

The Economic Security of Companies Within the Petroleum Machine-Building Sector in A Climate of Changing Market Conditions: Modeling Risks



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Abstract: *This paper explores the essence and establishes the key characteristics of companies' economic security in a climate of changing market conditions. Based on a summarization of research into the market conditions, the authors performed modeling of risk from changes in conditions in Russia's petroleum machine-building market using the paired comparison method.*

Index Terms: *economic security, conditions, risk from changes in market conditions, paired comparison method, companies within the petroleum machine-building sector.*

I. INTRODUCTION

Companies within the petroleum machine-building sector produce significant volumes of output for internal and external consumption, providing the national economic complex with machinery for extracting fossil fuels. This may require employing a set of approaches that would help ensure their economic security. Market relations encompass the various aspects of a company's activity, which simply cannot be characterized through a single indicator. Therefore, in the

present climate of extensive and stiff competition, importance is increasingly attached, in striving to ensure stable production and profitable activity, to market conditions, as a generalizing characteristic of the market [1].

The state of market conditions is a basis for the development of a program of action at every company within a corresponding market; it determines the company's place and role within society's economic system. Consequently, there is an imperious need to gain in-depth insight into the consistent patterns of the market mechanism which governs shifts in market conditions within a nation's economy, particular sectors thereof, or particular companies [2]. In today's economic conditions, of special significance for business entities is exploring various methods for assessing risks associated with market conditions in order to obtain the most up-to-date, objective, and comprehensive information on the state of the market. Investigating various trends in the development of the market, various characteristics of its operation, the nature of various processes taking place within it, its various states, the impact of various factors on it, and various cause-and-effect relationships that underlie its operation makes it possible to explore, analyze, and fine-tune the information-analytical framework designed to determine a set of priority research areas for the development of integral methods for assessing risks related to market conditions. In the current climate, the attention of researchers may, inter alia, need to be focused on exploring various methods for assessing risks related to market conditions within specific sectors of the economy. At the same time, the wide range of products manufactured by the petroleum machine-building sector not only complicates the overall study of market conditions in the sector but may cause additional complications during the practical application of tools related to investigating their emergence and assessing them. This implies the need to conduct further research on the development of relevant theoretical and methodological-applied aspects of investigating the emergence of and assessing market conditions in the petroleum machine-building sector based on assessments of risks from changes in market conditions,

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which should help ensure sustainable market positions for companies and their products. The purpose of this paper is to model risks related to market conditions in the Russian petroleum machine-building sector as a tool for helping ensure the economic security of companies operating within it.

II. CHARACTERISTICS OF COMPANIES' ECONOMIC SECURITY IN A CLIMATE OF CHANGING MARKET CONDITIONS

Ensuring a company's economic security (hereinafter 'ESC') requires employing a systemic approach that would make it possible to encompass in an integrated manner multiple objects of security using available methods and means of protection. The need to take account of the diversity and distinctive characteristics of objects of security at a company that require protection from internal and external threats objectivizes the need to break the overall process of ensuring ESC down into a number of independent functional components (areas).

Each of the functional components of ESC must reflect the mechanics of implementation of security measures in relation to particular areas of a company's activity, its business units, or its resources. That said, taken together they must harmoniously complement each other, creating the preconditions for putting in place an integral system for the stewardship of ESC.

An analysis of some of the key conceptual approaches to structuring ESC [3-5] helped identify the following key functional components thereof: technical-technological, market, foreign-economic, intellectual and staffing, information, law enforcement, political-legal, environmental, and financial security.

With that said, what directly has to do with the study's object is ESC's market component, which characterizes the degree to which the internal potential for the company's development is aligned with the external one, which is generated by the market environment, and reflects the soundness and protectedness of the company's market positions. That is, the market component characterizes the degree to which the parameters of the production system match the needs of the market. It does not matter if it is a highly effective and cutting-edge production operation – if it is not oriented toward a specific consumer and does not take into account of market conditions and the characteristics of the action of market forces in the sector (or a particular segment thereof), it will not be able to ensure profitable activity for the company.

There are numerous commodity markets out there, each distinguished by specific conditions of formation and factors for development [6]. At each stage in the development of their market conditions, each of them is characterized by a special combination of factors and indicators which determine the characteristics and parameters of prospective trends, their relative weight, and the hierarchy governing their interaction with each other. It follows from the above that the company assessing its market, investigating shifts in market conditions, determining its own positions in the market relative to similar products and substitutes, and exploring possible prospects

and areas for development is one of the key conditions for ensuring ESC.

Market conditions are a manifestation within a specific market of a system of factors (indicators) and conditions of reproduction that are characterized by continual development and interaction with each other, which is reflected in a certain correlation between demand and supply and price dynamics.

This inference is substantiated by the following tenets:

- the object of economic conditions is the commodity market. Based on this, market conditions are perceived as the state of affairs in the market, which is a component element of commodity-money relations;
- market conditions are not only a characteristic of exchange relations but incorporate the reproduction process as a whole (production, distribution, circulation, and consumption), viewed through the prism of exchange relations;
- relations related to market conditions are viewed in real time, in a state of continual development;
- market conditions are regarded through the lens of specific historical circumstances in the development of the reproduction process, as each subsequent stage in the reproduction process is characterized by a distinct combination of conditions and factors for the formation of market conditions;
- the key form of manifestation of market conditions is associated with the demand and supply and quality and price relationships. Consequently, it is these factors that determine the market's dynamics and represent its key links. All other indicators influence market conditions in a mediated fashion, through changes to key links [7].

A review of the literature on assessing risk related to market conditions [8-10] helped identify and analyze two major approaches to assessing it. The first approach helps assess risks related to market conditions through the assessment of their state and use of a set of universal assessment methods, namely: economic-mathematical, statistical, empirical, expert, and others.

The second approach implies assessing a set of backbone factors that impact market conditions using an assessment methodology whereby the researcher identifies a set of classification attributes and indicators for assessment (for a company or a sector) independently and individually. This kind of approach is oriented toward the use of a set of indicators that reflect the characteristics, nature, and state of and trends in risks related to market conditions in a particular sector.

When it comes to the actual object of this study – companies within the petroleum machine-building sector, of special note are the following considerations. The activity of petroleum machine-building companies in the market is constantly exposed to the influence of the uncertainty factor. Currently, business entities are compelled to focus on resolving the issue of change in production and sales volumes due to frequent shifts in the nature and structure of market demand and stiffening competition.

Therefore, companies may need to plan out and keep track of their activity in the market by reference to key areas and trends in its development. In these conditions, petroleum machine-building companies are faced with the pressing concern of having to engage in a permanent quest for and model a policy on their behavior in the market. It will be impossible to resolve this issue without taking into account the outcomes from exploring and analyzing risks related to market conditions. Based on the above, ensuring ESC may well require modeling risks related to market conditions.

III. MODELING RISKS RELATED TO MARKET CONDITIONS IN THE RUSSIAN PETROLEUM MACHINE-BUILDING SECTOR USING THE PAIRED COMPARISON METHOD

The findings from a set of research studies [11-13] indicate that a great many factors utilized in research into market conditions (e.g., demand, supply, price, quality, levels of competition, etc.) are of a likelihood-based nature and may eventually lead to uncertain and insufficiently substantiated end results in calculations.

Based on this, the authors are of the view that the outcomes from employing this kind of indicators may well require relevant methodological support in terms of assessments of the credibility of the results obtained, with the level of which jointly with assessments of risk in the calculations constituting a complete group of incompatible phenomena. This makes it possible to state that the lower the level of risk is, the greater is the accuracy of the calculations on market conditions in a certain sector and the greater is the degree to which the results obtained are substantiated.

It is quite hard to assess the likelihood of risk quantitatively, with calculation results built on computations of the frequency at which a certain phenomenon manifests

itself, i.e. the availability of certain statistics. Statistical computations should be regarded as more objective, as they are based on objective (factual) data. With that said, using them is complicated for a number of reasons. Firstly, far from always are data of this kind available – in fact, for the most part it is simply impossible to obtain them altogether. Secondly, they do not factor in sharp changes in market conditions. Thirdly, they do not factor in all nuances of the way market conditions form that cannot be gauged quantitatively. In this case, risk theory recommends employing expert (e.g., subjective and heuristic) methods, which do not have the above weaknesses and are oriented toward averaged expert opinion in the context of assessing market risk. Subjective likelihood implies projecting a certain result and can be computed using methods such as expert attributive assessments (intuitive assessments of permissible risk based on accumulated experience), expert assessments of risk factors and criteria, and risk likelihood modeling.

Based on the above, the authors suggest assessing risk related to market conditions in the petroleum machine-building sector using heuristic methods, more specifically paired comparison. This method, employed by the authors subsequently, can be adapted to market conditions to assess risks inherent in the operation of the market in a climate of limited statistical data and the impact of certain factors which yield themselves to measurement with some difficulty [14].

The authors assessed market risk in the Russian petroleum machine-building sector via a survey of a group of experts (specialists focused on the petroleum machine-building sector), who were presented with a set of factors regarded as carriers of market risk (Table 1).

Table 1: Risk Factors in Russia’s Petroleum Machine-Building Market

Code	Factor	Note
F1	Worsening of conditions in Russia’s overall market	There is a close link between the activities of all markets
F2	Emergence of an alternative to existing products manufactured by the petroleum machine-building sector (declines in the market’s absorptive power)	This is one of the integral risk factors
F3	Increase in the share of imported petroleum machine-building products in the Russian market	Imported products are pushing out domestic products
F4	Decline in the quality of petroleum machine-building products	Quality is a crucial factor for market conditions
F5	Intensification of the state’s fiscal pressure on manufacturers	This may have unpredictable consequences
F6	Difficulties providing the petroleum machine-building sector with quality materials	This may lead to declines in manufacture
F7	Change in target consumer preferences in favor of imported petroleum machine-building products	May lead to a change in the market structure in favor of imports
F8	Increase in the cost of manufacture of domestic petroleum machine-building products	This may lead to higher prices and decreased sales
F9	Disturbances in the operation of the banking sphere (difficulties obtaining a loan)	This may lead to difficulties in production and sales

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F10	Decline in domestic exports of petroleum machine-building products	This may lead to increased supply in the domestic market
F11	Lack of, or decline in, government support for the manufacture of petroleum machine-building products	There are difficulties in terms of innovation policy
F12	Worsening of the operation of market mechanisms for the manufacture and sale of products	This may lead to a worsening of conditions in the market
F13	Unfair practices by trading partners	This may lead to disturbances in the market

The experts were asked to evaluate the significance of risk factors using the method of paired comparison of a set of factors (each with each) by way of row sums, which implies ordering the factors by degree of the “role” in the worsening of market conditions without assigning a weight to them.

The examination procedure is based on the use of paired comparisons of a set of items whereby they are all compared in a pairwise fashion, with each subsequent assessment not linked with the previous one. All these paired assessments form a matrix of paired preferences, which, when subjected to special processing, helps produce the numerical parameters of indicators of an item’s priority for a particular company [14, 15].

The experts’ answers were processed, grouped, and represented as a table of preferences (Table 2). The answers were assessed using a special criterial table, which was constructed based on the following algorithm: in comparing two risk factors, at the crossing of a row and a column an expert would provide a relevant predetermined assessment.

The assessment procedure was performed in a pairwise fashion using the following assessments:

- “1.0” assessment, if an expert deemed a factor in the column to have the greater degree of risk (columns having priority);
- “0.0” assessment, if an expert deemed a factor in the column to have the smaller degree of risk (rows having priority);
- “0.5” assessment, if an expert deemed a factor in the column to have the same degree of risk (risk factors being on par with each other).

The opinions by all 16 experts were summarized in a criterial assessment table (Table 2). This table displays the outcomes from the first stage of the examination of the relative priority of the risk factors. In putting the criterial table together, the assessments by each expert were added up.

Table 2: Criterial Table of Expert Assessments of Market Risk Factors for Russia’s Petroleum Machine-Building Sector

Risk factor code	Risk factor code													Total	Rank
	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	F13		
F1	X	3.5	7.0	6.5	12.5	11.5	10.0	8.0	13.0	14.5	15.0	11.0	15.5	158.0	4
F2	12.5	X	10.5	9.5	15.0	13.0	12.5	13.0	14.5	15.0	16.0	14.5	15.5	196.5	1
F3	9.0	5.5	X	7.0	12.5	12.0	11.0	9.5	11.5	12.5	15.0	13.5	15.5	158.5	3
F4	9.5	6.5	9.0	X	12.5	12.0	11.0	10.5	13.0	13.5	14.5	12.0	15.0	161.5	2
F5	3.5	1.0	3.5	3.5	X	5.5	2.5	6.5	7.5	8.0	12.5	6.0	13.5	89.5	10
F6	4.5	3.0	4.0	4.0	10.5	X	8.0	8.5	9.5	10.5	15.0	12.5	14.0	123.0	7
F7	6.0	3.5	5.0	5.0	13.5	8.0	X	7.5	10.0	10.5	15.5	8.0	14.5	132.0	6
F8	8.0	3.0	6.5	5.5	9.5	7.5	8.5	X	9.5	11.5	15.0	12.5	13.5	133.5	5
F9	3.0	1.5	4.5	3.0	8.5	6.5	6.0	6.5	X	8.0	14.5	7.0	13.0	96.0	9
F10	1.5	1.0	3.5	2.5	8.0	5.5	5.5	4.5	8.0	X	9.0	7.0	10.5	78.5	11
F11	1.0	0.0	1.0	1.5	0.5	1.0	3.5	1.0	1.5	6.0	X	1.5	6.5	30.5	13
F12	5.0	1.5	2.5	4.0	10.0	3.5	6.0	3.5	9.0	9.0	14.5	X	14.0	98.5	8
F13	0.5	0.5	0.5	1.0	2.5	2.0	1.5	2.5	3.0	5.5	9.5	2.0	X	36.0	12

An analysis of the results obtained in this study helped draw a set of important inferences. Firstly, Russian manufacturers of petroleum machine-building products are not desperate to receive material assistance from the government to support their business. The factor F11 (‘Lack of, or Decline in, Government Support’) was identified by the experts as the least risky (Table 2).

The experts’ minimal attention to the factor risk F13 (‘Unfair Practices by Trading Partners’) may be due to the presence of elements of chaos and a lack of civilizational attributes with the market.

This explanation may also be applied to the factors F12 (‘Worsening of the Operation of Market Mechanisms for the Manufacture and Sale of Products’, ranked eighth) and F5 (‘Intensification of the State’s Fiscal Pressure on Manufacturers’, ranked 10th). The low ranking of the factor F9 (‘Disturbances in the Operation of the Banking Sphere (Difficulties Obtaining a Loan’) is, in the authors’ view,

due to domestic manufacturers of petroleum machine-building products overcoming the barriers from financial sanctions and a satisfactory level of immunity being achieved in this area. The high ratings on petroleum machine-building products in the internal market are not affecting significantly the process of exporting these products (Factor 10). The Russian petroleum machine-building sector has sufficient production capacity reserves in order to step up production.

IV. CONCLUSION

Market conditions are a complex, dynamic, and fast-changing phenomenon that consists of many singular phenomena, processes, and actions, which emerge under the influence of various factors, both random (accidental) and fixed, occurs in cyclical fluctuations (regular and irregular), and may run in small and large cycles. Therefore, a system for exploring market risk factors must contain indicators of the following dynamic and variative characteristics that are typical for the nature and state of and trends in market conditions – variability, dynamicity, and cyclicity, which are top-priority and dominant characteristics with regard to their nature. These indicators must be used in combination with other metrics in integrated analyses and be a top priority.

The use of a heuristic approach, particularly a paired comparison method adapted to market conditions, helps gain insight into some of the most significant risk-contributing factors for conditions in the petroleum machine-building market. However, research data have yet to make it possible to establish the “weightiness” of a particular factor in shaping certain market conditions, which may well be a matter for future research.

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