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Cognitive Model of the National Financial Market: Creating Process and Prospects for Assessing the Security of its Functioning

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ABSTRACT

The subject of the research is the Russian financial market. **The aim** of the study is to develop a cognitive model of the Russian financial market to assess the security of its functioning. **The relevance** of the study is due to the need to assess the reaction of the national financial market to various exogenous and endogenous stressors in the face of growing geopolitical tensions and the emergence of new artificial restrictions on the access of domestic investors to foreign sources of capital. The belonging of modern financial markets to complex adaptive systems consisting of elements and relationships, the formal description of the dynamics of which is very problematic, determines the advisability of using cognitive analysis and modeling **methods** in the process of assessing the safety of their functioning. **A feature** of the study is that when building a cognitive model of the national financial market, the author uses as the main elements not individual actors of the financial market, but macroeconomic aggregates that characterize the state of the financial market and the economy as a whole. The actor-network structure of the national financial market presented in this way makes it possible to consider the high degree of interpenetration of the financial and real sectors, which is characteristic of the modern economy. **The novelty** of the paper lies in the development of tools for analyzing the dynamics of the financial market as a result of constructing a methodological framework for studying the security of its functioning based on cognitive modeling. The developed cognitive model shows how the identified macro-aggregates change as a result of the spread of a positive or negative impulse, allowing to highlight the critical factors ensuring the sustainable functioning of the financial market. The author **concludes** that in the case of a balanced state of the considered macroeconomic aggregates, the existing hierarchical structure of the Russian financial market makes it possible to localize and neutralize crisis phenomena of an endogenous nature. At the same time, within the framework of the existing networks of the interaction of the financial market, exogenous stress impulses will intensify and lead to a violation of its effective performance of the function of capital circulation. **The practical significance** of the research results lies in the ability to determine the stabilizing processes and mechanisms operating in the economy as a whole and in the financial sector in particular, and in their absence, to identify the possibilities for their design that can increase the systemic security of the functioning of the country's financial market.

Keywords: financial market; cognitive modeling; security of financial market; cognitive model of the financial market; complex adaptive systems

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INTRODUCTION

Solving the problems of ensuring the safety of the functioning of complex systems of various nature becomes particularly relevant in the context of the emergence of new technologies, the complexity of relationships and organizational structures, etc. Currently, literally all aspects of socio-economic life are covered by processes of accelerating change and growing instability. The ongoing processes also largely affect the national financial market, raising the issue of relevant assessment methods and ways to ensure the safety of its functioning in the face of growing geopolitical tensions and the emergence of new artificial restrictions on the access of domestic investors to foreign sources of capital.

According to Yu. A. Danilova, O. V. Buklemishev [1], M. A. Eskindarov, V. V. Maslennikov, E. A. Zvonova [2], E. A. Loktionova [3], D. Baur, N. Schulze [4], and others the security of the financial market lies in the stable and efficient performance by the market of the functions of organizing the unhindered movement of capital, carried out at an acceptable level of transaction costs, contributing to the effective development of the national economy and ensuring the protection of the economic interests of the country at the international level. The theoretical and practical interest in the problem of ensuring the security of the functioning of national financial markets is largely due to the structural and functional changes taking place in the world economic system. The ongoing globalization of financial markets, the active development of the institutional structure of the global financial system and the emergence of new financial instruments not only act as drivers for the development of national financial markets but also create new threats to the security of their functioning.

W. Arthur [5], J. Foster [6], E. Solt [7], Yu. V. Lakhno [8], and others showed that being complex adaptive systems, financial markets are dynamic networks of

interactions, the elements of which change their behavior in accordance with a micro-event or a set of events that initiate changes. Since, as proved by J. Foster [9], F. Hayek [10], J. Holland [11], C. Hooker [12], and others, understanding the behavior of individual elements of complex adaptive systems does not provide a complete understanding of the behavior of the entire system, and a formal description of the relationship between their elements is quite problematic, to assess the response of the financial market as a whole to various kinds of exogenous and endogenous stressors, it becomes appropriate to use the cognitive modeling technique.

Cognitive modeling is the process of modeling the behavior of complex systems in response to changes in the external environment, based on the identification of factors that quantitatively and qualitatively characterize the state of systems, and the analysis of existing cause-and-effect relationships [13]. The main tool for cognitive modeling is a cognitive map — a causal network, the vertices of which are the elements of the system or the main factors of the problem situation, and the arcs are the causal relationships between them [14]. Detailed information about the methodology of cognitive analysis and modeling, as well as about the features of the practical use of cognitive tools for solving problems of managing complex semi-structured socio-economic systems, can be found in [15–19].

Based on the general scheme for the implementation of cognitive analysis and modeling, presented in the work of V. I. Maksimov, E. K. Kornoushenko and S. V. Kachaev [20], the process of assessing the security of the functioning of the national financial market based on the constructed cognitive map can be represented as consisting of the following stages:

1. The choice of any exogenous or endogenous factor that is a stressor for the system under consideration.

2. Analysis of the movement of the impulse, which arose as a result of the action of the selected factor, along the logical chains of the cognitive map.

3. Identification of the process of attenuation or amplification of the negative impulse as it spreads along the logical chains of the cognitive map.

4. General assessment of the stability of the system to the selected stressor.

5. Development of recommendations for the construction of a cognitive scheme that contributes to the attenuation of the negative impulse and leveling its consequences.

6. Despite the development of the relevant theoretical and methodological tools, cognitive modeling as a method of studying financial markets is rarely used. Due to the need to consider a lot of factors that affect a complex system, the development and analysis of cognitive models are time-consuming processes. However, modern digital technologies make it possible to build multi-element cognitive maps and apply cognitive modeling in very complex socio-economic systems, where elements and their relationships are distinguishable, but a formal description of the relationships between system elements is problematic.

Meanwhile, the possibilities of using cognitive modeling to predict the influence of certain exogenous and endogenous factors on the dynamics of the financial market as a complex adaptive system determine the applicability of this approach to assessing the level of security of its functioning. Through a visual representation of the interrelations of the elements of the financial market, based on their theoretical understanding, the cognitive model makes it possible to identify both the processes leading to the strengthening of the destabilizing forces acting in the system, and the processes that contribute to the strengthening of the destabilizing forces as well as restoration processes of the dynamic balance of the system. A targeted impact on these processes within the framework of

the implementation of the state economic policy can improve the systemic security of the functioning of the country's financial market.

COGNITIVE MAP OF THE RUSSIAN FINANCIAL MARKET

Cognitive modeling, like any modeling in general, begins with a simplification of the object of modeling by highlighting critical elements, factors and relationships, since the initial complexity and uncertainty of the interactions of all elements of the analyzed real system as an object cannot be transferred within the framework of the analysis. The adequacy of the constructed cognitive map and its compliance with the goals of modeling depend on the choice of factors, elements and networks of interaction between them, describing the process of functioning of the modeling object.

Cognitive modeling of processes occurring in financial markets is usually carried out by identifying individual subsystems of the financial market (banking market, insurance market, stock market, foreign exchange market, etc.) with their subsequent integration by formalizing the links between them [21, 22]. In our opinion, to solve certain problems, the use of this approach is justified and effective. However, in order to assess the security of modern financial markets operating in conditions of a high degree of interpenetration of the financial and real sectors, when determining the peaks of the future cognitive map, it is necessary to take into account both the features of the structural organization of the market and the features of its relationship with the real sector of the economy.¹

¹ The need to develop a new approach to assessing the security of the functioning of financial markets, which is fundamentally different from the traditional one, in which an integral assessment of the level of its security is obtained as a result of "adding" the values of the level of security of its individual elements, is disclosed in the article: Loktionova E.A. Development of a methodology for assessing the security of the financial market based on the actor-network theory. Finance and credit. 2020;26(10):2268–2289.

According to Yu. A. Danilov, I. V. Larionova, B. B. Rubtsov, D. Yu. Fedotov and others, **the Russian financial market has the following features that determine its structural organization:**

1. Absence of dominant segments of the financial market that determine the dynamics of development of its other segments. Despite the fact that a number of indicators (the predominant share of bank deposits in the structure of household savings, a significant share of bank loans in the structure of borrowed capital of organizations, the performance by the Bank of Russia of the functions of a mega-regulator of the financial market, etc.) indicate the dominance of the banking sector in the Russian financial market, it cannot be said that the banking sector is the driver of its development [23].

2. The presence of strict control over the banking sector due to compliance with the International Standards of the Basel Committee on Banking Supervision, which prevents the flow of high-risk financial instruments through the banking sector to other segments of the financial market [24–26].

3. Lack of a developed market for innovative financial instruments that unites different segments of the financial market. In Russia, there is no exchange market for securitized derivatives, and the structure of OTC transactions is very different from the structure prevailing in other countries: about 80% of all transactions with derivative financial instruments in the domestic OTC market are transactions with swaps, 17% — transactions with forwards and only 3% — transactions with other instruments (options, interest rate agreements and swap-tions) [27]. Since insurance, banking and investment capital are inseparable from each other in the world market as part of the creation and circulation of innovative financial instruments, the crisis, having originated in one segment, quickly passes through these financial instruments to other segments of the financial market. On the other hand, the lack of a developed market for innovative fi-

nancial instruments means that market participants do not have modern tools for managing investment risks.

4. Insufficient intensity of the use of internal channels of long-term financing of the economy due to the current structure of savings of the population [28], the peculiarities of the interaction of companies in the real sector with the financial market [29], insufficient number of large institutional investors [30], high concentration of financial market participants and their reduction number [31, 32], etc. Thus, according to the National Association of Stock Market Participants (NAUFOR), the Central Bank of the Russian Federation and Rosstat, despite the great interest of private investors in individual investment accounts (IIA), the share of cash in the structure of household savings is about 25%.² The debt of legal entities on loans by the end of 2020 increased by 11% in annual terms, increasing the share of bank loans in the structure of borrowed capital of organizations.³ At the end of 2020, the diversification of Russian financial market instruments is still insignificant (70% of the share market turnover was accounted for by the shares of the 10 most liquid issuers and was carried out through the 10 largest brokers); the concentration of assets of financial market participants continues to grow (80.9% of the assets of insurance companies account for the 20 largest insurers; 63.6% of the net assets of the Russian banking sector — for the 5 largest banks),⁴ while the number of financial market participants is declining (from 2014 to 2021 The number of companies licensed to carry out brokerage, dealer, depository and securities management activities decreased from 1093 to 407, non-state pension funds — from 119 to

² Monetary incomes and expenditures of the population. URL: <https://rosstat.gov.ru/compendium/document/13270> (accessed on 24.06.2021).

³ Financial stability review. URL: http://www.cbr.ru/collection/collection/file/31582/ofs_20-2.pdf (accessed on 24.06.2021).

⁴ Overview of the Russian financial sector and financial instruments. 2020. URL: http://www.cbr.ru/Collection/Collection/File/32168/overview_2020.pdf (accessed on 24.06.2021).

43, management companies — from 396 to 250, insurance companies — from 425 to 160, banks — from 834 to 366).⁵

Given the peculiarities of the structural organization of the Russian financial market and the nature of its interrelations with the real sector of the economy, in order to build a cognitive model that makes it possible to identify critical factors and mechanisms for ensuring its stability, it is necessary to single out macroaggregates that are backbone for the financial market and the national economy, the dynamics of which determines a process that ensures the internal and external balance of the economy, and the dynamics of the functioning of the real and financial sectors of the economy.

An analysis of the literature on the main trajectories of development of the real and financial sectors of the modern economy [33–35] made it possible to determine the following factors through which the interaction and interpenetration of the financial and industrial sectors occurs, which determines the stability, efficiency and security of the financial market:

- average rate of return on production capital;
- average rate of return on financial capital;
- the size of financial capital;
- cost of industrial capital;
- volume of the financial market.

The average rate of return on industrial capital determines the investment attractiveness of the real sector of the economy. Usually the average rate of return on industrial capital is not considered as a key factor in determining the level of security of the financial market. However, as R. Brenner showed, the dynamics of the average rate of return of industrial capital determines the dynamics of development and the security of the financial market in the long term [36]. In the case of a sufficiently high rate of return, the financial market actively implements its

redistributive function, transforming financial capital into industrial capital and vice versa. These processes activate the development of the institutional environment of the financial market, making it more efficient and adequate to the modern requirements of market and production entities. In the event of a fall in the rate of profit on industrial capital, financial capital may “break away” from the real sector of the economy. In this case, the movement of financial capital is carried out mainly within the framework of the financial market, which leads to a significant discrepancy between the average profitability of financial and industrial capital, the formation of imbalances in the economy, and in time, to a financial crisis.

When analyzing the security of the functioning of the financial market, it should be taken into account that the factors of average profitability of financial and industrial capital are a kind of transmission mechanisms that, on the one hand, characterize the ongoing processes in the economy, being the result of all interactions in the economic system, and on the other hand, they are key drivers of ongoing change.

The rate of return on financial capital determines the level of investment activity in the financial market. The rate of return of industrial capital determines investment activity in the real sector of the economy, but indirectly through the activity of financial capital within the framework of the functioning of the financial market. Thus, the growth of the real sector of the economy is determined by the development of the financial market, but the growth of the financial market can be activated not due to the development of the real sector, but due to the inflow of such a part of financial capital as speculative capital.

Speculative capital is one of the main catalysts for the processes taking place in the financial sector: it accelerates both the growth of market activity and the development of crisis phenomena. According to M. Rothbard, speculative capital is not a factor in the formation of crises, but rather

⁵ Overview of key indicators of professional participants in the securities market. URL: https://www.cbr.ru/analytics/rcb/review_rcb/#a_91271 (accessed on 24.06.2021).

a factor accelerating the process of smoothing disproportionate structures, while the source of the crisis is the monetary policy of the state [37]. If one can argue with the opinion of M. Rothbard on the stabilizing function of speculative capital, then it is obvious that speculative capital increases the liquidity of financial assets due to the presence of a pool of speculators who are ready to buy and sell transactions with financial assets not for the purpose of long-term investment, but for the purpose of earning on market fluctuations. As a result of increased market liquidity, the risks of investing in long-term assets are generally reduced, and investment activity is picking up. Thus, within the framework of the cognitive model of the financial market, speculative capital as a part of financial capital should be considered not as a purely negative factor underlying crisis processes, but as a factor that enhances the processes taking place on the market and, in certain situations, helps the financial system to come to a new state of equilibrium after the appearance of imbalances due to the implementation of various kinds of exogenous and endogenous events.

The inclusion of speculative capital in the cognitive model is associated with two difficulties. First, speculative capital is not separated from investment capital by any demarcation line. The speculative capital of an economic entity can easily be transformed into investment capital and vice versa as a result of a change in the economic situation. Secondly, speculative capital, by its nature, can be quickly withdrawn from circulation in the financial market [38], and, conversely, with a rapid increase in the profitability of financial assets within this financial market, speculative capital in huge amounts (compared to the capacity of the market itself or with the country's GDP) can be brought to the market.⁶ In other words, within the

framework of constructing a cognitive map, speculative capital should be considered as the most mobile and influential component of financial capital, the value of which depends on the volume of GDP and other macroeconomic indicators, the level of development of the infrastructure of the national financial market, the level of transaction costs, the degree of the feasibility of the possibility of inflow to the national financial foreign capital market and transfer of the capital of national investors to international trading platforms, etc.

One of the main functions of the financial market is to provide the real sector of the economy with industrial capital, which is a necessary condition for expanded reproduction. Acting as a source of growth in the capital-labor ratio and production capabilities of the economic system, industrial capital provides for the costs of R&D and the introduction of new technologies into production. Industrial capital, on the one hand, is a condition for innovative activity, and on the other hand, it is a conductor of the results of this activity in the economic system.

Within the framework of the cognitive map of the financial market, the size of industrial capital is a target factor. That is, through the relationships that exist within the financial system, it is possible to identify processes that increase and decrease the amount of industrial capital. However, industrial capital is embedded in the system of network connections of the formed cognitive map not only as a passive but also as an active factor (in the terminology of the actor-network theory — an actor) that influences the dynamics of development. the real sector of the economy, and hence, through the feedback system, and in the financial market. Unlike speculative capital, industrial capital is inherently more stable as a result of its attachment to the real processes of movement of goods, the provision of ser-

⁶ An example of a rapid decrease in the volume of speculative capital is given by A. Tooze: as a result of the bankruptcy of a number of large banks in the process of the development of the financial crisis of 2007, there was a massive outflow

of speculative capital. As a result, the financial markets of America and Europe experienced a significant shortage of liquidity, which was repaid by huge cash injections from the governments of countries affected by the crisis [38].

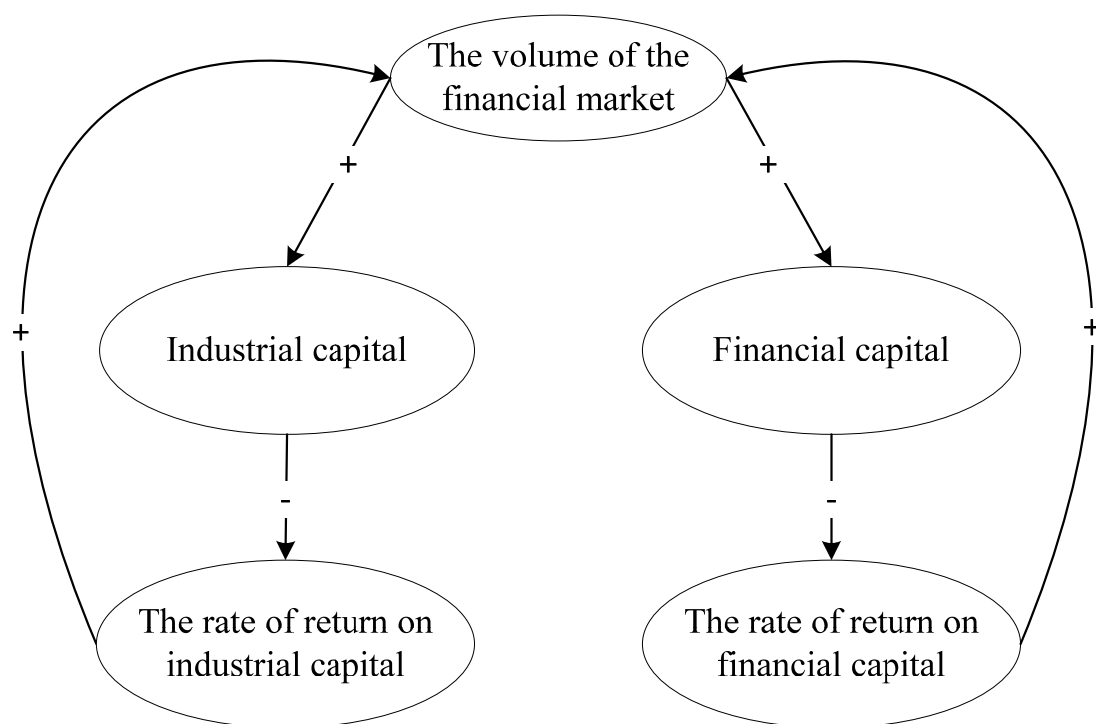


Fig. 1. Basic cognitive map of the national financial market

Source: compiled by the author.

vices, the establishment of commodity production chains, etc. Accordingly, the level of security of the functioning of the financial market is largely determined by the stability of the growth of industrial capital and the ability of the financial system to amortize negative disturbances in terms of the impact on the volume of industrial capital.

The concept of the security of the functioning of modern financial markets is based on the idea of the stability and efficiency of their performance of the function of capital movement, which ensures a stable process of expanded reproduction. This function can be characterized by a number of indicators, one of which is the volume of the financial market. The stable growth of the financial market directly indicates that the financial market is fulfilling its function of financing the real sector of the economy. The growth in the volume of the financial market can be ensured by the growth of industrial capital in the presence of an increase in financial capital, which, on the one hand, acts as a source of growth in industrial capital, and on the other hand, is

an indicator of the stability of the functioning of both the industrial and financial sectors, since in the case of an increase internal imbalances and as a result of the manifestation of the financial or economic crisis, financial capital in terms of its speculative component tends to rapidly decline.

Thus, to determine the dynamics of industrial capital, it is necessary to include in the cognitive map such a factor as the volume of the financial market. This factor, on the one hand, determines the actual volumes of industrial and financial capital, divided in accordance with the ratios of the rates of return, and on the other hand, it is itself, among other things, determined by the rates of return of industrial and financial capital: the higher the rate of return of industrial and financial capital, the more incentives to enter the market with «outside» (temporarily free or foreign) capital. If we conditionally accept the volume of the financial market as a fixed value, then the ratio of the volumes of financial and industrial capital directly correlates with the ratio of their rates of return.

The basic cognitive map of the national financial market, linking the identified factors into a single system striving for equilibrium due to the presence of stabilizing networks of interaction, is shown in *Fig. 1*.

The constructed basic cognitive map of the national financial market should be expanded by including additional factors that determine the dynamics of its development. The content of the cognitive map of the financial market should form semantic areas that, on the one hand, determine the relevant factors of its functioning, and on the other hand, reflect the logical networks of interaction. To solve the problem of constructing a cognitive map of the national financial market, which makes it possible to assess the level of security of its functioning, it is advisable to form the following semantic sections:

- interaction between the real and financial sectors of the economy (these areas are key in the process of forming a cognitive map of the financial market, the purpose of which is to analyze the safety of its functioning);
- balance of external and internal balances (in the context of globalization and the close interweaving of the financial systems of the countries of the world, external balance factors become decisive in ensuring the stable functioning of the financial market).

Thus, further expansion of the cognitive map of the financial market, used as a tool for analyzing the security of its functioning, should occur mainly due to the inclusion in it of factors that determine the volume of the financial market, the level of transaction costs. financial transactions, as well as factors and network interactions that form processes. stabilization of the external and internal balance of the economy.

P. Temin, exploring the problems of equilibrium of internal and external balance and revealing the process of formation and deepening of crisis phenomena both in the real and in the financial sectors of the economy, uses the

Trevor Swan diagram [39]. According to the Swan Diagram, internal equilibrium is expressed in the coincidence of supply and demand within the national economy at full employment of resources. The external balance is a dynamic correspondence of imports and exports, leading to a stable level of obligations of the country to other countries. Revealing the process of formation of disproportions of various nature, leading to a drop in the level of use of available resources, and hence to a drop in the real volume of production in the country, T. Swan argues that the main factor in stabilizing external and internal balances is the exchange rate [40]. Since the change in the exchange rate, which is the most important element of the national financial market, leads to the emergence of reaction waves in other segments of the financial market, the results of T. Swan's research can be used to build a cognitive map of the financial market. market to highlight the key factors for stabilizing the financial and economic system as a whole.

Summarizing the results of the study by P. Temin, T. Swan, R. Brenner and M. Rothbard, we can draw the following conclusions:

1. The key factors that determine both the process of ensuring the internal and external balance of the economy and the dynamics of the functioning of the real and financial sectors of the economy are: the exchange rate of the national currency, the rate of return of industrial capital and the rate of return of financial capital (as well as their ratio), the volume of the national product. The exchange rate of the national currency and the rate of return are balancing factors, i.e. factors, due to the flexible change of which the entire financial and economic system of the country is stabilized, and the national product is an inertial, target factor, the dynamics of which determines the safety and efficiency of the functioning of the entire national financial market. The volume of the national product is connected by direct positive feedback with

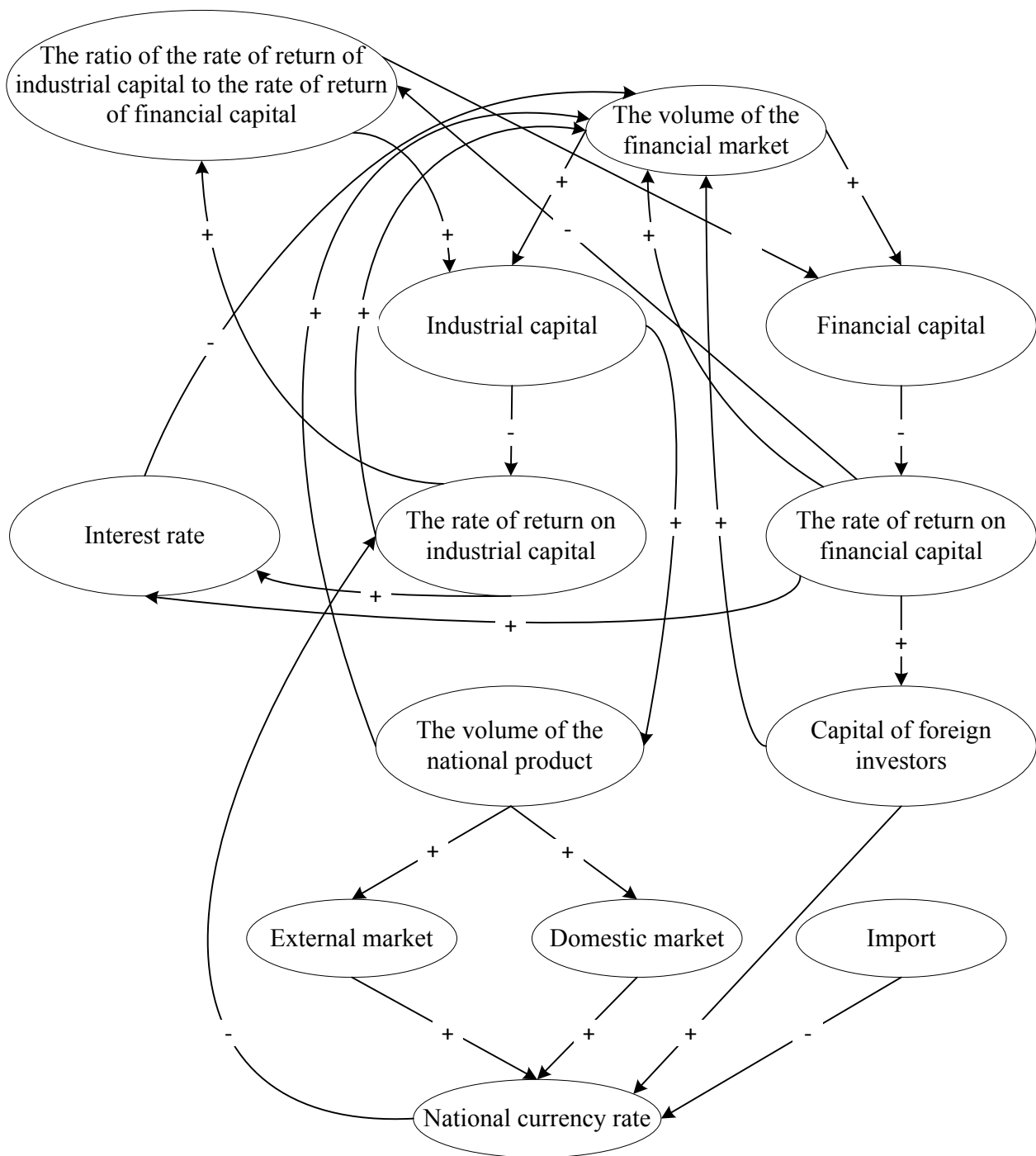


Fig. 2. Expanded cognitive map of the national financial market

Source: compiled by the author.

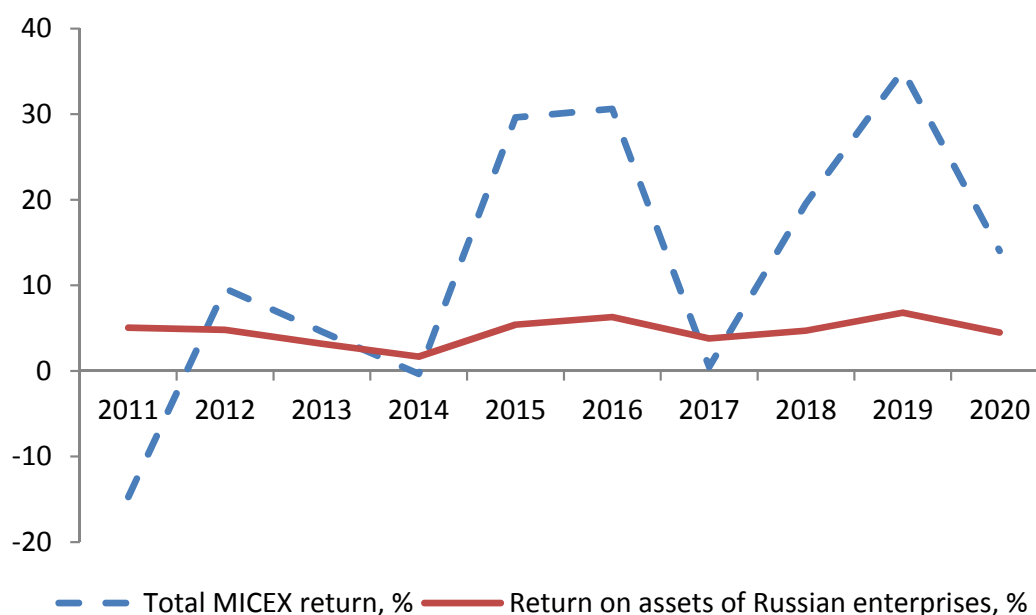


Fig. 3. Dynamics of industrial and financial capital's profitability

Source: compiled by the author on data of the Moscow Exchange and Rosstat. URL: <https://www.moex.com/ru/index/totalreturn/MCFTR/profitability>; https://rosstat.gov.ru/storage/mediabank/GOyirKPV/Rus_2020.pdf (accessed on 24.06.2021).

the volume of the financial market and with the volume of industrial capital: the greater the volume of industrial capital, the higher the volume of the national product, the greater the volume of the financial market and, *ceteris paribus*, the greater the volume of industrial capital.⁷

2. Additional factors representing the dynamics of the functioning of the financial market are the capital of foreign investors and the interest rate.

An extended cognitive map of the national financial market, which considers the key and additional factors that determine the dynamics of the functioning of the real and financial sectors of the economy, as well as network interactions that form the processes of stabilizing the external and internal balance of the economy, is shown in Fig. 2.

The peculiarity of this cognitive map is that its main elements are not the subjects of the financial market, but macroeconomic aggregates that characterize the state of

the financial market and the economy as a whole. As a result of cognitive modeling, a network of relationships is built showing how macroaggregates change as a result of the spread of a positive or negative impulse: through which channels the impulse propagates, which macroaggregates are covered, and what is the further impact on the financial result. The market as a whole and its individual elements have macroaggregates that have experienced the influence of an impulse. The constructed network of interactions makes it possible to determine the stabilizing mechanisms operating in the economy, and in their absence, to identify the possibilities for their construction.

RESULTS

An analysis of the constructed cognitive map shows that the critical factors for stabilizing and ensuring the stable functioning of the financial market as a whole are the flexibility of changing the rate of return of production and financial capital, the free inflow and outflow of foreign capital, and low transaction costs. For the stable and

⁷ In this network of interactions, the rate of return on industrial capital acts as a negative feedback factor.

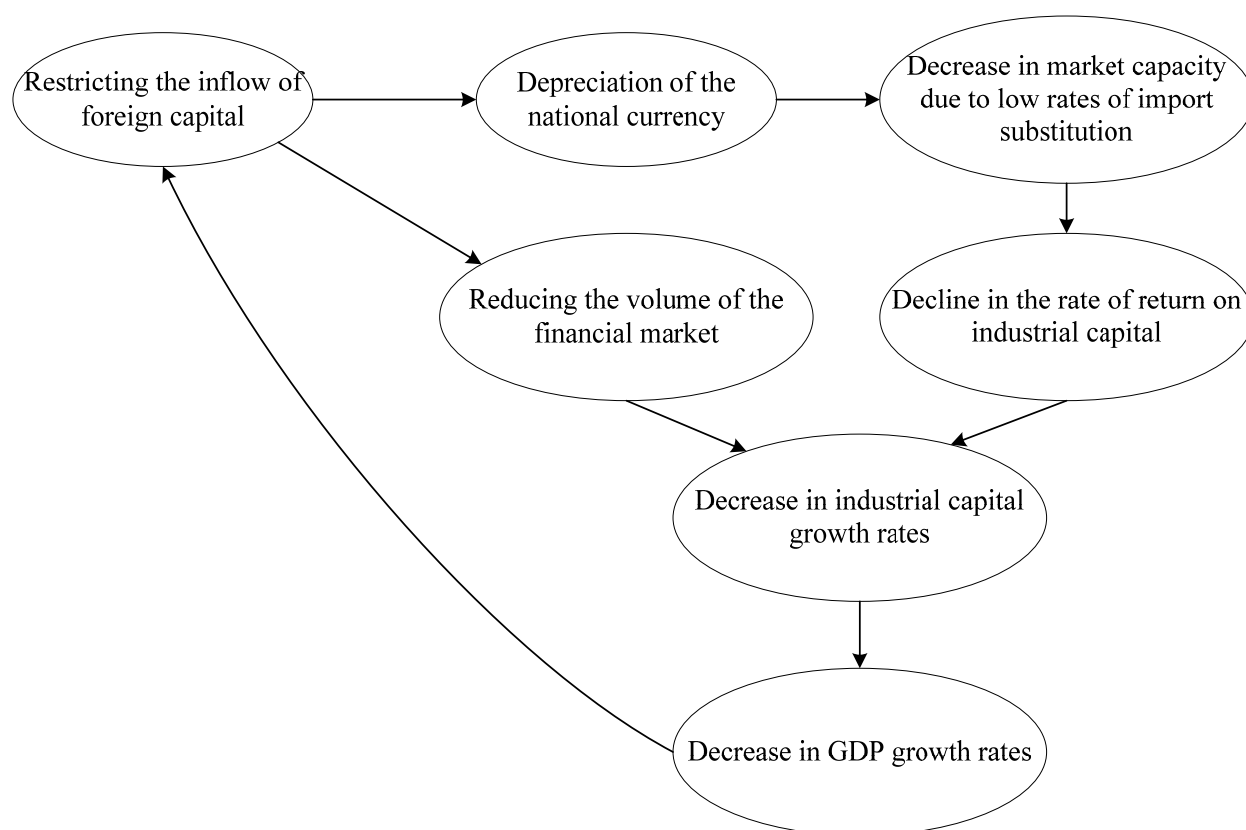


Fig. 4. The contour of the impulse propagation resulting from the realization of the threat of limiting the inflow of foreign capital to the national financial market

Source: compiled by the author.

safe functioning of the financial market, the dynamics of financial capital must correlate with the dynamics of industrial capital. To do this, the rate of return on financial capital should approach the rate of return on industrial capital, adjusted for the level of investment risk.

Since in Russia, in comparison with other countries, each individual segment of the financial market is relatively isolated and is not a system-forming one, threats to the security of its functioning are reflected precisely in the state of identified and accounted for macroeconomic aggregates. In a cognitive map, rather than aggregates that characterize the state of individual markets. The Russian financial market is hierarchically arranged in such a way that, with a balanced state of the selected macroaggregates, crisis phenomena are localized and resolved within individual subsystems (banking, insurance, securities,

etc.) without leading to the collapse of the entire system. Given this feature, an important stage in the analysis of the security and efficiency of the functioning of the national financial market using a cognitive map is the identification of endogenous and exogenous factors that form imbalances in the economy and the financial sector.

Endogenous factors for the emergence of disproportions in the financial system are those factors that, formed within the framework of the functioning of financial market institutions, distort the ratio of the rate of return of financial capital and the rate of return of industrial capital. For example, with a steady excess of the rate of return of financial capital over the rate of return of industrial capital, the financial market overheats, manifesting itself in a rapid influx of speculative capital and the formation of financial bubbles, which

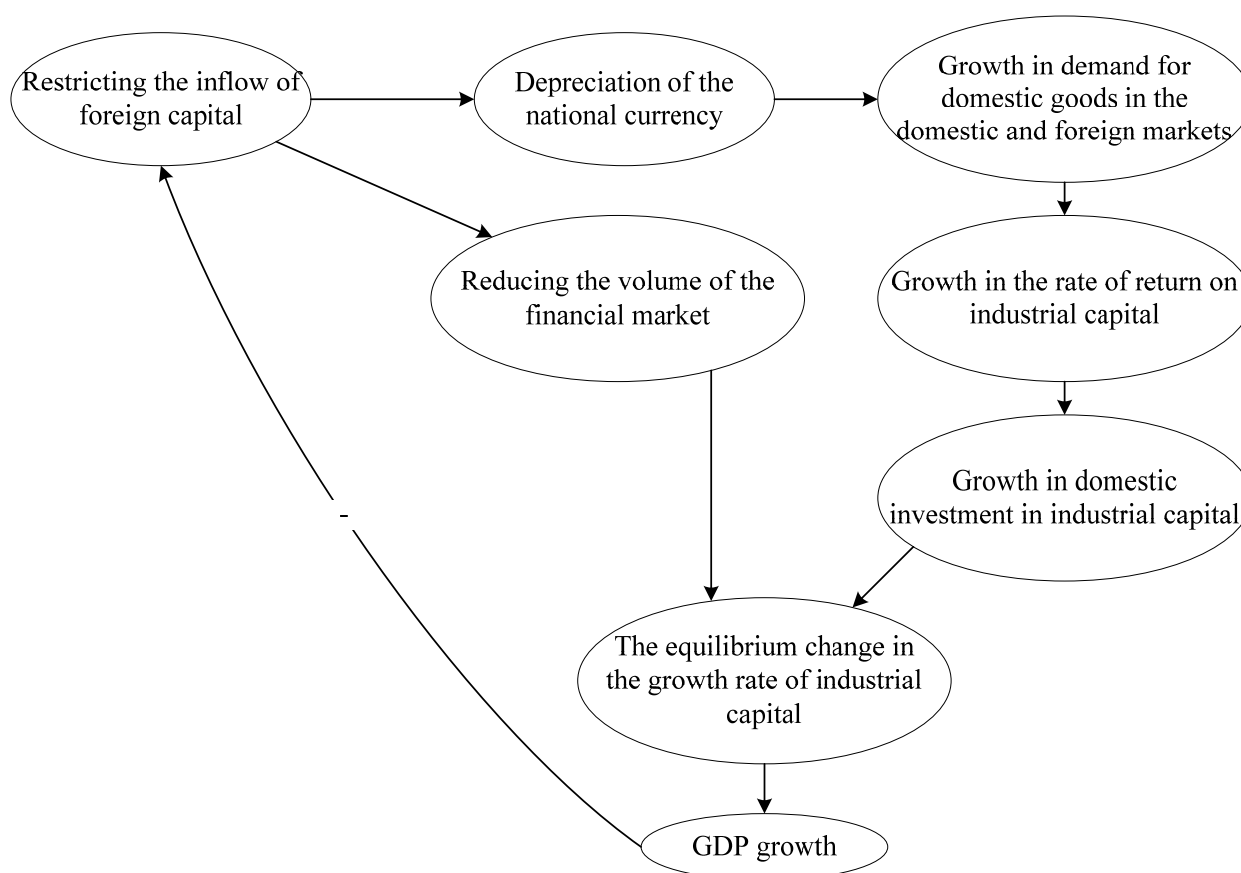


Fig. 5. Target contour with negative feedback, including a mechanism for ensuring the inflow of foreign capital to the national financial market

Source: compiled by the author.

disrupts the normal process of capital turnover in the economy.

Another source of risk of reducing the efficiency of the financial and industrial sector of the national economy is the excessively high volatility of the profitability of financial capital, which leads to a decrease in the ratio between the profitability of financial and industrial capital and, as a result, there is a violation of the stabilization mechanisms of the financial system. This is exactly the situation that has been observed in Russia for the last 10 years. *Fig. 3* shows the dynamics of the profitability of production and financial capital circulating on the stock market in 2011–2020.

Fig. 3 shows that in 2011–2020 the volatility of returns on financial capital circulating on the equity market was very high, ranging from –14.72% to 35.11%. The

correlation between the two returns was insignificant and amounted to 0.657.

Exogenous factors of destabilization of the financial market are factors formed within the framework of the functioning of political, social and general economic institutions, leading to a prolonged excess (or underestimation) of the actual rate of return of industrial capital over its equilibrium level (understood within the neoclassical school) in the economy as a whole or in individual industries.

Using the developed cognitive map of the national financial market, let us consider whether its structures contain elements and relationships that would generate closed negative feedback loops at the system level, sufficient to extinguish exogenous and endogenous negative impulses. As examples of events that can become sources of exogenous and endogenous negative

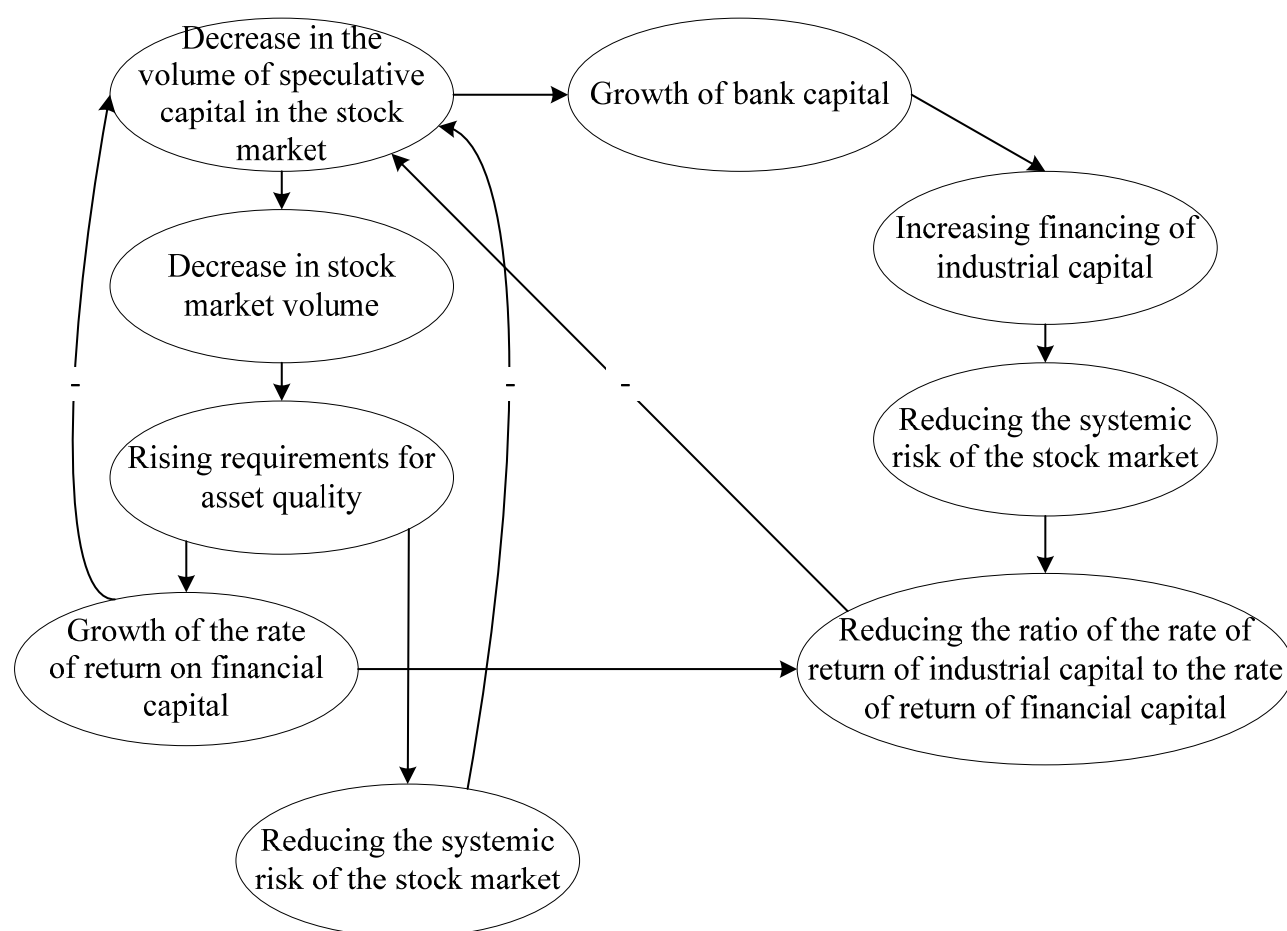


Fig. 6. Closed contour with negative feedback, reflecting the mechanism of stabilization of the national financial market in the event of an endogenous threat of a change in the structure of financial capital

Source: compiled by the author.

impulses, let us consider the restriction of the inflow of foreign capital into the national financial market and the reduction in the volume of speculative capital in the stock market due to the growing uncertainty in the dynamics of its further development.

The contour of the distribution of the impulse that arose as a result of the realization of the threat of restricting the inflow of foreign capital to the national financial market is shown in Fig. 4.

The presented contour shows that the impulse caused by the implementation of such an exogenous threat to the security of the financial market as a restriction of the inflow of foreign capital into the country does not fade over time, but destabilizes the market, reducing the efficiency of the development of the national economy. As

a result of the depreciation of the national currency, there is a decrease in the capacity of the domestic market (a reduction in aggregate demand): due to the low rates of import substitution in a number of industries, a “redistribution effect” occurs when the share of spending on imported goods increases in the structure of household spending, which reduces the demand for similar domestic goods and reduces the capacity of their markets. It should be noted that this statement is true for the national economy and may be different for local markets. For example, a depreciation of the ruble can significantly increase the capacity of the domestic food market.

It can be seen from the above contour that the negative impulse from the

introduction of financial sanctions can only be extinguished within the framework of the development of the real sector of the economy by increasing the competitive advantages of domestic producers through the depreciation of the national currency, accelerating the pace of import substitution and accelerated development of export-oriented industries.

Fig. 5 shows the target negative feedback loop, which includes a mechanism for ensuring the inflow of foreign capital into the national financial market.

Thus, the absence at the system level of elements and links that generate closed loops of negative feedback, is sufficient to dampen the negative impulse generated by such an exogenous factor as the forced reduction in the inflow of foreign capital within the framework of the sanctions imposed against Russia, can be compensated by building a target loop, including a mechanism for ensuring the inflow of foreign capital into the national financial market. In turn, in the current situation, the effective construction of this target outline is possible only as a result of creating an institutional environment favorable for the functioning of the real sector of the Russian economy.

At the same time, due to the peculiarities of the Russian financial market, the implementation of such an endogenous threat as a reduction in the volume of speculative capital represented on the national stock market, due to the growth of uncertainty and risks of its further dynamics, development creates a closed contour with negative feedback, stabilizing the work of the considered financial system (*Fig. 6*). An increase in the uncertainty of the functioning of the stock market as a whole leads to an increase in the volatility and riskiness of individual financial assets. Due to the structural features of the Russian financial market, an increase in its volatility will lead to the fact that investors will give preference to less risky investments in the banking sector over the more risky

placement of capital in the stock market. The growth of banking capital, facilitating an increase in the financing of industry, will ultimately lead to a decrease in the ratio of the rate of return of industrial capital to the rate of return of finance capital and the return of part of speculative capital to the rate of return of finance capital to the stock market.

As noted above, the formation of this contour is possible for a number of both structural and institutional reasons. The relatively high development of such segments of the financial market as the stock market and the banking sector determines that, with a high probability, the unfavorable situation in the stock market will lead to an outflow of part of speculative capital specifically to the banking sector, which is traditionally the main source of raising funds for Russian industrial companies. The absence of institutional obstacles in the form of legislative restrictions and high transaction costs will also contribute to the flow of capital from one sector of the financial market to another and its transformation from financial to industrial and vice versa, thereby ensuring the implementation of existing mechanisms for creating a balance and stabilizing the situation in the context of the spread of a negative endogenous impulse.

Further use of the constructed cognitive map to analyze the impact on the financial market of additional exogenous (decrease in the level of income of the population) and endogenous (decrease in the capitalization of the Russian stock market) factors led to the conclusion that the domestic financial market is characterized by relatively high resistance to endogenous stressors and its low stability to exogenous stressors.

For example, an unfavorable change in the exogenous factor “the level of income of the population” in relation to the financial market, caused by the introduction of international sanctions, forms a self-reinforcing process that reduces economic activity and poses a threat to ensuring

the effective and stable functioning of the financial market. The fall in the income of the population reduces domestic demand and triggers the process of reduction in industrial production, well studied in the framework of neo-Keynesianism, accompanied by a further decline in the income of the population and the contraction of the financial market due to the outflow of deposits from banks and the manifestation of the multiplier effect of an even greater reduction in credit capital.

At the same time, the fall in the capitalization of the Russian stock market as a result of an unfavorable foreign policy situation leads to the formation of a negative impulse of reaction, which, passing through the feedback contour, fades. The main mechanism leading to the damping of the impulse is the change in the rate of return of financial capital. An increase in the relative attractiveness of financial capital by reducing the ratio of the two types of rates of return and by converting part of industrial capital into financial capital forms a force that restores the initial level of capitalization of shares in the market. A fall in the volume of industrial capital, on the contrary, triggers a mechanism leading to its stabilization: a fall in the volume of industrial capital leads to an increase in its rate of return, and hence to an increase in its attractiveness for the private direct investment through increased savings.

CONCLUSIONS

Cognitive modeling, which is currently actively used in various areas of economic science, can also be used in the field of analyzing the security of the functioning of financial markets. In the process of creating a cognitive map, a network of relationships is built, showing what changes occur in the system as a result of the propagation of a positive or negative impulse.

A feature of the cognitive map of the financial market of Russia presented in the article is that when it is built, not individual subjects of the financial market are used

as the main elements, but macroeconomic aggregates that characterize the state of the financial market and the economy like everyone else. This makes it possible to consider the high degree of interpenetration of the financial and real sectors, which is characteristic of the modern economy.

An analysis of the cognitive map of the Russian financial market, as well as a study of the functioning of the actor-network structures of the national financial market, led to the conclusion that the decisive factors in stabilizing and ensuring the stable functioning of the financial market as a whole are the flexibility of changing the rate of return of production and financial capital, free inflow and outflow of foreign capital, low transaction costs.

It is shown that an important step in the analysis of the security and efficiency of the functioning of the national financial market using a cognitive map is the identification of endogenous and exogenous factors that form imbalances in the economy and the financial sector. It is concluded that, given the balanced state of the macroeconomic aggregates under consideration, the existing hierarchical structure of the Russian financial market makes it possible to localize and neutralize crisis phenomena that have arisen within individual subsystems (the banking sector, the insurance market, and the securities market, etc.) without the collapse of the entire system. That is, the endogenous causes of crisis phenomena will be quickly corrected, which will lead to the attenuation of stress impulses. At the same time, stress impulses of an exogenous nature will intensify within the existing networks of the interaction of financial markets and lead to a violation of the effective performance of the function of capital circulation.

The practical significance of the results of the study lies in the ability to determine the stabilizing processes and mechanisms operating in the economy as a whole and in the financial sector in particular, and in their absence, to identify the possibilities for their construction. A targeted impact

on stabilizing and destabilizing processes within the framework of the implementation of the state economic policy makes it possible to increase the systemic security of the functioning of the country's financial market.

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