunity to influence the results of their own economic activity. The article is aimed at researching the trend of the series of dynamics of financial and economic indicators of oil and gas industry enterprises using methods of quantitative assessments of the degree of risk. The problems of functioning and development of oil and gas production enterprises of Ukraine are considered. Two enterprises of the oil and gas industry of Ukraine were chosen for the study, which differ in the form of ownership, production capacities and specifics of economic development in the national market of primary sale of natural gas. The efficiency of the management of the state-owned enterprise Joint Stock Company "Ukrgezvydobuvannia" and the Privat Joint Stock Company "Naftogazvydobuvannia" was compared in terms of the profitability of production assets, current assets and equity. Three potential zones of business risks (acceptable, critical, catastrophic) for the resource base and financial results of the enterprises are defined. Based on the results of the research presents the threshold values of the risk zones of the financial and economic indicators of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia". The probability of JSC «Ukrgezvydobuvannia» and PrJSC «Naftogazvydobuvannia» falling into potential areas of entrepreneurial risk under different scenarios of the development of the political and economic situation in Ukraine and, accordingly, different risk criteria, was determined.*

**Key words:** oil and gas production enterprises, risk, entrepreneurial risk, risk zones, risk criteria, probability.

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**Introduction.** The current level of dynamism and uncertainty of the external conditions for conducting business leads to the deterioration of the financial and economic condition of enterprises in the oil and gas industry of Ukraine, which is one of the main budget-generating branches of the domestic economy, and from the point of view of energy security, the most important for the sustainable development of the country, since Ukraine traditionally uses for own needs energy sources oil, natural gas, coal, which together make up more than 60%

of the energy balance. Business activity is always influenced by a combination of external and internal factors. The external environment of enterprises of the oil and gas industry of Ukraine is formed under the influence of a large set of factors, which negatively affects their internal environment and financial and economic condition. Taking risk into account in the process of making managerial decisions reduces the probability of underpayment (loss) of income or profit, occurrence of a crisis situation or bankruptcy of the enterprise.

An overview of recent research sources and publication. The issue of assessing the efficiency of oil and gas enterprises, taking into account the risk factors of the external and internal environment, was studied by foreign and Ukrainian scientists. For example, Xiaolong He, Chaoyi Wang, Xiaowei Yang, and Zhoujing Lai (2021) [1] developed a TOPSIS-GRA entropy evaluation model for financial performance indicators of Chinese state-owned and private enterprises in the energy and gas industry. Anita Meidell and Katarina Kaarbøe (2017) [2] studied how the risk management system (ERM) affects decision-making using the example of an oil and gas company. Seon Tae Kim, and Bongseok Choi (2019) [3] evaluated the effect of price risk hedging for oil (or gas) production and processing projects. Michał Rubaszek, Karol Szafranek, and Gazi Salah Uddin (2021) [4] analyzed the dynamics of the US natural gas market using the Bayesian SVAR model and noted that market demand shocks are the main source of fluctuations in natural gas prices. Fan Chen, Scott C. Linn (2017) [5] substantiated that for regions of the world dominated by private independent oil companies, changes in investments in oil and natural gas fields, which are estimated by the cost of using drilling rigs, respond positively to changes in high prices for oil and natural gas. Fenglong Ge and Ying Fan (2013) [6] studied how world oil prices, import volumes, diversification index, as well as the political and economic situation in exporting countries affect the risks of importing crude oil to China, and also proposed a method for implementing optimal crude oil import strategies. Among Ukrainian scientists, we like to state the research of Fadeeva I.G., and Pyrig A.M. (2019) [7] risk-environments of modern oil and gas production enterprises. Kis S.Ya., Kis G.R., and Vivchar G.O. (2014) [8] studied the characteristic features and differences of capitalization processes of oil and gas complex enterprises. I.M. Khvostina (2020) [9] investigated the trends of the series of dynamics of integrated indicators of the financial condition of oil and gas-producing enterprises, under conditions of uncertainty and risk, using methods of financial analysis and taxonomic procedures. Hryniuk O.I. (2016) [10] ranked the risk factors of oil and gas production enterprises within risk groups according to the probability of their occurrence. The analysis of the latest research shows the need for further improvement of the existing methodical approaches to the assessment of business risks of oil and gas industry enterprises and the improvement of the effectiveness of their management.

**The main purpose of the article.** The purpose of the article is to improve the methodical approach to assessing potential areas of business risks (acceptable, critical, catastrophic) using various risk assessment criteria for the resource base and financial results of oil and gas complex enterprises, taking into account

various scenarios of the development of the political and economic situation in Ukraine.

**Research methods.** The article used general research methods, including synthesis, analysis, comparison, graphic methods for visualizing the research material. Among the special methods, it is possible to single out methods of quantitative assessments of the degree of risk to determine potential areas of business risks and the probability of enterprises losing part of their resources and not receiving income.

**The main results of the research.** The author's scientific-methodical approach to assessing potential areas of entrepreneurial risks of enterprises in the oil and gas industry of Ukraine includes two stages. The first stage involves the formation of an information base (that is, the determination of key factors and financial and economic evaluation indicators) and their analysis. The second stage involves the potential areas of entrepreneurial risks and the assessment of the probability of their occurrence for the enterprises under the study. Two enterprises of the oil and gas industry of Ukraine were chosen for the study, which differ in the form of ownership, production capacities and specifics of economic development in the national market of primary sale of natural gas.

Economic analysis shows that JSC "Ukrgezvydobuvannia" is the largest gas production company in Central and Eastern Europe, which produces 73% of natural gas and specializes in the production of gas condensate. The company operates on the territory of 12 regions of Ukraine, 96 districts and more than 300 territorial communities. JSC "Ukrgezvydobuvannia" is a 100% subsidiary of National Joint Stock Company "Naftogaz of Ukraine" [11]. PJSC Naftogazvydobuvannya is the largest Ukrainian private gas production company. The company operates in the Poltava and Kharkiv regions. The main shareholder of the company is the energy company DTEK [12].

Oil and gas industry enterprises are characterized by a large share of machinery and equipment in the structure of fixed assets, significant capital investments, which are necessary for the development of the oil and gas industry, and relatively large amounts of fixed assets, which account for one hryvnia of finished products, compared to other branches of industry in Ukraine. Provision of basic means in the economic process is carried out by forming long-term capital investments in the form of new construction, reconstruction, expansion, technical re-equipment of objects, including geological exploration and design and search works, construction and arrangement of wells, deconservation of old wells and intensification of extraction of them, by purchasing new buildings, structures, machines, equipment, environmental facilities, obtaining fixed assets as contributions to the author-

ized capital or free of charge, etc. Oil and gas production enterprises are characterized by a high specific weight of the cost of buildings (more than two-thirds in the composition of fixed assets). At the same time, wells account for 60-70%, for working machines and equipment – 10-15%, for transmission devices – almost 15%, for buildings, power equipment and vehicles – from 1 to 3% [13]. Therefore, to ensure the efficient operation of oil and gas industry enterprises, significant assets are needed, and the results of their activity largely depend on the availability and condition of fixed assets and other material non-current assets that ensure the economic stability of economic entities. The formation, state, structure and use of current assets of oil and gas enterprises have a significant impact on the efficiency of their operation. One of the general criteria for the efficiency of the use of current assets is current assets, which should be minimal, but sufficient for the successful and uninterrupted operation of the enterprise. In the structure of current assets of oil and gas enterprises, receivables have a significant specific weight, which significantly increases the risk of non-return of funds and reduction of their liquidity.

One of the criteria for the successful development of an enterprise is its capitalization. The source of the increase in the cost of capital can be considered an increase in profit, which is based on the added value created in the enterprise. The result of increasing the amount of profit will be to direct part of it to expanded

reproduction and increase of own capital. The process of capitalization of enterprises in the oil and gas industry is characterized by the use of real material resources, monetary capital, the result of which is the expansion of production, the acquisition of new modern technologies and the modernization of production processes.

Table 1 shows the dynamics of the main financial and economic indicators of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" for 2015–2020 [11; 12].

The significant deterioration of the financial condition of JSC "Ukrgezvydobuvannia" is associated with a number of reasons, one of them being the company's failure to implement the "20/20" Program within the framework of the Concept of the Development of the Gas Production Industry of Ukraine (2016), which declared the achievement of production volumes of 20 billion cubic meters of gas until 2020. In 5 years, it was planned that JSC "Ukrgezvydobuvannia" should produce 84.5 billion cubic meters of natural gas. Increasing the volume of domestic production and reducing domestic consumption of natural gas would make it possible to reduce the volume of imported gas purchases from 14 billion cubic meters in 2015 until complete refusal of imports in 2020. The actual volumes of natural gas production of JSC "Ukrgezvydobuvannia" turned out to be much smaller than determined by the "20/20" Program, Figure 1.

**Table 1 – Main financial and economic indicators of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" for 2015–2020, million USD**

| Indicator                             | 2015   | 2016   | 2017   | 2018   | 2019   | 2020  | Growth rate, % | Growth rate, % |
|---------------------------------------|--------|--------|--------|--------|--------|-------|----------------|----------------|
|                                       |        |        |        |        |        |       | 2018/2019      | 2020/2019      |
| <b>JSC "Ukrgezvydobuvannia"</b>       |        |        |        |        |        |       |                |                |
| Fixed assets                          | 1781   | 2335   | 2772   | 3338   | 4088   | 3572  | 22,45          | -12,6          |
| Current assets                        | 175    | 965    | 1101   | 1104   | 754    | 558   | -31,67         | -26,0          |
| Equity                                | 1747   | 2423   | 3504   | 4186   | 4715   | 3953  | 12,63          | -16,2          |
| Net profit (loss)                     | 6      | 435    | 1091   | 970    | 780    | 174   | -19,59         | -77,7          |
| Profitability of production assets, % | 0,34   | 18,61  | 39,36  | 29,06  | 19,09  | 4,88  | -34,31         | -74,4          |
| Return on current assets, %           | 3,43   | 45,03  | 99,11  | 87,88  | 103,44 | 31,23 | 17,71          | -69,8          |
| Return on equity, %                   | 0,34   | 17,94  | 31,14  | 23,17  | 16,55  | 4,41  | -28,59         | -73,4          |
| <b>PJSC "Naftogazvydobuvannia"</b>    |        |        |        |        |        |       |                |                |
| Fixed assets                          | 51     | 95     | 161    | 212    | 283    | 230   | 33,09          | -18,7          |
| Current assets                        | 139    | 235    | 407    | 346    | 393    | 434   | 13,69          | 10,5           |
| Equity                                | 206    | 326    | 537    | 754    | 1046   | 1001  | 38,85          | -4,3           |
| Net profit (loss)                     | 76     | 197    | 240    | 250    | 110    | 177   | -56,00         | 60,9           |
| Profitability of production assets, % | 125,82 | 189,35 | 145,08 | 116,08 | 38,46  | 74,97 | -66,87         | 94,9           |
| Return on current assets, %           | 54,17  | 83,89  | 59,06  | 72,27  | 28,00  | 40,66 | -61,25         | 45,2           |
| Return on equity, %                   | 36,67  | 60,55  | 44,76  | 33,16  | 10,52  | 17,65 | -68,27         | 67,7           |

Source: constructed by the authors based on data [11; 12]



**Figure 1 – Dynamics of natural gas production by JSC “Ukrgezvydobuvannya” according to the 20/20 Program**

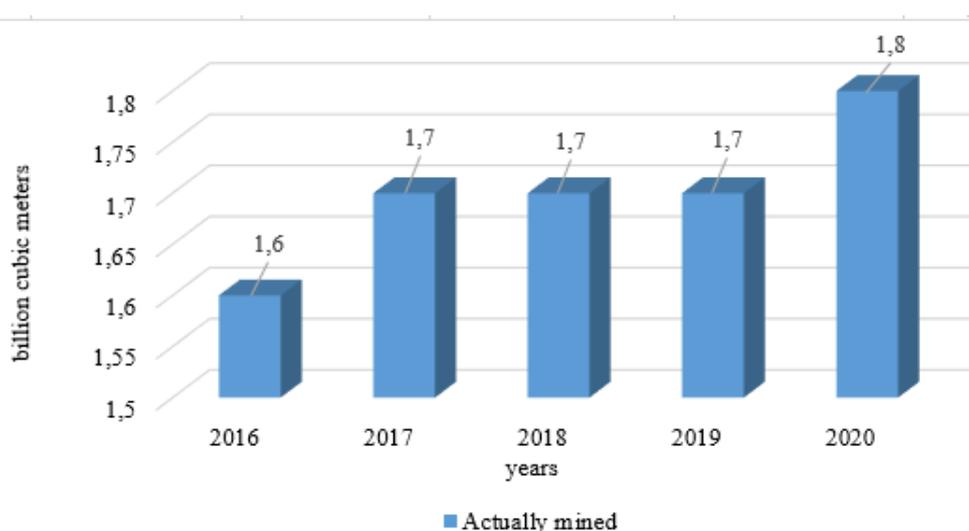
*Source: constructed by the authors based on data [14]*

During the research period (2015–2020), the actual volume of natural gas produced by JSC “Ukrgezvydobuvannya” amounted to about 74.9 billion cubic meters of natural gas. Thus, during this period, the planned production volumes were not fulfilled by 10 billion cubic meters, which was accompanied by non-fulfillment of other production and financial indicators that directly affected the implementation of the “20/20” Program (in particular, the construction of wells and financing of capital investments). In fact, despite multi-billion operating and capital expenditures, the state-owned company JSC “Ukrgezvydobuvannya” has reduced the volume of gas production, which primarily indicates the inefficiency of corporate management. At the same time, we are observing a situation where the

private company PJSC “Naftogazvydobuvannya” during the same period ensured an increase in natural gas production (an increase of 11.3% in 2020), Figure 2.

Taking into account the deterioration of the financial condition of JSC “Ukrgezvydobuvannya” in 2019–2020 and PJSC “Naftogazvydobuvannya” in 2019, it is advisable to identify potential areas of business risks, which will make it possible not only to prevent the occurrence of risks, but also to increase the efficiency of economic activity, taking into account the probability of their occurrence.

Risk is the probability of an enterprise losing part of its resources, not receiving income, or incurring losses as a result of certain production, financial, or other activities [15]. Entrepreneurial risk is the dan-



**Figure 2 – Dynamics of natural gas production by PJSC “Naftogazvydobuvannya”**

*Source: constructed by the authors based on data [12]*

ger of potentially possible, probable loss of resources and underachievement of income in comparison with their expected value, focused on the rational use of resources. It also characterizes the probability of deviation from the goal, the final result that was determined during the development of planned indicators [16]. Enterprise risks may increase under the influence of the following conditions: doubts about the honesty or competence of enterprise employees (there is a high turnover of personnel, leading specialists of financial and accounting services), unfavorable internal and external conditions for the development of the enterprise (there is a decline in the industry, the number of bankrupt enterprises is increasing; insufficient the working capital of the enterprise, the qualitative composition of income deteriorates, for example, in connection with the growing risk associated with the sale of products on credit, changes in business practices), the occurrence of extraordinary events.

The risks of oil and gas industry enterprises are defined as the danger of an adverse event occurring in conditions of uncertainty of a set of initial data in the internal and external environment of the organization, which is quantitatively expressed in the relative probability of deviations of actual results from planned expectations and in absolute economic losses incurred in this case [8].

Analysis of business risks is a process in which the enterprise determines what risks arise when performing operational activities. A distinction is made between qualitative and quantitative risk analysis. Qualitative analysis is carried out with the aim of identifying risk factors, stages and works, during the execution of which the risk arises, that is, to establish potential risk zones, after which to identify all possible risks and carry out an analysis of possible damage from the manifestation of risks. Quantitative risk analysis complements qualitative risk analysis by quantifying the size of risks, namely by determining the numerical values of the probability of risk events and their consequences, the quantitative assessment of the degree of risk, the permissible level of risk. Quantitative analysis is based on probability theory, statistics, operations research theory.

The system of quantitative risk assessment indicators includes absolute and relative values [17]. In absolute terms, risk can be determined by the amount of possible losses in material (physical) or value (monetary) terms. In relative terms, risk is defined as the amount of possible losses, attributed to some base, in the form of which it is most convenient to accept either the property status of the enterprise, or the total cost of resources for this type of business activity, or the expected income (profit).

In applied studies of entrepreneurial risk, three most important basic indicators of risk are distinguished [18].

Indicator of acceptable risk:

$$W_{ac} = W(x_{ac}) = P(X \geq x_{ac}) \quad (1)$$

i.e.  $W_{ac}$  this is the probability that losses will be greater than their maximum permissible level of  $x_{ac}$ . The zone of acceptable risk is characterized by the fact that the enterprise will cover all costs in the worst case, and in the best case – will receive a profit significantly lower than the planned level.

Critical risk indicator:

$$W_{cr} = W(x_{cr}) = P(X \geq x_{cr}) \quad (2)$$

i.e.  $W_{cr}$  – this is the probability that losses will be greater than their maximum allowable critical level of  $x_{cr}$ . The critical risk zone is characterized by the fact that the company can not only lose profits, but also reimburse part of the costs at its own expense.

Catastrophic risk indicator:

$$W_{ct} = W(x_{ct}) = P(X \geq x_{ct}), \quad (3)$$

i.e.  $W_{ct}$  – it is the probability that losses will be greater than their maximum permissible catastrophic level of  $x_{ct}$ . Catastrophic risk can lead to the bankruptcy of the enterprise and its liquidation.

Knowledge of these indicators makes it possible to develop considerations regarding the possibility of making a decision regarding the implementation of a certain entrepreneurial activity. But for making a final decision, information about the values of the mentioned indicators is not enough, it is still necessary to set their limit values so as not to fall into the zone of unacceptable risk. Such values are called the criteria of acceptable, critical and catastrophic risk, respectively –  $k_{ac}$ ,  $k_{cr}$ ,  $k_{ct}$ .

Considering the variance ( $\sigma^2$ ) as a measure of risk, it should be noted that it allows in some cases to clearly identify the marginal chances of the decision-maker. The theoretical basis of this is laid in the well-known Chebyshev's inequality, which states that for any random variable with finite variance, almost all values are concentrated near the value of the mathematical expectation ( $m$ ).

If, as a result of a certain type of business activity, the values of  $m = M(X)$  and  $\sigma^2 = \sigma^2(X)$ , have been evaluated, as well as the values of the criteria for acceptable, critical, and catastrophic risks  $k_{ac}$ ,  $k_{cr}$ ,  $k_{ct}$ , have been established for the activity, then the limits of the values can be estimated so.

Let  $m = \lambda_m \sigma$ ;  $x_{ac} = \lambda_{ac} \sigma$ ;  $x_{ac} > m$ . Then

$$W_{ac} = P(X \geq x_{ac}) = P(X - m \geq x_{ac} - m) \leq P(|X - m| \geq |x_{ac} - m|) \leq \frac{\sigma^2}{\sigma^2(\lambda_{ac} - \lambda_m)^2} = \frac{1}{(\lambda_{ac} - \lambda_m)^2} \leq k_{ac} \quad (4)$$

$$\text{i.e. } \lambda_{ac} \geq \lambda_m + \frac{1}{\sqrt{k_{ac}}} \text{ or } \lambda_{ac} < \lambda_m - \frac{1}{\sqrt{k_{ac}}}.$$

When deriving formulas for estimates of  $x_{ac}$ ,  $x_{cr}$  та  $x_{ct}$  the inequality (for example, for  $x_{ac}$ )  $|X - m| \geq |x_{ac} - m|$ ,

which takes into account both  $X \geq x_{ac} \geq m + \sigma/\sqrt{k_{ac}}$  and  $X \leq x_{ac} \leq m - \sigma/\sqrt{k_{ac}}$  estimates, i.e. the following relationship holds:

$$P(|X - m| \geq |x_{ac} - m|) = P\left(X \leq m - \frac{\sigma}{\sqrt{k_{ac}}}\right) + P\left(X \geq m + \frac{\sigma}{\sqrt{k_{ac}}}\right) \leq \frac{1}{(\lambda_{ac} - \lambda_m)^2} \leq k_{ac}. \quad (5)$$

In the event that there is reason to believe that

$$P\left(X \leq m - \frac{\sigma}{\sqrt{k_{ac}}}\right) \leq P\left(X \geq m + \frac{\sigma}{\sqrt{k_{ac}}}\right), \quad (6)$$

then we come to the assessment:

$$P\left(X \geq m - \frac{\sigma}{\sqrt{k_{ac}}}\right) \leq \frac{1}{2(\lambda_{ac} - \lambda_m)^2} \leq k_{ac}. \quad (7)$$

Taking into account the conducted research, Table 2 shows: formulas for calculating the threshold level of fall-

ing into the zone of permissible, critical and catastrophic risk of the financial and economic indicators of JSC "Ukr-gazvydobuvannia" and PJSC "Naftogazvydobuvannia", the values of  $k_{ac}$ ,  $k_{cr}$ ,  $k_{ct}$  are set taking into account the increased risk of activity oil and gas industry of Ukraine in modern conditions; formulas for determining the probability of enterprises losing part of their resources and not receiving income using the Laplace function.

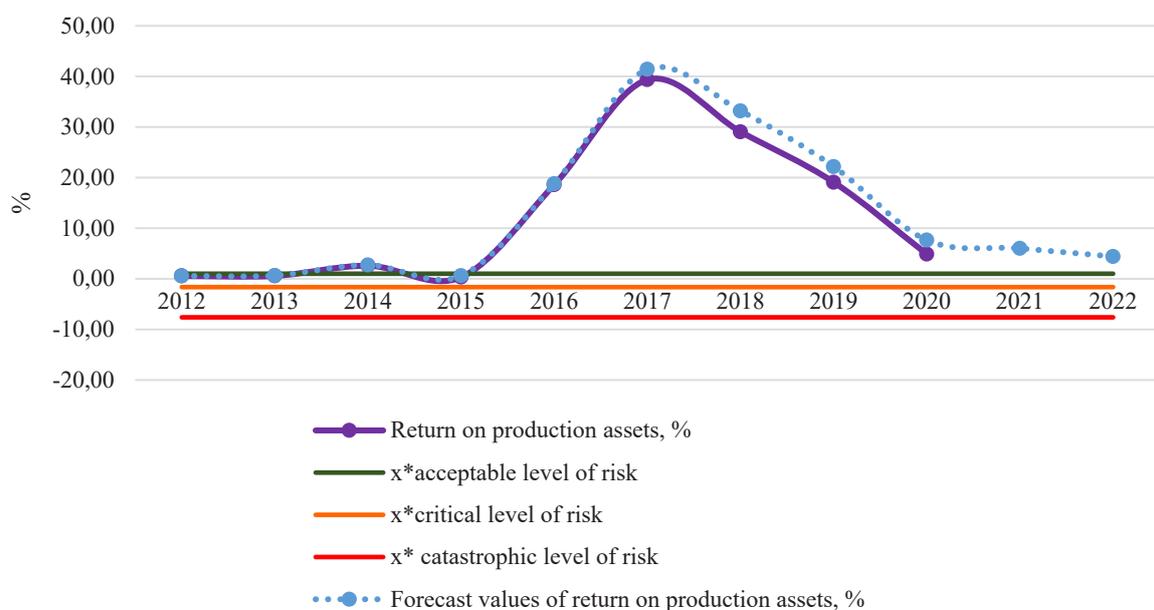
According to the given methodology, potential business risk zones for assets, capital, financial results and profitability indicators of JSC "Ukr-gazvydobuvannia" and PJSC "Naftogazvydobuvannia" were determined. To forecast the financial and economic indicators selected for the study, Holt's adaptive method was used, which is used to forecast time series when there is an upward or downward trend in the time series.

The dynamics of the profitability of the production assets of JSC "Ukr-gazvydobuvannia" and PJSC "Naftogazvydobuvannia" with the forecast for the studied period are presented in Figure 3-4.

**Table 2 – Main parameters for determining risk zones**

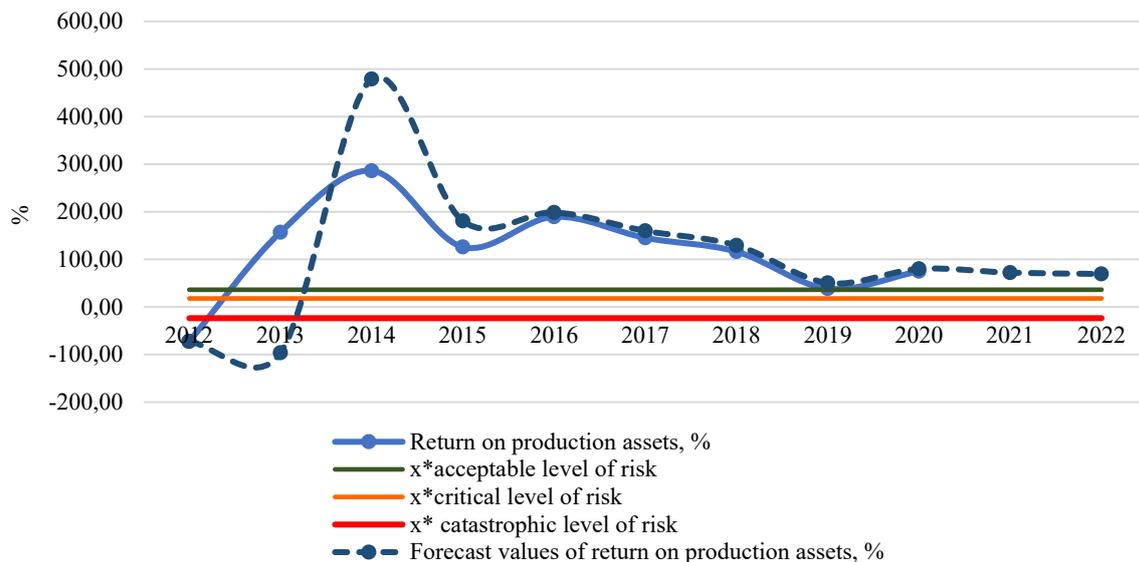
| Tolerable risk   | Critical risk  | Catastrophic risk  |
|--|--|--|
| $x_{ac}^* = m - \frac{\sigma}{\sqrt{2k_{ac}}}$                           | $x_{cr}^* = m - \frac{\sigma}{\sqrt{2k_{cr}}}$                           | $x_{ct}^* = m - \frac{\sigma}{\sqrt{2k_{ct}}}$                           |
| $W_{ac} = 0,5 + \left(\Phi\left(\frac{x_{ac} - m}{\sigma}\right)\right)$ | $W_{cr} = 0,5 + \left(\Phi\left(\frac{x_{cr} - m}{\sigma}\right)\right)$ | $W_{ct} = 0,5 + \left(\Phi\left(\frac{x_{ct} - m}{\sigma}\right)\right)$ |

Source: constructed by the authors based on data [18]



**Figure 3 – Dynamics of profitability of production assets of JSC "Ukr-gazvydobuvannia" with forecast and risk zone**

Source: developed by the authors



**Figure 4 – Dynamics of profitability of production assets of PJSC “Naftogazvydobuvannia” with forecast and risk zones**

Source: developed by the authors

Profitability of production assets is one of the key performance indicators of oil and gas enterprises, its control allows prompt decision-making regarding the modernization of the material base, the purchase of additional assets or the sale of inefficient fixed assets.

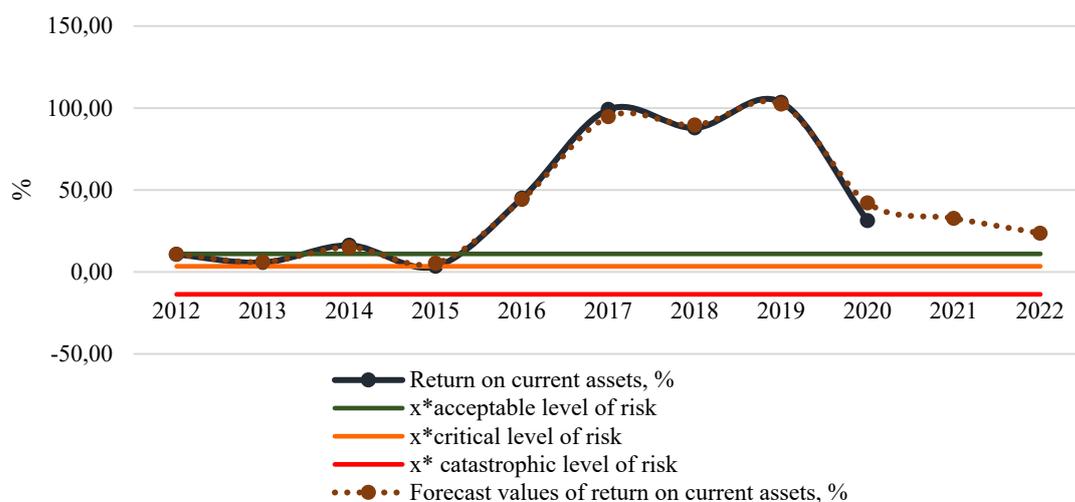
The dynamics of the profitability of current assets of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" with a forecast for the studied period is presented in Figure 5-6.

The profitability of working capital will be greater, the less resources the company spends to increase profit. However, the number of such assets must be sufficient to ensure continuous production. For enterprises of the

oil and gas industry, a decrease in the composition of current assets of receivables is relevant.

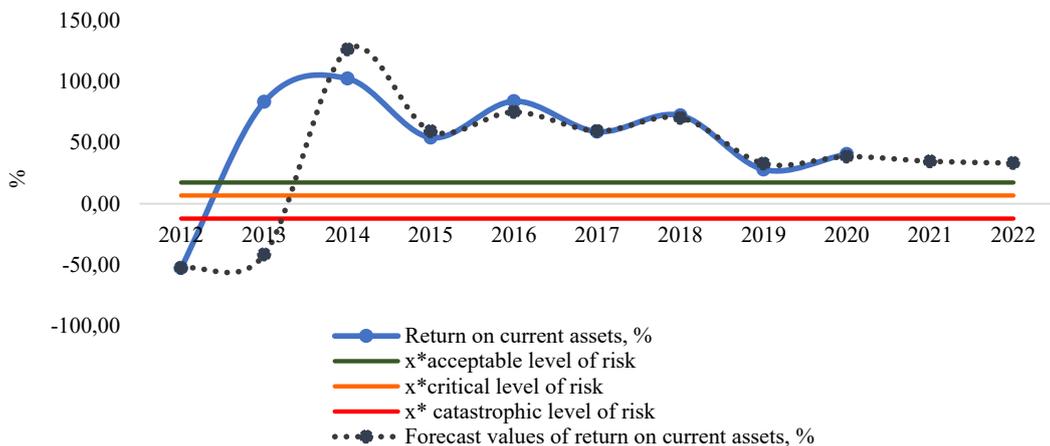
The dynamics of the return on equity of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" with a forecast for the studied period is presented in Figure 7-8.

Return on equity is one of the main indicators of investment profitability, which helps to assess the financial stability and investment attractiveness of the enterprise. A positive trend in the return on equity indicates that the company is reliable and capable of generating stable income, a decrease in this indicator may mean that the management is making the wrong decisions about investing in non-profitable assets.



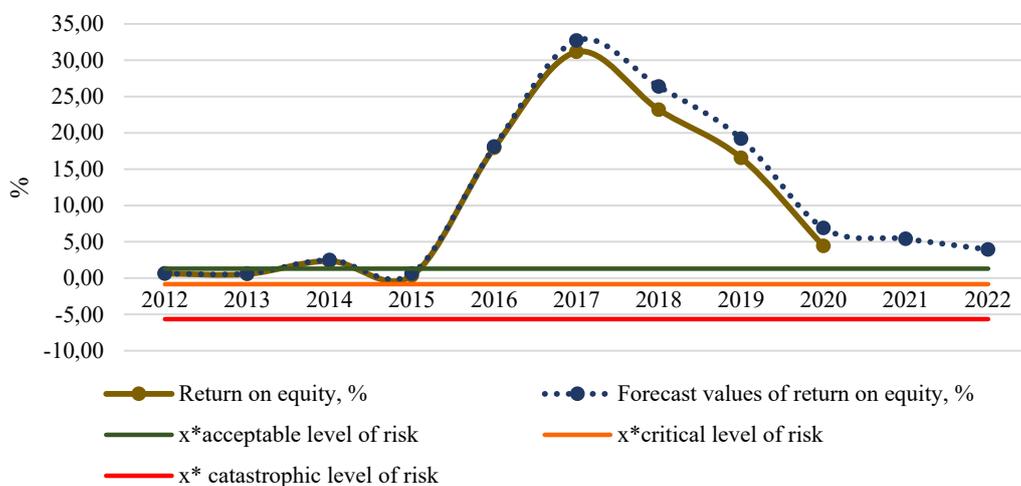
**Figure 5 – Dynamics of profitability of current assets of JSC “Ukrgezvydobuvannia” with forecast and risk zones**

Source: developed by the authors



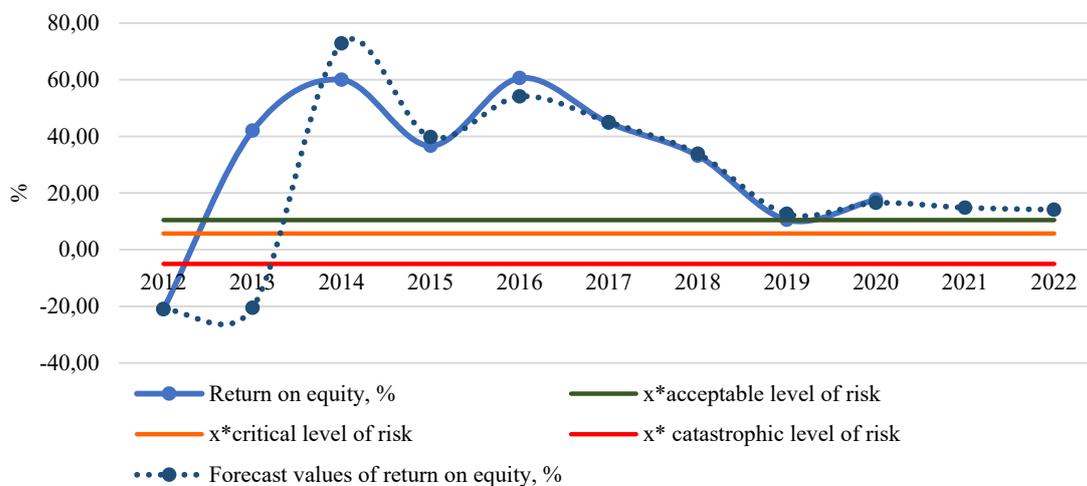
**Figure 6 – Dynamics of profitability of current assets of PJSC “Naftogazvydobuvannia” with forecast and risk zones**

Source: developed by the authors



**Figure 7 – Dynamics of return on equity of JSC “Ukrgezvydobuvannia” with forecast and risk zones**

Source: developed by the authors



**Figure 8 – Dynamics of return on equity of PJSC “Naftogazvydobuvannia” with forecast and risk areas zones**

Source: developed by the authors

So, comparing the considered indicators of profitability, it can be noted that PJSC "Naftogazvydobuvannia" uses production facilities more effectively, for 2013–2020, the profitability of production assets is many times higher than the indicators of JSC "Ukrgezvydobuvannia". The effectiveness of the use of working capital in enterprises is similar, but the trends are different. The highest rates of return on current assets were obtained by PJSC "Naftogazvydobuvannia" in 2013–2016, and by JSC "Ukrgezvydobuvannia" in 2017–2019. The efficiency of the use of equity capital is much higher at PJSC "Naftogazvydobuvannia", and therefore the attractiveness of investments is correspondingly better. In general, with the exception of 2012, which was unprofitable for PJSC "Naftogazvydobuvannia", the efficiency of the company's management is higher than that of JSC "Ukrgezvydobuvannia". Over the entire period of the study, the profitability indi-

cators of oil and gas enterprises were in most cases above the zone of permissible risk, in isolated cases at the marginal level of permissible risk, with the exception of 2012 for PJSC "Naftogazvydobuvannia" for all indicators, and 2013 and 2015 for JSC "Ukrgezvydobuvannia" on the profitability of current assets.

Based on the results of the research, table 3 presents the threshold values of the risk zones of the financial and economic indicators of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia".

Also, according to the results of the study, the probability of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" falling into potential business risk zones under different scenarios of the development of the political and economic situation in Ukraine and, accordingly, different risk criteria, was determined, Table 4.

Therefore, in the worst political and economic situation in the country (as shown by Russia's military

**Table 3 – Threshold values of risk zones according to financial and economic indicators of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia"**

| Indicators                            | x* acceptable level of risk | x* critical level of risk | x* cata-strophic level of risk |
|---------------------------------------|-----------------------------|---------------------------|--------------------------------|
| <b>JSC "Ukrgezvydobuvannia"</b>       |                             |                           |                                |
| Fixed assets, million USD             | 2 211 836                   | 2 052 258                 | 1 692 050                      |
| Current assets, million USD           | 286 631                     | 215 441                   | 54 747                         |
| Equity, million USD                   | 2 363 809                   | 2 170 591                 | 1 734 451                      |
| Net profit, million USD               | 31 008                      | -50 340                   | -233 963                       |
| Profitability of production assets, % | 1,01                        | -1,63                     | -7,61                          |
| Return on current assets, %           | 11,04                       | 3,46                      | -13,65                         |
| Return on equity, %                   | 1,30                        | -0,84                     | -5,65                          |
| <b>PJSC "Naftogazvydobuvannia"</b>    |                             |                           |                                |
| Fixed assets, million USD             | 56627535                    | 39766842                  | 1708000                        |
| Current assets, million USD           | 136935158                   | 110825121                 | 51888174                       |
| Equity, million USD                   | 218394461                   | 154489976                 | 10241411                       |
| Net profit, million USD               | 59759501                    | 42726857                  | 4279876                        |
| Profitability of production assets, % | 36,15                       | 17,79                     | -23,64                         |
| Return on current assets, %           | 17,37                       | 6,74                      | -12,16                         |
| Return on equity, %                   | 10,45                       | 5,70                      | -5,02                          |

Source: developed by the authors

**Table 4 – Probability of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" falling into entrepreneurial risk zones**

| Situation   | Permissible risk zone | Critical risk zone | Catastrophic risk zone |
|-------------|-----------------------|--------------------|------------------------|
| Pessimistic | $k_{ac} = 0,75$       | $k_{cr} = 0,50$    | $k_{ct} = 0,25$        |
|             | $W_{ac} = 0,21$       | $W_{cr} = 0,16$    | $W_{ct} = 0,08$        |
| Discreet    | $k_{ac} = 0,45$       | $k_{cr} = 0,20$    | $k_{ct} = 0,10$        |
|             | $W_{ac} = 0,15$       | $W_{cr} = 0,06$    | $W_{ct} = 0,01$        |
| Optimistic  | $k_{ac} = 0,2$        | $k_{cr} = 0,10$    | $K_{ct} = 0,01$        |
|             | $W_{ac} = 0,06$       | $W_{cr} = 0,01$    | $W_{ct} = 0,00001$     |

Source: developed by the authors

aggression), the probability of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" falling into the acceptable risk zone is 21%, the critical risk zone is 16%, and the catastrophic risk zone is 8%.

Accordingly, with the improvement of the political and economic situation in Ukraine (the end of the war), the probability of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" falling into the zone of acceptable risk is 15%, the zone of critical risk is 6%, and the zone of catastrophic risk is 1%.

With the best development of the political and economic situation in Ukraine (development of business opportunities, strengthening of economic security, competitiveness of domestic business), the probability of JSC "Ukrgezvydobuvannia" and PJSC "Naftogaz-

vydobuvannia" falling into the permissible risk zone of 6%, the critical risk zone of 1% and the catastrophic zone risk of 0,001%.

**Conclusions.** Thus, the definition of potential business risk zones of JSC "Ukrgezvydobuvannia" and JSC "Naftogazvydobuvannia" made it possible to characterize the effectiveness of enterprise management in critical periods, 2014–2015, the beginning of military operations in the east of Ukraine and the deepening of the economic and political crisis, 2020–2021. pandemic of the coronavirus disease. In 2022, a full-scale Russian invasion of Ukraine began, which requires the management of JSC "Ukrgezvydobuvannia" and PJSC "Naftogazvydobuvannia" to respond quickly in extreme conditions and contain the volume of Ukrainian gas production.

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**Комеліна Ольга Володимирівна**, доктор економічних наук, професор, Національний університет «Полтавська політехніка імені Юрія Кондратюка» (м. Полтава, Україна)

**Щербініна Світлана** Адамівна, кандидат економічних наук, Національний університет «Полтавська політехніка імені Юрія Кондратюка» (м. Полтава, Україна)

**Крайнєв Віталій** Миколайович, аспірант, Національний університет «Полтавська політехніка імені Юрія Кондратюка» (м. Полтава, Україна)

### **МЕТОДИЧНІ АСПЕКТИ ОЦІНЮВАННЯ ПОТЕНЦІЙНИХ ЗОН ПІДПРИЄМНИЦЬКИХ РИЗИКІВ ПІДПРИЄМСТВ НАФТОГАЗОВОЇ ГАЛУЗІ УКРАЇНИ**

Оцінка ефективності менеджменту підприємств нафтогазової промисловості потребує дослідження ймовірності виникнення ризикових ситуацій, що можуть загрожувати їх господарській діяльності. Урахування ризику у процесі прийняття управлінських рішень знижує ймовірність недоотримання (втрати) доходу чи прибутку, виникнення кризової ситуації чи банкрутства підприємства. Визначення меж ризику, у свою чергу, дає змогу диференціювати виявлені ризики на допустимі, критичні та катастрофічні, а управління ризиками є тим важелем, за допомогою якого підприємства мають можливість впливати на результати власної господарської діяльності. Стаття спрямована на дослідження тенденції рядів динаміки фінансово-економічних показників діяльності підприємств нафтогазової промисловості за допомогою методів кількісних оцінок ступеня ризику. Розглянуто проблеми функціонування і розвитку нафтогазовидобувних підприємств України. Для дослідження було обрано два підприємства нафтогазової галузі України, які відрізняються за формою власності, виробничими потужностями та специфікою економічного розвитку на загальнодержавному ринку первинної реалізації природного газу. Порівняно ефективність менеджменту державного підприємства АТ «Укргазвидобування» та приватного ПрАТ «Нафтогазвидобування» за показниками рентабельності виробничих фондів, оборотних активів та власного капіталу. Визначено три потенційні зони підприємницьких ризиків (допустима, критична, катастрофічна) для ресурсної бази та фінансових результатів діяльності підприємств. За результатами дослідження представлено порогові значення зон ризику фінансово-економічних показників АТ «Укргазвидобування» та ПрАТ «Нафтогазвидобування». Визначено ймовірність попадання АТ «Укргазвидобування» та ПрАТ «Нафтогазвидобування» в потенційні зони підприємницького ризику при різних сценаріях розвитку політично-економічної ситуації в Україні і відповідно різних критеріях ризику.

**Ключові слова:** нафтогазовидобувні підприємства, ризик, підприємницький ризик, зони ризику, критерії ризику, ймовірність.

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