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IMPROVING THE DECISION SUPPORT SYSTEM FOR MANAGING FINANCIAL RISKS OF INVESTMENT ACTIVITIES OF OIL AND GAS COMPANIES

УДОСКОНАЛЕННЯ СИСТЕМИ ПІДТРИМКИ ПРИЙНЯТТЯ РІШЕНЬ ДЛЯ УПРАВЛІННЯ ФІНАНСОВИМИ РИЗИКАМИ ІНВЕСТИЦІЙНОЇ ДІЯЛЬНОСТІ НАФТОГАЗОВИХ КОМПАНІЙ

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***Abstract**. The article substantiates a theoretical and methodological approach to identification and management of financial risks of oil and gas companies` investment activities, based on the use of IT, knowledge base and precedents. There is proposed a mathematical formulation of the problem on minimizing the financial risks of oil and gas companies` investment activities, formed on use of characteristics of internal and external environment of companies, as well as many possible types of situations and the likelihood of unexpected situations. It is proved that the result of this task is a set of specific ways to minimize and neutralize financial risks, a control action, the cost of a set of measures to minimize financial risk, the overall probability of the situation developing, as well as the total amount of losses. An integrated algorithm for identifying and managing financial risks of oil and gas companies` investment activities has been developed, taking into account the uncertainty caused by changes in the external and internal environment. There is also revealed influence of financial risks of oil and gas companies on the formation of competitive advantages.*

***Key words:** financial risk, investment activity, oil and gas company, uncertainty, decision support system*

Introduction. In the conditions of economic globalization, financial risk management importance is growing as a tool to respond to changes in the current uncertainty of the functioning of an industrial enterprise. This necessitates forming a knowledge base for the development and implementation of risk management methods in everyday practice under conditions of various types of uncertainties: economic, political, environmental, social, temporary, uncertainties of internal and external environment, presence of conflict situations, volatility of markets and prices, changes in ratings by agencies and etc.

Management under conditions of uncertainty is most effective when, during its implementation, an analysis of alternative strategic development scenarios is carried out, taking into account the specifics of the enterprise and possible types of risks, in particular the risks of investment activity.

The risks of investment activity are a complex multifaceted category. Their identification and management are an effective tool for creating a favorable economic and production environment for an enterprise.

It should be noted that the importance of managing the financial risks of companies' investment activities is constantly increasing, because it ensures an increase in the competitiveness of an enterprise in the domestic and international markets, contributes to the growth of its production and economic potentials. However, the financial risks of the investment activity of enterprises are studied, as a rule, in the context of various conceptual approaches, which led to the emergence of various characteristics of such risks` economic nature. At the same time, it is worth noting that at present there is no effective method for identifying risks and assessing the degree of their impact on the investment activity of an enterprise, in particular, for oil and gas companies.

It is worth noting that oil and gas companies are special objects that need to use specific financial risk management systems, taking into account production, technological, economic, managerial, informational and other characteristics.

The investment activities of oil and gas companies (OGCs) are occurred with risks of direct financial losses - total, credit, current, bankruptcy risk, etc. To counteract such risks, it should be ensured ongoing monitoring of situation, risks identification and their management. The leading scientific centers of foreign countries and Ukraine are engaged in the formation of effective methods for reducing risks. However, as a rule, the risks of OGCs investment activities are studied only in the context of different conceptual approaches. There is no unified system for assessing the degree of financial risks impact on the OGCs investment activities, which would be used by management in the decision-making process to minimize risks. The unified knowledge base lack for study of financial risks conducted by different OGCs leads to errors in the cost assessment of identifying risks and their negative consequences. As a result, there is reduced the effectiveness of their management.

Consequently, the search for new mechanisms that contribute to the neutralization and minimization of risks, as well as the problem solution of managing the financial risks of OGCs` investment activities, is a scientific and applied problem which must be solved urgently.

An overview of resent research sources and publication. The problems of risk minimization and neutralization are successfully studied by leading research centers abroad (USA, Germany, Japan, Canada, etc.) and Ukraine. Article [1] demonstrates that the "economic interface" is important for most decisions in the oil business. It has been highlighted that, to a large extent, due to a certain uncertainty of mining and geological conditions and the difficulty of predicting future oil prices, the concept of "risk" (the probability of financial losses or not achieving the goal) and, to a lesser extent, the possibility of obtaining financial benefits in excess of the goal, occupy a central position in the oil business. Authors of article [3] investigate risk assessment of oil and gas investment environment in countries along the Belt and Road Initiative. Fan Chen, Scott C. Linn [4] 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. Meidell A. and Kaarboe K. [5] 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 [6] evaluated the effect of price risk hedging for oil (or gas) production and processing projects. Among Ukrainian scientists, we like to state the research of Komelina O., Shcherbinina S. and Krainiev V. [9] in assessment of business risks for companies in the oil and gas sector. Gryniuk O.I. [7, 10] ranked the risk factors of oil and gas production enterprises within risk groups according to the probability of their occurrence and propose fuzzy-logik as a tool of risk control in the context of proactive management of oil and gas production enterprises. The analysis of the latest research shows the need for further improvement of the decision making systems for managing financial risks of OGCs` investment activities and the improvement of the effectiveness of their management.

Purpose of the article. Purpose of this article is development of decision support system in OGCs' financial risks of investment activities management.

Presenting main material.

To solve this problem, we take into account the fact that the main source of investment activity is the oil and gas companies` own funds. The financial potential of investment-active oil and gas companies, along with others, is characterized by financial risks of investment activities that need to be assessed, minimized and neutralized in order to form competitive advantages. Note that the initial data of the financial risk assessment process are the input data [12] for the process of decision support by the top management or risk manager of the company. Consequently, financial risks and their management are interrelated components of the decision support system, which should be based on the appropriate algorithm for managing the company's financial risks.

Based on the analysis of the latest research [1÷15, etc.] to minimize and neutralize risks, it has been established that the most important and difficult problem is to reduce the time to solve problems of minimizing or neutralizing financial risks with the participation of decision makers in the process of eliminating the primary consequences of an unexpected situation. It has been revealed that a systematic approach to integrating different types of knowledge bases with information on the financial risks of OGCs' investment activities in order to use well-known precedents to more effectively solution of risk minimizing problems has not been developed yet. Also, there has not been substantiated the need to introduce a systematic approach to solving such an optimization problem, caused by the growing requirements for minimizing risks and their economic, material and other impact the activities of OGCs.

In this context, it should be mentioned that building a model of a decision support system in financial risk management involves a primary study of risks` sources and their description using a formal algorithmic language, the formation of a possible risks classification using anthology, a description of existing scenarios for the course of events and resources available to the system, to minimize or neutralize the risk. The formation of such knowledge based on existing long-term statistical data on the company's financial risks increases the effectiveness of their minimization and reduces the time required to solve this problem through the use of precedents and cloud technologies.

Mathematical formulation of the problem of managing financial risks of oil and gas companies` investment activities.

In general terms, research problem can be formulated as follows.

It is known that:

A. Set of oil and gas companies (OGCs)

S{OGCs} = { $OGCs_1$, $OGCs_2$,…, $OGCs_m$}, involved in monitoring the financial risks of investment activities provided by decision support systems (DSSs);

S{DSSs} = {DSS_1, DSS_2,…, DSS_m}, for financial risk management based on precedents and cloud technologies.

B. For each OGC, the following is known:

– a set of "k" characteristics of the geological environment, which does not change during a certain time, in which hydrocarbon production is carried out.

Geo = <g_1, g_2,…, g_k>, i = 1, 2,…, k, g_i ϵ Geo;

– a set of "I" characteristics of the internal environment of an oil and gas company

Inter = < $inter_1$, $inter_2$,…, $inter_I$>, i = 1, 2, ..., I, $inter_i$ ∈ Inter.

These are resources (financial, commercial, technical, human) and functions - management, production, marketing, and development.

– a set of "E" characteristics of the external environment of an oil and gas company

Exter = < $exter_1$, $exter_2$,…, $exter_E$>, i = 1, 2,…, E, $exter_i$ ∈ Exter.

These are state and local authorities (tax and other regulation, environmental protection, social stability, tax revenues, economic stability), shareholders, investors, suppliers, consumers.

– a set of El elements (production and injection wells, group measuring installations, heaters, separation plants, demulsification plants, tanks, oil and water treatment plants, oil and water pumping units, pipelines, etc.) combined into a single STR structure, with the help of their properties $P_{r_{El}}$ and relations $R_{e_{El}}$ between them, functioning in a specific Geo environment, i.e. OGC is viewed as complex system:

$$S = \{El, STR, P_{r_{El}} R_{e_{El}}, Geo\}, \quad (1)$$

where: El is the set of elements {El_1, El_2,…, El_n}, i = 1, 2,.., n; E_i ϵ El;

n is the number of system elements;

STR - structure;

$P_{r_{El}}$ – properties of $P_{r_{El}} = \{P_{r_{El_1}}, P_{r_{El_2}}, ..., P_{r_{El_n}}\}$ elements

$R_{e_{El}}$ –relationships between $R_{e_{El}} = \{R_{e_{El_1,El_2}}, R_{e_{El_1,El_3}}, R_{e_{El_1,El4}}, ..., R_{e_{El_n El_{n-1}}}\}$ elements;

In this case, P_{r_c} properties are not determined by a simple sum of the properties of $P_{r_{El}}$ elements included in the STR structure of the system, but depend on the relations between $R_{e_{El,El}}$ elements. That is, the general property of the complex dynamic system S under study is a certain function of properties and relationships of its individual elements and can acquire a completely new quality that does not follow from the sum of the properties of these system elements and their relationships, i.e., there is a synergistic effect:

$$P_{r_s} = \varphi\left(P_{r_{El}}, R_{e_{El}}\right), \tag{2}$$

where the function φ characterizes the phenomenon of synergy [16] in a complex system, i.e. the excess of the system overall effect over the sum of its elements effects, while maintaining the properties of integrity.

The grounds for classifying an OGC as a subsystem of large complex dynamic systems with complex institutional forms and relationships in them, as well as with a non-linear nature of development are [16]:

– the hierarchical nature of the organization with a constant redistribution of vertical and horizontal connections caused by the non-linear environment of external and internal environments;

– the diversity and complexity of institutional forms and relations in the company, which mostly are not subject to quantitative assessment and description and are in a state of continuous phase structural, legal changes and transformations;

– different interests and goals of owners, investors, managers, suppliers, employees, which does not allow defining the target function of the system as an arithmetic or algebraic sum;

– multifactorial and polycriteria of processes in the company's subsystems, which do not allow establishing adaptive correlations between factors, parameters and the efficiency of functioning and development of the system;

– current financial situation *Sit* in the form of *"n"* non-stationary time series x_n numerical characteristics of the current financial state

$$\text{Sit} = \langle \{x_1\}, \{x_2\}, ..., \{x_n\} \rangle, i = 1,2,...,n; x_i \in \text{Sit}; \tag{3}$$

– availability of a knowledge base (precedents) about earlier decisions

$$\text{BK}_n = \langle \text{BK}_{n1}, \text{BK}_{n2}, ..., \text{BK}_{n_b} \rangle, i = 1,2,...,b; \text{BK}_{n_i} \in \text{BK}_n; \tag{4}$$

$$\text{BK}_{ni} = \langle g_i, \text{MSit}_i, \text{measure}_i, losses_i, \text{price}_i \rangle,$$

where: MSit is a microsituation;

- measure_i - measures taken;
- $losses_i$ - losses;
- price_i is the cost of the measures taken.

C. A set of possible types of situations that can give rise to financial risk in OGC's investment activity

$$\text{TypeSit}^{\text{financial}} = \langle \text{typesit}_1^{\text{fin}}, \text{typesit}_2^{\text{fin}}, ..., \text{typesit}_u^{\text{fin}} \rangle, i = 1,2,...,u; \text{typesit}_i^{\text{fin}} \in \text{TypeSit}^{\text{financial}}. \tag{5}$$

D. Corresponding $\text{TypeSit}^{\text{financial}}$ vector of maximum admissible probabilities of this type situations occurrence

$$P_{\text{pos}} = \langle p_{pos_1}, p_{pos_2}, ..., p_{pos_u} \rangle, i = 1,2,...,u; p_{pos_i} \in P_{\text{pos}}. \tag{6}$$

The result of solving this problem is:

– a set of measures (Complex measures - Cm), that is, specific ways to minimize and neutralize financial risks

$$\text{Cm} = \langle \text{cm}_1, \text{cm}_2, ..., \text{cm}_z \rangle, i = 1,2,...,z; \ \text{cm}_i \in \text{Cm}. \tag{7}$$

They are different for economic, infrastructure, production, managerial, monetary

and innovative potentials of an oil and gas company. However, there are also general ways to minimize and neutralize the risks of companies` investment activities [17]: compensation for risk and its consequences; risk localization; diversification; distribution (dissination); avoidance of risk; analysis and forecasting of the conjuncture; application of different forms and methods of estimated and credit relations; hedging; insurance, etc.

As for the investment potential of the company, for risks at the initial stages of investment, the following methods of neutralizing and minimizing risks can be applied [17]:

– establishing correspondence between technologies for performing operations, staffing and risk management system;

– application of an integrated algorithm for identifying and managing the risks of the company's investment activities;

– control action Direct, which, by means of Cm measures, transfers the current situation $Sit^{specific}$ to the regular Sit^{stat} situation

$$Direct: Sit^{specific} \xrightarrow{C_m} Sit^{stat}; \quad (8)$$

– the cost of a set of measures to neutralize or minimize financial risk.

The cost of a set of measures to minimize the consequences of an unexpected situation is calculated as the sum of these measures cost:

$$Price(Cr = \langle price(cm_1), price(cm_2),..., price(cm_z)\rangle, Price(Cm) = \sum_1^i price(Cm_i); \quad (9)$$

– the overall probability of the situation development, leading to the emergence of financial risk P*(Geo, Inter, Exter, Sit^{stat}, BK_n);

– the overall probability of the situation development:

$$P^*(Geo, Inter, Exter, Sit^{stat}, BK_n) = \frac{\sum_{i=1}^{u} P(Geo, Inter, Exter, Sit^{stat}, BK_n, typesit_i^{fin})}{u}, \quad typesit_i^{fin} \in TypeSit_i^{financial}, \quad (10)$$

where: u is the number of situations of a particular type;

$P(Geo, Inter, Exter, Sit^{stat}, BK_n, typesit_i^{fin})$ is the probability of the development of a particular type situation, obtained by using existing management systems or based on expert assessments;

– total loss estimate losses (Cm):

$$losses(Cm) = \sum_1^z \left(l_i^U + l_i^U(Cm^*) + l_i^H(Geo)\right), \quad (11)$$

where: z is the number of unexpected situations types that have arisen in the current situation;

l_i^U is the cost of direct losses from the occurrence of an unexpected situation of the *i-th* type;

$l_i^U(Cm^*)$ is the cost of losses associated with the elimination of losses due to the elimination of the consequences of the *i-th* type situation;

$l_i^H(Geo)$ is the cost of non-renewable losses as a result of an unexpected situation in a certain geo-information context.

Thus, the mathematical statement of a multicriteria problem of minimizing the financial risks of oil and gas companies` investment activities under conditions of uncertainty can be formulated as follows:

$$\begin{aligned} &I_1 = P^*(Geo, Inter, Exter, Sit^{stat}, BK_n) \to \min; \\ &\forall typesit_i^{fin} \in TypeSit_i^{financial} : P(Geo, Inter, Exter, Sit^{stat}, BK_n, typesit_i^{fin}) < P_{prev}^{typesit_i}; \\ &I_2 = price(Cm) \to \min; \\ &I_3 = losses(Cm) \to \min. \end{aligned} \quad (12)$$

Criteria (12) cannot be chosen as uniform for the entire oil and gas company, but must complement each other. Here it is advisable to apply the Pareto principle.

So, since the problem is multi-objective, then to solve it, we use Pareto search the optimal solution:

$$\begin{aligned} &Risk = \lambda_1 P^*(Geo, Inter, Exter, Sit^{stat}, BK_n) + \lambda_2 price(Cm) + \lambda_3 losses(Cm) \to \min \\ &Sit_1 \neq Sit_2 \neq ... \neq Sit_n, \sum_{i=1}^{3} \lambda_i = 1, \end{aligned} \quad (13)$$

where λ_i are criteria weights.

The general approach to solving such a complex problem is based on its decomposition into two conditionally independent tasks:
– multicriteria optimization in deterministic conditions;
– decision making under uncertainty with the assumption that the objective function is scalar.

However, this approach is incorrect [18], since both tasks are informationally strongly interconnected. This is due to the fact that traditional methods for solving problems of multi-criteria optimization are associated with the fundamental need to use expert information containing interval uncertainty. Its determination in the early stages leads to losses of valuable information and, as a result, misrepresentation of final results.

Therefore, to solve the set multi-criteria problem, it is advisable to use an integrated approach based on the theory of utility [19].

First, a polynomial model of a multi-factorial scalar evaluation of the alternative solutions effectiveness is synthesized:

$$H(x) = F(A, \text{Crit}(x)), \quad (14)$$

where: $H(x)$ is utility;

$x \in X$ is the set of valid alternative solutions;

$A = \langle a_i \rangle$, $i = 1,2,\ldots,n$ is tuple of model parameters;

$\text{Crit}(x) = \langle \text{crit}_i(x) \rangle$, $i = 1,2,\ldots,m$ is a tuple of criteria that fully characterize the system.

In the second stage, model (14) is analyzed and uncertainties of $\overline{A}$ parameters and $\overline{\text{Crit}_i(x)}$ variables are identified also. All uncertainties are characterized by the quantitative value of the interval (left and right boundaries) on the numerical axis and qualitatively - the nature of possible values distribution within the interval (probability, fuzzy set or equal possibility).

Then, taking into account the fact that for each type of interval uncertainty there is a specific arithmetic, according to the model

$$\overline{H}(x) = F\left(\overline{A}, <\overline{\text{crit}_i}(x)>\right) \quad (15)$$

the interval value of utility $\overline{H}(x)$ is calculated. This value is analyzed and, depending on the type of interval uncertainty, a point solution is selected based on negative and positive losses.

An integrated algorithm of identifying and managing OGCs' financial risks of investment activities under uncertain conditions is shown in Figure 1.

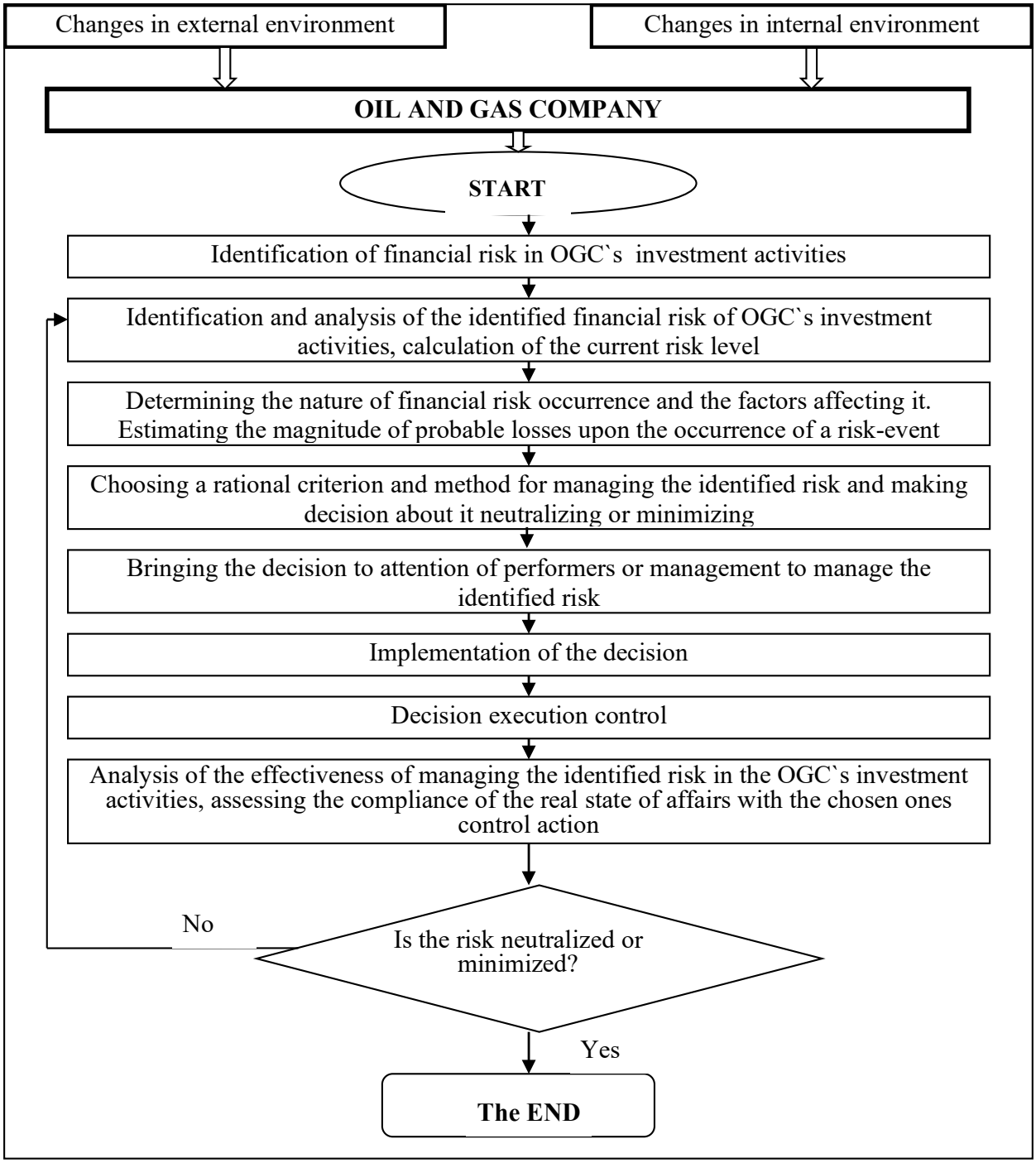

Figure 1 - An integrated algorithm for identifying and managing oil and gas companies` financial risks of investment activities under uncertainty conditions

Source: developed by authors based on [10, 11]

It should be noted that a global criterion of assessing the effectiveness of risk management in the oil and gas companies` investment activities should be the achievement of set goals at the lowest cost. Local criteria *i* in this case can be quantitative and qualitative [20]. Local quantitative characteristics of *I* are:

– minimum cost of financial resources,
– minimum losses,
– minimum expenditure of human resources,

The class of local qualitative criteria for assessing the effectiveness of managing OGCs' financial risks of investment activities includes: assistance to insurance companies in hedging financial risks of oil and gas companies; strengthening economic and production potentials; increasing the innovativeness of business; increasing the production efficiency level; increasing the technical equipment level of the company; increasing the motivation and stability of employees level; minimizing negative consequences of unexpected situations.

This formulation of the problem and the algorithm (Figure 1) of optimal control corresponds to the holistic functional structure of the financial risk management system for investment activities of oil and gas companies, shown in Figure 2.

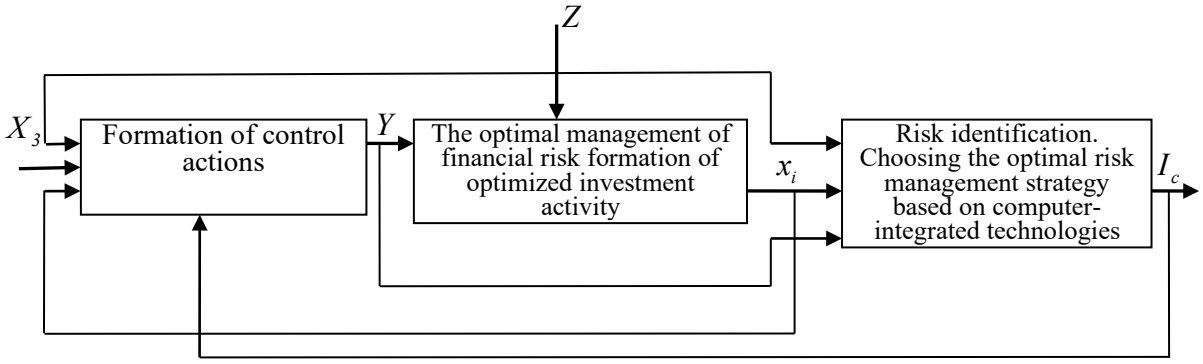

Figure 2 - Holistic functional structure of the automated system of financial risk management of oil and gas companies` investment activities

Source: authors' development

In this formulation of the optimal financial risk management problem, it is assumed that there is complete information on the process of *Xi* risk formation in relation to external influences *X3,Z,Y*. However, often external factors are probabilistic and cannot be represented as specific functions of time. Accordingly, the risk indicator *Ic* is a random variable. Advisable to assess risk management effectiveness by using some statistical characteristics, such as estimating the average value of *Ic* indicator at a certain time interval, calculated for a certain set of conditions. Since in our case *Ic* is a function of losses, the average value is an estimate of the average risk.

The system obtained as result of solving the problem according to statistical criterion I*c* is statistically optimal. It exercises control that is optimal only on average for the entire set of conditions under consideration. In each particular case, the control may not be optimal.

To solve the optimization problem based on the average risk criterion, it is needed to know statistical characteristics of external impacts. If statistical characteristics of external impacts are unknown, then it is advisable to use the minimax optimality

criterion, which provides the best result in the worst situation. The disadvantage of this criterion is that in lighter conditions it gives worse results than, for example, the average risk criterion.

In order to make the correct management decision under conditions of changes in the external environment and such risks as an unstable economy or war, it is necessary to deliberately forecast the future conditions of the company's operation in such conditions, to develop various alternatives for the consequences of possible situations, to evaluate and determine the probability of each event and to evaluate the alternatives according to selected criterion. Therefore, in addition to operational management methods, strategic methods should be used: management based on a development strategy or on the basis of a risk strategy (moderate, conservative or aggressive).

To ensure the selection of the optimal ratio of risk and profitability, the algorithm for choosing a risk strategy must take into account the possible future states of the economy and use as indicators of the company's risks, the size of possible losses (losses) and the probability of their occurrence. Then the risk strategy consists in determining the maximum and minimum values of these indicators

$$losses_{\min} < losses \le losses_{\max};\ P_{los\min} < P_{los} \le P_{los\max}.$$

Given that the choice of a risk strategy depends on the future state of the economy, let's consider its three possible states: an economic rise, a stable state, and an economic decline. It is assumed that two alternative risk strategies A and B have conditionally specified rates of return (IRR), and the future states of the economy have a full probability of their realization (Table 1).

Table 1 -Source data for a comparative analysis of strategies of oil and gas companies to solve the problem of managing financial risks of investment activities, taking into account the state of the economy

The state of the economy	State probability, P_{los}	Strategy A IRR, %	Strategy B IRR, %
1	2	3	4
Economic rise	0,2	30	110
Stable condition	0,2	20	85
Economic decline	0,6	10	60

Source: authors' development

Let's calculate the expected rate of return (ERR), standard deviation and coefficient of variation (CV) for two strategies A and B using the following formulas [17]:

$$ERR = \sum_{i=1}^{n} IRR_i \cdot P_{los_i}\ , \quad (16)$$

where n - is the number of possible situations,

$$\sigma = \sqrt{\sum_{i=1}^{m} (IRR_i - ERR)^2 \cdot P_{losi}}\ , \quad (17)$$

where m - the number of years for which the calculation is made;

$$CV = \sigma / ERR\ . \quad (18)$$

Therefore, we have: $ERR_A = 30 \cdot 0.2 + 20 \cdot 0.2 + 10 \cdot 0.6 = 16\%$

$$ERR_B = 110 \cdot 0.2 + 85 \cdot 0.2 + 60 \cdot 0.6 = 75\%$$

$$\sigma_A = \sqrt{(30-16)^2 \cdot 0.2 + (20-16)^2 \cdot 0.2 + (10-16)^2 \cdot 0.6} = 8\%$$

$$\sigma_B = \sqrt{(110-75)^2 \cdot 0.2 + (85-75)^2 \cdot 0.2 + (60-75)^2 \cdot 0.6} = 24.08\%$$

$$CV_A = \frac{\sigma_A}{ERR_A} = \frac{8}{16} = 0.5$$

$$CV_B = \frac{\sigma_B}{ERR_B} = \frac{24.08}{75} = 0.032.$$

Based on the obtained data, it can be concluded that strategy **B** has a larger root mean square deviation than strategy **A**, so it is more risky. However, the value of the expected rate of return in strategy B is greater than in strategy **A**, so it is more profitable.

At the same time, the value of the coefficient of variation for strategy B is lower than for strategy **A**. Therefore, strategy **B** shows a lower risk per unit of return, which is achieved due to a larger value of the expected rate of return.

Therefore, it is advisable to choose strategy **B.** The practical significance of the obtained results is that their implementation will allow oil and gas companies to:

– reduce operating time at the stage of risk identification and promptly start actions to neutralize them and minimize losses;

– conduct a qualitative and quantitative analysis of investment risks and create production conditions under which the probability of investment risk in the future will be minimized;

– increase the efficiency of financial risk management of investment activities in the conditions of a priori and current uncertainty regarding the parameters and structure of the management object.

The evaluation of the possibilities of practical use of the developed methodology, formal models and algorithms was carried out on the basis of the analysis of financial risks of investment activities in the system of long-term planning of production and sale of oil and gas of the leading enterprise "Dolynanaftogaz" PJSC "Ukrnafta". The following areas of investment activity were considered: investing in field exploration, investing in technological support of the production process and intensification of production by influencing the development object, investing in the conservation of low-yield deposits.

The following most important principles were taken into account within the framework of the proposed approach:

– the goal of investment activities in the long term is to maximize the value of the oil company;

– investment activity should cover all business segments of the company, ensuring their balanced development;

– investment activity should ensure sustainable implementation of such corporate restrictions as production plans, financial limits, license agreements and others under various scenario conditions.

When evaluating the effectiveness of investment projects, it is taken into account that in the upstream business segment, the forecast of technical and economic

indicators is a priori made with a high degree of accuracy.

It is also taken into account that the profitability of investment projects depends on the dollar exchange rate, oil prices, inflation and other factors, the parameters of which are determined by forecasting methods.

The result of evaluating the effectiveness of investment projects was management decisions of a recommendatory nature.

The implementation of such an approach in practice is a complex task that requires the analysis of huge amounts of information, consideration of feedback, construction of models of the investment process, etc.

The conducted empirical research on real data showed the practical feasibility of the proposed methodology for improving the decision support system for managing financial risks of investment activities of oil and gas companies.

The use of the proposed methodology in industrial conditions showed an increase in the effectiveness of decision-making support procedures for choosing and maintaining the correct oil and gas production regime compared to existing systems at the level of 30÷35%.

Based on the results of the calculations, it can also be concluded that the risk of DCF (Discounted Cash Flow) reduction by 35÷60% according to the developed scenarios of the long-term plan for oil and gas production and sale is very high.

Therefore, the practical approbation of the methodology for assessing the financial risks of investment activity on the example of the oil and gas production enterprise "Dolynanaftogaz" allowed to estimate the economic losses that the enterprise and the oil and gas company may incur when planning activities in the event of the development of unfavorable situations during the development of an oil and gas field.

The above results will help to increase the competitiveness of OGCs, and, consequently, increase investment in economy of the industry and the country as a whole.

Conclusions. Scientific novelty of research results is in theoretical substantiation of new approach to identifying and managing financial risks of oil and gas companies` investment activities, namely: there is proposed, for the first time, a mathematical formulation of the problem of minimizing OGCs' financial risks of investment activities, based on use of geo-environment, internal and external environment characteristics, as well as a set of elements, possible types of situations, probabilities of an unexpected situation occurrence.

It has been proven that the result of this problem solution is a set of specific ways to minimize and neutralize financial risks, a control action, the cost of financial risk, the overall probability of the situation development, which leads to the emergence of financial risk, as well as the total amount of losses.

The task of minimizing financial risks of OGCs` investment activities is formulated as a multi-criteria one; to solve it, it has been proposed to apply the Pareto principles and information technologies. The use of the method of managing the financial risks of oil and gas companies` investment activities developed on the basis of a holistic approach will help improve investment attractiveness and form competitive advantages.

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