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**Research of endogenous and exogenous factors  
influencing the results of forecasting the development  
of the oil and gas industry against the background of the transformation of the  
structure of the fuel and energy balance**

**Specialty:**

5.2.3. "Regional and sectoral economics"

**ANNOTATION  
of the dissertation for the degree of Doctor of Economics**

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## **The main results of the dissertation of T.Yu. Safonova**

### **«Research of endogenous and exogenous factors influencing the results of forecasting the development of the oil and gas industry against the background of the transformation of the structure of the fuel and energy balance»**

Dissertation for the degree of Doctor of Economics in the specialty 5.2.3. "Regional and Sectoral Economics" by T. Yu. Safonova - is a comprehensive study of the problem of forecasting in the oil and gas industry, which is important for the Russian economy.

**The relevance of the topic of the dissertation** is determined by the increasing importance of forecasting in the implementation of investment and innovative projects in the fuel and energy industry, which has a direct impact on long-term production and economic indicators.

Since the fuel and energy industry is the budget-forming for Russia and a number of other countries, the correctness of forecasting is a key factor in future economic growth or, conversely, stagnation.

In this regard, the formation of a predictive model, adapted to the constantly changing information picture of the world, changing the structure of the global energy balance, and allowing investors to make informed decisions, is of particular importance.

The relevance of the topic of the dissertation is also associated with a significant discrepancy between the data of forecasts in the energy sector, formed by the most authoritative developers, which creates the problem of using these forecasts for business planning and prerequisites for the formation of new approaches and methodology for forecasting fuel and energy balances.

To automate the forecasting process, the author has developed a model using digital technologies (machine learning), conducting multivariate analysis and identifying and eliminating fluctuations (noise) that have an additional impact on the results. In addition, the coefficients of influence of each factor on the final forecasting result are entered into the system.

The forecasting system proposed by the author, on the one hand, makes it possible to take into account the available institutional assessments of the development of the energy sector in Russia and the world and, on the other hand, to form a range of expected changes taking into account the assessment of the influence of a full range of factors and be able to make prompt changes to the model, taking into account the constantly changing macroeconomic, production and information picture of the world energy.

When forecasting the country's fuel and energy complex, the author proposes to take into account an extended list of prerequisites for changing the structure of the global energy balance, including the influence of geopolitical factors, which is extremely important in the era of global transformation of supply chains, the transition from surplus to deficit in the global energy market.

**The object of the research** is forecasting methods, existing methods for identifying factors affecting the development of the fuel and energy complex, as well as the dynamics of the main macroeconomic indicators of the country, demonstrating the development and state of the country's energy industry.

**The subject of the research** is the factors that determine the development and sustainable functioning of the fuel and energy complex of the Russian Federation, as well as the impact of existing systems of taxation, pricing, global balance of supply and demand on indicators characterizing the state and development of the fuel and energy complex of the Russian Federation.

**The purpose of the research** is to identify the main factors influencing the development of the energy industry and necessary for the subsequent forecasting of the country's fuel and energy balances.

In accordance with the goal, the following tasks are defined:

- 1) assessment of the impact of endogenous factors on the Russian oil and gas sector, including the impact of taxation in the oil and gas industry on the levels of government revenues from taxation in the oil and gas industry on the Russian budget and economic growth rates in the industry;
- 2) formation of proposals for adjusting taxation systems that ensure the development of the oil and gas industry in the future;

- 3) development of a synergistic pricing mechanism for Russian oil and oil products, taking into account quality factors, the cost of transportation and taxation, which ensures non-discriminatory conditions for the operation of oil and gas producing and oil refining enterprises in Russia;
- 4) study of demand for motor fuel in Russia in order to assess the effectiveness of investments in the modernization of Russian refineries;
- 5) assessment of the impact of exogenous factors on the Russian oil and gas sector;
- 6) analysis of the prospects for the implementation of the "green" agenda in the world and changes in demand for Russian hydrocarbons by 2050;
- 7) identification of growth points for the Russian energy sector;
- 8) study of existing methods for forecasting energy markets in the world and in Russia, analysis of forecasts for the development of the energy industry in Russia and the world, identifying the advantages and disadvantages of existing forecasting models and developing proposals for options for neutralizing the weaknesses and using the strengths of existing forecasts for the Russian energy sector, developing the concept of a forecasting model;
- 9) development of a forecast for the development of the fuel and energy industry based on an analysis of an extended list of prerequisites for three scenarios until 2050 based on the author's forecasting model.

**New scientific results** obtained by the author and corresponding to the scientific specialty of the Higher Attestation Commission of the Ministry of Education and Science of the Russian Federation - 5.2.3. - "Regional and sectoral economics", included in the nomenclature of scientific specialties, approved by order of the Ministry of Education and Science of Russia No. 118 dated February 24, 2021, are as follows:

In the process of researching and determining endogenous factors that affect the forecast indicators for the development of the Russian oil and gas industry:

1. The post-Soviet history of the development of taxation systems in the oil and gas industry has been systematized and 8 stages have been identified, taking into account changes in tax regimes.

As a methodological basis for separating the stages of the evolution of taxation systems, the study uses the sign of changing the procedure for calculating the tax on the extraction of minerals, the abolition and restoration of customs duties and excises, as well as the introduction of subsidies.

2. Recommendations have been developed for fine-tuning the tax system of the oil and gas industry, which will allow stabilizing revenues from the key tax – MET (mineral extraction tax), providing the necessary support to oil and gas production and oil and gas processing enterprises, and creating a mechanism for subsidizing the end consumer, which should become a beneficiary in case of abrupt changes in the motor fuel market.

Recommendations are as follows:

2.1. To reduce the dependence of oil and gas taxes on world prices and external market conditions (MET, additional income tax - AIT, customs duties on oil, gas, oil products) and subsidies (reverse excise tax on oil and the damping component), reduce the risks of dependence on foreign price indicators, as well as stabilize the budget filling with the dissertation, it is recommended to make changes focused not on netbacks (external market prices subject to changes in world market conditions), but on Russian price indicators (limiting domestic prices).

2.2. Prior to the transition for the purposes of taxation in the oil and gas sector to Russian price indicators, during the transition period, in order to ensure the sustainability of budgetary fillings, the author substantiates the expediency of increasing the base tax rate of the mineral extraction tax and reducing the value of the coefficient characterizing the dynamics of world oil prices.

The mechanism proposed by the author makes it possible to smooth out the dependence of budget revenues on the assessment of the cost of Russian oil on the world market and ensure a higher filling of the budget. The absence of the exchange rate of the national currency against the US dollar in the severance tax formula makes it possible to radically “detach” exchange rate dependence and ensure the stabilization of the national currency exchange rate to form a trusting investment climate in the country.

2.3. It is recommended to exclude the reverse excise and damper from the list of tax preferences, as well as to keep the customs duty on oil and oil products for Russian enterprises, since customs duties are a supporting mechanism for the purchase of crude oil by the oil refining sector and at the same time a restraining mechanism for increasing supplies to the foreign market to the detriment of the domestic market.

3. The international practice of using benchmarks in hydrocarbon trading has been systematized and the problems of oil pricing have been identified.

In this regard, the concept of synergy of logistics and quality parameters and final price indicators has been developed, including:

3.1. taking into account the established current price ceilings for gasoline, diesel fuel and jet fuel, the introduction of Urals oil price ceilings with annual indexation on “inflation minus” terms, which will ensure the marginality of oil refineries (refineries);

3.2. ensuring daily publication of the following indicators of prices for Russian oil in the national currency:

- price indicators of exchange transactions with Russian marker grades of oil formed on domestic stock exchanges;
- price indicators of OTC transactions based on the final price based on the consolidation of the reporting data of foreign economic activity;
- price indicators of over-the-counter spot market transactions (including tenders) concluded at a fixed price;

3.3. determination of the cost of Russian marker grades of oil: Urals, ESPO, Siberian light, Sokol, Vityaz, Varandey, Novoportovaya light, Arco, as well as high-sulfur and especially high-sulfur oil, taking into account the de-escalator quality formula proposed by the author of the research, taking into account coefficients for density, sulfur content, ballast and differentials, which are the difference between the normalized and actual value of the listed indicators in destination;

3.4. In order to ensure the sustainability of budgetary fillings, to exclude dependence on foreign quotations and discounts, the author proposes to use a

system of national price indicators for calculating oil and gas taxes, taking into account the recommendations presented in paragraph 2.

4. Taking into account the obtained predictive indicators of changes in oil refining volumes in Russia by 2050 under three scenarios, taking into account the analysis of the prospects for the implementation of the "green" agenda in the world, suggesting a decrease in global demand for hydrocarbon fuels, the dissertation substantiates the need to conduct an inventory of the output parameters of the modernization program refineries (including analysis of planned investments) and assessment of comparability with the forecast of demand for motor fuel in the domestic and foreign markets to determine the relevance and feasibility of these investments and possible options for the development of the industry.

In the current situation of "challenges" for the Russian oil refining industry, the expediency of applying a strategy to reduce the volume of Russian oil exports in order to increase interventions and increase the importance of Russian oil products on the world market and get added value from their sale is justified.

5. Exogenous factors of influence for the development of the Russian oil and gas industry have been identified: the implementation of the energy decarbonization strategy adopted by the European Union; Russia's participation in the OPEC+ international deal; restrictions of a fundamental nature, the main of which is the unwillingness of developed countries to support the economies of other countries by importing raw materials and processed products; the sanctions pressure of the coalition of the European Union, the G7 and Australia, which has transformed over the past decade from an exceptional measure of influence into a traditional measure of influence on the economy of the oil and gas sector of Russia; non-market methods of price regulation introduced by the coalition; transformation of global cargo flows of oil, gas and oil products.

6. An analysis of the structure of the world cargo flows of oil, gas, oil products and LNG, as well as the capacity of Russian export terminals and pipelines, made it possible to substantiate the conclusion that it is necessary to preventively transform the sales markets for Russian energy resources, taking into account the sanctions pressure on Russia, the essence of which is to expand cooperation with the OPEC+ countries in terms of

implementing joint efforts to reorient the Eurasian oil cargo flows in order to prevent the escalation of the global energy crisis.

This conclusion is important in order to exclude unreasonable losses during the period of the anti-Russian sanctions regime, to exclude confrontation and competition with friendly countries in the Asia-Pacific market, to form a plan of coordinated actions for the purpose of coordinating changes in Eurasian cargo flows with an increase in the segment of Russia's presence in the market of the Asia-Pacific countries with a simultaneous increase in supplies by countries OPEC of the fallen Russian resources to the EU countries with the implementation at world prices.

A coordinated strategy of Russia, OPEC+ countries and friendly importing countries is necessary not only to maintain the balance of supply and demand for oil in the world, but also to support market pricing mechanisms, the formation of optimal export cargo flows, and also as a countermeasure against the NOPEC bill to impose price ceilings for key oil exporting countries.

7. The position on the lack of investment in the Russian petrochemical industry, as well as in the production of hydrogen cleaned from the "carbon footprint" and in alternative energy, is substantiated, based on the opinion on the need to ensure demand for petrochemical products in the domestic and foreign markets, industrial independence and accelerate import substitution petrochemical products, using the potential of the resource base and restoring lost gas production volumes as a result of sanctions, as well as developing the production of environmentally friendly types of energy in Russia to smooth out global warming processes and prevent environmental disasters in the world.

8. Based on a study of actual data on sea transportation of oil cargo from Russia, the need for preventive reorientation by Russian companies of the main part of sea transportation of oil and oil products to friendly and neutral countries before the introduction of an embargo and price ceilings on oil and oil products of Russian origin is proved, and the following conclusions are substantiated on the ineffectiveness of sanctions pressure:

- as a result of the transformation of international cargo flows, the EU countries have lost the opportunity to purchase oil cargo, taking into account efficient logistics and a short transport “shoulder” from Russia,

- the embargo and price ceilings did not affect the prices of actual transactions, the sale of Russian oil and oil products is carried out to foreign buyers according to price formulas with an indication of the contractual differential,
- sanctions turned into a price “boomerang” for the EU countries - the compounded or replaced Russian resource is returned to the EU, but not at the “ceiling”, but at world prices, taking into account the cost of freight,
- Oil and gas revenues of the Russian budget demonstrate stability, in particular, due to additional fixed contributions from large corporations.

9. In the definition of the author, “a forecasting model of fuel and energy balances means the formation of predictive fuel and energy balances based on the assessment of endogenous and exogenous factors of influence and the identification of an extended list of prerequisites for each of the development scenarios in the prospective period, taking into account the dependencies between the balance values of the world and Russian market”.

The proposed concept of the forecasting model includes, in particular, a tool for consolidating the most authoritative forecasts for the development of the energy sector in Russia and the world, as well as econometric models of research institutes, identifying a significant discrepancy between these forecasts and suggesting the consolidation of institutional assessments of the development of the energy sector in Russia and the world with the formation of consensus forecasts of authoritative international and Russian development organizations.

The author's forecasting model, on the one hand, makes it possible to take into account the available institutional assessments of the development of the energy sector in Russia and the world, and, on the other hand, to form a range of expected changes taking into account the assessment of the influence of an extended range of factors and be able to make prompt changes to the model, taking into account the constantly changing macroeconomic, production and information picture

It is proved that the key factor influencing the forecast of production indicators of the fuel and energy complex of a particular country is the international energy balance of supply and demand for specific energy resources, which eliminates the isolation of

forecasting from the factors of reorganization of foreign markets, and an extended list of influence coefficients allows taking into account the peculiarities of the conjuncture of the external and internal markets. for each energy carrier.

A model for automating the forecasting process has been developed, the key elements of which are the use of digital technologies (machine learning), conducting multivariate analysis, identifying and eliminating fluctuations (noise) that have an additional impact on the results, as well as corrective factors for taking into account the influence of each factor on the final result of forecasting.

10. A system of predictive indicators has been developed, formed using machine learning technologies and controlling systems for the results of machine processing of databases, based on an extended list of prerequisites for changing the structure of the world energy balance in three scenarios until 2050:

- basic,
- oil and gas confrontation scenario (optimistic for the oil and gas industry),
- scenario of rapid change in the structure of the world energy balance (pessimistic for the oil and gas industry).

Both exogenous and endogenous factors are systematically taken into account by the author in the prerequisites for the formation of each of the forecast scenarios.

The main factors in the implementation of the three scenarios, the forecast indicators of which depend on indicators of the international energy balance of supply and demand for specific energy resources, are: the pace of further escalation or easing of sanctions pressure and non-market price restrictions on energy resources, the pace of global reorientation of Russian cargo flows of oil cargoes in the direction of friendly and neutral countries, the pace of implementation in the world of programs to reduce the carbon footprint (including the introduction of a carbon tax) and the transition to electric transport, the applied systems of taxation and incentives for the development of the industry.

**Approbation of the research results.** The dissertation is based on the results of the author's many years of experience in the structures of «Transneft», «Rosneft», as a coordinator of the working group to finalize the regulatory framework for the creation of

Russian price indices in the State Duma of the Federation Council of the Russian Federation, a member of the expert council under the Ministry of Energy of Russia, the results numerous studies by LLC "Independent Analytical Agency of the Oil and Gas Sector", in which the author was directly involved, expert work at the RANEPa, participation in collective studies of fuel and energy markets.

The reliability of the dissertation provisions is confirmed by the development and successful practice of implementing Russian and interstate regulatory documents for accounting for oil and petroleum products, participation in delegations from the Russian Federation when concluding long-term interstate agreements for the supply of oil.

In addition, a number of conclusions and proposals were publicly discussed and reflected in the author's expert assessments published in leading media and trade publications.

The developed provisions of the dissertation were reported by the author and discussed at meetings of the working group on finalizing the regulatory framework for the creation of Russian price indices in the State Duma of the Federation Council of the Russian Federation, at a meeting of the expert council for the development of competition in the oil and oil products market of the Federal Antimonopoly Service of Russia, as well as at numerous international and Russian business and scientific and practical conferences, round tables, business forums, where Safonova T.Yu. was a speaker: at the Analytical Center under the Government of the Russian Federation, at the National Oil and Gas Forum, at the international congress "Transportation, storage and transshipment of oil, liquefied gases and petroleum products", at the Baltic Oil and Gas Trade and Transport Conference, at the Forum of Entrepreneurs, at the Business Forum "TEK in the 21st Century", at the Caspian Oil and Gas Trade and Transport Conference, at the professional energy forum "Fuel and Energy Complex: Pricing and Market Risks", are presented in the course of lectures at the "School of Oil Traders".

The main conclusions and proposals of the dissertation are presented in several dozen articles in such leading economic and specialized journals covering the fuel and energy industry as "Oil and Gas Vertical", "Oil and Capital", "Oil, Gas and Business", "Oil of Russia", " Pipeline transport of oil", "Energy market".

The results, conclusions and recommendations obtained in the work are substantiated using a system analysis of modern theoretical approaches and models that describe both the results of the industry and the forecasting system.

The reliability of the results of the dissertation research is confirmed by the use of economic and mathematical methods of analysis, empirical observations and experience in the practical implementation of proposals in the course of expert work, the formation of forecasts and marketing research of energy markets, as well as the use of a large amount of statistical information visually presented in tables and figures.

Preparation, statistical analysis and interpretation of the obtained results were carried out using modern methods of information processing (automated control systems, business process monitoring, machine learning technologies).

The result of the study is the development of forecast expectations for changes in the structure of the Russian oil and gas complex according to three scenarios proposed by the author, with details on the directions and types of fuel and energy resources.

As an example of practical use, the study presents an expanded list of prerequisites for changing the structure of the global fuel and energy balance and develops indicative parameters for three scenarios for the development of the world energy sector.

The research task has been completed: an example of the development of forecasts for the development of the Russian oil and gas industry, which can be used, in particular, by Russian companies in the fuel and energy complex, is presented.

The system for publishing national oil price indicators, developed by the author, is used by the Independent Analytical Agency of the Oil and Gas Sector for the daily publication of the Russian Oil Market Indicators publication, which is used by the largest Russian and foreign oil and gas companies.

The forecasting methodology developed by the author has been published in the Scopus Indexed publication and is used in practice by LLC «Independent Analytical Agency of the Oil and Gas Sector» in the development of market research, approved by the Research Customers, as well as by banks using the Research to open credit lines.

### **Publications.**

The main provisions of the dissertation were reflected in 43 works, including 1 article in the Scopus Indexed journal, 4 articles in journals on the RANEPa list, 1 dissertation, 1 monograph and 13 articles in scientific journals determined by the VAK of the Ministry of Education and Science of Russia, as well as in numerous expert assessments of the author, published by leading Russian and foreign media.

### **Dissertation structure.**

The dissertation work consists of an introduction, 8 chapters with conclusions for each chapter, a conclusion, a list of sources used, a list of abbreviations and symbols.

The work with a total volume of 410 pages, includes 74 tables, 83 figures, 32 formulas, a list of references from 94 titles of used scientific sources.

*T.Yu. Safonova*