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On the Specifics of Assessing the Subjective Risks of Project Activities of Oil and Gas Companies

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ABSTRACT
The article describes the peculiarities of assessing a special type of risks inherent in strategic oil and gas projects, namely risks, whose source is the opportunistic intentions and capabilities of stakeholders. The paper notes the role of the domestic oil and gas complex in the structure of the Russian economy and analyses the features of strategic oil and gas projects; describes the essence of entrepreneurial risks, their main characteristics, as well as approaches to the classification of risks; provides a brief description of the stages of risk management, as well as tools for their identification and assessment; the essence of subjective risks and subjective probability is revealed, the problems of their assessment are investigated. Based on the analysis of the peculiarities of subjective risks, an assumption was made about the advisability of using the expert approach and, in particular, the apparatus of fuzzy sets to assess the risks under consideration.

Keywords: *Oil and gas companies, Oil and gas projects, Entrepreneurial risks, Risk management, Risk assessment, Stakeholders, Subjective risks, Subjective probability.*

1. INTRODUCTION

Today, the oil and gas sector of the national economy of the Russian Federation continues to play a leading role in shaping the country's budget and ensuring its energy security. The so-called “oil and gas revenues” of the Russian Federation in 2018 amounted to almost half (46 %) of the total revenues (Figure 1) [1].

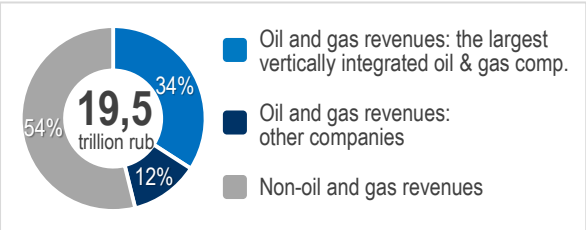

Figure 1 The share of “oil and gas revenues” in the budget of the Russian Federation for 2018.

Although the indicators for 2019 and 2020 demonstrate a decrease in the share of the oil and gas sector in the country's budget, the energy sector remains the main one in the structure of the Russian economy. At the same time, almost a third of the budget was formed by six domestic oil and gas companies: PJSC NK Rosneft (2.5 trillion rubles), PJSC Gazprom (1.8 trillion rubles), PJSC Lukoil (1.03 trillion rubles). rubles), PJSC Surgutneftegas (0.86 trillion rubles), PJSC Tatneft (0.36 trillion rubles), PJSC NOVATEK (0.1 trillion rubles).

Entrepreneurial activity as such is closely related to the phenomenon of uncertainty, namely the lack or complete absence of information about the conditions in which this activity is carried out. Uncertainty, although it always manifests itself in a unique way, has a significant impact on the results of economic activity of market entities. Oil and gas corporations, whose financial and economic efficiency is directly related to the ability of companies to carry out their activities in conditions of uncertainty and risk, are not an exception. Considering the role of companies of the domestic oil and gas complex (OGC) in the structure of the national economy, the task of continuously increasing their risk stability and competitiveness seems to be a sought-after research area. However, as events of recent years show, studies (as shown by an analysis of the available literature) of the least studied area of uncertainty - the uncertainty created by some participants in the external environment of an oil and gas company, which pose a direct threat to the results of the economic activity of the

latter – are of relevance in this area [2]. The difficulties of objectifying and assessing such threats are the problem of this study.

2. OIL AND GAS COMPLEX AND FEATURES OF ITS FUNCTIONING

Oil and gas enterprises are companies that carry out their economic activities in the fields of exploration, production, transportation, and processing of hydrocarbon resources.

There are three main sectors in terms of employment in the oil and gas industry:

- search for oil and gas deposits and production of hydrocarbons (upstream)
- transportation of oil, gas and products of their processing (midstream)
- processing of hydrocarbon resources, distribution of refined products and their sale on the market (downstream)

Structurally, all three sectors can be represented as a sequential chain of production of hydrocarbon resources: from the extraction of raw materials from the bowels of the earth to the supply of final products to consumers. There is a special type of companies, presented in the work earlier, whose activities include managing several sectors of oil and gas production at once, organized into groups of companies – vertically integrated oil and gas companies. Thus, all domestic enterprises engaged in the listed sectors of the oil and gas industry constitute the oil and gas complex of the Russian Federation.

Strategic oil and gas projects are a special type of projects that can be based on the exploration, construction and development of oil and gas field, transportation of extracted raw materials, as well as the processing and sale of hydrocarbon resources and their products. The activities of all oil and gas enterprises are directly or indirectly related to the constant extraction of hydrocarbon resources from the bowels, which are finite in nature due to their own non-renewability (at least on a natural time horizon for humans). This dependence of oil and gas companies on a limited number of reserves determines the entire nature of the economic activities of oil and gas companies as exclusively project-based.

The features of strategic oil and gas projects include:

1. Unique scale. The implementation of such projects requires oil and gas enterprises to use complex systems and tools for organizing, coordinating, monitoring, controlling and evaluating the implementation of all successive stages of each project; as well as a multi-billion-dollar investment, the return on which may not come in the first decade after the completion of the project, not to mention the high exposure of the expected profit to market fluctuations and many other risk factors. Thus, oil and gas companies implement complex projects with many components and conditions. Because each element of the project can be considered as sources of various risks, it can be argued that the implementation of strategic oil and gas projects is highly risky, which is formed by the cumulative effect. As an analogy, we can cite the position from the theory of reliability, applicable to socio-economic systems: the more in a complex system of sequentially placed elements, the less the likelihood of its failure-free operation [3];

2. Unique terms of implementation. The wide time frame for the implementation of a strategic oil and gas project does not allow for accurate forecasting of financial indicators (discounted cash flows, payback periods, internal rate of return, etc.) in a dynamic world market and its components;

3. Unique implementation practices. Although long-term, the predominantly project-based nature of the economic activities of oil and gas companies is the reason for the uniqueness of most of the planning and preparation stages for each project;

4. Territorial conditionality. The implementation of strategic oil and gas projects is limited by the location of the discovered hydrocarbon resources that are profitable for production, which narrows the range of alternatives for the location of production by the oil and gas company;

5. Large list of stakeholders. Strategic oil and gas projects affect many elements and individual systems of the external environment, which implies the inevitable formation of several interested parties (stakeholders), whose behavior in relation to the project – constructive, neutral, opportunistic, openly destructive, or otherwise – is conditioned by their own economic, social, value, political, reputation or other interests. This predetermines the heterogeneity of the composition of stakeholders: from industrial and financial to public, political and economic actors in the external environment;

6. Interdependence with other system of the external environment. There is a close connection between the energy sector and several related sectors, including industrial, economic, political, etc. Therefore, all qualitative or quantitative changes in one system inevitably affect the other: a change in the composition of participants in the economic environment, the emergence of breakthrough technologies in industry, a change in tax legislation, etc. Therefore, the state of the majority of related systems inevitably affects the oil and gas sector, as well as the opposite;

7. Political conditioning. The energy sector is recognized as strategic in most countries and regions of the world. The security of states and supranational

associations directly depends on energy, which inevitably affects the economic activities of vertically integrated oil and gas companies that are politically influenced by state and political actors, including foreign ones;

8. Vulnerability to uncertainty and cost. A company implementing an oil and gas project risks not only multi-billion-dollar investments, but also investor confidence, the health of hired personnel, the ecological state of the environment, reputation, business relations, etc. (in contrast to financial institutions that risk mainly financial capital, which is not so limited in directions and application markets).

Thus, the intention of an oil and gas company to carry out a large-scale project in the field of production, transportation or processing of hydrocarbon raw materials forms a set of actors in the external environment (economic, political, social and actors) in relation to this project, and, sometimes, resources and opportunities to realize their interest [4].

It should be said that the term "stakeholder" in this work is understood as persons or organizations that can have (or think that they can) influence a particular project [5]. Strategic oil and gas projects and the oil and gas sector always form a vast, diverse and unique set of stakeholders pursuing their own interests and often having the ability to implement them. In this case, we can talk about the uncertainty of intentions, which may pose a threat to the project if these interests are opportunistic – that is, they are a source of entrepreneurial risks. This is where the research task of objectifying such a phenomenon is revealed with the aim of further analyzing its features. However, to disclose the problem of risks from opportunistic external stakeholders, it is necessary to disclose the essence of entrepreneurial risks as such.

3. BUSINESS RISKS: CLASSIFICATION, KEY FEATURES AND MANAGEMENT

In this work, entrepreneurial risk is understood as the "influence of uncertainty on the goals" of a market entity [6]. By their nature, risks are divided into many types and types, which is due to a large set of their classification features:

- the level of the economic system – megaeconomic, macroeconomic, mesoeconomic and microeconomic;
- the sphere of origin – production, transport, commercial, financial and economic, tax, technological, informational, political, environmental;
- place of origin – external and internal;
- the possibility of influencing risk factors – systemic and non-systemic;
- project implementation stage – pre-investment, investment and post-investment;
- the possibility of insurance – insured and non-insured;
- the nature of the consequences is pure (simple) and speculative (conditional);
- foresight capability – predictable and unpredictable;
- the possibility of regulation – controlled, poorly controlled and uncontrolled;
- duration of exposure – permanent and temporary;
- types of losses – material, labor, financial, time losses, special types of losses;
- other classifications and classes.

With all the variety of entrepreneurial risks, two key parameters are distinguished, according to which risks can be characterized – the probability of risk realization (unlikely, probable, highly probable) and the magnitude of the corresponding consequences (permissible, critical and catastrophic). The presented characteristics determine the magnitude of the risk threat, which can be represented in the form of the formula:

$$R = P * I \quad (1)$$

where: R is the degree (level) of the risk threat; P is the probability of the risk being realized; I – consequences of risk realization.

Determining the degree of risk threat is one of the main tasks in the management of entrepreneurial risks – that is, in ensuring the functioning of an enterprise in conditions of market uncertainty. The stages of risk management are shown in Figure 2.

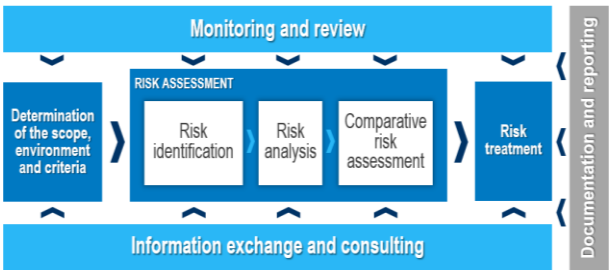

Figure 2 The main stages of risk management.

There are two main approaches to identifying and assessing entrepreneurial risks.

1. Qualitative approach:

- expert assessments;
- rating estimates;

- checklists.

2. Quantitative approach:

- mathematical and statistical methods;
- analytical methods.

Different approaches do not imply their mutually exclusive application in practice: qualitative and quantitative methods of risk analysis can be used jointly (including sequentially) at the stage of risk assessment, complementing each other.

When determining the degree of threats of all identified (identified) risks of a company or its project, they are ranked, which is necessary to prioritize the leveling (processing) of identified and assessed risks. When processing a risk, the likelihood of its realization is reduced, or damage is minimized in the event of its realization (the best result of risk leveling is the complete removal of the threat). Risk mitigation measures are developed in accordance with their economic feasibility.

Returning to the tools for identifying and assessing risks, it should be noted that the use of mathematical and statistical (probabilistic) methods is based on the classical understanding of the phenomenon of "probability", also called "objective".

"Objective" is the probability of an event, including a risk one, reflecting the frequency of this event in the total mass of the investigated observations revealed by the analysis. This definition is given based on a statistical concept of probability; its classical definition can be called the following: probability is the ratio of the number of favorable outcomes to their total number. Thus, as both definitions suggest, the objective probability is the result of calculations of a certain number of observations that meet the requirement of representativeness – in other words, it is based on statistics [7].

The simplest example of objective probability is the chance of a certain side of a coin tossed out, which with many observations will be equal to 50 %. Objective probability can also be observed in technical systems (for example, equipment failure), in sociology (in the study of patterns of human behavior in complex social systems), etc.

In these cases, we are dealing with a calculated probability based on statistical observations and derived laws. In other words, objective probability is based on an objective statistical component, although it is amenable to the influence of the human factor, nevertheless it is not strictly determined by it and is susceptible to methods of objective (quantitative) assessment. This allows the use of mathematical and statistical tools for assessing entrepreneurial risks - for example, in the production area – whose probability is objective. This, in turn, allows, as a result, to obtain quantitative estimates of the objective probability, expressed in the form of a certain numerical value or distribution of calculated data, one way or another having an advantage over qualitative results in the form of a relatively high accuracy and the possibility of their use in subsequent financial and economic calculations. However, not all phenomena can be represented through the prism of objective probability.

4. SUBJECTIVE RISKS AND FEATURES OF THEIR ASSESSMENT

The previously noted uncertainty of the stakeholders' intentions, which creates a special type of uncertainty and risks, at this stage of the development of science cannot be described from the standpoint of objective probability. Such risks are based not on an objective component in the above sense of the word, but on the reasonable principle of organized stakeholders, described through the prism of their private interests, motivations, features and capabilities, which have a qualitatively greater level of unpredictability and uncertainty. These risks complicate the use of classical mathematical and statistical research methods in assessing their probability due to the impossibility of providing the required volume of similar observations of risk events and their outcomes, which are based on the intention of opportunistic actors. However, these risks can have a significant impact on the business results of companies, including a catastrophic one. In relation to such risks, the source of which are intentions, as well as direct and indirect actions of external stakeholders in relation to an economic entity, which come into conflict with the interests and activities of the latter, the term "subjective risk" was introduced [8].

The focus of the study is the relationship between the interests of stakeholders and the situation of uncertainty of stakeholders' intentions created by them, which forms entrepreneurial risks. The essence of such risks does not allow the concept of objective probability to be used in relation to them, therefore, to describe the probability of the realization of subjective risks, a subjective probability was chosen.

The concept of "subjective probability" was introduced by the English mathematician Frank Plumpton Ramsey in the 1920s. This term is understood as the degree of confidence of a subject or a group of subjects in the possibility of a certain event occurring [9]. The fundamental difference between subjective and objective probability is the reliance not on the results of objective statistical observations, but on the logic of the subject and his idea of the probability of the occurrence of a particular event or the realization of any risk. Subjective probability is based on the private opinion of a subject or a group of persons, which, meanwhile, can rely on statistical data, but is not limited to them.

An example of the subjective probability of a risk event may be the decision of an entrepreneur to refuse to purchase imported equipment from abroad based on his convictions that the bureaucratic procedures and tax legislation of the supplier country are significant factors of uncertainty and risks. In this case, the individual, relying only on his own opinion (possibly based on objective or similar data) and prejudice, assessed the likelihood of realizing the risks of purchasing foreign equipment as too high, which led to the rejection of the risky option. And although the example draws attention to the advantages of subjective probability in the form of a low value of labor costs for assessing several risks and the promptness of decision-making, most modern works oppose the essence of subjective probability and objective in favor of the latter as more "correct" in making managerial decisions. As a result, beyond the framework of economics, there remains a high potential for research on subjective probability and tools for its qualitative and quantitative calculation. At the same time, it must be admitted that a person is inclined to overestimate the correctness of his own judgments, which leads to the adoption of ineffective managerial decisions and forces us to exercise prudence when choosing to rely on subjective probability in certain situations.

These features of subjective probability predetermined the choice of this phenomenon to describe the probabilistic characteristics of subjective risk: if human interest limited to mathematical and statistical research underlies subjective risk, then an assessment of such a phenomenon, it seems, should be given through the prism of human perception of the situation and understanding of the context. After all, the relevant experience and knowledge of an expert, his heuristic abilities and skills in assessing similar situations can make it possible to assess the uncertainty of the intentions of interested parties where the classical methods of risk probability analysis cannot cope with this task. This is where the need arises to assess the subjective probability in the problem of general management of subjective risks.

The features of subjective risk and subjective probability described above limit the use of classical mathematical assessment tools in the general problem of subjective risk management. To avoid the use of qualitative assessment indicators, it is proposed to use the apparatus of fuzzy sets, which, as expected, will make it possible to present expert assessments in the form of quantitative indicators: the probability of the realization of a particular subjective risk *x* will correspond to one of the initially specified probability ranges *U* (term) with one or another a different degree of confidence in this experts μ_*A (x)*.

$$A = \{\langle X, \mu\_A\,(x) | x \in U \rangle\} \quad (2)$$

The obtained quantitative values of the probabilities of subjective risks can be analysed using quantitative tools (Monte Carlo methods or sensitivity analysis), which will make it possible to form an idea of possible project losses due to the influence of uncertainty of intentions.

5. CONCLUSION

The article examines a special type of entrepreneurial risks, the source of which is possible opportunistic interests and opportunities of stakeholders of strategic oil and gas projects – subjective risks. When analyzing the characteristics of subjective risks, a number of their features were identified:

1. Sources of subjective risks are opportunistic stakeholders, whose behaviour is purposeful.

2. The presence of a rational component in the behaviour of an opportunistically-minded stakeholder can predetermine the uniqueness and uniqueness of his actions in a particular business situation of realizing his own interests, which can make it impossible to use statistical approaches to assessing such risks and forces one to rely on the phenomenon of subjective probability in the process of managing subjective risks.

3. Operating with subjective probability in assessing subjective risks puts forward special requirements for the formation of a corporate body for managing subjective risk, not only in terms of competencies, but also the organization of such processes in general.

4. The complexity of the study of subjective risks through the prism of objective probability significantly limits the use of statistical methods of assessment, which forces the use of expert methods that rarely provide quantitative results of assessing subjective risks.

5. Thus, within the framework of the study, it is proposed to use an expert approach to identifying and assessing subjective risks caused by the peculiarities of strategic oil and gas projects. If at the stage of risk identification the expert approach ensures the formation of a list of subjective risks, then, it seems, at the stage of risk assessment, experts will face the need to use qualitative indicators for assessing subjective risks when using the classical methods of the expert approach. Such an outcome can be partially offset by using the apparatus of fuzzy sets, which will allow one to operate with quantitative data – albeit based on heuristics and presented in the form of ranges of probabilities. It is expected that the application of the proposed approach will increase the risk resilience of oil and gas companies in the context of global market instability.

The following promising areas of research can be identified within the framework of the concept of subjective risks:

1. Development of a procedure for the formation of a working group on subjective risk management and requirements for involved experts, including external ones.

2. Development of tools to improve the accuracy of the results of assessing subjective risks.

3. Investigation of subjective risks in terms of the presence of stakeholder coalitions as a source of risk and the emergence of a cumulative effect of the implementation of two or more interrelated risks.

4. Inclusion in the model of subjective risk management of non-economic consequences of their implementation.

5. Investigation of situations in which the bearer of the opportunistic interest is not identical to the actor who implements measures to achieve this interest.

6. Development of tools for assessing the degree of rationality of the behaviour of external stakeholders, etc.

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