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8(499) 553-10-71
isdovgal@fa.ru
financetp.fa.ru

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isdovgal@fa.ru
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The Development of a Scientific and Practical Approach to Selecting a Public-Private Partnership Model for Implementation of an Investment Project in a Region

E.B. Tyutyukina, A.M. Gubernatorov, D.A. Egorova
Financial University under the Government of the Russian Federation, Moscow, Russian Federation

ABSTRACT

Subject: financial and economic relations associated with the implementation of an investment project (hereinafter referred to as the project) using public-private partnership (hereinafter referred to as PPP) models in a constituent entity of the Russian Federation (hereinafter referred to as the region). **Objective:** to develop of a scientific and practical approach for justifying the selection of the most suitable PPP model for implementing the project in a given region from the perspective of both private and public stakeholders. **Tasks:** to identify factors influencing the use of PPP in the regions, as well as approaches to choosing a PPP model for project implementation based on content analysis; to develop and test an algorithm for selecting a PPP model for project implementation in a specific region; based on the results obtained, justify different levels of use of PPP models in the regions; propose modifications to PPP models that can be implemented in the Russian economy. **Methods:** content analysis to identify factors influencing the use of PPPs in the regions; grouping method and scenario approach to develop an interactive matrix for selecting potential PPP models for project implementation; correlation and regression analysis to identify factors influencing the use of PPP models in the regions; a method for calculating the efficiency of PPP projects for both public and private partners using formulas. **Results:** An algorithm for selecting a PPP model is proposed, which acts as a funnel to select models for project implementation in a specific region. At the first stage, potential PPP models are identified using an interactive matrix. Then, at the second stage, the feasibility of using a particular PPP model in the region is assessed based on financial and economic factors identified through correlation and regression analysis. The commercial, budgetary, and socio-economic feasibility of each PPP project is evaluated at stages three through five. Finally, the most suitable PPP model is chosen based on an integrated assessment at the sixth stage. Based on these results, differences in demand for PPPs across regions are demonstrated, as well as the necessity and suggestions for developing customized PPP models.

Keywords: PPP models; algorithm for selecting PPP models; factors for selecting a PPP model; integrated assessment of a PPP project; reasons for not using PPP models; modified PPP models

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INTRODUCTION

Currently, Russian legislation defines the possibility of using a wide range of models (forms) PPP in the implementation of investment projects[1] grouped according to various criteria [1].[2] The division of models into classical PPPs[3] and quasi-PPPs[4] is carried out according to the organizational criterion [2, 3]. Classification criteria are not used in the context of this study.

In accordance with Russian legislation, various PPP models can be used in the implementation of the project. The alternative choice of PPP models is provided even for the space industry by the new federal laws[5] adopted in 2024. Each PPP model in Russian legislation is regulated by a separate legislative act, since it has specific features of goal setting, facilities being created and ownership rights to them, financing, government support measures, and management, which ultimately determines its advantages, disadvantages, and risks [4–7].

Among the main PPP models in 2020–2023, CS prevails, both in terms of the number of concluded PPP projects and the volume of investments.[6] Each PPP model has its own industry priorities.[7] Almost all models are implemented at the regional and municipal levels (with the exception of the NWPC). Consequently, it is the regions that play the main role in using PPP as a mechanism to stimulate private investment in the economy. In 2020–2023, PPP models were used to launch projects in 63 regions of the Russian Federation.[8] The largest number of projects in 2020–2023, both in terms of number and volume of investments using all PPP models, were launched in the following regions: Perm region, Republic of Tatarstan, Krasnodar region, Moscow and Sverdlovsk region.[9] During the analyzed period, a quarter of the regions did not utilize the PPP (Public-Private Partnership) mechanism at all. In regions where PPP models are used, CA is still considered the most promising and profitable form of cooperation [8].

In this regard, the authors propose a scientific and practical approach to the choice of a PPP model, taking into account the established practice of using PPP models, the specifics of the project, and the level of economic development of the region. The proposed approach can be used by public and private partners to determine the comparative advantage of PPP models in the implementation of projects in the region.

OVERVIEW OF APPROACHES TO CHOOSING A PPP MODEL FOR PROJECT IMPLEMENTATION

Choosing the most appropriate PPP model is a rather complicated process. According to the authors, various factors should be taken into account when choosing a PPP model.

[1] Rosinfra information resource. URL: https: dpo.rosinfra.ru/base-projects?page=2 (accessed on 30.03.2025).

[2] Legal, functional, organizational, managerial, financial and economic.

[3] A concession agreement (hereinafter referred to as the CA), an agreement on public-private, municipal-private partnership (hereinafter referred to as the PPP/MPP agreement).

[4] Life cycle contract (hereinafter referred to as LCC), lease agreement with investment obligations, offset contracts with investment obligations, investment agreement (hereinafter referred to as IA), agreements on protection and promotion of investments (hereinafter referred to as IPPA), special investment contract (hereinafter referred to as SIC), corporate competitiveness improvement programs (hereinafter referred to as CCIP), territories of advanced development (hereinafter referred to as the TAD).

[5] Federal Law No. 196-FZ dated 02.07.2024 "On Amendments to Certain Legislative Acts of the Russian Federation"; Federal Law No. 302-FZ dated 08.08.2024 "On Amendments to the Federal Law "On Public-Private Partnership, Municipal-Private Partnership in the Russian Federation and Amendments to Certain Legislative Acts of the Russian Federation".

[6] Rosinfra information resource. URL: https: dpo.rosinfra.ru/base-projects?page=2 (accessed on 28.03.2025).

[7] CA is mainly used in the following industries: housing and communal services and the urban environment, heat supply and sanitation, MSW management, (municipal solid waste)education and science, school education, incidents and dormitories, industrial production; IP — housing and communal services and the urban environment, culture and leisure, mass sports; LCC — heat supply and gas supply, medical industry, electrical installation, SIC — chemical and automotive industry, ferrous metallurgy, IPPA— chemical industry, mining, transport and logistics complexes, industrial production. pipe industry and metal structures,

[8] Excluding new regions.

[9] Calculated by the authors according to the Rosinfra Information Resource website. URL: https: dpo.rosinfra.ru/base-projects?page=2 (accessed on 10.05.2024).

In particular, S.P. Kurdjieff and V.N. Shkred [9] consider it necessary to evaluate the statistics of the current development of the PPP market in the regions, the investment climate of the region, and the availability of financing tools. V.N. Parakhina, O.A. Boris, G.V. Vorontsova [10] identifies three groups of factors: institutional (development of the regulatory framework and PPP management bodies in government agencies), competence-based (availability of experience and competencies from partners), socio-economic (investment attractiveness of the region and its potential). The necessary level of competence of public and private partners is also noted by D.M. Kolosova and K.A. Kuzmin [11]. The impact of the socio-economic situation on the number of PPP projects being implemented is empirically substantiated by E.A. Fedorova and A.A. Gubanov [12]. According to T.G. Shelkunova and A.V. Dvadnenko [13], D.V. Baibulatova [14] the development of PPP is influenced by the availability and quality of the institutional framework at the regional level. The trend of digitalization of the economy, according to I.M. Shor [15], should also be considered as a factor in the development of PPP. M.A. Adamenko [16] notes the need for transparency of data on the economic development of the region. The same opinion is expressed by M.A. Fedorova [17], who also considers financial support for PPP projects from the authorities to be an essential factor. The mechanism of financial support for PPP projects at the regional level was studied by D.K. Aliyev [18]. According to A.A. Rabadanova [19], the expansion of the use of PPP models by industrial enterprises is influenced by the financial participation of the state and the conditions of monetary policy. I.V. Kosorukova, O.V. Loseva and M.A. Fedotova believe that state financial support should be provided only if regional projects and their performers are attractive to investment [20].

Open sources suggest approaches to choosing a PPP model for project implementation. In particular, the Ministry of Economic Development has approved a methodology for assessing the comparative advantage of using the PPPA/MPPA and LCC models (hereinafter referred to as Methodology-894).[10] In its development, A.A. Kuznetsov [21] proposes a methodology for modeling cash flows for public and private partners to identify the comparative advantage of these two PPP models. O.S. Salomatina and E.N. Kukina [22] propose a choice between CA and LCC based on the results of a SWOT analysis of the project in the region. N.G. Radchenko [23] considers a two-stage approach to the formation of a PPP mechanism in the region, noting the need to take into account the experience and rating of the best regions. According to T.M. Barbysheva [24], when choosing the optimal PPP model, it is necessary to take into account external and internal factors of regional development, and the key factor should be an assessment of the effectiveness of the project for various participants, including the population.

THE ALGORITHM FOR SELECTING A PPP MODEL FOR THE IMPLEMENTATION OF AN INVESTMENT PROJECT IN THE REGION

Based on the study of the authors' research, as well as the opinions of practitioners involved in the implementation of PPP projects in the regions, we propose an algorithm for selecting a PPP model for both public and private partners. The algorithm includes six stages.

Stage I. Selection of potential PPP models for project implementation.

Based on the analysis of panel data on projects launched using various PPP models for the period 2020–2023,[11] the characteristic features of its application were identified for each model: the sphere of economy, the level (municipal, regional, federal), the volume

[10] Order No. 894 of the Ministry of Economic Development of the Russian Federation dated 30.11.2015 "On Approval of the Methodology for Evaluating the Effectiveness of a Public-Private Partnership Project, a Municipal-Private Partnership Project and Determining their Comparative Advantage".

[11] Rosinfra information resource. URL: https: dpo.rosinfra.ru/base-projects?page=2 (accessed on 10.05.2024).

Table 1

Selection of PPP Models Using an Interactive Matrix

PPP models	The economic sphere in which the project is being implemented	The share of private investment, %	Project implementation level	The volume of investments, million rubles*
LCC	Electricity generation, heat and hot water supply	100	Municipal	min – 57230; average bill– 69514; max – 81798
Investment agreement		100	Federal	min – 5000; average bill– 9000; max – 13000
Concession agreement		40–90	Federal	min – 2526; average bill– 29371; max – 41000
The PPP Agreement		35–90	Regional	min – 10; average bill– 10517; max – 15302
The MPP Agreement		6–69	Municipal	min – 116; average bill– 771; max – 2576
SIC 1.0		100	Regional	min – 750; average bill– 17050; max – 120738
SIC 2.0		100	Municipal	min – 18; average bill– 24490; max – 227192
IPPA		100	Federal	min – 32200; average bill– 36500; max – 40800
			Regional (possible implementation)	-

Source: составлено авторами / Compiled by the authors.

Note: * It was determined based on data on projects launched in 2020–2023.

of investments for each level (minimum, average and maximum check), the share of co-financing of investments by each partner.

The results obtained make it possible, taking into account the experience of the regions in using PPP models, to form a funnel for selecting potential PPP models based on the specified conditions of the project implementation — the economic sphere and the volume of investments. An interactive matrix for selecting PPP models was developed using the Excel environment (a fragment is presented in *Table 1*).

The algorithm for working with the matrix is as follows:

1) selecting a sphere in the corresponding window "Economic sphere in which the project is being implemented" gives a list of possible models in the "PPP Models" window;

2) selecting a model in the "PPP Models" window from the proposed list provides the following data:

- possible investment volumes in the "Investment Volume" window, linked to the "Project implementation level" window. This allows you to determine the level of project implementation (if it is not defined by the specified conditions) or the possibility of implementation at the level determined by the project conditions;
- the interval values of the share of project financing by a private partner in the "Share of private investment" window;
- a list of all possible government support measures in the "Government support measures" window.

Thus, for each model from the proposed list, a decision is made on the possibility of its

use. As a result, a list of potential PPP models for the implementation of the project is being formed.

Stage II. Assessment of the possibility of implementing PPP models in the region based on the results of correlation and regression analysis.

A review of the literature has shown that the use of PPP models in project implementation is influenced by a combination of regional development factors. For the study, 12 factors were selected, systematized into three groups (investment and credit ratings of the region, financial support of the region) (*Table 2*). The indicator characterizing the use of PPP models in the region is the volume of transactions for each PPP model. The empirical base was formed in general for all regions of the Russian Federation over nine years (2015–2023). The sample included the regions that launched the implementation of the PPP model during the analyzed period, namely: 62 regions — CA, 20 regions — SIC 1.0 and SIC 2.0, 15 regions — IA, 10 regions — PPPA and MPPA.[12] The statistical method of correlation and regression analysis is used as a mathematical tool for data processing.

The results showed that no significant factors were identified for any of the PPP models.[13] Nevertheless, correlation analysis has shown that there are correlations between transaction volumes for various PPP models and almost all factors that can be taken into account when deciding whether to use a specific model (*Table 2*). At the same time, there is a multidirectional influence of factors for different PPP models.

Correlation and regression analysis was performed to identify the impact of three factors on the implementation of PPP models in a particular region: the region's investment rating (X_0), the region's debt burden (X_{10}), and the amount of subsidies from the federal budget provided to the region's budget (hereinafter referred to as subsidies to the region's budget) (X_{11}). *Table 3* shows regions with statistically significant regression analysis results, according to which the level of debt burden and the amount of subsidies to the region from the federal budget are significant factors for the implementation of the IA and SIC models, and the amount of subsidies for the CA model.

To assess the possibility of using the PPP models selected at the first stage for the implementation of a project in a particular region, one can compare the value of the corresponding factor in the region with its regional average value in Russia as a whole. For example, according to *Table 2*, PPPA/MPPA models can be used in project implementation if the values of factors X_3, X_4, X_6–X_8 are higher in the region, and factors X_9, X_{10}, X_{12} are lower than the corresponding regional averages. To use the CA model, it is important that the value of factor X_{11} in the region is higher than the regional average.

A similar approach can be used for regions with the identified most significant factors (*Table 3*).

The next stages of the algorithm are related to evaluating the effectiveness of the project using various PPP models. It should be noted that according to the Methodology-894, the financial efficiency of the project and the socio-economic effect are calculated, and if available, a comparative analysis of the use of budget funds in the PPPA/MPPA and LCC models is carried out. However, it should be noted that the absolute indicators used in the methodology (NPV as financial efficiency and socio-economic effect) will determine the different effectiveness of the project (commercial and socio-economic) depending on the PPP model. Based on this, we propose our own approach to a comprehensive assessment of the comparative advantage of PPP models.

Stage III. Evaluation of the commercial effectiveness of the project.

Each PPP model affects the cash flows from the current and investment activities

[12] Rosinfra information resource. URL: https: dpo.rosinfra.ru/base-projects?page=2 (accessed on 10.05.2024).

[13] The resulting R-square, respectively, is: 0.24 (according to CA), 0.04 (according to IA), 0.03 (according to MPPA and PPPA) 0.15 (according to SIC).

Table 2

The Presence of Correlation Links Between the Volume of Transactions Under PPP Models and Factors in the Russian Federation as a Whole

Factor Characteristics		The average value by region for the analyzed period	The relationship between transaction volumes and factor characteristics in PPP models			
			CA	IA	PPPA/MPPA	SIC
1	2	3	4	5	6	7
I	Investment rating of the region (X_0)					
X_1	The volume of innovative goods, works, and services, million rubles	74 991,1	*	*	*	*
X_2	Investments in fixed assets, million rubles	390 856	*	*	*	*
X_3	The index of digital maturity of regions, *k*	7.5[a]	*	Positive		
X_4	The cost of a fixed set of consumer goods (consumer basket), million rubles	0.02[b]	*	Negative	Positive	*
X_5	The average monthly nominal accrued salary of employees, million rubles	0.064	*	*	*	*
X_6	Registered unemployment rate,%	0.65[b]	*	*	Positive	Negative
X_7	Index of industrial production in the region, %	8.20[b]	*	Positive		
X_8	Information openness, accessibility and transparency,%	83.60[c]	*	Positive		
X_9	ESG ratings/ recklings, *k*	0.53[d]	*	Negative		Positive
II	Credit rating of the region					
X_{10}	Debt burden level of the region, *k*	0.38[e]	*	Negative		Positive
III	Financial support for the region					
X_{11}	Subsidies from the federal budget provided to the regional budget, million rubles	36 556.71[f]	P ositive	*	*	Positive
X_{12}	Subsidies, million rubles	12 452.14[g]	*	Negative		

Source: Compiled by the authors.

Note: * lack of relationships; calculated from the data: [a] URL: https: www.cnews.ru/analytics/rating; [b] URL: https: rosstat.gov.ru/statistics/price; [c] URL: https: www.iminfin.ru/areas-of-analysis/rejtingi/rejting-regionov-po-urovnyu-otkrytosti-byudzhetnykh-dannykh?territory=45000000; [d] URL: https: www.ra-national.ru/renkingi/rjenking-ustojchivosti-razvitija-i-integracii-esg-kriteriev-v-dejatelnost-subektov-rossijskoj-federacii/; [e] URL: https: www.iminfin.ru/news/569-gosudarstvennyj-dolg-rossijskikh-regionov-v-2023-godu; [f] URL: https: www.budget.gov.ru/web/guest/%D 0% 91%D 1%8E%D 0%B 4%D 0%B 6%D 0%B 5%D 1%82; [g] URL: https: www.iminfin.ru/areas-of-analysis/budget/finansoviy-pasport-subjecta-rf/dokhody-sravnenie-po-regionam?territory=45000000 (accessed on 20.04.2024).

Table 3

Final Results of the Regression Analysis of the Influence of Factors on the Volume of PPP Transactions in Regions with Statistically Significant Results

Region	The regression equation	R-square	Fischer's F-criterion			Student's t-test			Factors influencing the development of PPP models in the region (positive (+), negative (–))
			actual value	critical value	adequacy of the model	actual value	critical value	significance of the coefficient	
1	2	3	4	5	6	7	8	9	10
Concession agreement									
Arkhangelsk region	$Y = 98791.39 - 114895 \times X_2$	0.52	7.6	0.01	yes	2.75	2..36	yes	The level of the region's debt burden (–)
Amur region	$Y = 999.53 + 0.204 \times X_3$	0.76	22.3	0.004	yes	4.72	2.36	yes	Subsidies to the regional budget (+)
Primorye region	$Y = 5103.86 - 77954.3 \times X_2 + 0.101 \times X_3$	0.77	10	0.05	yes	2.81/ 4.18	2.45	yes	The level of the region's debt burden (–); Subsidies to the regional budget (+)
St. Petersburg	$Y = -34431.2 + 571865.4 \times X_2$	0.82	33.8	0.004	yes	5.81	2.36	yes	The level of the region's debt burden (+)
Sverdlovsk region	$Y = 26.48 + 0.11 \times X_3$	0.56	9.07	0.004	yes	3.01	2.3	yes	Subsidies to the regional budget (+)
Investment Agreement									
Krasnoyarsk region	$Y = 6101.11 + 0.801 \times X_3$	0.72	17.61	0.004	yes	4.2	2.36	yes	Subsidies to the regional budget
SIC									
Nizhny Novgorod region	$Y = 13323.15 + 1.08 \times X_3$	0.55	8.62	0.004	yes	2.93	2.36	yes	Subsidies to the regional budget

Source: Compiled by the authors.

of the project. Therefore, the commercial effectiveness of the project will vary depending on the model used.

To assess the commercial effectiveness of the project, we suggest using the Discounted profitability index (hereinafter *DPI*), determined by the formula:

$$DPI = \sum_{t=1}^{n} \frac{CF_{C_t}}{(1+r)^t} \div \sum_{t=0}^{n} \frac{CF_{I_t}}{(1+r)^t}, \quad (1)$$

where $CF_{C\,t}$ is the value of net cash flow from current activities in period *t*, $CF_{I\,t}$ is the value of net cash flow from investment activities in period *t, t* is the step of the billing period, *r* is the discount rate[14] at the step of the billing period, *n* is the number of steps of the billing period of the project.

The project is commercially effective if the *DPI* is > 1. Accordingly, at this stage, PPP models are selected, using which the project is commercially effective for a private partner.

Stage IV. Assessment of the budgetary effectiveness of the project.

Each PPP model affects the cash inflows and outflows of budget funds, which, accordingly, affects the budgetary effectiveness of the project.

To assess the budgetary effectiveness of the project, we propose using the discounted yield index of budgetary funds of the budgetary system of the Russian Federation (hereinafter — DPI_{BS}), taking into account the participation of different levels of the budgetary system, which have their own requirements for the level of profitability:

$$DPI_{BS} = \left(\sum_{t=1}^{n} \frac{CI_{FB_t}}{(1+r_{FB})^t} + \sum_{t=1}^{n} \frac{CI_{RB_t}}{(1+r_{RB})^t} \right) \div \left(\sum_{t=1}^{n} \frac{CO_{FB_t}}{(1+r_{FB})^t} + \sum_{t=1}^{n} \frac{CO_{RB_t}}{(1+r_{RB})^t} \right), \quad (2)$$

where $CI_{FB\,t}$ is the amount of funds received from the federal budget and state extra — budgetary funds from the implementation of the project in period *t* (cash inflows); $CI_{RB\,t}$ is the amount of funds received from the budgets of the subjects of the Russian Federation and municipalities from the implementation of the project in period *t* (cash inflows); $CO_{FB\,t}$ is the expenditure of federal budget funds from the implementation of the project in period *t* (cash outflows); $CO_{RB\,t}$ — expenditures of the budgets of the subjects of the Russian Federation and municipalities from the implementation of the project in period *t* (cash outflows); r_{FB} is the discount rate for federal budget expenditures at the step of the billing period;[15] r_{RB} is the discount rate for expenditures from the budgets of the constituent entities of the Russian Federation and municipalities at the step of the billing period;[16] *t* is the step of the billing period; *n* is the number of steps of the billing period for project implementation.

The project has budgetary efficiency if the DID_{BS} >1. Accordingly, at this stage, PPP models are selected, using which the project has budgetary efficiency.

Stage V. Assessment of the socio-economic effectiveness of the project.

We propose to evaluate the socio-economic efficiency index (*SEEI*):

$$SEEI = \frac{\sum_{t=1}^{n} SEE_t}{\sum_{t=0}^{n} CF_{I_t} + \sum_{t=1}^{n} CO_{FB_t} + \sum_{t=1}^{n} CO_{RB_t}}, \quad (3)$$

where SEE_t is the socio-economic effect obtained in the period *t*.

For projects using PPP models implemented within the framework of national projects (hereinafter referred to as the national project), the target indicators of the corresponding national project are taken as the SEE_t indicator, the values of which are calculated based on the

[14] It is traditional to use the cost of capital (in %) raised to finance the project for each year of the project's implementation as the discount rate.

[15] It is determined by the Order of the Ministry of Economic Development of the Russian Federation dated November 30, 2015 No. 894 "On Approval of the Methodology for Evaluating the Effectiveness of a public-Private partnership project, a municipal-Private partnership project and determining their comparative advantage."

[16] The same.

results of the project implementation. Only those targets that can have monetary value are taken. The availability of SEE_t from the project implementation will be in the event that at least two targets can be calculated for the project.[17]

The denominator of formula (3) characterizes the funds invested in the project by private and public partners during the entire duration of the project.

During the project implementation, the value of SEE_t will be the same regardless of the PPP model used. However, the socio-economic effectiveness of the project will vary in different PPP models. A project with a higher *SEEI* value will be more effective.

Stage VI. The selection of a PPP model for project implementation based on an integrated assessment.

The selection process involves projects that have commercial and budgetary effectiveness. The choice of a PPP model should be based on a multi-criteria approach that takes into account the criteria of commercial, budgetary and socio-economic efficiency. The advantage of this approach is considered in the works of a number of authors [25–28].

For an integral assessment of the effectiveness of the project, a point method is proposed, according to which:

- for each criterion, one point is assigned to a less effective project, then the points increase as efficiency increases;
- the maximum score for all three criteria characterizes the most effective PPP model for project implementation.

The algorithm was tested when selecting a PPP model for the implementation of standard investment projects for the construction of secondary schools in Tyumen Region (*Table 4*).

Despite the initially obvious choice of a CA model, the results of the assessment from the perspective of a public partner and his social responsibility show the same possibility of implementing CA and IA.

CONCLUSIONS

The study showed why the CA model is so popular, while other forms of PPP are not widely used in the regions. It helps to understand how to make them more attractive.

For the regions, the availability of a wide range of infrastructure facilities[18] and strategic objectives for their development necessitate the attraction of private investment. For almost 20 years of use, the CA model has become a well-developed tool for implementing large infrastructure projects. For a private partner, the attractiveness of the CA model is determined by a combination of factors: the financial participation of the public partner in the implementation of the project (including capital grants, the concession fees and the minimum guaranteed income); state support measures such as provision of preferential land and environmental management conditions, and tax benefits, the possibility of attracting significant amounts of external investment into projects through bank loans and the issuance of concession bonds); For a private partner, the attractiveness of a CA model is determined by several factors: the financial contribution of the public partner to the project (including capital grants, concession fees, and minimum guaranteed income), state support measures such as provision of preferential land, environmental management conditions, and tax benefits, the possibility of attracting large amounts of external investment through bank loans and the issuance of concession bonds, simplified procedures for concluding a CA agreement (including electronic application processes), and a detailed payment mechanism with provisions for special circumstances.

Other PPP models, including for the implementation of infrastructure projects, despite also having a number of advantages, are inferior in attractiveness to the CA model.

[17] This approach is defined by the Order of the Ministry of Economic Development of the Russian Federation dated November 30, 2015 No. 894 "On Approval of the Methodology for evaluating the Effectiveness of a public-private partnership project, a municipal-private partnership project and determining their comparative advantage."

[18] Infrastructure facilities and projects are understood in the context of federal laws on concession agreements and agreements on public-private, municipal-private partnership.

Table 4

Testing the Algorithm for Selecting a PPP Model for Implementing an Investment Project

No.	Algorithm Stages	Potential PPP models				
		CA	IA	MPPA	PPPA	IPPA
1	Stage I. Selection of potential PPP models for project implementation					
2	Economic sphere	CA	IA	MPPA	PPPA	IPPA
3	Investment volume, level, share of co-financing, state support measures	CA	IA	MPPA		
4	The result of the selection based on the results of stage I	CA	IA	MPPA		
5	Stage II. Assessment of the possibility of implementing models in the region based on the results of correlation analysis					
6	Subsidies to be transferred from the federal budget under agreements, million rubles	Yes				
7	The level of the region's debt burden		Yes	Yes		
8	The region's Digital Maturity Index		No	No		
9	The cost of a fixed set of consumer goods (consumer goods basket)		Yes	Yes		
10	Registered unemployment rate,%			No		
11	Index of industrial production in the region, %		No	No		
12	Information openness, accessibility and transparency, %		Yes	Yes		
13	ESG-ratings/recklings		Yes	Yes		
14	Subsidies		Yes			
15	The result of the selection based on the results of stage II*	CA	IA			
16	Stage III. Evaluation of the commercial effectiveness of the project	0.786** (2 points)	0.243*** (1point)			
17	Stage IV. Assessment of the budgetary effectiveness of the project	0.260 (2 points)	0.001331 (1 point)			
18	Stage V. Assessment of the socio-economic effectiveness of the project	0.000325 (1 point)	0.000411 (2 points)			
19	Stage VI. Selecting a PPP model for project implementation based on an integrated assessment					
20	Total (sum of lines 16–18)	5 points	4 points			
21	For a private partner (line 16)	2 points	1 point			
22	For a public partner (sum of lines 17 and 18)	3 points	3 points			
23	From the perspective of social responsibility of a private partner (sum of lines 16 and 18)	3 points	3 points			

Source: Compiled by the authors.

Note: * The decision was made based on the fact that more than half of the factors had a positive impact on the implementation of the model. ** Cash flows from operating activities include payments from the competitor in the form of investments and maintenance payments. *** These cash flows also include tax benefits from the main activities of the private partner.

From the perspective of the regions, disinterest in the implementation of projects using PPP models has, first of all, a financial basis, namely:

- in almost all PPP models (CA, IA, PPPA/MPPA, SIC, IPPA), co-financing of the project is possible from the public partner (in PPPA/MPPA models, the minimum return to the private partner is also guaranteed). But for this, the budgets of the regions and municipalities must have the necessary funds. In addition, in accordance with budget legislation, the use of budgetary instruments is limited to the fiscal year and/or the planning period, without taking into account the possibility of exceeding the validity period of the approved limits of budgetary obligations. However, large projects have a pre-investment and investment stage, usually more than two years. At the same time, the public partner must report on the targeted use of budget funds in the year of achieving the KPI;
- in PPP models (IA, SIC, IPPA), it is possible for the public partner to provide tax incentives for taxes credited to regional and local budgets, as well as preferential land and environmental management conditions, which causes the occurrence of tax shortfalls, and non-tax revenues of regional and local budgets.

For the private partner, the disinterest in using PPP models is explained by a combination of reasons:

- lack of practice of co-financing by the public partner in the IA, SIC, IPPA models;
- risks of low profitability (lack thereof) for infrastructure facilities created using IA, PPPA/MPPA models and owned by a private partner after the completion of the agreement;
- an unregulated procedure for securing the ownership rights of a private partner to an object created as a result of a project using IA, PPPA/MPPA models;
- a lengthy and costly procedure for the private partner to submit and approve tender documents (in particular, on PPPA/MPPA and IPPA);
- lack of effective mechanisms for judicial and pre-trial (or out-of-court) dispute resolution (negotiations, mediation, etc.) between partners.

In addition, as shown by the results of the correlation analysis (*Table 2*), the necessary level of socio-economic development of the region (industrial production index, digital maturity, information openness) must be in place to implement the IA, PPPA/MPPA and SIC models. At the same time, a number of factors (consumer basket, unemployment rate, ESG ratings/recklings, debt burden level) have a multidirectional impact on the use of models, which can also be taken into account when choosing them. For example, a high level of registered unemployment may prompt regional authorities to conclude a PPP as a measure to reduce it. At the same time, for the implementation of projects using the SIC model, this indicator may indicate an insufficient qualification of workers in the region. It should also be noted that the use of the PPP mechanism largely depends on the political will of the regional leaders and their team. For example, in Arkhangelsk region and Primorye region, the number of CA contracts increases with a decrease in the region's debt burden. In St. Petersburg, on the contrary, in the context of an increasing debt burden, the conclusion of the CA is considered as a measure to increase budget revenues (*Table 3*).

The proposed algorithm for selecting a PPP model was developed based on the existing experience in their implementation in the regions. Using the algorithm allows you to select alternative PPP models for the project, evaluate the possibilities of their implementation in a particular region, and calculate the comparative advantages for each of the partners, including private ones, from the perspective of traditional and socially responsible investment.

Further development of the PPP mechanism based on the results we have obtained, as well as the position of the PPP market participants, should be carried out in terms of expanding the use of PPPs by industry through the use of combined PPPA/MPPA mechanisms, as well as

their combination with classical PPP models. This request exists in foreign countries, in particular, in the United States, the issue of creating a new form of PPP in the field of microelectronics and IT infrastructure is being considered.[19]

To create modified PPP models in the Russian economy, it is necessary: the state's systemic request for cross-industry PPP formations; lifting the ban on private investor involvement of companies directly or indirectly under state control; creation of customized financial instruments;[20] the possibility of admission of development institutions on the side of a public partner, so that all support measures can be provided centrally within one project office with the potential to use a variety of combinations of PPP models; the development of inter-industry collaboration on technical and innovative projects, with direct involvement of representatives from public authorities in these projects.

We believe that modified PPP models can provide maximum multiplier effect for each of the parties and become a tool for implementing strategies for socio-economic development of the regions.

[19] Lessons Learned from Public-Private Partnerships (PPPs) and Options to Establish a New Microelectronics PPP. The Institute for Defense Analyses. URL: https: www.ida.org/research-and-publications/publications/all/l/le/lessons-learned-from-ppps-and-options-to-establish-a-new-microelectronics-ppp (accessed on 13.06.2024).

[20] A customized financial instrument has the characteristics that the user needs.

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ABOUT THE AUTHORS

Elena B. Tyutyukina — Dr. Sci. (Econ.), Prof., Department of Corporate Finance and Corporate Governance, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
http://orcid.org/0000-0001-5195-7230
EBTyutyukina@fa.ru

Aleksey M. Gubernatorov — Dr. Sci. (Econ.), Prof., Department of Economics and Finance, Vladimir Branch of the Financial University under the Government of the Russian Federation, Vladimir, Russian Federation
https://orcid.org/0000-0001-7695-7050
Corresponding author:
AMGubernatorov@fa.ru

Daria A. Egorova — Cand. Sci. (Econ.), Assoc. Prof., Department of Corporate Finance and Corporate Governance, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0000-0002-7981-2583
DAEgorova@fa.ru

Author's declared contribution:
E. B. Tyutyukina — formulation of the problem, development of the article's concept, justification and choice of methodology, verification of conclusions.
A. M. Gubernatorov — collection of statistical data, description of the results, and formation of study conclusions.
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Bitcoin, Altcoins, Digital Ruble: On the Economic Nature of Cryptocurrencies

O.N. Volkova
National Research University Higher School of Economics — Saint Petersburg, Saint Petersburg, Russian Federation

ABSTRACT

Cryptocurrencies are a type of financial instrument that has been widely used by financial market participants since the early 2010s. Despite their growing popularity, their status within financial systems across different countries remains a topic of ongoing discussion. There is still no consensus on how to best understand the economic nature of these digital assets. This paper uses discourse analysis and content analysis to explore the various interpretations of cryptocurrencies' economic nature. The paper argues that the interpretation of cryptocurrency's economic nature depends heavily on the perspective of the stakeholder and the intended purpose of using the term. It considers arguments both for and against treating cryptocurrencies as commodities, currencies (including electronic and private currencies), or properties (assets, such as financial assets). It concludes that traditional cryptocurrencies do not meet the criteria for being considered money, and only central bank-issued digital currencies can fulfill all the functions associated with money. Decentralized cryptocurrencies, such as Bitcoin, cannot be classified as securities because there are no companies or organizations that issue these assets and bear any obligations under them. Instead, these assets have the characteristics of commodities. Different types of cryptocurrencies can be treated as either commodities or securities for tax purposes, depending on the specific circumstances. At the same time, assets with unique characteristics and behavior in the financial market may be included in a separate category for accounting purposes, or if the state allows for the use of cryptocurrencies in transactions without restrictions, they can be considered equivalent to cash.

Keywords: cryptocurrency; bitcoin; altcoins; money; central bank digital currency; financial asset; electronic currency; digital currency; virtual currency; decentralized currency

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INTRODUCTION

The terms given in the title of our article have been found quite often in the media, the blogosphere, professional and academic publications, and conversations among fellow economists over the past few years. In addition to investors and researchers, legislators and central banks from different countries[1] are actively interested in the problems of digital instruments, which is primarily due to the desire to integrate them into national tax systems. Cryptocurrencies themselves and transactions with them can be used as the basis for determining taxable bases. In addition, there are currently several countries (including Russia) central banks' digital currencies are already being tested.

Today, there is a wide variety of opinions on the nature of cryptocurrencies and how they should be regulated. Depending on who we ask, the answer to the question of whether or not to legalize cryptocurrencies for economic agents varies. Should governments allow the use of these currencies? Should they create centralized or decentralized systems based on cryptography? Should they encourage the development of cryptocurrency markets? These are all important questions that require attention and discussion. The main research issues of our work:

1) How are different money market instruments related to each other and what is the place of cryptocurrencies among other non-traditional instruments?

2) What is the economic nature of cryptocurrencies and how do they compare to other forms of money?

This paper examines the arguments for and against treating cryptocurrencies as commodities, currencies (both electronic and private), property (including financial assets), and games.

[1] See, for example, the development of the digital asset market in the Russian Federation. A report for public consultation. URL: https://cbr.ru/Content/Document/File/141991/Consultation_Paper_07112022.pdf (accessed on 08.01.2025).

ELECTRONIC, DIGITAL, AND VIRTUAL MONEY

The term "cryptocurrency", which is attached to the financial instrument we are discussing, has a reference to "currencies", that is, money. However, there are discrepancies in the literature regarding the place of cryptocurrencies among money,[2] and whether they relate to money [1].

Academic publications often confuse the concepts of "electronic money",[3] "digital money"[4] and "virtual money".[5] From a technological point of view, the content of the units of account designated by these terms is the same [2, p. 127]. However, there are such differences in financial practices, and for the sake of completeness of definitions related to money, we should clarify them. The correlation of the main terms with each other can be traced in *Figure 1*.

The most widely used term is "electronic money" — a representation of a fiat currency, a legal mechanism that allows transactions with it through computer networks.[6] But, unlike regular cash and non-cash money, they arise as a result of an advance payment made by the owner of the funds, who can dispose of them.[7] They exist in the form of records on electronic media, are denominated in the national currency, are part of the country's monetary system and are regulated by its legislation. Issuers and operators of electronic money can only be considered as technical intermediaries in the relationship between the owner of electronic money and its counterparties. The obligations of the issuer can be expressed in both monetary units and physical goods.

Electronic money includes:

1) funds on physical media (plastic card or paper certificate), such as:

a) prepaid bank cards issued by banks without opening a bank account[8];

b) prepaid cards issued by non–banking organizations and intended for receiving goods and/or services (transfers are not possible on them):

- denominated in monetary units, for example, gift cards of stores;
- denominated in physical units, for example, fuel cards, the limit of which is expressed in liters of fuel;
- denominated in different units, for example, transport cards, the balance of which can be expressed both in trips and in monetary units. They can be replenished or not;

2) funds that exist exclusively in electronic form, such as:

a) electronic (digital) wallets intended for money payments and transfers, which can be replenished;

b) non-cash money in the country's banking system — accounts, deposits, reserves (money in the traditional sense of the word)[9];

c) digital currencies of central banks.

Issuers of electronic money can be banks and financial organizations (instruments 1a, 2a and 2b), as well as any other economic entities, including states.

Instruments 1a, 1b, and 2a are not linked to bank accounts. The absence of such a link makes payments using electronic money, on the one hand, anonymous, fast and secure, and on the other hand, the issuer's obligations are not subject to deposit insurance.

Digital money (digital currency) is money that exists exclusively in digital form, in the form of account entries. The definition of digital currency is fixed in Russian legislation.[10]

In addition to the above-mentioned electronic money (instruments 2a, 2b, 2c), digital money also includes virtual currency.

Virtual money (virtual currencies) is a type of digital currency that functions as a means of exchange and payment, but does not have the status of legal tender in any jurisdiction and is accepted only by agreement within the community of users of a particular type of currency. This circle of people can be: communities of computer game players

[2] In this section, defining the location of the CC, we will understand "money" by default, in the broadest sense.

[3] Electronic money or electronic currency.

[4] Digital money or digital currency.

[5] Virtual money or virtual currency.

[6] FATF Report. Virtual Currencies Key Definitions and Potential AML/CFT Risks. June 2014. P. 4. URL: https://www.fatf-gafi.org/content/dam/fatf-gafi/reports/Virtual-currency-key-definitions-and-potential-aml-cft-risks.pdf (accessed on 27.12.2024).

[7] The definition is provided in article 3, paragraph 18 of Federal Law No. 161-FZ, dated 27 June 2011, as amended on 24 July 2023, "On the National Payment System", as amended and supplemented and effective from 21 October 2023.

[8] It should be noted that ordinary bank cards and online banking are not money themselves, but rather a technical tool that allows users to access fiat currency in their accounts.

[9] Committee on Payments and Market Infrastructures. 2015. Digital Currencies. Bank for International Settlements. https://www.bis.org/cpmi/publ/d137.pdf (accessed on 27.12.2024).

[10] Federal Law No. 259-FZ, dated July 31, 2020, "On Digital Financial Assets, Digital Currency, and on Amendments to Certain Legislative Acts of the Russian Federation," article 1, paragraph 3.

<table>
<tr><td colspan="3">Electronic Money</td><td colspan="2">Virtual Money</td></tr>
<tr><td rowspan="2">1a and 1b
(prepaid cards issued by banking and non-banking organizations)</td><td rowspan="2">2a and 2b
(electronic wallets and other forms of non-cash payment methods in the banking system)</td><td rowspan="2">2c
(CBDC)</td><td rowspan="2">Bonuses from banks and platform companies.</td><td>Cryptocurrencies: instruments of financial markets</td></tr>
<tr><td>Game currencies</td></tr>
<tr><td colspan="4">Centralized</td><td>Decentralized</td></tr>
<tr><td></td><td colspan="4">Digital Money</td></tr>
</table>

Fig. **Electronic Money, Digital Money, Virtual Currency: How they Relate Each to Other**

Source: интерпретация автора / Author's interpretation.

who have a "game currency" (such as in World of Warcraft); customers of a bank, marketplace, or airline who receive bonuses or prize miles; owners of cryptocurrencies.

Just like all electronic money, virtual money can be centralized. The administrator of each virtual money project issues units, sets the rules for their use, maintains a register of transactions with them, sets the exchange rate for real or virtual goods, and has the right to change the rules for the circulation of virtual money or stop using them altogether. Examples of centralized virtual currencies include:

- bonuses that exist in the ecosystems of banks;
- all kinds of "credits", "coins", etc., used inside computer or mobile games[11];
- tokens (cryptoassets) issued by persons who control their turnover. Tokens, as a rule, are cryptocurrencies in themselves; they are often built on well-known blockchains for specific purposes, for example, participation in the management of decentralized projects or to preserve the uniqueness of real or virtual assets;
- stablecoins are projects linked to fiat currencies implemented by specific companies in the crypto market to support and hedge financial transactions.

Decentralized virtual currencies are peer–to-peer (based on the principles of distributed ledgers) networks that do not have a central regulatory authority or person. All transactions with monetary units in such networks are carried out without intermediaries in the person of a bank or other organization, and all participants in such a network have equal status. Decentralized virtual currencies include bonuses in rare open source games and a reward system, as well as classic cryptocurrencies (bitcoin, etc.).

Private Money: Cryptocurrencies and Their Markets

Cryptocurrencies are a type of virtual money, the functioning of which is provided by a network of a large number of independent users. Sometimes only decentralized instruments are called cryptocurrencies, denying this to stablecoins and most tokens. A more lenient approach refers to cryptocurrencies all tools built on cryptographic protocols, including stablecoins [3]. The term "cryptocurrency" was first used in 2011,[12] and in March 2018 it was included in the Webster Dictionary.[13]

The main idea that originally underlay bitcoin and other early cryptocurrencies is decentralized money, the control over the issue and turnover of which is distributed over a network of equal participants.

The idea of a decentralized currency — private money — is not new. Periods of "free banking" have occurred at different times in many countries. The most

[11] URL: https://app2top.ru/game_development/11-tipov-vnutriigrovoj-valyuty-182072.html (accessed on 27.12.2024).

[12] URL: https://www.forbes.com/forbes/2011/0509/technology-psilocybin-bitcoins-gavin-andresen-crypto-currency.html (accessed on 27.12.2024).

[13] URL: https://www.merriam-webster.com/wordplay/new-words-in-the-dictionary-march-2018 (accessed on 27.12.2024).

famous is the American Era of free banking (1837–1866) [4]. More modern discussions about the fate of private money began with the publication in 1976 of a book by the economist F. Hayek's "Denationalization of money"[14] [5], in which the expediency of decentralizing monetary mechanisms, private money and the complete abandonment of government regulation of this market were substantiated.

Almost simultaneously with the idea of decentralized money, the interest of mathematicians and programmers in the issues of cryptography, anonymity and confidentiality in the transmission of information has increased dramatically.[15]

The decentralization of each cryptocurrency is provided by distributed ledger technologies, the most famous of which is the blockchain, an ever–growing chain — a list of records (blocks) connected to each other and cryptographically protected. The declaration that initiated the creation of the bitcoin network was published in late 2008,[16] and the first blockchain was formed in early 2009.

Initially, crypto enthusiasts were involved in the bitcoin network, motivated by a pure sporting interest. However, by the end of 2009, the opportunity to monetize this technology became apparent. The New Liberty Standard website took over the exchange of bitcoins for money.[17] The first bitcoin quote took place on 5.10.2009 with the ticker BTC, and six months later the first transaction took place for the sale of real goods for virtual money (two pizzas for 10.000 BTC),[18] however, such cases remained entertainment within the community of crypto enthusiasts for a long time. By and large, neither bitcoin nor other cryptocurrencies have become a means of payment until now.

In 2011, the cryptocurrency transactions became a real-world market. Firstly, this was followed by the emergence of alternative bitcoin projects, or altcoins, which differ from bitcoin in technical specifications. Since then, various types of blockchain have been developed, and thousands of digital tools have been introduced, transforming the global financial landscape.

Secondly, the bitcoin market itself experienced its first bubble: its price increased from $ 0.39 at the beginning of the year to $ 31 in the summer and then dropped to $ 2 at the end of the year.[19] Later, similar price bubbles (rapid growth and subsequent significant decline over several months) occurred in 2013 (twice), at the turn of 2017 and 2018, in 2021 and 2022.

The rapid growth of bitcoin's popularity among financial market practitioners in the early 2010s is attributed by some authors to the results of the global financial crisis of 2008–2009 and the European sovereign debt crisis of 2010–2013 [7]. In the following years, bitcoin and some other cryptocurrency projects became part of the global financial market [8], which led to the development of regulatory regulation of this segment.

In all countries, the regulatory regulation of cryptocurrency markets is carried out in different ways, but it is always based on an understanding of the economic nature of cryptocurrencies.

THE NATURE OF CRYPTOCURRENCY

Cryptocurrency as an Asset

Is cryptocurrency an asset? If we are talking about assets, it would be advisable to refer to the definitions and regulations of financial and civil law and see how cryptocurrencies fit within these frameworks. According to the accounting definition, an asset is a resource (tangible or intangible) with the following characteristics:[20]

1) owned or controlled by the owners (individuals, legal entities or the state) as a result of past events (clause 4.3 of the Conceptual Framework for the presentation of financial Statements.[21] Here and further

[14] The book was published in Russian translation in 1996 under the title "Private Money".

[15] The pioneer in the development of digital signatures was David Chaum. In 1982, he proposed the idea at a cryptography conference [6].

[16] Nakamoto S. (2008). Bitcoin: A peer-to-peer electronic cash system.

[17] URL: https://www.bankrate.com/investing/bitcoin-price-history/ (accessed on 27.12.2024).

[18] URL: https://www.marketwatch.com/story/bitcoin-pizza-day-laszlo-hanyecz-spent-3–8-billion-on-pizzas-in-the-summer-of-2010-using-the-novel-crypto-11621714395(accessed on 27.12.2024).

[19] URL: https://www.bitcoin2040.com/bitcoin-price-history/ (accessed on 27.12.2024).

[20] "Conceptual foundations of Financial reporting", official translation into Russian. URL: https://minfin.gov.ru/common/upload/library/2015/01/main/conceptual.pdf (accessed on 27.12.2024).

[21] "Conceptual foundations of financial reporting", official translation into Russian. URL: https://minfin.gov.ru/ru/document/?id_4=117374; URL: kontseptualnye_osnovy_predstavleniya_finansovykh_otchetov_dokument_kontseptualnye_osnovy_predstavleniya_finansovykh_otchetov_prinyat_sovetom_po_msfo. _nastoyashchaya_publikats (accessed on 27.12.2024).

in this section there are links to the paragraphs of this document). For cryptocurrencies, these events can be mining, purchase on exchange platforms for fiat currency, or transfer from previous owners in exchange for other benefits. The use of the term "in ownership" may be controversial when there is no legal registration of the rights to CC. This poses some legal difficulties, but from an economic point of view, whoever has access to operations with CC controls this asset;

2) having the potential to bring economic benefits determined by various rights (clause 4.6), related or unrelated to the obligations of third parties. Cryptocurrencies also correspond to this feature, since they create economic benefits by giving the owner the right or the opportunity to perform one or more of the following actions (paragraphs 4.16, paragraphs (a), (b), c(i)), (d), (e)):

- to receive cash flows from sales of cryptounits for fiat currency;
- to exchange for other economic resources (goods, services, or other digital assets, if the owner of these resources agrees to it) on favorable terms;
- to ensure the flow of funds or reduce costs, "for example, by using this economic resource either individually or in combination with other economic resources to produce goods or provide services" — this is possible when executing smart contracts or hedging risks using cryptocurrencies.;
- to repay obligations by transferring this economic resource, if the counterparty agrees to such a repayment method.

As an economic benefit, one can understand the possible profit (the difference between income and costs) of mining companies, as well as the positive difference between the purchase and subsequent sale rates of crypto units by their owners. The fact that such a difference may be negative does not mean that a cryptocurrency cannot be recognized as an asset in the accounting sense of the word (clause 4.15).

In addition to the two main features of an asset, to analyze its economic nature, it is important that the object has economic value, that is, it has a monetary value. With the advent of exchange platforms where cryptocurrencies can be exchanged for fiat money, this condition is also fulfilled.

So, based on the accounting definition of assets, cryptocurrencies are certainly assets. But what type?

Is Cryptocurrency Money?

The phenomenon of money has been of interest to economists for more than a century. Money is often defined as "universally recognized maximum liquid wealth with instant liquidity when paying for transactions."[22]Among the generally accepted functions of money in Russian publications, as a rule, five are distinguished: (A) a measure of value, (B) a means of circulation, (C) a means of payment, (D) a means of accumulation (treasure formation) and (E) world money. The performance of all these functions by fiat money at the present stage of the development of the global economy is seriously criticized [9], nevertheless, there is a definite consensus among practical economists and politicians about what money is.

The question of whether cryptocurrency is money has been debated since the early 2010s, when bitcoin moved beyond the community of enthusiasts. The subsequent transformation of bitcoin and some altcoins into a tool in the financial markets has stimulated a discussion about government regulation of transactions with these assets. The first authors considered bitcoin as a currency and proposed regulating it in a similar way to regulating money turnover [10], however, later, especially with the advent of a large number of altcoins and new types of cryptographic protocols, other arguments and alternative approaches to understanding the nature of this phenomenon appeared.

To be money, an asset must have the following properties:

a) purchasing power, and their general recognition in this capacity[23] in the economy of at least one country. Cryptocurrencies do not meet this quality. Payments for real goods and services are extremely rare and are typical only for special, often criminalized, markets. CC is not considered by economic entities as a widespread means of payment and is not regulated by States. The lion's share of cryptocurrency transfers is related to their movement within the Forex market and withdrawals into fiat currency. Therefore, the functions of money (A), (B), (C), (E) are not fulfilled;

[22] Ivanov V.V. and others. Banks and banking operations: textbook and workshop for universities / edited by B.I. Sokolov. Moscow: Yurait Publishing House; 2024. P. 18.

[23] Ivanov V.V. and others. Banks and banking operations: textbook and workshop for universities / edited by B.I. Sokolov. Moscow: Yurait Publishing House; 2024. P. 6.

b) it must retain its value over (at least some) time. In our opinion, the biggest problem with cryptocurrencies is their enormous volatility, which is expressed in rapid fluctuations in the value of cryptocurrency units, bubbles in the markets of individual cryptocurrencies, and the ease of launching new, unsecured, cryptocurrency projects. It is almost impossible to guess whether the next project will "take off", which of the "sleeping" cryptocurrencies will suddenly be actively traded, and which of those trading today will completely cease circulation in the foreseeable future. On the one hand, all this makes it extremely risky to play in this market and the idea of preserving the value of a CC asset in the short term is questionable. However, if we talk about the top ten or two largest cryptocurrencies in terms of turnover, then the general trend of their prices is certainly upward. If we talk about bitcoin, then for almost 15 years of its exchange trading, only two calendar years (2018 and 2022) ended with a lower exchange rate than they began. Thus, cryptocurrency can be considered as a completely reasonable tool for long-term savings. This tool does not depend on time, state borders and political changes, however, it strongly depends on the availability of the owners of CC units of the Internet, stable power supply and reliable operation of computer equipment. In general, this means that the cryptocurrency partially performs the accumulation function (D);

c) uniformity, qualitative identity of units; divisibility into small fractions; units and their fractions do not deteriorate with time. For cryptocurrencies, this is certainly the case;

d) difficulty of forgery. Counterfeiting cryptocurrencies is extremely unlikely, as this is hindered by both the ideas of the blockchain and the distributed registry underlying them, as well as specific cryptographic protocols. In addition, individual CC units do not have a physical carrier. The difficulty of counterfeiting distinguishes cryptocurrencies from ordinary money;

e) portable (easy to carry), easy to use. There are similarities and differences with fiat currencies in these qualities. On the one hand, exchange interfaces are quite simple, do not require special equipment other than a regular computer or smartphone, and are not difficult for an experienced user. Even hardware cold wallets[24] don't take up much space. On the other hand, a necessary condition for working with cryptocurrency is to have some, non-zero, level of technical and IT literacy, to be able to work at least in user interfaces and the Internet.

As a result, if we apply the definition of money given at the beginning of the section to cryptocurrencies, then money is not a "generally recognized" asset, and the remaining features — "maximum liquidity", "wealth", "instant liquidity when paying for transactions" — can only be discussed within a limited circle of entities involved in the turnover of this asset.[25]

At the same time, there is a noticeable movement in different countries towards the "transformation" of cryptocurrencies into money, some states have been considering bitcoin as a virtual currency for quite some time and allow it to be used as a means of payment between individuals and through online stores that agree to accept such payments.[26] Thus, the Court of Justice of the European Union in 2015 acknowledged that "bitcoin is a means of payment used similarly to legitimate means of payment," and exchange transactions with it "are exempt from VAT in accordance with the regulation regarding transactions involving "currency, banknotes and coins used as legal tender".[27]

In our country, from 2022, it was expected to allow the use of mobile phones as a means of cross-border payments.[28] The laws on the regulation of mining and on experimental settlements in cryptocurrencies, adopted by the State Duma of the Russian Federation

[24] A cold wallet is a physical device or application designed to store and manage cryptocurrencies without a regular internet connection. URL: https://finance.mail.ru/card/kholodnyy-hoshelek-dlya-kriptovalyuty-725/#card-54443 (accessed on 27.12.2024).

[25] Note that our argument specifically applies to cryptocurrencies and private money, and not to central bank digital currencies, which are being discussed and tested by many countries, including Russia. These are the third type of money, and they are a different concept.

[26] Numerous corporate companies (Microsoft, Intuit, PayPal) accept payments in cryptocurrency; the client of this company Overstock.com, which opened in January 2014, followed by Microsoft in December 2014. (Holbrook E. 2018. Will Bitcoin turn the business upside down? Risk management. URL: https://www.rmmagazine.com/articles/article/2018/03/01/-Will-Bitcoin-Turn-Business-on-Its-Head (accessed on 27.12.2024).

[27] URL: https://curia.europa.eu/jcms/upload/docs/application/pdf/2015–10/cp150128en.pdf (accessed on 07.01.2025).

[28] URL: https://lenta.ru/news/2022/09/22/cryptotrans/ (accessed on 25.07.2025).

on July 30, 2024, fill this gap at least partially, allowing foreign trade settlements and exchange trading in cryptocurrencies within the framework of experimental legal regimes.[29]

In any case, cryptocurrency is not yet money in the full sense of the word, many economists agree with this [11]. Cryptocurrency is not money, but an asset. What kind of property is it?

Is Cryptocurrency a Commodity?

Bitcoin and other private cryptocurrencies are not backed by real assets and have no intrinsic value, but they are successfully created for the first time and change their owners subsequently. Opportunities to become a crypto asset owner include:

1) mining on own or leased facilities. From an economic (and accounting) point of view, the creation of "something" (some kind of asset) through the operation of equipment and using electricity as an incoming raw material is akin to production. The cryptocurrency obtained as a result of mining is usually intended for sale on the stock exchange. This way of using the asset obtained as a result of "production" makes it a finished product (commodity);

2) purchase on exchanges, including during the ICO, for fiat currency. In the vast majority of cases, crypto assets are purchased for the purpose of further resale and in the hope of increasing their value. In this case, they can be considered as goods for resale;

(3) a simple transfer of crypto units or their shares between participants as a reward for something. Such an operation is akin to a barter exchange of goods, and in this case cryptocurrencies can also be considered as a commodity;

(4) as a gift. This is a one-sided transaction, and it is the only way to purchase crypto assets in which they cannot be considered as a commodity. However, for the new owner, with the opportunity to sell them, these units again acquire the property of a commodity.

An additional argument for understanding cryptocurrencies as a commodity is the fact that a significant part of cryptocurrencies are traded on exchanges. Their prices are difficult to predict, but analysts do not give up trying to find patterns, correlations, or at least qualitative similarities in the behavior of crypto assets with traditional assets and exchange-traded commodities. Researchers find that bitcoin behaves more like gold and silver than as a currency [12]. There is a significant causal relationship between cryptocurrencies and commodity futures [13], an inverse relationship with oil prices [14], while the relationship of cryptocurrencies with traditional financial market instruments and fiat currencies is weak [15]. Currently, cryptocurrencies, primarily bitcoin, are widely used to hedge risks associated with other, more traditional financial instruments [14, 16].

So, cryptocurrencies can be considered as a commodity (finished goods or goods for resale) in cases where their owner has the opportunity to sell them for fiat currency.

Is Cryptocurrency a Security?

The Civil Code of the Russian Federation (Articles 142 and 149) defines a security (hereinafter referred to as the CB) as a document certifying the property and non–property rights of its owner. In order for a financial instrument to be considered a security, there must be a specific person responsible for fulfilling the obligations associated with it. Therefore, if a cryptocurrency is a distributed ledger, similar to bitcoin, and does not have a person responsible for fulfilling financial obligations, then such an instrument cannot be considered a security.

If a cryptocurrency project (and there are many of them) is implemented by specific companies operating in certain jurisdictions, and their issues are carried out in accordance with the laws of a particular country, then such instruments can be considered as securities. If a financial instrument is offered to investors as a share in a common enterprise based on profit, which depends on the efforts of third parties (in our case, other investors in the cryptocurrency market), it meets all the criteria of the Central Bank (Howie test).[30] This is how the nature of cryptocurrencies is understood in the United States, where securities laws are widely used to regulate crypto assets and transactions with them.

However, not all cryptocurrencies, even those with an issuing center, can be considered as a central bank.

[29] URL: https://pravo.ru/news/254384/ (accessed on 25.07.2025).

[30] URL: https://www.economist.com/finance-and-economics/2021/08/07/the-sec-sets-its-sights-on-the-crypto-wild-west, https://www.theblock.co/learn/251857/are-cryptocurrencies-securities (accessed on 25.07.2025).

Stablecoins pegged to conventional currencies or assets do not meet the Howie test. Each stablecoin, with Tether being the most well-known example, has an issuer that is responsible for ensuring its level of stability. However, the stablecoin itself does not function as an investment but rather serves as a means of exchange, helping to solve other investment challenges, including reducing volatility when trading other cryptocurrencies.

To a first approximation, cryptocurrencies that are not stablecoins and have a single issuer can be considered as securities.

However, there are several other considerations that support doubts about whether cryptocurrencies can be classified as securities. Traditional central banks issue securities to finance the activities of their issuer, and the success of these activities significantly affects the value of the securities of "ordinary" issuers, both during the initial offering and during their subsequent trading.

The purpose of cryptocurrency projects, on the other hand, is simply to launch a mechanism for creating and circulating corresponding units. These projects do not conduct operational activities, and the funds received from the initial sale are not used for these activities. Instead, they are used to support the functioning of the cryptocurrency protocol. Therefore, the financial results of these projects have no impact on the price movements of cryptocurrencies.

Another feature of traditional central banks is the way they are interpreted and reflected in the accounting and financial statements of those who purchase them on the market and of issuing companies. For those who acquire property, whether securities or cryptocurrencies, either on the market or through other means, this property represents an asset with a monetary value that will generate future benefits.[31]

There are significant differences between the issuers of cryptocurrencies and traditional central banks. For the latter, these securities represent liabilities, obligations to shareholders and other holders of central banks. In contrast, for most cryptocurrencies, even with a nominal issuer, project launches do not create specific obligations for the issuer to repay or pay something under specific conditions. In other words, the issuance does not create liabilities. If the initial public offering (IPO) prospectus only involves maintaining a record of transactions with cryptocurrency, then this is similar to an ordinary sale with post-sale support. Therefore, the lack of issuers' recognition of most of their obligations towards their owners prevents cryptocurrencies from being equated with traditional securities.

From an economic perspective, not all cryptocurrencies possess the characteristics of securities. This depends on the specific details of their creation and operation.

Is Cryptocurrency a Financial Asset?

Cryptocurrencies do not have a tangible form, but they are not traditional intangible assets (IA), whose characteristics are well known. In the scientific literature and financial regulations of different countries, CCs are often referred to as financial assets. Is this justified?

The definition of a financial asset (hereinafter referred to as the FA) is given by paragraph 11 of the International Financial Reporting Standard 32,[32] which classifies into this category: "(a) cash; (b) an equity instrument of another entity; (c) the contractual right to: (i) receive cash or other financial asset from another entity; or (ii) exchange financial assets or financial liabilities with another entity on terms potentially beneficial to the entity" (IAS 32, paragraph 11). Rosstat provides a list of such assets recognized for statistical purposes:[33] financial assets include, in addition to cash, bank deposits, accounts receivable (in the Russian Federation), equity and debt securities, etc.

[31] This point of view has long been held by the US Internal Revenue Service (IRS), which decided on 25.03.2014 that bitcoin would not be considered as a currency, but as property, for tax purposes. This means that bitcoin, followed by many other cryptocurrencies, is subject to capital gains tax. URL: https://www.bloomberg.com/news/articles/2024–07–01/turkey-turns-to-ai-to-crack-down-on-rampant-tax-evasion (accessed on 25.07.2025).

[32] "International Financial Reporting Standard (IAS) 32 "Financial Instruments: Presentation" (introduced in the Russian Federation by Order of the Ministry of Finance of the Russian Federation dated December 28, 2015 No. 217n) (as amended on December 14, 2020). URL: https://minfin.gov.ru/common/upload/library/2017/01/main/MSFO_IAS_32.pdf (accessed on 07.01.2025).

[33] The list of financial assets recognized as such for statistical purposes is given in Order No. 159 of the Federal State Statistics Service dated February 27, 2014 "On Approval and Implementation of the Classifier of Financial Assets (CFA) in Statistical Practice." URL: https://www.garant.ru/products/ipo/prime/doc/70509702/#100 (accessed on 07.01.2025). The value of an asset is determined by both real assets and the market. For some stocks, the price is volatile and is determined only at the time of exchange for money.

Obviously, they are neither bank deposits nor accounts receivable (paragraph 11 c(i)). We have already shown that cryptocurrencies are not money (paragraph 11 (a)), and only some cryptocurrencies can be considered as securities under certain conditions (paragraph 11 (b)). With regard to paragraph 11 (c) in general, the definition of IAS 32 implies contractual requirements. However, traditional cryptocurrencies as decentralized networks do not have an emission center, are built on trust, and therefore do not imply contractual requirements of the owners of CC units to anyone. Classical cryptocurrencies (bitcoin and similar fully decentralized cryptocurrencies) cannot be classified as financial assets.

It would seem that cryptocurrencies do not meet the established accounting definition of financial assets. However, in recent years, first in Russian legislation and then in financial practices, a new asset class has emerged — **digital financial assets (CFAs)** — "digital rights that include monetary claims, the issuance, accounting and circulation of which are possible only by making (changing) entries in an information system based on a distributed registry, as well as to other information systems."[34] Centralized cryptocurrencies, therefore, could be classified as digital financial assets if their turnover were regulated by Russian legislation. This recognition began with the adoption of Russian laws on the mining of cryptocurrencies and the experimental use of them in international transactions on July 30, 2024.

Is Cryptocurrency a Special Asset?

For issuers who launch cryptocurrency projects, the tokens they create can be classified as either securities or commodities, depending on the specific obligations of the issuer to market participants. For holders of decentralized cryptocurrencies, in addition to these two categories, there is a third approach to understanding the economic nature of these assets.

From an accounting perspective, if resources have been invested in a cryptocurrency (either through acquisition or creation) and this asset belongs to a legal entity, it is considered property, even if it does not fit into any specific category and is not currently being used in the entity's operations. These "dormant" cryptocurrencies, which are not currently in circulation, are still valued and reported on in financial statements. Determining the monetary value and fair value of these assets is a separate topic outside the scope of this discussion. However, if a company acquires or creates CC units, they must be included in its financial statements.

There is still no agreement on the interpretation of which asset class cryptocurrencies should be classified for the purposes of regulating their turnover. In addition to the interpretations of CB as a commodity, security, and other property discussed above and adopted in a number of countries, there were proposals to introduce a special class of assets (pseudo-currency) into commercial legislation [10, p. 638] or even consider them as something special (sui generis) [17].

An argument for considering cryptocurrencies as a special asset class may be the behavior of their prices and their correlation with other financial instruments. An asset class is defined as "a stable set of investment units that is internally homogeneous and externally heterogeneous, which, when added to a portfolio, increases its expected usefulness and can be accessed efficiently in terms of costs and benefits" [18, p. 2]. In general, cryptocurrencies satisfy this definition.

The leader in price and trading volume from the very beginning to the present day is bitcoin, which defines the nature of the entire cryptocurrency market. The correlation of alcoin prices with bitcoin is high in all studies, and the direction of this relationship is always such that the price and dynamics of bitcoin determine the prices and price dynamics of altcoins [19], that is, the behavior of investment units within the class is homogeneous. At the same time, the correlation of CB with other instruments is low [15, 20], which indicates a strong difference from other groups of investment units and makes it possible to use cryptocurrencies for portfolio optimization [16] and hedging [15].

Econometric studies of cryptocurrencies as a special class of market assets based on archived data in recent years have yielded a lot of interesting results and opportunities to test new quantitative methods. Approaches to cryptocurrencies as something special are interesting from a purely theoretical point of view, however, they are difficult to apply for regulatory and tax purposes, so legislators from different countries choose for each specific case an interpretation of the

[34] Federal Law No. 259-FZ dated 31.07.2020 "On Digital Financial Assets, Digital Currency and on Amendments to Certain Legislative Acts of the Russian Federation." Art. 1.

nature of cryptocurrencies by analogy with the already well-known types of assets discussed above. Differences in understanding of the nature and, consequently, taxation of transactions with cryptocurrencies in different countries lead to the emergence of "tax havens" and allow global investors to use them in tax minimization schemes.

CRYPTOCURRENCY RESEARCH

The first academic publications on bitcoin and blockchain issues in English appeared in 2011, and researchers' interest in crypto assets has been steadily growing since then (see, for example, reviews of publications in various discourses [21–23]).

All research projects and aspects of consideration in publications can be roughly divided into three groups of areas.

1) From a technical perspective, cryptocurrency is a software program based on open source code, consisting of sequences of zeros and ones. Despite its simplicity, it creates a powerful tool with extensive functionality. Scientific research focuses on the principles, challenges, and techniques of developing software applications that enable cryptocurrency projects, including digital assets, payment systems, and security systems. These areas are not relevant to the goals of this article.

2) Research on the economic aspects of operations with cryptocurrencies includes the following topics:

- pricing (of particular interest here is the analysis of price bubbles in the markets) and the analysis of the mutual influence of these instruments with other financial market instruments;
- diversification of portfolios, both consisting of different cryptocurrencies and combined (from cryptocurrencies and traditional financial instruments);
- the effectiveness of cryptocurrencies as a financial instrument (analysis of risk, profitability, the nature of price time series dynamics, etc.).

3) The third group of research areas of cryptocurrencies concerns legal aspects such as:

- the legal nature of cryptocurrencies, the nature of rights and transactions with cryptocurrencies;
- cybercrimes related to cryptocurrencies and ways to combat them;
- regulatory regulation of the turnover of cryptocurrencies.

A special group of works consists of research at the intersection of economics and regulatory regulation, devoted to the possibilities of recognizing cryptocurrencies and cryptocurrency projects for tax purposes and reflection in the financial statements of companies. It is this area that is directly related to the research issues of our work.

The number of journal publications can serve as a quantitative measure of researchers' interest in certain topics. As for English-language publications, the authors of the reviews [21, 23] write about the exponential growth of interest in the topics of cryptocurrencies from 2013 to 2020, and [24] notes a change in rhetoric and the evolution of the discourse on cryptocurrencies in 2019–2020.

The picture seems to be similar for Russian-language publications.[35] There has been a sharp, almost exponential increase in the number of publications in the period from 2012 to 2018, and then some stabilization of the authors' interest in the topics of cryptocurrencies. The data on two sections of the NEL, which are the main interest of our work, are the categories "Economics. Economic Sciences" and "State and Law. Legal Sciences" show similar dynamics. Note, however, that the number of publications in the NEB database does not reflect the quality of their content — out of more than 5 thousand. Of the works included in our sample, only 73 were published in journals included in the RSCI index (46 articles from the category "Economics. Economic Sciences" and 28 articles from the category "State and Law. Legal Sciences"). The dynamics of these publications is not as variable as the dynamics of the total number.

In the topics of cryptocurrencies and blockchain, we see a new research object for several sections of socio-economic sciences. Speaking about research programs [25], it can be noted that from an epistemological point of view, almost all publications, both Russian and English, so far follow the line of functionalism. At the same time, from a methodological point of view, two classes of work are easily distinguishable — positivist (mainly quantitative financial studies of risk, profitability, volatility and arbitrage opportunities of CC) and

[35] Data on the number of publications posted on the NEB, by year. URL: https://www.researchgate.net/publication/387789239_Tablica_s_dannymi_NEB_dopmaterial_k_state (accessed on 07.01.2025).

normative, performed in a "legal" discourse and related to the possibilities of regulating these financial instruments. Different ideas about the nature of cryptocurrencies (which is the subject of our article) can form ontological paradigms, but there is no certainty about the nature of the objects being studied yet. We discussed some of the possible ontologies in our work from the perspective of traditional businesses, i.e. economic entities that should reflect transactions with cryptocurrencies in their reporting to external users, including tax authorities. The list of options we have considered is not exhaustive, and when viewed from other perspectives — for example, from various government agents — there may be a different understanding of the nature of the objects under study. We did not consider, in particular, centralized blockchain projects — both state-owned (digital currencies of central banks) and private (issuance of cryptotokens), and here the interpretation of nature may be completely different.

Further prospects for research in the field of cryptocurrencies seem to us to be quite wide. In addition to the functionalist research that has been developing for about a decade on the possibility of using cryptocurrencies to hedge and build infrastructure for new segments of financial markets, there is already a need to understand and discuss more broadly the non–quantitative aspects of the functioning of these markets and instruments, taking into account the interests of different stakeholders — from individual investors to society as a whole. We anticipate significant interest in interpretive and critical research in this area in the near future. Researchers will have to answer the following questions: is it worth legalizing operations with CC? Is cryptocurrency ethically neutral? How justified are the energy costs in the production (mining) of cryptocurrencies? Can such production be considered "green" and sustainable? Will the cryptocurrency markets expand and in which direction? What is the role of cryptocurrencies in the architecture of global finance? Can I trust a centralized and/or decentralized blockchain?

CONCLUSIONS

A decentralized monetary unit, bitcoin, created in 2009 as a tool for small, anonymous private payments, has now evolved into the ancestor of a whole class of investment instruments — cryptocurrencies. These tools, based on the idea of the blockchain, have formed a segment of financial markets. However, their economic nature remains debatable.

The question of whether most crypto assets are securities, commodities, or other forms of assets may seem academic, but if the answer is clear, it will have significant consequences for financial markets and investors. Not only investors who work in the cryptocurrency market will be affected, but also those in other market segments as cryptocurrencies are widely used for both speculation and risk management.

We have demonstrated that the interpretation of cryptocurrencies' economic nature depends on the perspective of the stakeholder and the purpose of the discussion.

We have considered the arguments for and against recognizing cryptocurrencies as commodities, currencies (including electronic and private money), and property (assets, including financial assets). Despite the term "currency" in the name of this financial instrument, traditional cryptocurrencies are not money. Only digital currencies issued by central banks meet all the criteria of money.

Decentralized cryptocurrencies, such as bitcoin, cannot be considered securities either, as there are no issuers with any obligations under these instruments. These cryptocurrencies have the characteristics of a commodity. Therefore, from an economic perspective, for the purpose of regulation and taxation, different types of cryptocurrencies could be classified as either commodities or securities. At the same time, assets with unique properties and behavior in the financial market should be allocated to a special category for the purposes of financial reporting. In the case where the government allows the use of cryptocurrencies for settlements without restrictions, they should be considered equivalent to cash.

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ABOUT THE AUTHOR

Olga N. Volkova — Cand. Sci. (Phys.-Math.), Assoc. Prof., National Research University Higher School of Economics — Saint Petersburg, Saint Petersburg, Russian Federation
https:orcid.org/0000-0002-7188-3395
volkova@rambler.ru

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The Effect of Financial Innovation on Economic Growth: A Theoretical Model

T.T.H. Luong, T. Laosuthi, A. Lerskullawat
Kasetsart University, Bangkok, Thailand

ABSTRACT

In contrast to the abundant theoretical literature on the finance-growth nexus, there is a lack of research that directly examines the impact of financial innovation on growth models. This study proposes a theoretical model that systematically interprets the transmission mechanism of how financial innovation affects economic growth. By establishing a paradigmatic economy, the research constructs a model based on the microeconomic foundations of four main agents: households, financial innovators, financial intermediaries, and firms. The influence of financial innovation on economic growth is examined through the actions of each agent. The results of the model demonstrate a positive external effect of existing financial innovations leading to the creation of new financial innovations. Additionally, new financial innovations enhance the efficiency of financial intermediaries. Moreover, an increase in financial intermediary efficiency leads to higher savings and investment. Consequently, new financial innovations contribute to the enrichment of the capital stock and have a positive impact on economic growth. This research provides a theoretical basis for conducting empirical studies and implementing policies.

Keywords: financial innovation; financial innovators; financial intermediaries; microeconomic foundation; capital stock; economic growth; Solow growth theory; theoretical model

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INTRODUCTION

A diverse body of research has developed and modified theoretical models to enrich our understanding of the finance-growth nexus. Extensive research has demonstrated several mechanisms by which the introduction of financial intermediaries, financial instruments and financial markets could boost economic growth through enhancing resource allocation for investments [1–3], reducing transaction cost [4, 5], enabling trading and hedging activities to deal with risk [6–9], and facilitating technological innovation [10–13]. Meanwhile, little attention has been devoted to directly capturing the role of financial innovation in the model of growth.

Extant theoretical works have demonstrated the effect of financial innovation on economic growth but they also exhibited limitations. Chou [14] modelled the linkage between financial innovation and economic growth based on the growth theory of Solow [15]. Through connecting the efficiency of financial intermediaries with producing financial innovation, Chou [14] explored directly the positive link of financial innovation and economic growth. However, Chou [14] neglected to consider microeconomic foundation in terms of how each agent makes decisions. Thus, there is no clear transmission channel how financial innovation affects economic growth.

Approaching the other side, Laeven et al. [16] considered the role of financial innovation in improving the screening of borrowers' performance and its effect on endogenous growth. Laeven et al. [16] addressed the core implication that technological innovation and financial innovation have a positive relation. Also, the growth of an economy would eventually stagnate if financiers do not innovate. The deficiency of this study is that financial innovation was limited in capturing any changes in the financial system that could improve the screening efficiency in identifying capable innovation projects by entrepreneurs. Similarly, the financier agent is constructed to play a simple role in screening the idea of entrepreneurs. Moreover, this study neglected the essential role of financial institutions in mobilizing savings in the households, allocating capital in the economy and facilitating the development of the financial markets.

In this research, we construct the model based on the microeconomic foundation in a paradigm economy to examine the implications of introducing financial innovations in the framework of the Solow growth model. By doing that, we could interpret systematically how introducing new financial innovations in the economy affects mobilizing more capital from savings of households through financial intermediaries in the economy. This study captures financial innovations in a broad spectrum from its production and application in the financial system. Based on the conceptual framework, financial innovations in this model are determined as a new class of financial products or services that functions the activities of financial intermediaries. The production of new financial innovations has the positive spillover effect which means that the invention of new one also is supported by innovating and modifying existing financial products and services. We have constructed the paradigm of the economy that includes four types of agents: households, financial innovators, financial intermediaries and firms.

The remainder of this paper is organized as follows. In the next section, we will describe the environment and the framework of the model based on microeconomic foundation. Also, in this section we will explore the objective functions of each agent, and solve for the solutions in the steady-state equilibrium. Consequently, there is a clear transmission channel on how financial innovation affects economic growth. This is followed by a results and discussion section and a conclusion.

MODEL

Environment and Research Framework

The environment consists of four agents: households, financial innovators, financial intermediaries and firms. Their characteristics will be described in more detail later.

Households in this model consist of two-period-lived agents. During the young period (t), these agents are labor suppliers for both firms $\left(L_Y^S\right)$ and financial innovators $\left(L_\tau^S\right)$. They choose to allocate the number of labors in each sector. The wage rate of working for firms and financial innovators are w_Y and w_τ respectively. Hence, when they supply L_Y^S labor into firms, their labor income received

from firms is $w_Y L_Y^S$. Similarly, their labor income received from financial innovators is $w_\tau L_\tau^S$ if households contribute L_τ^S labors to financial innovators. The labor income of households is spent on consumption during this period (c_t) and the rest for saving (S_t) at the financial intermediaries. The amount of savings (S_t) would create saving income $(\gamma_S S_t)$ at the second period of their life. The old period $(t+1)$ is assumed that no labor income so household's consumption (c_{t+1}) is entirely funded from the saving (S_t) and interest of saving $(\gamma_S S_t)$. The objective of households is to maximize their utility function by allocating their consumption over two periods c_t and c_{t+1}.

The second agent is financial innovators who have a need to employ the workforce from the household in order to produce financial innovations. They decide to produce how many units of financial innovation in the financial system ($\dot{\tau}$). Their financial innovations are bought out by financial intermediaries with price $P_{\dot{\tau}}$. Hence, the revenue of financial innovators in this model is estimated by the value of $P_{\dot{\tau}}\dot{\tau}$. Households contribute L_τ^S labor to financial innovators with the wage rate being $w_{\dot{\tau}}$. Hence, the expenditure of financial innovators which is assumed only labor cost equals $w_\tau L_\tau^D$. By deciding on the demand for labor and the number of financial innovations produced, financial innovators will determine their optimal profit.

Next, financial intermediaries in this model are constructed in the traditional manner. They collect savings in the economy from households, and then allocate K capital to firms. Their income is determined by the interest of capital (γ_K) which they receive from firms' loan (K). The cost for financial intermediaries comes from interest payment for households' savings and purchasing financial innovations produced by financial innovators with $\dot{\tau}$ quantity of financial innovations and their price $P_{\dot{\tau}}$. The role of financial innovations in this model is facilitating the operation of financial intermediaries. Financial intermediaries would evaluate the price of financial innovations and the interest rate on savings in order to maximize their profit.

Lastly, firms are the final agent in the economy. They employ labor from households and capital from financial intermediaries as inputs to produce final goods and earn the value of Y as outputs. With the quantity of labor is represented as L_Y^D at wage w_Y, and the labor cost for firms equals $w_Y L_Y^D$. They borrow K units of capital from financial intermediaries with the interest rate of borrowed capital being γ_K, hence the capital cost of firms would be $\gamma_K K$. Their objective is to maximize profits by estimating the value of wage (w_Y) and the interest rate of borrowed capital (γ_K).

In terms of the timing of the model, households are the first to allocate labor to financial innovators and firms. Next, financial innovators are the second to produce new financial innovations which facilitate the activities of financial intermediaries. The third mover is financial intermediaries who use savings to lend external capital of firms. Firms are the last in this economy to produce final goods.

The connection between four players including households, financial innovators, financial intermediaries and firms is illustrated in *Figure*.

Based on the framework, we consider the decisions of each agent in the following way.

HOUSEHOLDS

The objective of households is to determine their consumption in two periods c_t and c_{t+1} in order to maximize their utility function together with their budget constraint. The price of consumption is set to be one (as a numeraire good). The households' utility maximization problem is a function of c_t and c_{t+1} as follows:

$$\max_{c_t, c_{t+1}} \ln c_t + \beta \ln c_{t+1}, \tag{1}$$

subject to:

$$w_Y L_Y^S + w_\tau L_\tau^S - c_t = S_t, \tag{2}$$

$$c_{t+1} = \gamma_S S_t + S_t, \tag{3}$$

$$L_Y^S + L_\tau^S = 1, \tag{4}$$

$$L_Y^S, L_\tau^S, c_t, c_{t+1} > 0. \tag{5}$$

Equation (2) implies the budget constraint in the young period of households where saving is estimated as the difference of their income and consumption. Equation (3) presents the budget constraint in the old-aged period. Their consumption is funded by savings and interest on savings accumulated from

the young period. Households are the only supplier of labor in the economy, including two sectors for working so we set it equal to 1 as equation (5).

As presented in *Appendix A*, the consumption of households in the first period (c_t) is derived:

$$c_t = \left(\frac{1}{1+\beta}\right) w \cdot \quad (6)$$

By deriving for the consumption of households, this model also obtains the results of wage: $w_\tau = w_Y = w$ (see *Appendix A*). This finding implies the wage of labor in financial innovation equals the wage of labor in firms. This creates a balance state in the labor market because if the wage of financial innovators is higher than that of firms, households would tend to work for financial innovators and do not choose to work for firms. Because the wage rate in both sectors does not have any different, households have free entry in these sectors. Therefore, the allocation of labor in this economy will be determined by the labor demand of financial innovators and firms.

The consumption of households in the second period c_{t+1} is derived:

$$c_{t+1} = (1+\gamma_S)\frac{\beta}{1+\beta} w \cdot \quad (7)$$

Financial Innovators

Financial innovators' objective is to maximize profits. Their profits are determined based on two decisions, encompassing the number of new financial innovations $(\dot{\tau})$ and the number of labors employed (L_τ^D). The profit maximization function could be written as follows:

$$\max_{\dot{\tau}, L_\tau^D} P_\tau \dot{\tau} - w_\tau L_\tau^D, \quad (8)$$

where $w_\tau L_\tau^D$ is the cost of labor engaged in producing financial innovation; P_τ denotes the unit price of financial innovations. In this research, the price of financial innovations is determined by financial intermediaries because financial innovations are only used for the operation of financial intermediaries. Then, financial innovators are price-takers.

Financial Innovation Production

This section focuses on constructing the production function of financial innovators. The operation

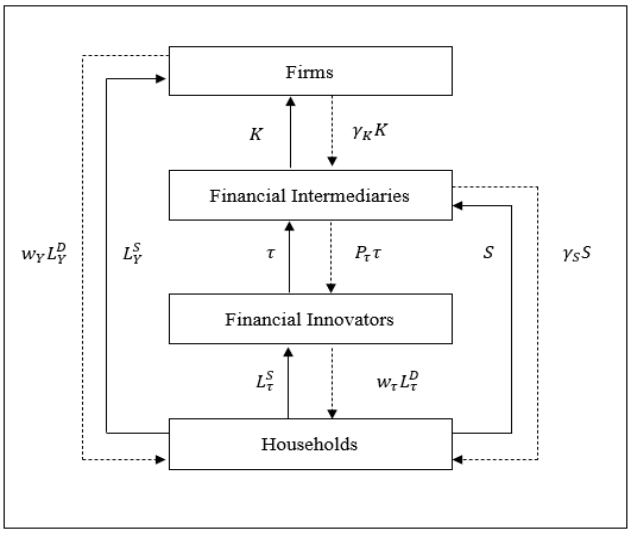

Fig. **Framework of the Theoretical Model**

Source: Compiled by the authors.

of financial innovators is to create new financial innovations. We assume that these innovations do not become obsolete (we exclude the effect of shocks such as the economic crisis, change in regulation, etc.). In particular, based on characteristics of existing financial innovations, financial innovators improve them to better versions and consider to be new financial innovations. This characteristic is presented by the term "positive spillover". Accordingly, the production process of creating new financial innovation is as follows:

$$\dot{\tau} = F\, L_\tau^{D\lambda}\, \tau^{\phi}, \quad (9)$$

where F is a parameter of productivity which captures the joint effects of factors such as new technology, managerial skill, labor skill and other factors which affect the change in production.

$\lambda \in (0,1)$ denotes the effect of labor on producing new financial innovations. In other words, λ presents how new financial innovations respond to the change of labor in the financial innovation sector. For example, when the value of $\lambda = 0.25$ implies the effect of labor on new financial innovations produced accounted for one quarter. Other factors account for three quarters.

τ^{ϕ} represents positive spillovers which could be explained by the fact that new financial innovations are created based on combining or innovating

characteristics of existing financial products or services.

$\phi \in (0,1)$ represents the effect of existing financial innovations on producing new financial innovations. Similarly to λ, we assume that $\phi \in (0,1)$ indicates the positive effect and diminishing marginal returns from existing financial innovations.

Solving for Financial Innovators

We obtain the workforce for producing financial innovations (see *Appendix B*):

$$L_{\tau}^{D} = \left(\frac{w}{\lambda P_{\tau} F \tau^{\phi}} \right)^{\frac{1}{\lambda - 1}}. \quad (10)$$

Also, we obtained the following results of $\dot{\tau}$:

$$\dot{\tau} = \left(F \tau^{\phi} \right)^{\frac{-1}{\lambda - 1}} \left(\frac{w}{\lambda P_{\dot{\tau}}} \right)^{\frac{\lambda}{\lambda - 1}}. \quad (11)$$

This result indicates that the number of new financial innovations $(\dot{\tau})$ depends positively on the productivity of creating new financial innovations (F), existing financial innovations (τ^{ϕ}), price of new financial innovations $(P_{\dot{\tau}})$ and depends negatively on the wage of labor (w). The effect of main factors including F, τ^{ϕ} and $P_{\dot{\tau}}$ on the number of new financial innovations produced $(\dot{\tau})$ is interpreted as follows.

Given the same input level, when financial innovators increase the productivity (F) in production, they can produce more new financial innovations $(\dot{\tau})$ because higher productivity leads to faster production at the same time. Consequently, financial innovators could increase their revenues and profits as well.

In terms of the positive effect of existing financial innovations (τ^{ϕ}), the intuition is that when we have higher numbers of existing financial innovations (τ^{ϕ}), financial innovators can produce more new financial innovations $(\dot{\tau})$. This is due to the existence of the positive spillovers effect. Financial innovators tend to use characteristics of existing financial innovation and then modify, combine or improve it into new financial innovations. Therefore, a variety of existing financial innovations is a good foundation for facilitating the innovation process in order to create better and more new financial innovations.

The higher financial innovations' price $(P_{\dot{\tau}})$ positively affects the number of financial innovations produced $(\dot{\tau})$. In the case that the price of financial innovations increases, the profit per unit of new financial innovations is also higher. As a result, financial innovators have more incentive to produce more new financial innovations.

Financial Intermediaries

Financial intermediaries play an essential role in the allocation of the capital resources in the economy from savings of households. The objective of financial intermediaries is to determine the interest of savings (γ_S) and the price of financial innovations $(P_{\dot{\tau}})$. The profit function of financial intermediaries can be summarized as follows:

$$\max_{\gamma_S, P_{\dot{\tau}}} \gamma_K K - \gamma_S S_t - P_{\dot{\tau}} \dot{\tau}. \quad (12)$$

Identifying the Role of Financial Innovation in the Financial System

Based on setting the link between saving, investment and capital in the Solow model, we determine the role of financial intermediaries in the economy. investment in the Solow model is always equal to saving. However, in our model, we have relaxed this assumption by introducing the parameter ξ to measure the effectiveness of intermediations in mobilizing savings into investment. Thus, the investment-savings linkage is specified:

$$I = \xi S. \quad (13)$$

We set the number of new financial innovations $(\dot{\tau})$ embodied for the measure of ξ

$$\xi \equiv \dot{\tau}. \quad (14)$$

That means in the link of savings and investment, the efficiency of financial intermediaries is presented by the new class of financial innovations. The introduction of a new type of financial innovation would reduce the cost of financial intermediation, improve the allocation of resources and provide a range of hedging possibilities. This could make

financial intermediaries more efficient [17–20]. For example, the author mentioned the introduction of credit cards in the 1950s. This product not only functions as a convenient payment method but also provides short-term loans. That facilitates users in lowering transaction cost and funding for their consumption. Also, operating new financial institutions such as mutual funds, micro finance and providing securities in the financial markets could reduce risk and offer a variety of investment choices for individual investors. These innovations make financial intermediaries more efficient and ultimately contribute to mobilizing the savings process. Hence, the number of new financial innovations $(\dot{\tau})$ plays an important role in the savings-investment process and is an important metric for ξ in our model.

Concerning the relationship between investment and capital, we used the Solow model to construct the change in capital stock. Denoting ΔK is the change of capital stock and I is the new investment added to capital stock. Now, let's take into account the depreciation of capital. We define depreciation as a value reduction of capital stock caused by obsolescence and wear out and denote δ as the depreciation rate of capital stock. The change in the capital stock over time is measured by investment minus capital depreciation:

$$\Delta K = I - \delta K. \tag{15}$$

At the steady state, the stock of capital will stay constant so $\Delta K = 0$, investment from equation (15) is derived as a function of capital:

$$I = \delta K. \tag{16}$$

From equation (13) and equation (16), the capital stock in our model now becomes:

$$K = \frac{\xi}{\delta} S. \tag{17}$$

We obtain the solution for the capital stock:

$$K = \frac{\beta}{1+\beta}\left(\frac{1}{\lambda}\right)^{\frac{\lambda}{\lambda-1}} \frac{\left(F\tau^{\phi}\right)^{\frac{1}{1-\lambda}} w^{\frac{2\lambda-1}{\lambda-1}}}{\delta} P_{\dot{\tau}}^{\frac{\lambda}{1-\lambda}}. \tag{18}$$

This result demonstrated that capital in the economy (K) depends positively on productivity in producing financial innovations (F), positive spillovers of existing financial innovations (τ^{ϕ}), the price of financial innovations $(P_{\dot{\tau}})$, and wage of labor (w).

Taking into account both productivity (F) and positive spillovers of existing financial innovations (τ^{ϕ}), these factors increase would lead to a raising of capital in the economy. As mentioned in the environment of financial innovator, F and τ^{ϕ} function as the important element in producing new financial innovations. With higher levels of productivity and existing financial innovations, there are more new financial innovations being created. Hence, its effect on capital could be interpreted through the engaging of financial innovations in the mobilized saving process and variety investment portfolio that would increase the level of capital stock in this economy. In particular, more new financial innovations are being introduced, and financial transactions being conducted more conveniently at lower cost. That mobilizes more savings into the financial intermediaries and increases the liquidity of capital. In addition, new financial innovations in financial institutions and financial markets provide more investment opportunities which can create more capital from savings. Overall, new financial innovations enhance the efficiency of financial intermediaries and consequently increase capital.

Also, higher price of financial innovation $(P_{\dot{\tau}})$ results in higher capital is explained by the profit-maximizing objective of financial intermediaries. The price of financial innovations increases the cost of purchasing financial innovations. That lowers the profit of financial intermediaries. In order to offset the highest costs, financial intermediaries must increase their revenue by allocating more capital which is the main source to generate their income. As a result, capital in the economy will reach a higher level.

Solving for Financial Intermediaries

The solution to the problem of the price of financial innovations is as follows (see *Appendix C*):

$$P_{\dot{\tau}} = \left[\frac{\beta}{1+\beta}\frac{\lambda}{\delta}\right]\gamma_K w.$$

By conducting the comparative statics, this result supports that the rental rate of capital (γ_K) and wage (w) exert positive effects on the price of new financial innovations while the depreciation rate of capital stock (δ) negatively affects on the price of new financial innovations $(P_{\dot{\tau}})$.

As mentioned in the *Appendix A*, S_t does not depend on γ_S so financial intermediaries will set γ_S as low as possible. In order to maximize their profits, financial intermediaries should minimize the costs paid for households' savings interest. Hence, γ_S is determined equal to 0 in this model.

Firms

The objective of firms is to maximize their profits in the final goods industry. Y is the output of firms that also is firms' revenue. This model applies the traditional Solow growth model with a Cobb-Douglas form of output. Capital provided by financial intermediaries (K) and workforce in the final good sector (L_Y^D) are two input factors so the output function can be written as:

$$Y = AK^{\alpha}\left(L_Y^D\right)^{1-\alpha}.$$

This model assumes that firms have two expenditures including labor cost $(w_Y L_Y^D)$ and cost for using external capital with γ_K is the interest rate of borrowed capital (K). The objective of firm is to determine how much is the optimal wage (w_Y) and the interest rate for loans borrowed from financial intermediations (γ_K) in order to maximize their profit as follows:

$$\max_{w_Y,\gamma_K} Y - w_Y L_Y^D - \gamma_K K.$$

By taking the first derivative with respect to w and γ_K, we can show that there are solutions for firms in identifying the optimal wage (w) and the interest rate on loans (γ_K) to maximize their profit (see *Appendix D*).

RESULTS AND DISCUSSION

1. There is a positive spillover effect from existing financial innovations to new financial innovations.

Our result demonstrate that with a higher level of existing financial innovation (τ^{ϕ}), financial innovators are more likely to create new financial products and services $(\dot{\tau})$. This is due to the fact that production of new financial innovations is also based on existing financial innovations to create the new one through combining, modifying, and innovating them.

2. New financial innovations have a positive effect on the efficiency of financial intermediaries

An increase in new financial innovations produced $(\dot{\tau})$ could enhance the efficiency of financial intermediaries (ξ). This is because using new financial innovations can reduce transaction costs and mitigate risk. That makes financial transactions more convenient and financial intermediaries work more efficiently.

3. The efficiency of financial intermediaries has a positive effect on saving and investment

Through the effect of financial innovation, financial intermediaries work more efficiently and result in higher saving and investment (see *Equation 13*). This is due to the financial intermediaries is facilitated infrastructure and instruments that enhance the liquidity of capital flows in the economy and increase the mobilizing savings into the investment process. Additionally, operating more efficiently of financial intermediaries can satisfy the needs of individual savers and investors.

4. New financial innovations have a positive effect on capital and economic growth.

An increase in financial innovations $(\dot{\tau})$ results in higher capital stock (K), greater output (Y) and economic growth. The transmission channel on how financial innovations affect economic growth is interpreted as follows. The advent of new financial products and processes in the banking system could enhance the convenience of financial transactions and lower cost of transactions. This results in more liquidity of capital and more mobilized savings. Hence, financial innovation enriches the source of capital, the capital stock thus increases. In the context of firms, they could conveniently capture a variety of capital sources from the financial system. Thus, the interactions of financial innovation, financial intermediaries and firms address the increasing of capital in the economy. In this way, a variety of capital sources facilitate expanding firms' business activities, producing more finished goods and accelerating economic growth.

CONCLUSION

The model demonstrates a positive spillover effect of existing financial innovations on

development of new financial products. This presents the continuation of producing new financial innovations. Additionally, the positive effect of new financial innovation on the efficiency of financial intermediaries presented by a higher number of new financial innovations results in the operation of financial intermediaries more efficiently. Moreover, with higher efficiency, financial intermediaries play a positive role in saving and investment. Finally, we pointed out the positive effect of new financial innovations on economic growth. These activities efficiently mobilize savings and enhance capital resources for businesses, accelerating economic growth.

Our findings provide an overall understanding of the transmission channel on how financial innovation is linked to economic growth. Based on this, the policymakers should take into account the benefits of financial innovation when formulating policies. Also, our evidence provides a theoretical foundation for developing further empirical research in specific cases.

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ABOUT THE AUTHORS

Thi Thuy Huong Luong — candidate for PhD, Department of Economics, Faculty of Economics, Kasetsart University, Bangkok, Thailand
https://orcid.org/0009-0007-1525-1004
Corresponding author:
thuyhuongueh@gmail.com

Thanarak Laosuthi — PhD, Assist. Prof., Department of Economics, Faculty of Economics, Kasetsart University, Bangkok, Thailand
https://orcid.org/0009-0005-8254-5809
fecotrl@ku.ac.th

Attasuda Lerskullawat — PhD, Assoc. Prof., Department of Economics, Faculty of Economics, Kasetsart University, Bangkok, Thailand
https://orcid.org/0009-0001-1653-3800
fecoadl@ku.ac.th

Author's declared contribution:
T.T.H. Luong — conceptualization, writing-original draft and editing.
T. Laosuthi — conceptualization, supervision, and validation.
A. Lerskullawat — conceptualization.

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APPENDIXS

APPENDIX A

Derivation of the Consumption for Households

From equation (2), deriving for $c_t = w_Y L_Y^S + w_\tau L_\tau^S - S_t$.

From equation (4), substituting $L_Y^S = 1 - L_\tau^S$ into equation of c_t:

$$c_t = w_Y \left(1 - L_\tau^S\right) + w_\tau L_\tau^S - S_t.$$

By substituting c_t and c_{t+1} into equation (1), we obtain households' utility maximization problem:

$$\max_{L_\tau^S, S_t} \ln\left[w_Y \left(1 - L_\tau^S\right) + w_\tau L_\tau^S - S_t\right] + \beta \ln\left[S_t \left(1 + \gamma_S\right)\right].$$

By taking the first derivative with respect to L_τ^S and S_t, we obtain $w_\tau = w_Y = w$.

Deriving the result of S_t, c_t, c_{t+1} as follows:

$$S_t = \frac{\beta}{1+\beta} w.$$

From the second component of households' utility maximization problem, we deduce that $\beta \ln\left[S_t \left(1+\gamma_S\right)\right] = \beta \ln S_t + \beta \ln\left(1+\gamma_S\right)$. Hence, when taking the first derivative of the maximization function with respect to S_t, γ_S was gone. Besides, the result of S_t indicated that S_t only depends on, so households tend to send their savings into financial intermediaries and do not care about the interest rate in the economy.

Deriving the result of c_t, c_{t+1} as follows:

$$c_t = \left(\frac{1}{1+\beta}\right) w,$$

$$c_{t+1} = (1+\gamma_S) \frac{\beta}{1+\beta} w.$$

APPENDIX B

Derivation of Financial Innovation and the Labor Demand for Financial Innovators

From equation (9), we substitute $\dot{\tau}$ into equation (8) and obtain:

$$\max_{L_\tau^D} P_\tau F L_\tau^{D\lambda} \tau^\phi - w_\tau L_\tau^D.$$

The first order conditions with respect to L_τ^D indicates the labor demand function:

$$L_\tau^D = \left(\frac{w_\tau}{\lambda P_\tau F \tau^\phi}\right)^{\frac{1}{\lambda - 1}}.$$

Given $w_\tau = w$, we also rewrite L_τ^D as:

$$L_\tau^D = \left(\frac{w}{\lambda P_{\dot{\tau}} F \tau^{\phi}} \right)^{\frac{1}{\lambda - 1}},$$

by substituting L_τ^D into equation (9), we obtain the function for $\dot{\tau}$:

$$\dot{\tau} = \left(F \tau^{\phi} \right)^{\frac{-1}{\lambda - 1}} \left(\frac{w}{\lambda P_{\dot{\tau}}} \right)^{\frac{\lambda}{\lambda - 1}}.$$

APPENDIX C

Derivation of Interest Rate of Savings and Price of Financial Innovators

By substituting K from equation (18); $S_t = \frac{\beta}{1+\beta} w$ and $\dot{\tau} = \left(F \tau^{\phi} \right)^{\frac{-1}{\lambda - 1}} \left(\frac{w}{\lambda P_{\dot{\tau}}} \right)^{\frac{\lambda}{\lambda - 1}}$ into equation (12) and rearranging

parameters, the profit maximization problem of financial intermediations becomes:

$$\max_{\gamma_S, P_{\dot{\tau}}} \gamma_K \frac{\beta}{1+\beta} \left(\frac{1}{\lambda} \right)^{\frac{\lambda}{\lambda - 1}} \frac{\left(F \tau^{\phi} \right)^{\frac{1}{1-\lambda}} w^{\frac{2\lambda - 1}{\lambda - 1}}}{\delta} P_{\dot{\tau}}^{\frac{\lambda}{1-\lambda}} - \gamma_S \frac{\beta}{1+\beta} w - \left(F \tau^{\phi} \right)^{\frac{1}{1-\lambda}} \left(\frac{w}{\lambda} \right)^{\frac{\lambda}{\lambda - 1}} P_{\dot{\tau}}^{\frac{1}{1-\lambda}}.$$

The first derivative with respect to $P_{\dot{\tau}}$ indicates $P_{\dot{\tau}} = \frac{\lambda}{\delta} \frac{\beta}{1+\beta} \gamma_K w$.

APPENDIX D

Derivation of Wage of Labor and Interest Rate of Capital for Firms

As mentioned in the *Appendix A*, the wage in the economy is equal in every sector:

$$w_\tau = w_Y = w.$$

By substituting the function of Y into the profit-maximizing problem and replacing $w_Y = w$ the profit maximization becomes:

$$\max_{w, \gamma_K} A K^{\alpha} L_Y^{D1-\alpha} - w L_Y^D - \gamma_K K. \tag{D1}$$

Given $K = \frac{\beta}{1+\beta} \left(\frac{1}{\lambda} \right)^{\frac{\lambda}{\lambda - 1}} \frac{\left(F \tau^{\phi} \right)^{\frac{1}{1-\lambda}} w^{\frac{2\lambda - 1}{\lambda - 1}}}{\delta} P_{\dot{\tau}}^{\frac{\lambda}{1-\lambda}}$. Then, substitute $P_{\dot{\tau}} = \left[\frac{\beta}{1+\beta} \frac{\lambda}{\delta} \right] \gamma_K w$ into the function of K, obtaining:

$$K = \left(\frac{1+\beta}{\beta} \frac{\delta}{F \tau^{\phi}} \right)^{\frac{1}{\lambda - 1}} \lambda^{\frac{2\lambda}{\lambda - 1}} w \gamma_K^{\frac{\lambda}{1-\lambda}}.$$

We also have $L_Y^D = 1 - \left(\frac{1+\beta}{\beta}\frac{\delta}{F\tau^{\phi}}\right)^{\frac{1}{\lambda-1}} \lambda^{\frac{2}{1-\lambda}} \gamma_K^{\frac{1}{1-\lambda}}$.

We set $Z = \left(\frac{1+\beta}{\beta}\frac{\delta}{F\tau^{\phi}}\right)^{\frac{1}{\lambda-1}}$; the function of K and L_Y^D becomes:

$$K = Z\lambda^{\frac{2\lambda}{\lambda-1}} w\gamma_K^{\frac{\lambda}{1-\lambda}}, \tag{D2}$$

$$L_Y^D = 1 - Z\lambda^{\frac{2}{1-\lambda}} \gamma_K^{\frac{1}{1-\lambda}}. \tag{D3}$$

By substituting equation (D2) and (D3) into (D1), the objective function now becomes:

$$\max_{w,\gamma_K} A\left[Z\lambda^{\frac{2\lambda}{\lambda-1}} w\gamma_K^{\frac{\lambda}{1-\lambda}}\right]^{\alpha}\left[1 - Z\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{1}{1-\lambda}}\right]^{1-\alpha} - w\left[1 - Z\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{1}{1-\lambda}}\right] - \gamma_K Z\lambda^{\frac{2\lambda}{\lambda-1}} w\gamma_K^{\frac{\lambda}{1-\lambda}}.$$

The objective function is rewritten as follow:

$$\max_{w,\gamma_K} A\left[Z\lambda^{\frac{2\lambda}{\lambda-1}} w\gamma_K^{\frac{\lambda}{1-\lambda}}\right]^{\alpha}\left[1 - Z\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{1}{1-\lambda}}\right]^{1-\alpha} - w + wZ\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{1}{1-\lambda}} - Z\lambda^{\frac{2\lambda}{\lambda-1}} w\gamma_K^{\frac{1}{1-\lambda}}.$$

The first derivative with respect to w indicates:

$$w = (A\alpha)^{\frac{1}{1-\alpha}}\left[1 - Z\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{1}{1-\lambda}}\right]\left[Z\lambda^{\frac{2\lambda}{\lambda-1}}\gamma_K^{\frac{\lambda}{1-\lambda}}\right]^{\frac{\alpha}{1-\alpha}}\left[1 + Z\gamma_K^{\frac{1}{1-\lambda}}\left(\lambda^{\frac{2\lambda}{\lambda-1}} - \lambda^{\frac{2}{1-\lambda}}\right)\right]^{\frac{1}{\alpha-1}}. \tag{D4}$$

The first derivative with respect for γ_K indicates:

$$w = \left[\frac{1 - Z\lambda^{\frac{2}{1-\lambda}}}{Z\lambda^{\frac{2\lambda}{\lambda-1}}}\right]^{\frac{\alpha}{\alpha-1}} \gamma_K^{\frac{\alpha}{(1-\lambda)(\alpha-1)}}\left[\frac{Z\lambda^{\frac{2\lambda}{\lambda-1}} - Z\lambda^{\frac{2}{1-\lambda}}}{\left(A\alpha\lambda\gamma_K^{-1}\right) - \left(A\alpha Z\lambda^{\frac{3-\lambda}{1-\lambda}}\gamma_K^{\frac{\lambda}{1-\lambda}}\right) + \left(A(1-\alpha)Z\lambda^{\frac{2}{1-\lambda}}\gamma_K^{\frac{\lambda(1+\alpha)}{1-\lambda}}\right)}\right]^{\frac{1}{\alpha-1}}. \tag{D5}$$

To simplify the analysis, this model assumes $\alpha = 0.5$ and $\lambda = 0.5$. The function of w and γ_K as equation (D4) and (D5) now become:

$$w_1 = \frac{2A^2 Z\gamma_{K1} - 0.125Z\gamma_{K1}^3}{\left[\frac{63}{16}Z\gamma_{K1}^2 + 1\right]^2},$$

$$w_2 = \frac{256}{3969}\frac{\left(0.5^5 AZ\gamma_{K2}^{5/2} - 0.5^6 AZ\gamma_{K2}^2 + 0.25A\right)^2}{\gamma_{K2}^4\left(Z - 0.5^4 Z^2\right)}.$$

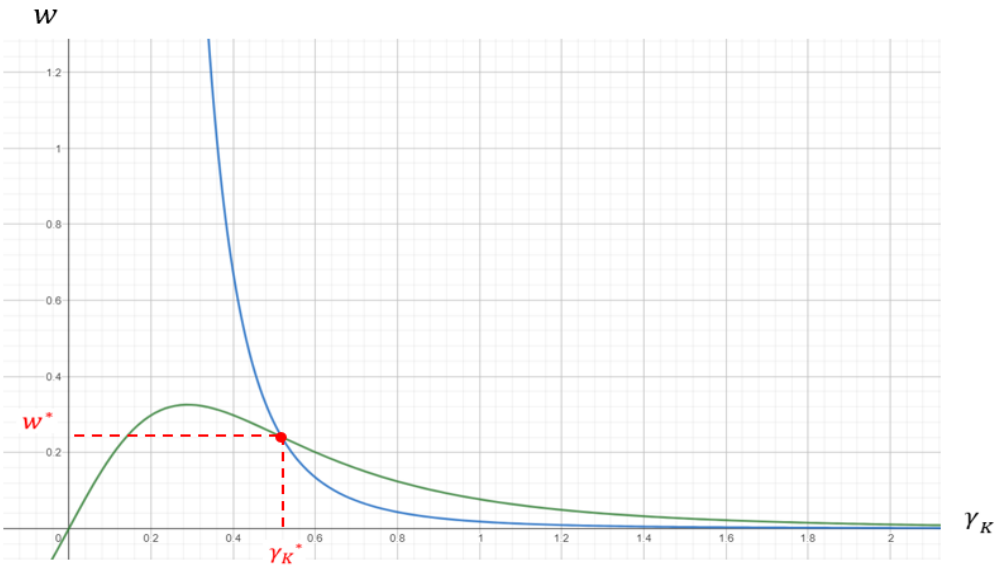

Fig. 2. **The Equilibrium of Wage of Labor and Interest Rate of Borrowed Capital**

Source: Compiled by the authors.

Figure 2 illustrates the wage of labor and interest rate of borrowed capital at the equilibrium through determining the curve of w_1 (green line) and w_2 (blue line). At the intersection of w_1 and w_2, the value of w^* and $\gamma_K{}^*$ would be settled. By doing that, this model can find the solution of wage (w) and the interest rate for loans (γ_K). Also, determining w^* and $\gamma_K{}^*$ confirms the existence and validity of the economy we constructed.

Translated by N.I. Sokolova

ORIGINAL PAPER

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Liquidity Maneuver in the Russian Financial System in the Context of Inflation Issues and Stock Market Development

O.M. Eskindarov[a], T.V. Maniakhin[b]
[a] Holding company "Sindika", Moscow, Russian Federation;
[b] Financial University under the Government of the Russian Federation, Moscow, Russian Federation

ABSTRACT

The **object** of the study is the financial system of Russia. The subject of the study is the reasons for the increase in household deposits in banks and the impact of these funds on the economy during the period of reducing the key rate. The **relevance** of the work is due to the potential impact of these funds on inflation. The **purpose** of the study is to assess the volume of funds on bank deposits that can exert inflationary pressure, and to develop proposals for its minimization. Econometric modeling and general scientific **methods**, including analysis and synthesis, were used. Based on the results of the study, it was recommended that authorized government agencies carry out a liquidity maneuver in order to reduce inflationary pressure from deposits. This should also contribute to the growth of stock market capitalization. **Scientific novelty** lies in a comprehensive study of the problem of household savings and the proposal of a liquidity maneuver to solve a number of macroeconomic problems. Conclusions are made that deposits can affect inflation depending on the macroeconomic scenario. To minimize this impact, the authors proposed to conduct a liquidity maneuver, the effectiveness of which will depend on the implementation of a set of measures, including: expanding the investment insurance system to include property recorded in all household investment accounts; increasing the profitability and diversity of collective investment schemes through legal incentives for management companies by the regulator within the framework of consolidated supervision; improving the culture of dividend payments within the framework of the exercise of shareholder rights; promoting the creation of independent "long-only" funds that invest for the long term; creating a state-controlled fund to support the IPO market and secondary circulation of recently listed shares; fine-tuning tax incentives for companies entering IPO and SPO, and for households investing in industries critical to the economy; exemption from dividend taxation; creating guarantees for households participating in IPOs; popularizing the culture of investment in the media. The results of the study may be useful to government agencies when making decisions on further macroeconomic policy.

Keywords: stock market; inflation; deposits; investments; key rate; shares; liquidity maneuver

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INTRODUCTION

The rise in inflation in Russia, caused by changes in the conditions of the economy's functioning, necessitated countermeasures from the state, with the main instrument being an increase in the key interest rate — from 9.5% in February 2022 to 21% in October 2024.[1] This led to an increase in the attractiveness of bank deposits, as well as money market funds and bonds. As a result, over three and a half years (2022 — first half of 2025), the volume of household deposits doubled, reaching 61 trillion rubles,[2] which accounted for 50% of the money supply (M2). For comparison: over a similar period before 2022, when the rate was in the range of 4.25–8.5%, the volume of deposits grew by only 34%. As the key interest rate decreases, risk-free instruments will become less attractive. At the same time, considering that according to the Bank of Russia's assessment,[3] high consumer activity has become one of the main drivers of inflation, the transformation of part of savings into consumer spending could again influence inflation both through demand and

[1] Bank of Russia. The Bank of Russia's key rate. URL: https://cbr.ru/hd_base/KeyRate/ (accessed on 05.07.2025).

[2] Bank of Russia. Money supply (national definition). URL: https://cbr.ru/statistics/ms/ (accessed on 05.07.2025).

[3] Bank of Russia. Statement by the Governor of the Bank of Russia following the meeting of the Bank of Russia Board of Directors on October 25, 2024. URL: https://www.cbr.ru/press/event/?id=21111 (accessed on 05.07.2025).

the "marker good" effect, where rising prices for in-demand assets form high inflationary expectations [1]. The possibility of pro-inflationary factors intensifying cannot be ruled out, which, in stress scenarios, could activate consumer sentiment aimed at protecting savings, as was the case, for example, in Turkey in 2021–2023 [2].

As a result, an unusual situation is observed — a vicious cycle could form when monetary policy is reversed: the Bank of Russia responded to accelerating inflation by tightening monetary conditions, the easing of which could once again trigger inflation.

The scientific hypothesis became the assumption about significant volumes of the deposit "overhang" capable of exerting inflationary pressure, as well as about the possibility of its neutralization by market mechanisms. The aim of the study was to test the hypothesis and, if confirmed, to develop proposals for minimizing the potential for inflationary pressure.

MATERIALS AND METHODS

The research was based on data from the Bank of Russia, Rosstat, the State Corporation "Deposit Insurance Agency" (DIA), PJSC "Moscow Exchange", JSC "DOM.RF", the National Association of Securities Market Participants (NAUFOR), foreign regulators, the World Bank, and the Organization for Economic Co-operation and Development.

Relevant legal acts, data from specialised resources (Expert RA, Finmarket, Autonews, Frank RG), and federal media (TASS, Kommersant, RBC, Izvestia) were studied. Research results have been taken into account. The scientific apparatus included analysis and synthesis methods, a regression model was applied, and expert assessments were conducted.

RESULTS AND DISCUSSION

The achievement of the research goal is ensured by the consistent solution of a number of tasks, which are described further in the text.

Assessment of the Inflow of Funds Into Bank Deposits Due to the Increase in Interest Rates

As can be seen in *Fig. 1*, the sharp increase in deposit volumes coincided with the Bank of Russia's decision to hike the key interest rate to 20% at the end of February 2022.

At the same time, a noticeable inflow of funds into deposits occurred not only against the backdrop of a high interest rate, but also at low levels — for example, at the end of 2022 and in 2023. It was the same in 2015–2021.

Analysis of data on the dynamics of total real disposable income of the population[4] showed that income grew significantly in 2023, most of which the rate was low (7.5–8.5%), and also in 2024 — by 5.4% and 7.3% respectively, which suggests that this factor also influenced savings.

Additionally, until 2022, foreign assets, including stocks, crypto assets, and real estate, were in demand among Russians: in the fourth quarter of 2021, foreign stocks accounted for 10% of retail investors' net purchases, and foreign stocks worth 1 trillion rubles were held in their accounts.[5] The volume of investments in crypto assets was estimated at 5 trillion rubles.[6] In 2021, according to some estimates,[7] Russians were among the top 5 buyers of the most expensive real estate in the UK, France, Spain, Italy, and Monaco.

Statistics confirm a decrease in foreign investment: non-residents' investments in foreign stocks and other forms of equity participation decreased by 40% between the beginning of 2022 and the first quarter of 2025.[8]

To estimate the contribution of each factor to the increase in deposits from the first quarter of

[4] Rosstat. Information and analytical materials. URL: https://rosstat.gov.ru (accessed on 08.07.2025).

[5] Bank of Russia. Review of Key Performance Indicators for Professional Securities Market Participants in 2021. URL: https://cbr.ru/Collection/Collection/File/40858/review_secur_21.pdf (accessed on 08.07.2025).

[6] TASS. Aksakov reported that Russians have invested 5 trillion rubles in the cryptocurrency market. URL: https://tass.ru/ekonomika/13245805 (accessed on 08.07.2025).

[7] RBC Real Estate. Where should Russian investors invest their money abroad? URL: https://rbcrealty.ru/news/62b0953a9a79475a5a6bb17c (accessed on 08.07.2025).

[8] Bank of Russia. Household savings. URL: https://cbr.ru/statistics/macro_itm/households/hh (accessed on 09.07.2025).

2022 to the second quarter of 2025, a regression model of the following type was applied:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon, \quad (1)$$

where Y — growth in household deposits in rubles as part of the M2 monetary aggregate (31.7 trillion rubles); β_0 — free member; β_1, β_2, β_3 — coefficients; X_1: the weighted average key rate in the quarter (by the number of days in effect); X_2 — change in real disposable income of the population compared to the same quarter of the previous year; X_3 — change in household investments in non-resident stocks and debt securities and in other forms of non-resident equity relative to the previous quarter; ε — regression residual.

Model Statistics: $R^2 = 0.96$; adjusted $R^2 = 0.95$; F- statistic = 14.38; P-value < 0.0001.

The regression results and the calculation of the contribution of the independent variables to the dependent variable are presented in *Tables 1* and *2*.

The dominant factor was the increase in the key interest rate — 21.5 out of 31.7 trillion rubles (68%), followed by the growth in total real disposable money income (7.7 trillion rubles, or 24%). The reduction in investments in foreign securities and other forms of non-resident capital participation contributed about 2 trillion rubles (6%) to the overall increase in funds.

The unexplained remainder — about 1 trillion rubles — could be data not reflected in statistics. The inflow of funds was also affected by overall market uncertainty, the decline in the attractiveness of reserve currencies as a means of saving, high prices for "safe-haven assets", and other factors.

These figures are approximate, but they align with data from the Bank of Russia, according to which the increase in funds on deposits during the period preceding and equal in length to the analysed period was only 34.2% against 109.3% in the analysed period, against the backdrop of a low-key interest rate (4.25–8.5%).

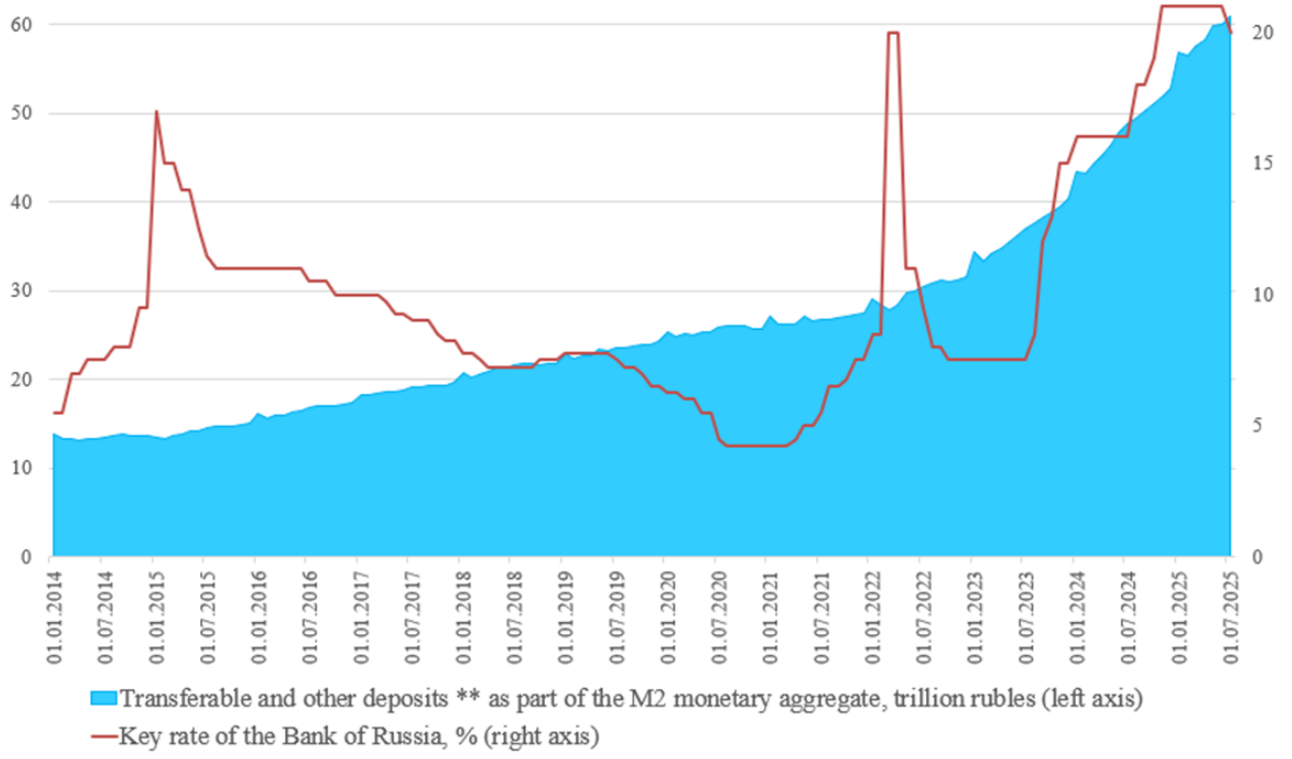

Fig. 1. **The Key Rate of the Bank of Russia and the Volume of Funds on Household Bank Deposits As Part of the M2 Monetary Aggregate in 2014–2025***

Source: Compiled by the authors.

Note: * monthly data as of the 1st; ** in the terminology of the Bank of Russia.

Table 1

Regression Results

Variable	Regression coefficient (β_i)	Standard error	P-value
X_1	0.110	0.008	<0.0001
X_2	0.130	0.015	<0.0001
X_3	–0.045	0.006	<0.0001

Source: Compiled by the authors.

Table 2

Calculation of the Contribution of Independent Variables to the Change in the Dependent Variable

Variable	ΣX_i (sum of values)	Regression coefficient (β_i)	Contribution of variable X_i to Y	
			in trillion rubles	in %
X_1	195.75	0.110	21.5	68
X_2	58.90	0.130	7.7	24
X_3	–40.3	–0.045	1.8	6
Total for X_{1-3}	–	–	31.0	98
Total	–	–	31.7	100

Source: Compiled by the authors.

LIQUIDITY RELEASE FROM BANK DEPOSITS IN A RATE-CUTTING CYCLE

As the study showed, representatives of scientific schools and practicing economists agree that lowering interest rates holds the potential for consumption growth, at least through the impact of the monetary policy (hereinafter — MP) interest rate channel on lending and a decrease in the propensity to save, which is noted, for example, in [3, 4].

At the same time, many, including John Maynard Keynes [5], point out the non-linearity of the relationship. The influence varies depending on the monetary context (high or low-interest rate environment) [6], and it is important to consider factors that either restrain or strengthen the correlation, including household income [4], inflation and inflation expectations [7, 8], the state of the economy [9, 10], and government support measures.

Economic classics in all their diversity are also applicable to Russia. According to the Bank of Russia,[9] the interest rate channel of monetary policy effectively transmits changes in rates to consumption: in 2020–2023, about 70% of funds deposited into escrow accounts were for mortgage lending, and 40% of passenger car sales were for auto loans. Pro-inflationary factors also play a significant role: limited supply in the economy, business competition for resources, budget deficit, growth in total household income, weakening of the national currency, etc. — all of this the regulator is forced to take into account when making a decision on the rate.[10]

According to the authors' estimates, consumer demand will be able to grow significantly after market lending rates reach levels of 14–15%, which corresponds to a key rate of 10–

[9] Bank of Russia. Main Directions of the Single State Monetary Policy for 2025 and the Period of 2026 and 2027. URL: https://cbr.ru/Content/Document/File/164702/on_2025(2026–2027).pdf (accessed on 12.07.2025).

[10] Bank of Russia. Statement by Bank of Russia Governor Elvira Nabiullina following the Bank of Russia Board of Directors meeting on 25 July 2025. URL: https://cbr.ru/press/event/?id=26808 (accessed on 13.07.2025).

12%. However, as market rates approach 10% and below (key rate: 7.5–8.5% and below), a noticeable shift in the population's propensity to save towards increased consumption and investment is quite possible.

The importance of the key rate threshold of 10–12% is confirmed by retrospective data for 2023–2025 (*Fig. 2*), according to which a sharp decline in auto lending and mortgages in September-October 2023 followed the key rate moving above the 10–12% range. Industry representatives attributed the temporary revival in auto lending to expectations of further interest rate hikes and to a rise in the recycling fee.[11]

If the key interest rate falls below 10%, the likelihood of funds being withdrawn from deposits will increase even further, which is confirmed by retrospective data on the decline in the savings rate and the rise in consumption in response to lower interest rates (*Fig. 3*).

However, if pro-inflationary factors intensify, increased consumer pressure on inflation can occur even at higher rates, which is confirmed by research, including [11, 12]. Pressure on inflation can also be exerted by an increase in the total income of the population: for example, in the work [13], it is noted that over time, a positive response in inflation is observed even with an increase in nominal wages.

The authors' position also aligns with the opinion of businesses (banks, real estate agents, the automotive industry, etc.), who point to a revival of demand when the key rate reaches 15%,[12] a noticeable rise in consumer sentiment at a key rate of 10–12%[13] and a sharp increase in activity at a rate of 7–8%.[14]

Of course, the amount accumulated over three and a half years against the backdrop of high interest rates (around 21.5 trillion rubles), taking into account the propensity to save and other factors, will not be fully used for consumption, especially in the short term. However, even 30–50%, which is up to 10% of the money supply (M2), will be enough to put pressure on inflation, not considering stress scenarios.

To minimize the impact of consumption on inflation, it seems advisable to implement measures in advance, before the key rate reaches a level of 10–12%, that would redirect a portion of the deposit "excess" towards purposes unrelated to final consumption. This would constitute a *liquidity manoeuvre* — a state-managed, natural, and stimulated flow of liquidity within the financial system without affecting inflation. According to the authors, the most harmonious absorption of funds can be achieved by utilizing the potential of the stock market.

THE POTENTIAL OF THE RUSSIAN STOCK MARKET TO ABSORB THE DEPOSIT "OVERHANG"

The choice of the stock market for a liquidity manoeuvre is due to its natural correlation with rates in the fixed income segment, which is noted in many studies, such as [14–17]. Russia is no exception (*Fig. 5*).

Following 2015 and up to 2021, against the backdrop of a key rate decrease, there was a slowdown in the growth of funds on deposits, accompanied by an increase in the capitalization of the stock market, with the exception of 2017, when the market declined under the influence of a number of factors (sanctions, uncertainty regarding dividends, falling oil prices, outflow of non-resident funds, etc.), and 2020 (pandemic).

In stressful scenarios, this correlation can strengthen, for example, with a sharp decrease in the real interest rate, as happened in Turkey in 2021–2023, where the BIST 100 index rose by 500% in just two years due to the population's desire to protect their savings from inflation, which far exceeded the risk-free rate [18].

Choosing the stock market for a liquidity manoeuvre is important, especially in the context

[11] Izvestia. Ruble booster: car loans increased by 70% over the year. URL: https://iz.ru/1808884/evgenii-grachev/usilitel-rublya-vydachi-avtokreditov-vyrosli-na-70-za-god (accessed on 18.07.2025).

[12] News. The Russian Union of Industrialists and Entrepreneurs (RSPP) has named the optimal key interest rate level for business. URL: https://iz.ru/1907166/2025-06-19/v-rspp-nazvali-optimalnyi-uroven-kliuchevoi-stavki-dlia-biznesa (accessed on 15.07.2025).

[13] RA Expert. Mortgage rates could drop to 15% no earlier than 2026. URL: https://raexpert.ru/researches/publications/rbc_mar25_2025 (accessed on 16.07.2025).

[14] Autonews. When will Russians start buying cars again? URL: https://www.autonews.ru/news/6883562b9a7947e0dc827d9a (accessed on 17.07.2025).

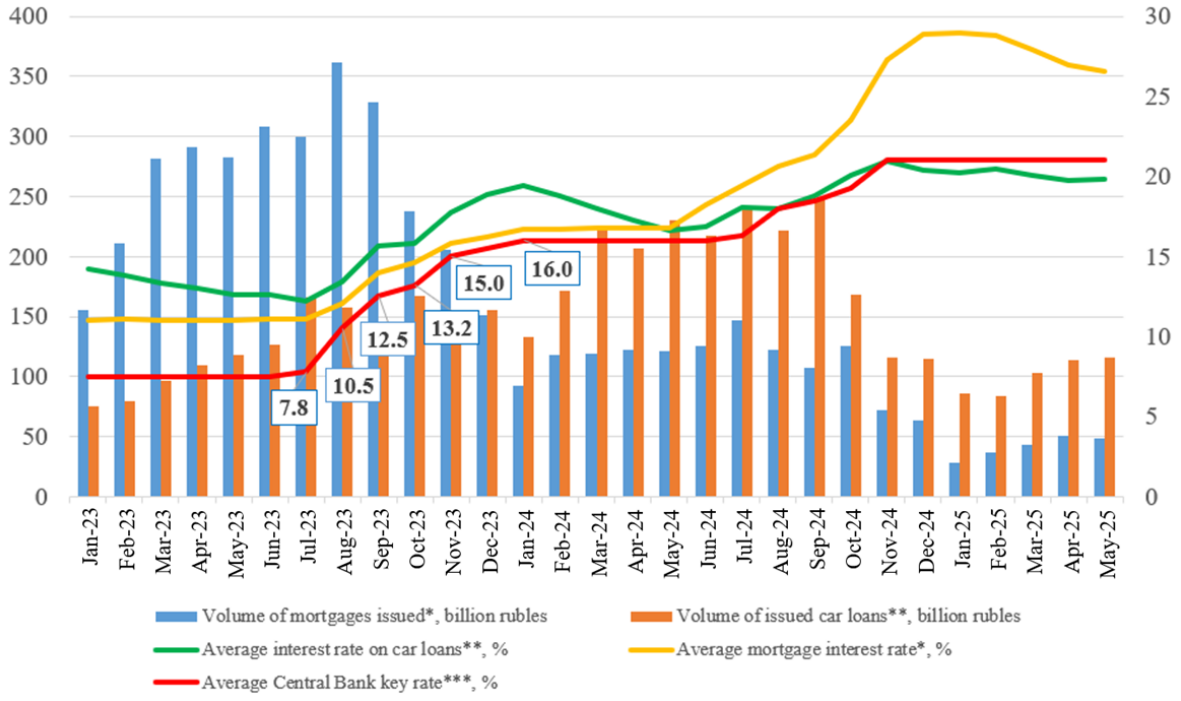

Fig. 2. **The Key Rate of the Bank of Russia, the Volume of Issued Mortgages and Car Loans and Interest Rates on them in January 2023 — May 2025**

Source: Compiled by the authors.
Note: * based on data from TOP-20 mortgage banks for market mortgage programs; ** average rate for new and used cars; *** weighted average rate by the number of days of validity.

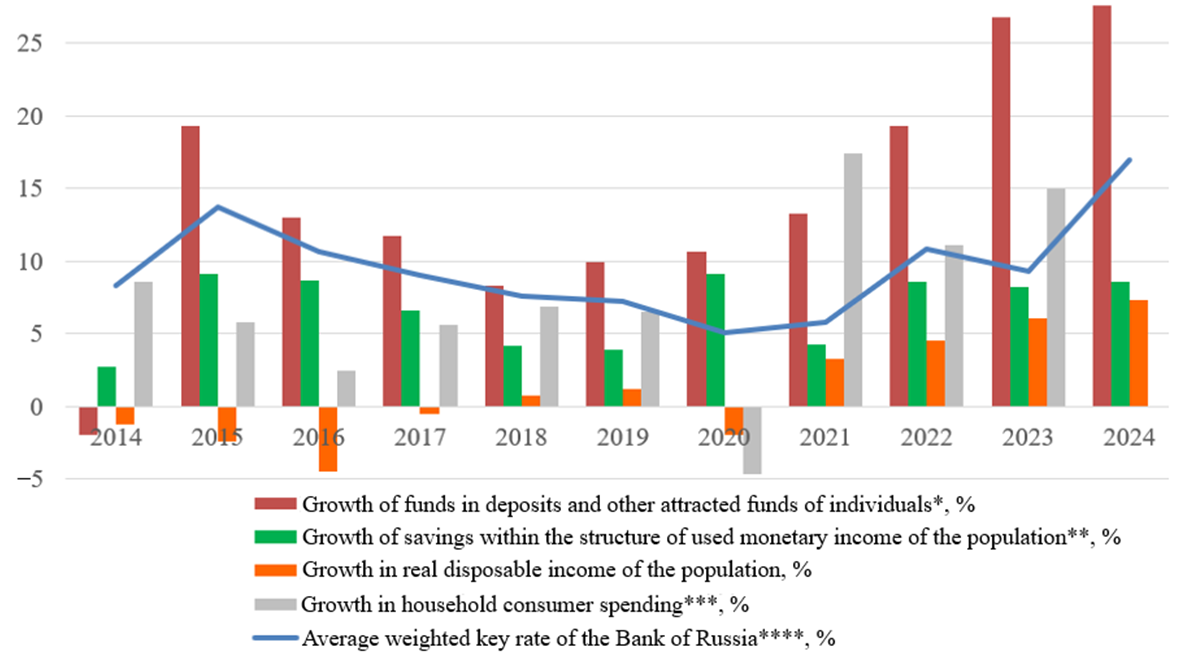

Fig. 3. **Selected Indicators Characterizing the Propensity of the Russian Population to Save in 2014–2024, %**

Source: Compiled by the authors.
Note: * including escrow accounts; ** reflects both changes in funds on deposits and other components of savings; *** data for 2024 were not available at the time of preparing the chart; **** by the number of days of validity.

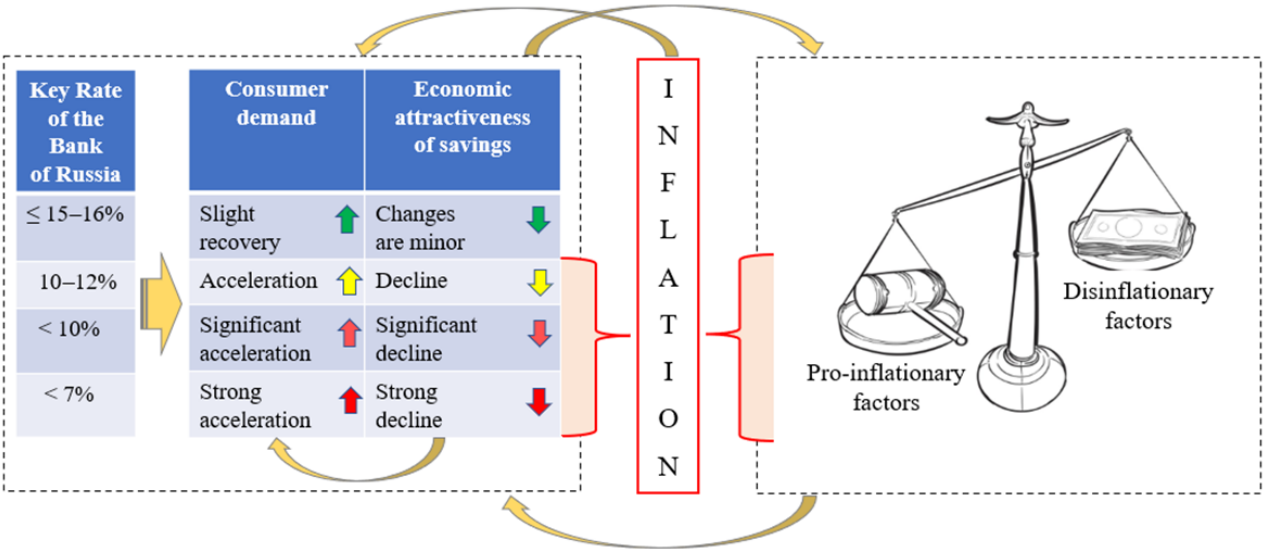

Fig. 4. **The Impact of the Lowering of the Key Rate of the Bank of Russia on Inflation in the Current Conditions of the Functioning of the Russian Economy**

Source: Compiled by the authors.

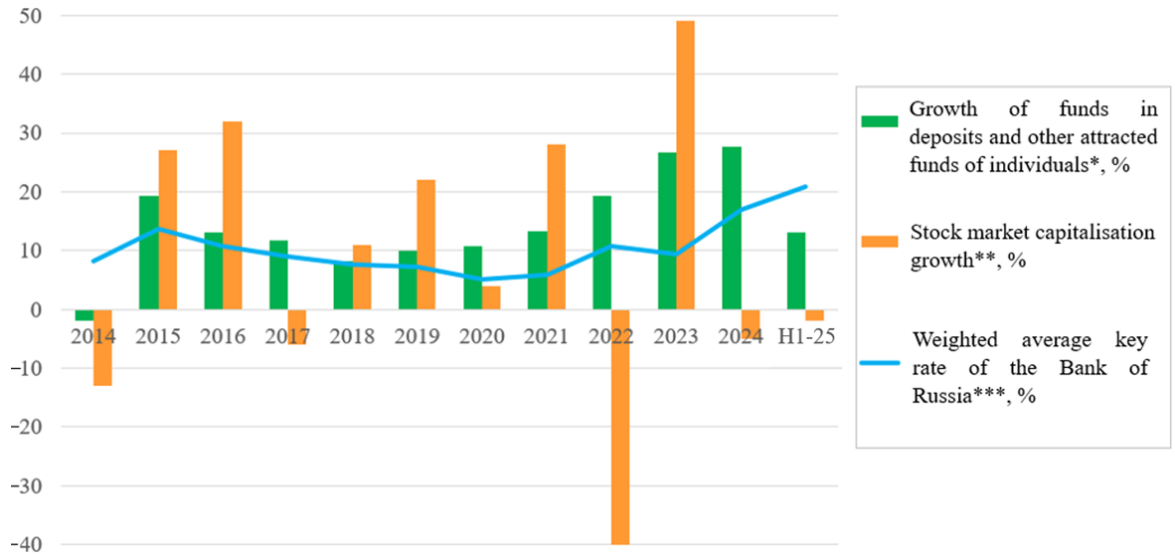

Fig. 5. **Growth in Market Capitalization of the Russian Stock Market, Funds on Deposits and Other Attracted Funds of Individuals and the Average Weighted Key Rate of the Bank of Russia in 2014 — First Half of 2025, %**

Source: Compiled by the authors.
Note: * to ensure comparability of data with previous periods, the increase for the first half of 2025 is given in annual terms; ** based on the results of trading on the stock market of Russian issuers of Moscow Exchange PJSC; *** by the number of days of validity.

of the need to fulfil the Russian President's instruction to achieve a market capitalization level of 66% of GDP by 2030,[15] which will require increasing it by at least 81 trillion rubles (based on current capitalization and GDP values). In this regard, the funds of individuals, considering their share in market liquidity (*Fig. 6*), are of great importance.

At the same time, the fact that households increased their deposits against the backdrop of high interest rates doesn't mean they will all buy stocks when rates are low: some of the funds represent pent-up demand, and some were intended for travel, etc.

[15] Website of the President of Russia. List of instructions for implementing the President's Address to the Federal Assembly. URL: http://www.kremlin.ru/acts/assignments/orders/73759 (accessed on 21.07.2025).

An analysis of the age structure of investments showed that the investor's age criterion is not entirely suitable for this purpose: almost all assets are held by people over 30, and among them, it is impossible to distinguish those who do not invest or, conversely, are the main investors. The data is from 2022, but the situation in this part hasn't changed significantly.[16]

An analysis of the DIA data on the structure of deposits by size (*Fig. 8*) showed that 96% of depositors had deposits with balances up to 1 million rubles, which accounted for 23% of the total value of all deposits. Regarding this category of deposits (15 trillion rubles), it's difficult to count on their outflow into stocks, which is why it can be excluded from the assessment.

The remaining amount has been adjusted for the willingness to invest in stocks: taking into account the share of investments in stocks and other forms of equity participation in the structure of the population's financial assets (on average about 35% over the past three and a half years), the potential for a natural outflow of funds from deposits into stocks in the baseline scenario can be estimated at 2.5–3 trillion rubles, and taking into account money market and bond funds, it is estimated at 4–7 trillion rubles.

Considering the multiplicative effect noted by several researchers, such as [19–21], which arises from demand pressure in a growing market, against the backdrop of low stock liquidity and prices relative to the size of investments, etc., the increase in market capitalization under favorable conditions can significantly exceed the volume of investments. It is impossible to accurately predict the size of this effect because it acts in conjunction with other factors, some of which are difficult to assess. Several studies, such as [22, 23], also point to the short-term effect of market injections. However, as the study showed, "being in the market" does allow for judging the presence of an effect, including in relation to the Russian market (*Fig. 9*).

In a positive market environment, as was the case, for example, from December 2022 to January 2024 (economic adaptation, low interest rates, a favorable exchange rate for exports, etc.), against the backdrop of a stable net inflow of funds from individuals, demand pressure led to an increase in capitalization, in some months exceeding the

[16] See, for example, the Bank of Russia. Financial Literacy Level Study: Phase Five. URL: https://cbr.ru/analytics/szpp/fin_literacy/research/fin_ed_5 (accessed on 22.07.2025).

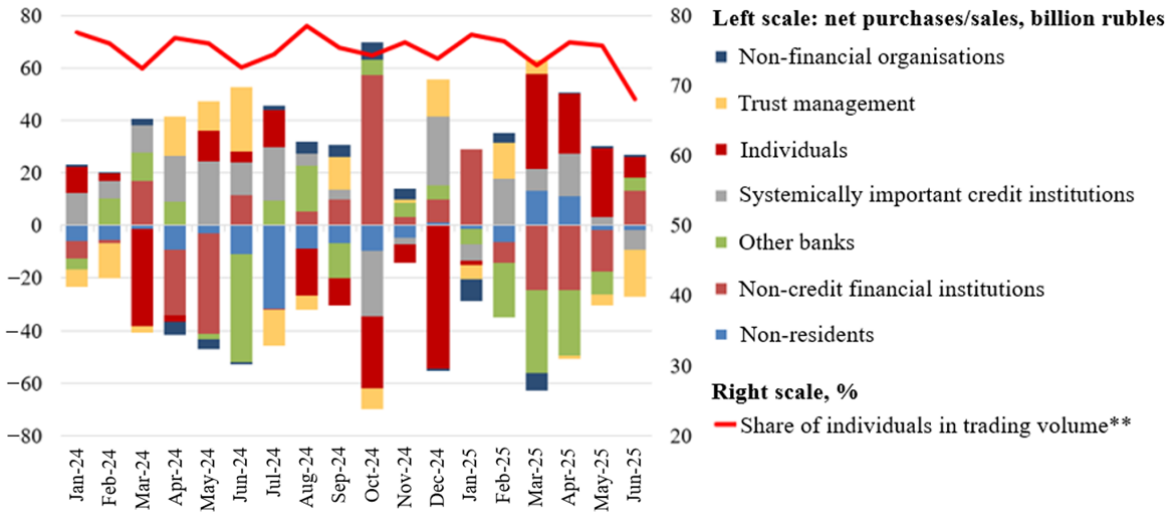

Fig. 6. **The Structure of Net Purchases/Sales of Shares at Moscow Exchange PJSC Trading by Their Participants and the Share of Individuals in the Trading Volume in the Period from 2024 to June 2025***

Source: составлено авторами / Compiled by the authors.
Note: * secondary stock market; ** average for the month.

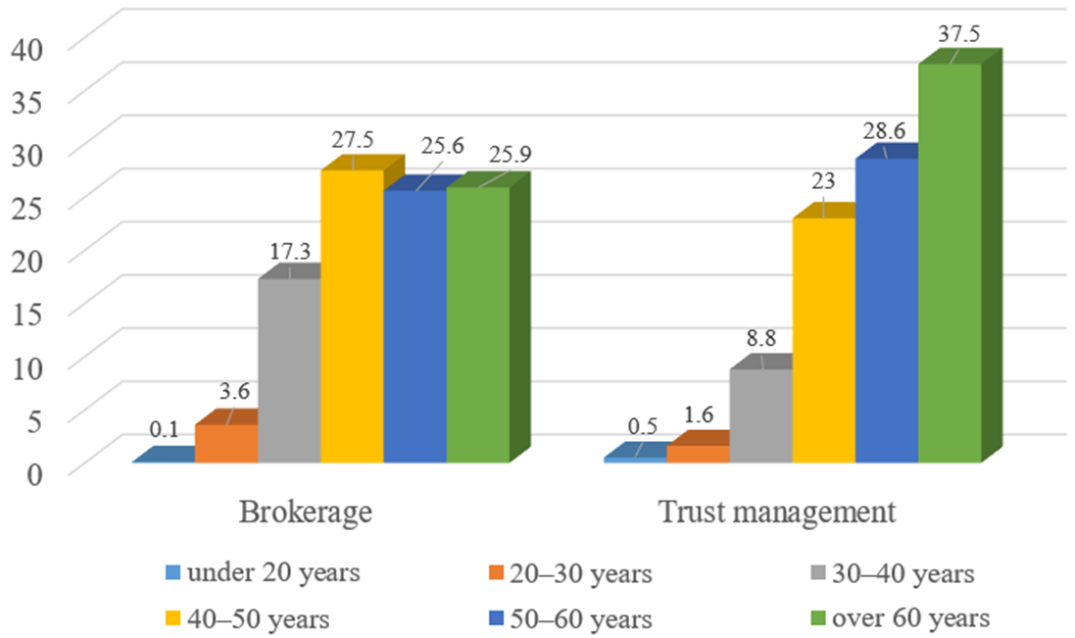

Fig. 7. **Age Structure of Assets of Retail Investors Within the Framework of Brokerage Services and Trust Management Based on the Results of the First Half of 2022, %**

Source: Compiled by the authors.

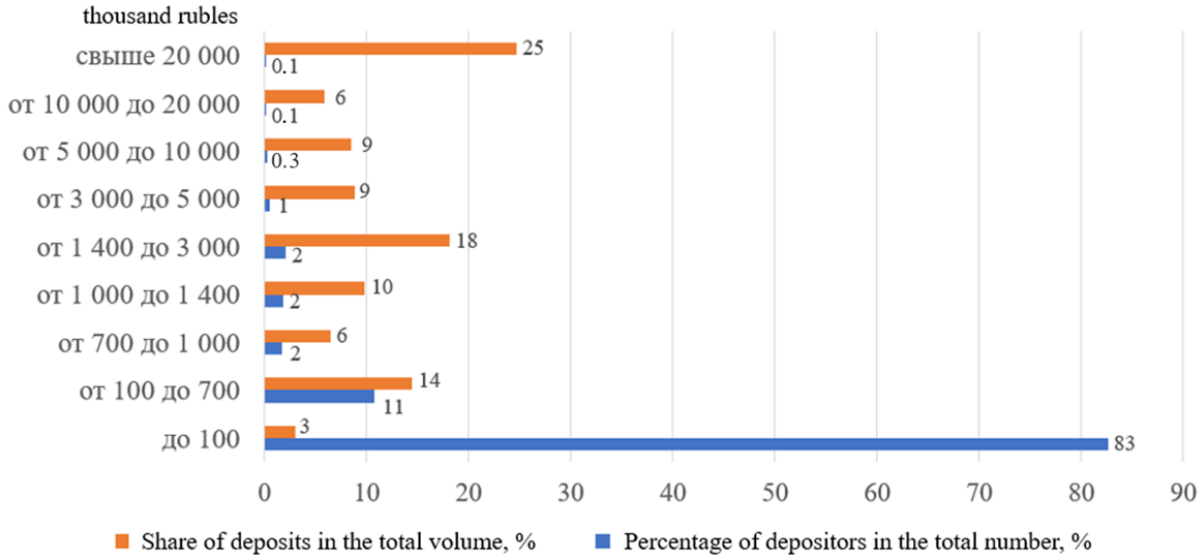

Fig. 8. **Structure of Deposits of Individuals in Banks Participating in the Deposit Insurance System by Deposit Size as of 01.07.2025***

Source: Compiled by the authors.
Note: * according to the DIA methodology, excluding escrow accounts and special accounts.

inflow of funds from individuals by hundreds of times. In total, from December 2022 to January 2024, against the backdrop of a total net inflow of funds from individuals of approximately 200 billion rubles, combined with other factors, capitalization grew by 22 trillion rubles.

The liquidity manoeuvre should also help unlock the market's potential, which is currently fundamentally undervalued, as evidenced, among other things, by the data in *Fig. 10* and *11*.

The potential of the Russian market is also evidenced by the results of other studies. For

example, in the work [24], it is noted that despite the progressive development of the retail market segment, there are still opportunities for further capital inflow.

THE ROLE OF PUBLIC OFFERINGS IN EXECUTING A LIQUIDITY MANOEUVRE

Research results on various aspects of the impact of initial public offerings (IPOs) on the stock market, such as [25–27], indicate a two-way relationship and the multifaceted nature of the effects. Under favorable economic conditions and high liquidity, new investment ideas often lead to market growth. It's no coincidence that IPOs are considered in Russia as one of the drivers for achieving the target ratio of stock market capitalization to GDP by 2030. Most estimates put the total size of IPOs in the next 5 years at 5–10 trillion rubles.[17]

An active IPO market benefits all stakeholders. By listing on an active market, issuers gain the necessary demand and price, while investors get new ideas. Investors and stakeholders also benefit from the transparency of public companies and stakeholders' awareness of companies' activities and development plans, as well as from better governance (including through the institution of independent directors).

Cross-sectoral effects are also evident — strengthening the structures of banks responsible for trust management, IPO support, and broking. Since these areas are profitable, almost risk-free for banks, and do not burden capital, the development of the IPO market will contribute to lower provisioning and cheaper loans.

Secondary offerings (SPOs) can also benefit from an active IPO market, including through the opportunity to unload large credit portfolios.

However, the current state of the IPO market in Russia does not yet lend itself to a significant contribution to the development of the stock market.

Since the end of 2022, Russia has seen a trend towards active IPO development, driven by the economy's adaptation to external challenges and

[17] For example, NAUFUR. The goal of increasing the capitalization of the Russian stock market has become difficult to achieve. URL: https://naufor.ru/tree.asp?n=30380 (accessed on 17.08.2025).

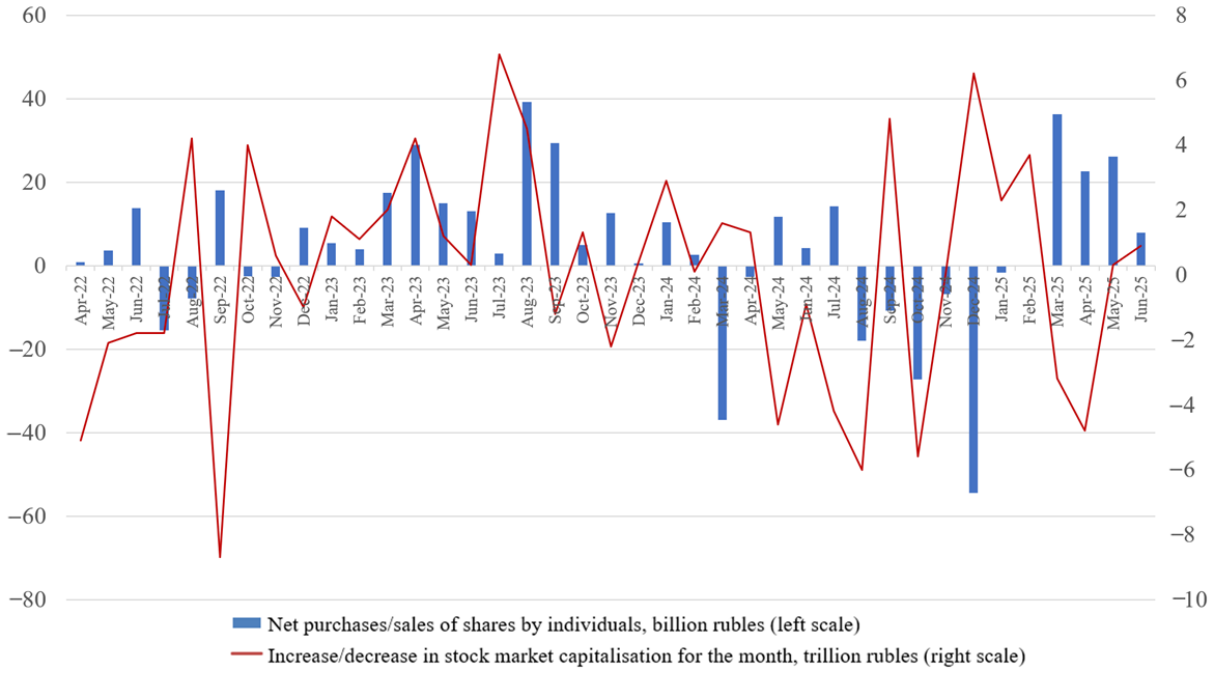

Fig. 9. **Net Purchases/Sales of Shares by Individuals and Increase/Decrease in Capitalization of the Moscow Exchange PJSC Share Market in 2022 — First Half of 2025**

Source: Compiled by the authors.

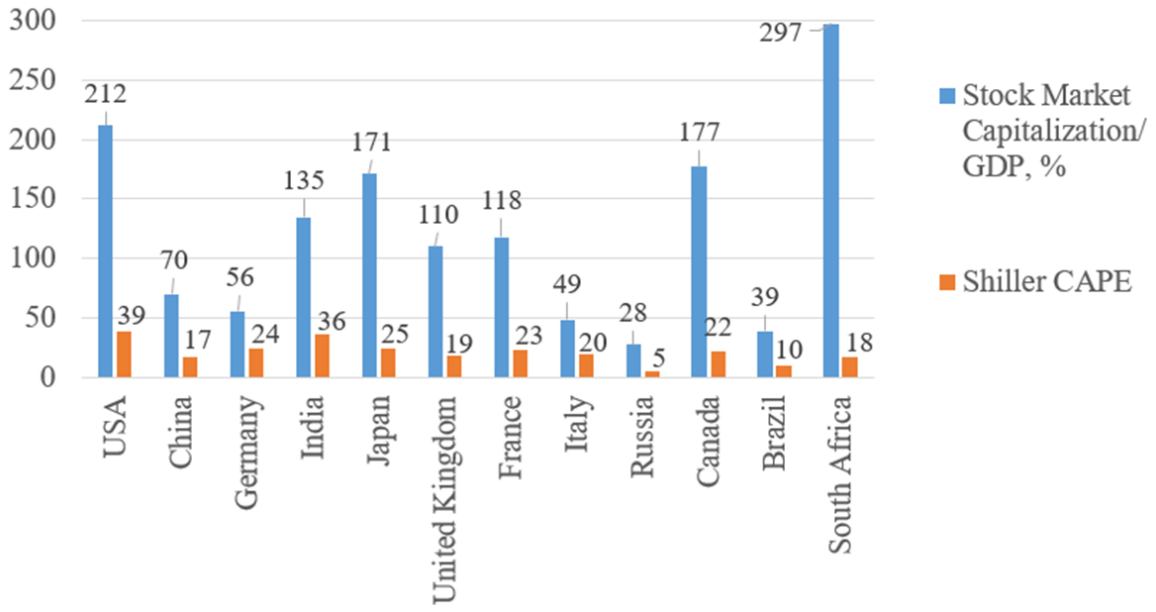

Fig. 10. **Stock Market Capitalization to GDP Ratio and Shiller CAPE Ratio in G-7 and Major BRICS Economies as of 01.08.2025**
Source: Compiled by the authors.

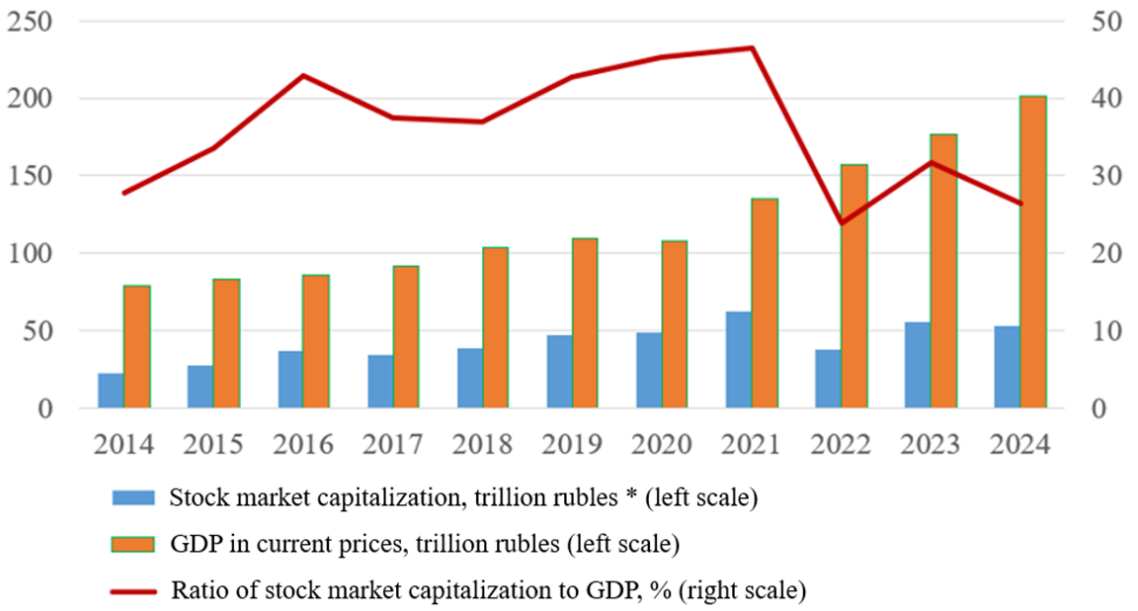

Fig. 11. **The Ratio of Russian Stock Market Capitalization to Russian GDP in 2014–2024**
Source: Compiled by the authors.
Note: * for shares of Russian issuers based on the results of trading on the stock market of PJSC Moscow Exchange, on the 1st day of the following year.

low interest rates: from December 2022 to March 2025, 24 IPOs took place, raising 128 billion rubles. In 18 cases (75%), the book-building was oversubscribed multiple times, including more than 10 times for the IPOs of PJSC MTS-Bank, PJSC Sovcombank, PJSC Diasoft, and PJSC Astra Group. But the market effectively froze from mid-2024, after the key rate exceeded 16% (*Fig. 12*). Individual placements no longer affected the overall picture.

According to the authors' assessment, the current state of affairs in the Russian IPO

market does not match its potential: public joint-stock companies account for only 0.03% of commercial organizations and 1.5% of joint-stock companies.[18] Even more striking, especially in comparison to developed markets, is the indicator of the share of value added created by public companies in GDP — in Russia, this is around 7% and less than 4% — excluding state-controlled companies. Only China among the leading economies has similar indicators (*Fig. 13*).

RECOMMENDATIONS FOR MAINTAINING LIQUIDITY

As the study showed, even a natural flow of funds into stocks amounting to 4–7 trillion rubles is not guaranteed in conditions where stock prices are at 5–10-year-old levels, and the return on investments in the IMOEX over the past 5 years, taking dividends into account (MCFTRR), is lower than investments in money market funds — 31% versus 76%. To shift the focus to the stock market, it needs to be made economically attractive for both the population and businesses. For this purpose, two sets of measures are proposed.

As part of the first set of measures, it is proposed:

1) Expand the coverage of the investment insurance system from funds in Individual Investment Accounts (IIA)[19] to assets held in all household accounts used for investment, as assets in IIA are almost 20 times less than the total volume of funds invested.[20]

2) Increase the role of collective investment, the current state of which does not motivate households to use it: investments in instruments in this segment are more than 10 times lower than direct investments.[21] For comparison: in the US in the first quarter of 2025, the share of

[18] Federal Tax Service of Russia. Statistics and Analytics. URL: https://www.nalog.gov.ru/rn77/related_activities/statistics_and_analytics (accessed on 17.08.2025).

[19] Federal Law No. 331from 31 July 2025.

[20] Bank of Russia. Time series of key performance indicators for professional securities market participants (PSMP). URL: https://cbr.ru/statistics/rcb/purcb_stat (accessed on 26.07.2025).

[21] NAUFUR. Conference "Collective Investment Market 2025". URL: https://naufor.ru/download/2025/RKI_24072025/data/20250724_RKI_16.pdf (accessed on 29.07.2025).

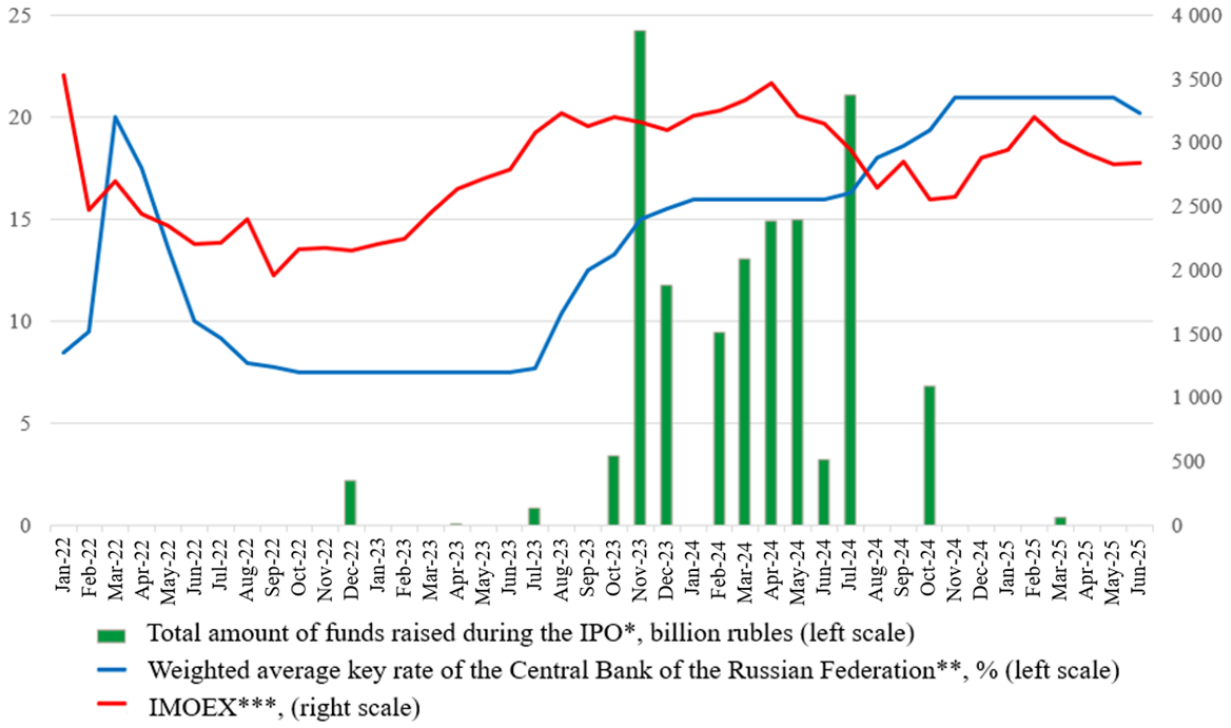

Fig. 12. **IMOEX, the Key Rate of the Bank of Russia and the Volume Of Funds Raised During IPOs in 2022 — First Half of 2025**

Source: Compiled by the authors.
Note: * for all IPOs for the month; ** by the number of days of validity; *** at the end of the month.

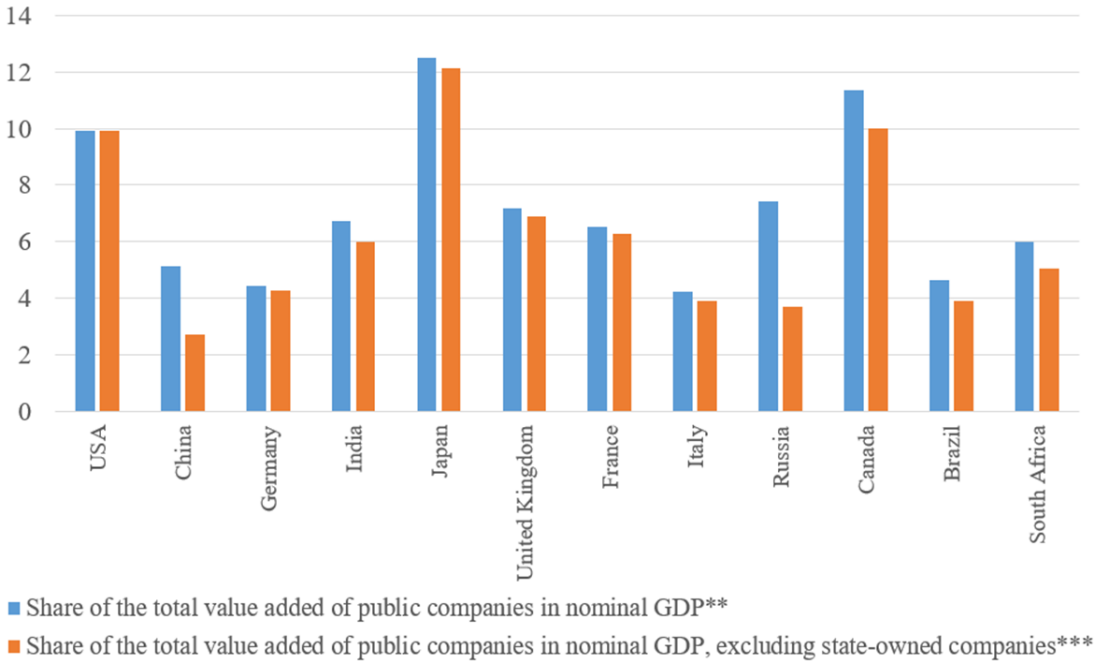

Fig. 13. **Share of Total Added Value of Public Companies in Nominal GDP in G-7 Countries and in the Largest BRICS Economies As of 15.08.2025, %***

Source: Compiled by the authors.
Note: * GDP data are taken for 2024, for added value — depending on available data [for 2024 or for the last 4 quarters (TTM)]; ** the operating profit indicator is used, taking into account the specifics in different countries; *** taking into account the OECD methodology, based on the share of SOE in the country's market capitalization.

households' indirect investments in securities (through funds, etc.) in the structure of their financial assets was only 2 times less than direct investments.

The main reason for the current situation is the low level of profitability in this sector (across the market as a whole): no type of investment fund has outperformed the returns from investing in money market funds over the past 5 years.[22] It is also noted that there is a lack of diversity in investment ideas and an infrastructure deficiency — there is no platform where operations with all funds could be conducted in one place.

The low returns of collective investment, in turn, are unlikely to be related to insufficient professionalism on the part of management companies (MCs). The Bank of Russia notes their good profitability as financial intermediaries. But fund managers don't share enough of the profits from the funds they raise with investors. The root cause of this situation, according to the authors, based in part on their professional experience, may lie in the banking business model of the management company, where collective investment acts more as a tool for attracting funds to be used in the interests of the group (REPO, lending, etc.) rather than a professional field.

In this situation, in the authors' opinion, it would hardly be fair to blame the management company: collective investment is a business, and management companies use it as they see fit within the group.

In such a situation, the role of the state in unlocking the industry's potential needs to be taken on, as it can increase the motivation of management companies to demonstrate higher returns on invested funds (relative to the risk-free rate) in the long term, specifically for collective investment products. In the authors' view, this can be achieved by balancing financial incentives and regulatory requirements in legal acts within the framework of consolidated supervision as a whole, in such a way that

[22] NAUFUR. Conference "Collective Investment Market 2025". URL: https://naufor.ru/download/2025/RKI_24072025/data/20250724_RKI_16.pdf (accessed on 27.07.2025).

professional collective investment receives the necessary emphasis in the activities of banking groups.

It is also advisable for the Bank of Russia, together with Moscow Exchange and management companies, to work on the creation of a "single supermarket" for collective investment funds, including assessing the technological capabilities of the Finuslugi platform and addressing data exchange and "end-to-end" transaction processing issues.

3) Develop a culture of dividend payments, considering their direct impact on market capitalization. Unlike developed markets, where dividends consistently fuel the market and their announcements rarely lead to significant market fluctuations due to their predictability, in Russia, dividend decision announcements often cause strong movements in the IMOEX.

Considering that many blue chips in the Russian market are state-controlled enterprises, it is advisable to use administrative and corporate tools to encourage profitable issuers to implement a policy of regular dividend payments, which would simultaneously serve as a stable fiscal stimulus. There are variations of this policy in international practice.[23]

4) Take measures to establish independent "long-only" funds that invest long-term based on in-depth fundamental analysis. After foreign funds left the Russian market, such organizations are virtually absent there, while significant movements are often observed in the market that are difficult to justify with fundamental factors. Technically, the authors see the solution to this problem in financial (grants, preferential taxation, etc.) and administrative support for relevant initiatives.

5) Improve the institution of qualified investors. Meeting many requirements for obtaining the status (asset size, frequency and volume of transactions, etc.) does not indicate qualification, which does not contribute to quality pricing in the market. Such criteria can be additional; only those that confirm competencies should be made mandatory.

The second set of measures — fine-tuning measures:

1) "Targeted" tax incentives that are in the best interests of both the market and the state simultaneously:

- tax benefits for companies conducting IPOs or SPOs of the "cash in" type. Of the total funds raised through IPOs in Russia in 2022–2025, over 50% were not directly used for business development (purposes included covering expenses, debt repayment, "cash out", etc.).
- inking VAT payment for SMEs with going public (possible distribution of the tax increase over time).
- linking tax benefits for households to the criticality of stock issuers for ensuring sovereignty and economic development, for which it is advisable to create a corresponding taxonomy, taking into account existing lists intended for various purposes.[24] The possibility of using maternity capital funds to purchase securities, linking investments to preferential lending, and so on can also be considered.
- exemption from dividend taxation, at least for funds remaining in the IIA. The current practice of withholding tax at the time of payment, regardless of whether the funds remain in the broking account or the type of account, reduces the motivation to reinvest dividends.
- providing advantages to issuers going public when participating in government procurement.

2) Guarantees for private investors participating in an IPO:

- guarantees of repurchase by a state agent of shares at the IPO offering price, with the hedge paid by the issuer and/or repurchase of shares from certain categories of long-term investors, such as those who invested in the offerings of

[23] OECD/World Bank (2024), Dividend payments by state-owned enterprises: Policies and practices. OECD Business and Finance Policy Papers, OECD Publishing, Paris. URL: https://doi.org/10.1787/bf84ff64-en (accessed on 05.08.2025).

[24] Including Russian Government Decree No. 603 of April 15, 2023; Appendix No. 1 to the minutes of the meeting of the Subcommittee on Enhancing the Resilience of the Financial Sector and Certain Sectors of the Economy of the Government Commission on Enhancing the Resilience of the Russian Economy under Sanctions from 22 April 2022; the list of issuers of the Innovation and Investment Market of PJSC Moscow Exchange.

issuers from critical state sectors, if the price falls by 20–30% from the offering price.

• guarantee of repurchase by banks from private investors at a specific price of the shares of over-indebted borrowers, provided that the funds raised in the placements are used to repay the loan or a portion of it.

3) Establishing a fund managed by a structure similar to VEB.RF, which would support IPOs meeting a state-defined list of criteria, investing at least 30% of the declared volume. At least 50% of the fund's resources would be reserved for stabilizing and maintaining the secondary market. Such a measure would ensure positive price dynamics, which would add confidence in the IPO market for private investors, the majority of whose IPO investments in 2023–2024 are currently unprofitable or underperforming the risk-free rate. This would also allow hundreds of companies to refinance their loans and restart the investment cycle.

4) Popularizing investment culture in the media space, for which separate media outlets can be created with state support. Similar techniques are successfully used abroad, for example, in Brazil with the participation of the B 3 exchange, where trending topics and current financial issues are discussed on leading platforms with popular figures.

To refine and "adjust" the proposed measures, a working group could be established based on relevant ministries and departments, with the participation of systemically important infrastructure organizations, major market players, and the Financial University under the Government of Russia.

CONCLUSION

The main driver behind the doubling of household deposits in Russia in three and a half years was high interest rates — accounting for about 70% of the increase. A significant contribution was made by the increase in the total (nationwide) disposable cash income of the population (up to 24%) and the reduction in investments in foreign assets (up to 6%). Market uncertainty, a decline in the attractiveness of reserve currencies, and other factors also played a role.

Given the negative impact of high interest rates on the economy, a key rate cut cycle is inevitable. At the same time, the deposit "overhang" that formed against the backdrop of high interest rates will represent a potential for inflationary pressure during a cycle of interest rate cuts, at least through increased consumption and a decrease in the attractiveness of deposits. The specific effect will depend on a combination of many factors, but even a 30–50% deposit "overhang", which accounts for up to 10% of the money supply (M2), will be enough to put noticeable pressure on inflation.

The authors see the way out of the situation in performing a liquidity *manoeuvre* — a state-managed, natural, and stimulated flow of liquidity within the financial system without affecting inflation. The stock market has been proposed as a natural "communicating vessel" with deposits, the liquidity of which is interconnected with interest rates. Performing this manoeuvre is a way out of the situation that will contribute to solving a whole range of challenges — inflation, business over-indebtedness, the task of increasing stock market capitalization, attracting capital for business development, and others.

Against the backdrop of falling rates, we can only expect a natural outflow of funds into stocks in the amount of 2.5–3 trillion rubles, and 4–7 trillion rubles including money market and bond funds. This amount is significant in terms of its potential impact on inflation, and in the stock market, considering the possible multiplier effect, a noticeable contribution to market capitalization can also be expected.

The authors see the problem in the still insufficient long-term attractiveness of the stock market compared to risk-free instruments, which should be the focus of the complex of general and "fine-tuning" measures proposed by the authors, linking the interests of the population, business, and the state.

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ABOUT THE AUTHORS

Oleg M. Eskindarov — president of the holding company "Sindika", professional investor, Moscow, Russian Federation
https://orcid.org/0009-0008-4241-9025
Oeskindarov@sindika.ru

Timofei V. Maniakhin — Cand. Sci. (Econ.), Assoc. Prof., Financial Markets and Financial Engineering Department, Financial University under the Government of the Russian Federation, Moscow, Russian Federation; certified risk-manager of the Professional Risk Managers' International Association (PRMIA)
https://orcid.org/0009-0005-7315-286X
Corresponding author:
tvmanyakhin@fa.ru

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The Effectiveness of the Fed's Monetary Policy in Targeting Inflation in the Years 2022–2024

E.N. Belozorova
Financial University under the Government of the Russian Federation,
Moscow, Russian Federation

ABSTRACT

This article analyzes the inflationary dynamics in the United States and Europe, the factors that drive them, and the recessionary risks obscured by understated official statistics. The study emphasizes the global significance of monetary policies implemented by the Federal Reserve (Fed) and the European Central Bank (ECB) under inflation targeting. The objective is to assess the effectiveness of these policies in the face of divergent regulatory measures. Using systems theory, financial and statistical analysis, and liquidity cycle modeling, the research identifies the key drivers of inflation in 2022–2024, evaluates the Fed's policy of interest rate hikes and balance sheet reduction, and examines their impact on inflation and recession dynamics. The findings show that measures intended to curb inflation have instead increased Treasury yields, worsened debt refinancing, and pushed the financial system towards a liquidity crisis by early 2025. The study highlights persistent imbalances, including oil market cycles, low strategic reserves, unrealized bond losses, central bank deficits, and rising sovereign debt costs, which hinder the stabilization of inflation. It concludes that monetary tightening has had counterproductive effects, making interest rate reductions unlikely before 2026. These results valuable provide insights for policymakers and other stakeholders in developing effective monetary strategies.

Keywords: Inflation; monetary policy; interest rates; global liquidity index; reverse REPO

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INTRODUCTION

Global inflationary processes are an important economic factor that significantly impacts the standard of living and development of territories. Therefore, they are a focus of attention for central banks and financial institutions.

The main instruments used by monetary policy to influence inflationary processes include interest rate policy, changes in mandatory reserve requirements, currency regulation, and REPO operations. These measures are aimed at achieving the central bank's objectives, which include maintaining price stability and ensuring economic growth.

In accordance with these objectives, the Central Bank of Russia has set a target for inflation targeting of "near 4%" [1] for 2025 and beyond. This target is designed to ensure stable prices and economic growth, while also taking into account the specific circumstances of the country's economy. But, as experience shows, inflation targeting does not solve the problems of economic growth, and often on the contrary — it does not ensure balanced and sustainable growth in any way [1]. Monetary policy is a complex trade-off between stimulating economic activity on the one hand and avoiding bubbles on the other. For example, in the post-covid period, central banks faced a dilemma between "... containing the rate of inflation by monetary methods and supporting aggregate demand" [2].

Higher interest rates have a negative impact on economic growth, as they limit resources for the development of the industrial sector.

[1] The official website of the Central Bank of the Russian Federation «The main directions of the unified state monetary policy for 2025 and the period 2026 and 2027». URL: https://www.consultant.ru/document/cons_doc_LAW_489408 / (accessed on 05.09.2025).

However, its impact depends on many factors, such as the situation in the labor market, the level of inflation, and the state of the financial market.

The aim of the study is to determine how indicators of macroeconomic development react to changes in interest rates and what problems this causes. The research methodology includes a systematic analysis of the functioning of the main elements of macroeconomic policy and their interrelations as factors of inflationary processes, a statistical study of liquidity cycles, and a horizontal analysis of financial market indicators. Empirical relationships between the mutual influence of macroeconomic indicators and the volume of the money supply, identified at the beginning of the XXI century, are currently not relevant. The tools used by central banks in the system of financial management of the economy do not take into account that the inflation formula contains not only the amount of money supply, but also the volume of commodity output, which the monetary authorities are not authorized to manage.

Thus, the study includes an analysis of data on inflation, GDP indicators, the state of financial markets, treasury rate growth, yield curve inversion, global liquidity volumes, central bank losses, and commercial bank unrealized losses. The results of this study can help government and other stakeholders make informed monetary policy decisions based on more accurate data and forecasts.

ANALYSIS OF US AND EU INFLATION AND GROSS DOMESTIC PRODUCT

Financial analysts involved in forecasting the level of inflation and economic development predicted optimistic indicators of the inflation rate for 2022. For example, according to the World Bank, the global inflation rate in 2021 was 3.5%,[2] and the forecast for growth rates in economically developed countries has assumed a decrease, from 5% in 2021, to 3.8% in 2022, and 2.3% in 2023.

The growth rate of economically developed countries and the rate of inflation in these countries are traditionally influenced by a significant number of factors. *Figure 1* shows the US and EU inflation rates over the past 10 years, and *Figure 2* shows the rate of change in GDP in these countries.

Using the Bayesian dynamic factor model of the euro area, economists estimated output deviations from the trend that are consistent with the behavior of inflation. The version that best predicts inflation shows that after the 2011 sovereign debt crisis, the output gap in the euro area was much larger than official estimates [3]. To more accurately predict the level of inflation, it is necessary to take into account the factor of production gaps and make an objective assessment of production volumes.

According to the Harmonised Consumer Price Index (HICP), overall inflation in the euro area, which was 1.2% in 2019, fell to 0.3% in 2020 and was even negative in the second half of 2020 before rising again to 2.6% in 2021. Since mid-2021, overall inflation has increased particularly sharply, reaching a historic high of 5.9% in February 2022 [4]. As of August 2022, cyclical and residual inflation contribute 3.2% and 2.8% to overall EU inflation, respectively. Inrelation to cyclical inflation, the demand component shows the largest contribution — 1.9% compared to 1.3% for supply. As for residual inflation, we can see that the largest contribution from the supply side (energy and logistics) is 1.6% compared to 0.5% from the demand side. Other factors, such as geopolitical tensions, contributed 0.7% to overall EU inflation [5].

One of the extreme positions of financial analysts is that attempts by central banks to deal with the negative effects of inflation can lead to a prolonged and deep recession. In their opinion, such measures will cause serious economic difficulties and debt crises [6]. On the other hand, forecasting

[2] The official website of the World Bank "Inflation, consumer prices (annual%). The World Bank Data". URL: https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG (accessed on 28.05.2025).

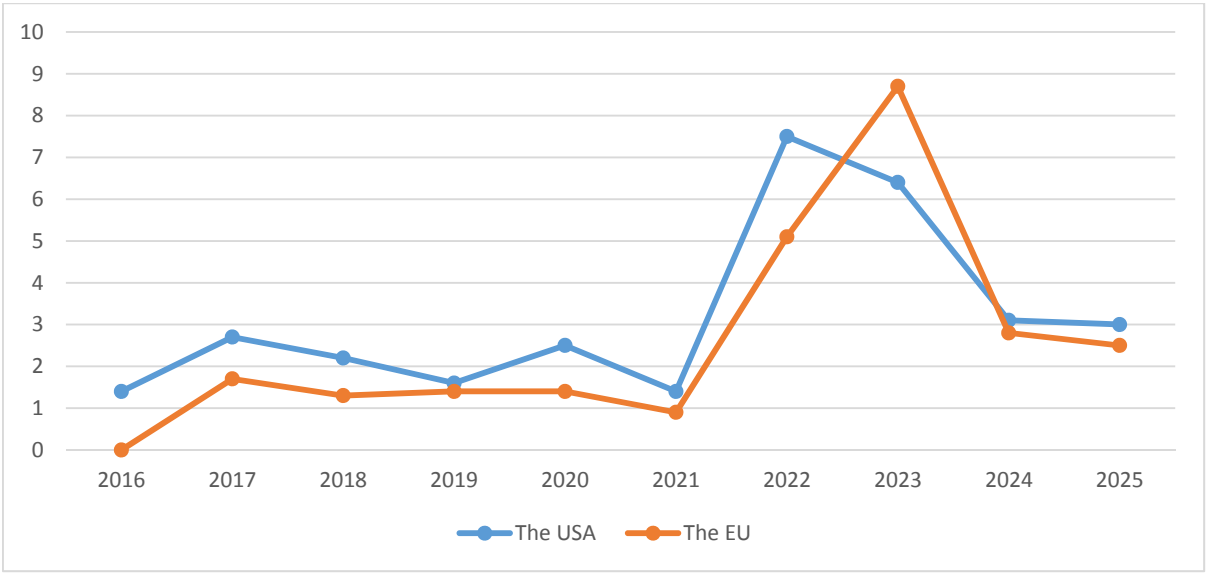

Fig. 1. **Inflation Rate in the US and the EU, %**

Source: Author's calculations from the database of world market indicators. URL: https://tradingeconomics.com/united-states/inflation-cpi; https://tradingeconomics.com/euro-area/inflation-cpi (accessed on 05.09.2025).

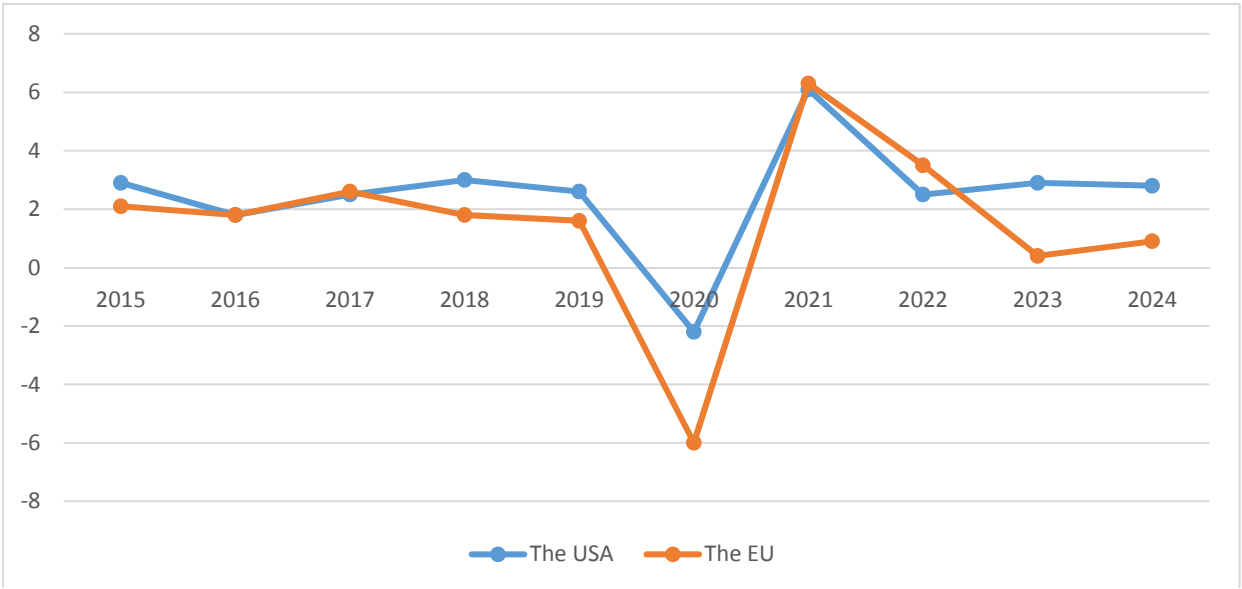

Fig. 2. **United States, EU GDP Growth Rate, %**

Source: Author's calculations based on the database of world market indicators. URL: https://tradingeconomics.com/united-states/gdp-growth; https://tradingeconomics.com/euro-area/gdp-growth (accessed on 05.09.2025).

macroeconomic and financial cycles is always a multi-factor model that takes into account common deterministic and random factors, but statistical relationships between the dynamics of money supply increment and GDP have been repeatedly proved by scientists [7]. In practice, the method of forecasting inflation based on unobservable components, a flexible approach to the inflation trend, and an alternative indicator of labor market weakness shows that there is a direct relationship between accrued wages, inflation, and GDP [8].

Central banks, represented by the Federal Reserve System (FRS) and the European Central Bank (ECB), began to tighten monetary policy back in 2022.A sharp increase in the key rate and a reduction in the balance sheet of the Fed and the ECB were aimed at reducing the monetary component of inflation. The rate hike

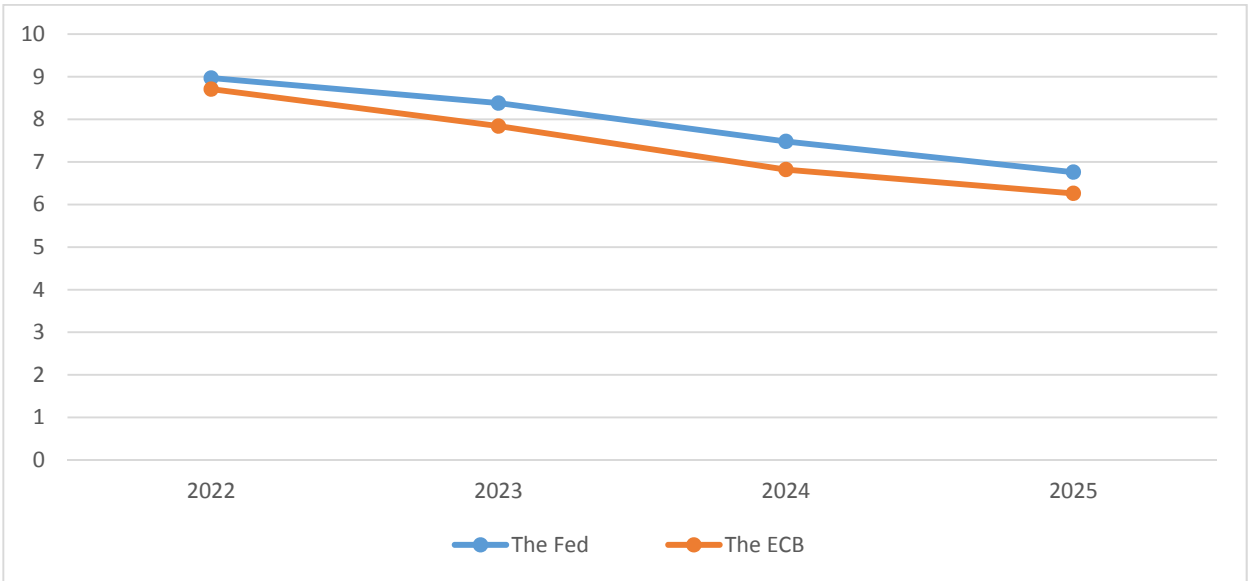

Fig. 3. **The Reduction of the Balance Sheets of the Federal Reserve and the European Central Bank, in Trillion Dollars and Trillion Euros**

Source: Author's calculations based on the database of world market indicators. URL: https://tradingeconomics.com/united-states/central-bank-balance-sheet; https://tradingeconomics.com/euro-area/central-bank-balance-sheet (accessed on 05.09.2025).

occurred in the US from 0.25% to 5%.[3] Since US inflation is well above the 2% target (and its true values are being falsified), the current restrictive monetary policy will continue. The Fed's balance sheet tightening is shown in *Fig. 3*. The US Federal Reserve's balance sheet reduction, also known as "QT" or "quantitative tightening," is the process of gradually reducing the size of the Fed's balance sheet by selling government securities and other assets from its portfolio. During the period under review, the Fed systematically reduced its balance sheet. Overall, the balance sheet was reduced by $ 2 trillion 370 billion from March 2022 to September 2025.

It is natural that in the situation of an increase in the key rate and the sale of such significant volumes of securities on the open market, their value decreased and profitability increased. As can be seen in *Figure 4,* starting in July 2022, when the Fed's balance sheet reduction began, interest rates on Treasury bonds began to rise, which currently amount to about 4% per annum.

Central banks set a monetary policy horizon of several years, but it can be adjusted depending on changes in the economic situation. For example, the central bank can increase the horizon if inflation expectations are stable and the economy is growing, or reduce it if inflation is accelerating and a quick response is required. The study [9] shows that inflation targeting is an important tool for ensuring the economic security of the state. Adequate value of the key rate is a debatable issue, but as the study [10] shows, developed countries are characterized by low values of the key rate, while developing countries have higher values. In turn, high interest rates are a barrier to entry into high-tech industries, which again makes it difficult for a country to move from the developing to the developed category [11].

The role of the financial cycle in macroeconomics requires a rethink of modeling strategies and significant adjustments to macroeconomic policies. The study [12] examines the political implications of the financial cycle in macroeconomics and reveals that the recession phase, which is

[3] The official website of the US Federal Reserve System. Overview: The Federal Reserve Board and the Federal Open Market Committee will publish economic forecasts following the FOMC meeting on March 21–22. URL: https://www.federalreserve.gov/newsevents/pressreleases/monetary20230322a.htm (accessed on 28.05.2025).

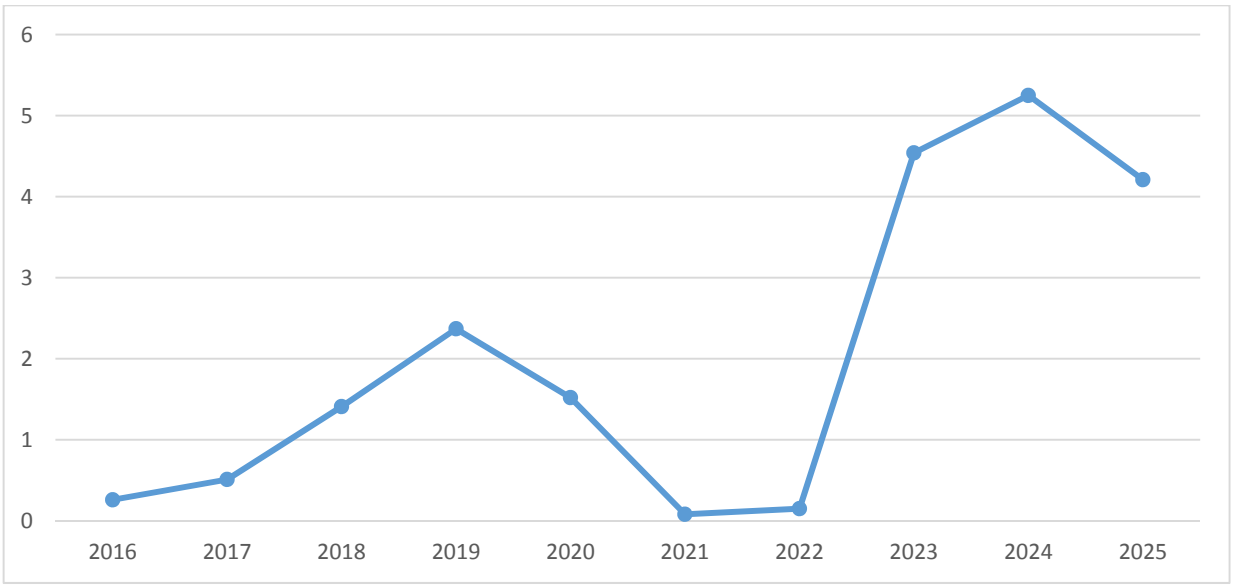

Fig. 4. **The Dynamics of Growth Rates on Treasury Bills. 3-Month Treasury Bill Secondary Market Rate, Discount Basis**

Source: Author's calculations based on the database FRED. URL: https://fred.stlouisfed.org/series/TB3MS (accessed on 05.09.2025).

less well understood, now raises much more questions in the economic environment. Economists, considering the cyclical nature of financial, inflationary, and macroeconomic processes, ask how to explain this cyclical nature, and whether the factors of recovery are already the cause of the subsequent decline [13]. The formation of aggregate fluctuations is the result of various mechanisms related to the position of global monetary policy (large deviation), the behavior of financial institutions that accept risks (large use of borrowed funds) and global imbalances [14].

PROBLEMS OF GOVERNMENT DEBT REFINANCING AND LIQUIDITY IN THE FINANCIAL SYSTEM

The financial authorities of various countries face the issue of refinancing public debts in the face of rising inflation. Since real interest rates turn out to be negative, the issue and placement of a new volume of government bonds becomes a very problematic task for ministries and relevant government agencies.

Before the key rate hike, i.e. until July 2022, the government debt could be effectively refinanced. Prerequisites for smooth refinancing of the national debt were:

- dynamics of the key rate reduction over the decades and its fixation at values near zero, which allowed for "cheap" issuance;
- high liquidity of the banking sector; during this period, the Fed's balance sheet was actively growing, and the quantitative easing policy providedcommercial and central banks of other countries with barrier-free access to dollar liquidity;
- valuation, accounting and collateral of US Treasury bonds at zero risk ratios, which allowed not to create reserves, issue loans and use securities in circulation as risk-free assets;
- increased leverage, as low interest rates andrisk-free assets allow commercial banks to use them as collateral repeatedly, which leads to a 10-fold increase in leverage and an increase in credit issuance;
- lower rates on credit default swaps, provided a cheap cost of hedging risk, and in some cases completely eliminated the need to hedge risks;
- "non-inflationary" state of the economy, since the absence of inflation or its moderate value determines the normal distribution of interest rates, when rates on the long-term debt market are higher than rates on the short-term one.

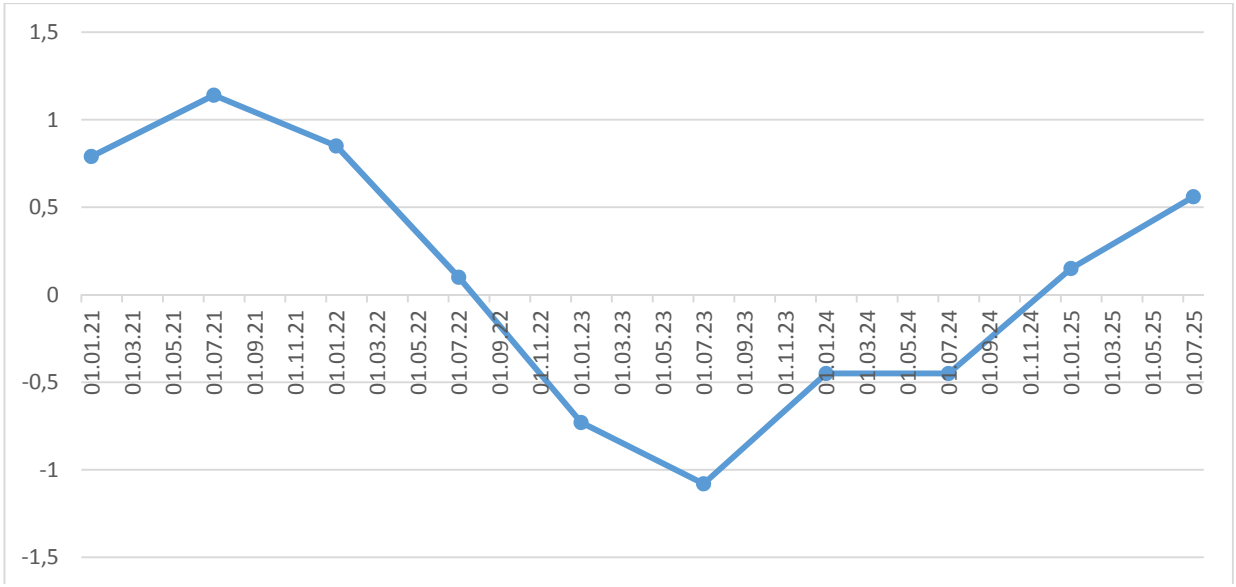

Fig. 5. **Inversion of the Yield Curve of 10- and 2-Year US Treasury Bonds**

Source: Author's calculations based on the database FRED. URL: https://fred.stlouisfed.org/series/T10Y 2Y (accessed on 05.09.2025).

However, in a state of high inflation, refinancing public debt becomes more difficult, as inflation and inflationary expectations generate an inversion of the yield curve. As we can see in *Fig. 5*, since July 2022, the difference between the yield on ten-year and two-year bonds has entered negative territory and remained there until the beginning of 2025.

Rising interest rates have a negative impact not only on the ability to refinance government debt, but also on the overall liquidity of the financial system. The Global Liquidity Index is an important indicator for investors, as the level of liquidity can strongly influence asset prices and the overall economic situation in the world. As noted in the study [15], "financial liquidity is largely procyclical. Its volume increases with upward economic dynamics. Under these conditions, the liquidity of many financial instruments is maximized." It is quite logical to conclude the opposite, that with a decline in economic activity, the liquidity of financial assets will decrease, and in times of recession it will be minimal. Thus, according to the Bank for International Settlements (BIS), the volume of international debt securities denominated in US dollars declinedfor the first time since the 2008–2009 financial crisis.[4] If we estimate the change in global liquidity based on the MDB data shown in *Fig. 6*, we can trace 65-month cycles and conclude that by the end of 2025 — beginning of 2026, the financial system will be at the limit of liquidity decline.

As rising interest rates in the US debt market have led to a stronger dollar against other global currencies, this has had a significant impact on sovereign debt and foreign exchange markets. The main problem of the decade of low interest rates is the growing global debt denominated in US dollars. Global liabilities amount to about $ 300 trillion, and as interest rates rise, it becomes more expensive to refinance global debt. Owners of major US debts are China, South Korea, Japan, Germany — find themselves in a situation of devaluation of national currencies and the need to reduce the balance sheets of their central banks by selling US Treasurybonds, which provokes a new round of asset depreciation and higher interest rates. A typical example is the crisis of the Japanese yen and the British pound in the fall of 2022. Thus, the UK's foreign exchange reserves by

[4] The official website of the Bank for International Settlements. What is international debt security in the statistics of the BIS? URL: https://www.bis.org/publ/qtrpdf/r_qt2106z.htm (accessed on 28.05.2023).

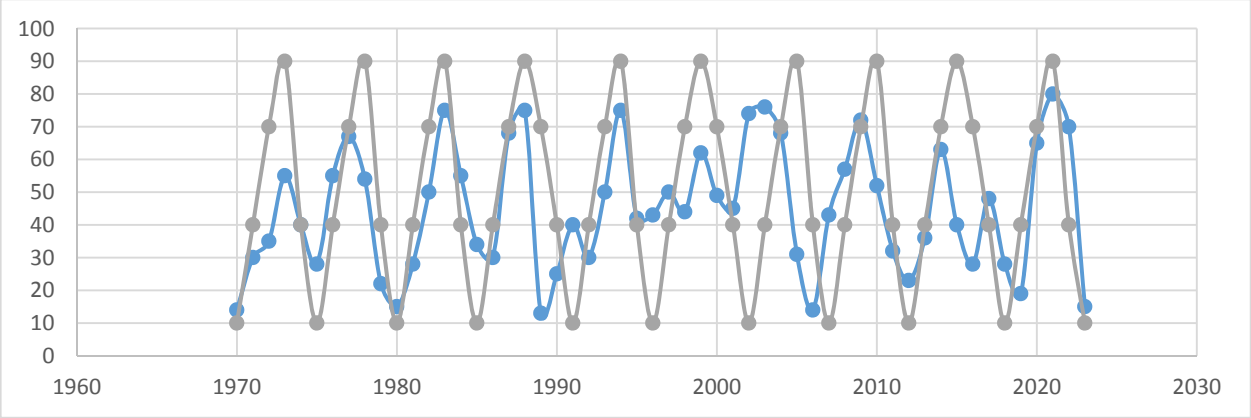

Fig. 6. **Global Liquidity Index**

Source: Author's calculations based on the database BIS. URL: https://www.bis.org/statistics/gli.htm?m=2690 (accessed on 05.09.2025).

the beginning of autumn 2022 amounted to only $ 108 billion, while the pound sterling lost almost 20% against the dollar, and there was a maximum increase in rates on ten-year British bonds. Bloomberg called it "the bursting of the government bond bubble, the worst since 1949".[5]

REVERSE REPO AND OIL CYCLE FACTORS, DESTABILIZING THE FINANCIAL SYSTEM

In the context of rising interest rates and tightening monetary policy, an interesting trend can be noted — an impressive volume of reverse (for banks) repos with the Fed in 2022–2023. Reverse REPO — a lending transaction secured by securities. If the bank makes a reverse REPO, it buys the security from the Fed, thereby lending funds, and then sells the paper back, but at a higher price. The difference between the purchase and sale prices is the repo rate at which the bank lends. In the case of the Fed, the repo rate is 4.8% per annum.[6] U.S. Treasuries act as collateral for such transactions.

Figure 7 shows that the Fed's lending growth from banks began in the second quarter of 2021, before the FOMC's first hike decision on March 17, 2022. What is the reason for this trend?

First factor: reverse REPO is, on the one hand, a lending transaction, and on the other — a tool for opening a short position, that is, the bank receives paper through the REPO and sells it to the market, expecting that it will buy it back cheaper. Since the REPO with the Fed is an overnight loan, that is, for a period of 1 day, banks simply roll over the transaction every day.

Comparing the beginning of the growth of reverse repo transactions with the Fed with the chart of changes in the yield on the ten-year UST (*Fig. 8*), we can conclude that banks and management companies began to increase the volume of REPO transactions in response to a sharp increase in UST rates in the first quarter of 2021. Thus, banks took UST on REPO and opened a short position on securities on the eve of a strong rate increase, well in advance of the Fed Funds Rate hike cycle Rate. As you can see, the strategy was fully justified, since the growth of interest rates has a negative correlation with the price of bonds. In other words, banks borrowed paper to sell it at a high price, and now they are rolling over this deal, waiting for the UST price to reach the lowest possible value given the current Fed rate hike cycle, then buying back the much cheaper bonds and closing the REPO.

[5] The website of the Bloomberg News agency. The big bond bubble burst in the worst year since 1949. URL: https://www.bloomberg.com/news/articles/2022–09–24/the-great-bond-bubble-is-poof-gone-in-worst-year-since-1949 (accessed on 28.05.2025).

[6] The official website of the Federal Reserve Bank of New York «Reverse REPO options with the Fed». URL: https://www.newyorkfed.org/markets/rrp_faq.html (accessed on 28.05.2025).

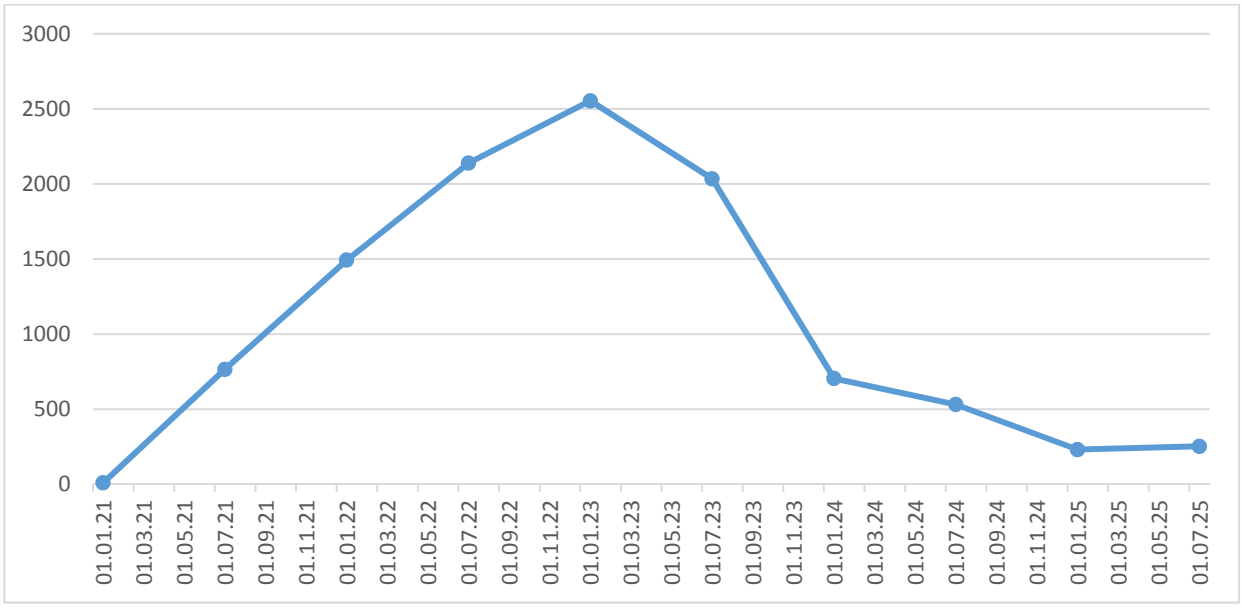

Fig. 7. **Volume of Reverse Repo Transactions with the Federal Reserve, USD Billion**

Source: Author's calculations based on the database FRED. URL: https://fred.stlouisfed.org/series/RRPONTSYD (accessed on 05.09.2025).

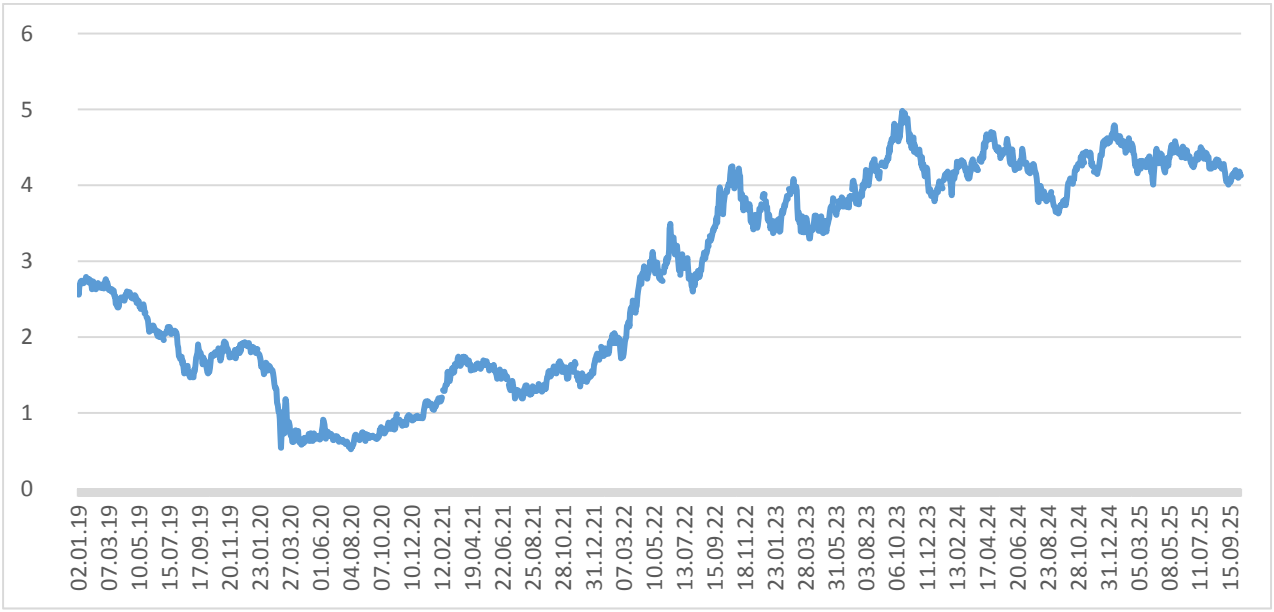

Fig. 8. **Chart of Yield Changes for Ten-Year UST. 10-Year Treasury Constant Maturity**

Source: Author's calculations based on the database FRED. URL: https://fred.stlouisfed.org/series/T10Y 2Y (accessed on 28.05.2025).

The second factor is direct lending under REPO. To conclude a reverse REPO transaction, the bank needs to have sufficientliquidity, in other words, have money in the account for which it will buy paper for the first part of the REPO. A bank or financial institution cannot afford to keep money: every ruble, dollar, or dirham must always be invested. It should be noted that the regulator was given more than 2.2 trillion US dollars on a daily basis. This indicates that banks and other financial institutions have exhausted other investment opportunities: either they consider them too toxic in terms of risk, or they simply do not see opportunities for investing such a significant amount of liquidity. That is, the Fed and

news sources do not deceive when, against the background of the collapse of banks, they say that there is enough liquidity in the US financial system. However, there is one caveat: not everyone is allowed to REPO with the Fed, but only two groups of financial institutions — Fed Primary Dealers[7] and RRP Counterparts.[8] The first group consists of the most famous names in global markets, plus a couple of local players (JP Morgan, Goldman Sachs, Wells Wells Fargo, BofA, etc.). The second group includes the largest management companies, whose names are also known to everyone in the market (Alliance Bernstein, Black Rock, Fidelity).An increase in interest rates is a favorable situation for the fourth year already for the largest participants in the financial market, who knew about it in advance, back in 2021, before the Fed and ECB started raising rates, and began to make the necessary trading operations.

The sale of SPR — strategic oil reserves — is included in the list of factors that destabilize the financial system, since the strategic oil reserve for the United States acts as a kind of analogue of the gold and foreign exchange reserves of developing countries. When a sovereign currency is devalued, the central banks of countries begin to sell foreign exchange reserves to stabilize the national currency. The United States sells its oil reserves for the same purpose — to reduce inflation — by balancing the dollar against energy. The Fed's view of inflation dynamics is that three components are important:

- a trend driven by long-term inflationary expectations;
- a cycle connecting nominal and real variable factors.
- oil prices.

The econometric structural model of inflation that formalizes this view indicates a stable trend of expectations, a significant and well-defined Phillips curve, and the oil cycle, which, contrary to the standard model of rational expectations, affects inflation through expectations, without affecting the supply gaps of petroleum products. Thus, the use of the US strategic petroleum reserve is aimed at avoiding crises in the supply of petroleum products, which often exceed the Phillips curve. "In fact, the combined dynamics of the Phillips curve cycle and oil cycles explain the inflationary conundrums of the last ten years" [16].

CENTRAL BANK LOSSES AND UNREALIZED LOSSES ACROSS THE ENTIRE FINANCIAL SYSTEM

Thus, the main problem that arises in the context of rising inflation and tightening of monetary policy by central banks is the vulnerability of the entire financial system to high interest rates. If you look at the structure of the Fed's balance sheet according to report Z1, you can estimate the unrealized loss on bonds, that is, the amount of discrepancy between the nominal and real value. The total unrealized loss on government, municipal, mortgage and corporate bonds will amount to almost $ 5 trillion. In this situation, it is obvious that the debt market is experiencing significant pressure frominterest rates, the growth of which leads to such a record drop in the market value of securities. If you look at the share of each type of paper in total losses, then government bonds contributed 46% to total losses, corporate bonds — 30%, mortgage securities — 21%, municipal securities –3%. However, on the balance sheet of commercial banks, securities are evaluated by different methods depending on the type. And manipulating the transfer of securities into various types, mainly from securities for resale to securities before holding, allows banks to avoid recording all unrealized losses.

Also in the list of factors that provoke the maximum load on the financial system, include losses of the Fed. This is an exceptionally rare event that occurred for the

[7] The official website of the Federal Reserve Bank of New York. Primary dealers with the Fed. URL: https://www.newyorkfed.org/markets/primarydealers (accessed on 28.05.2023).

[8] The official website of the Federal Reserve Bank of New York "Reverse REPO counterparties with the Fed". URL: https://www.newyorkfed.org/markets/rrp_counterparties#additions-and-removals (accessed on 28.05.2025).

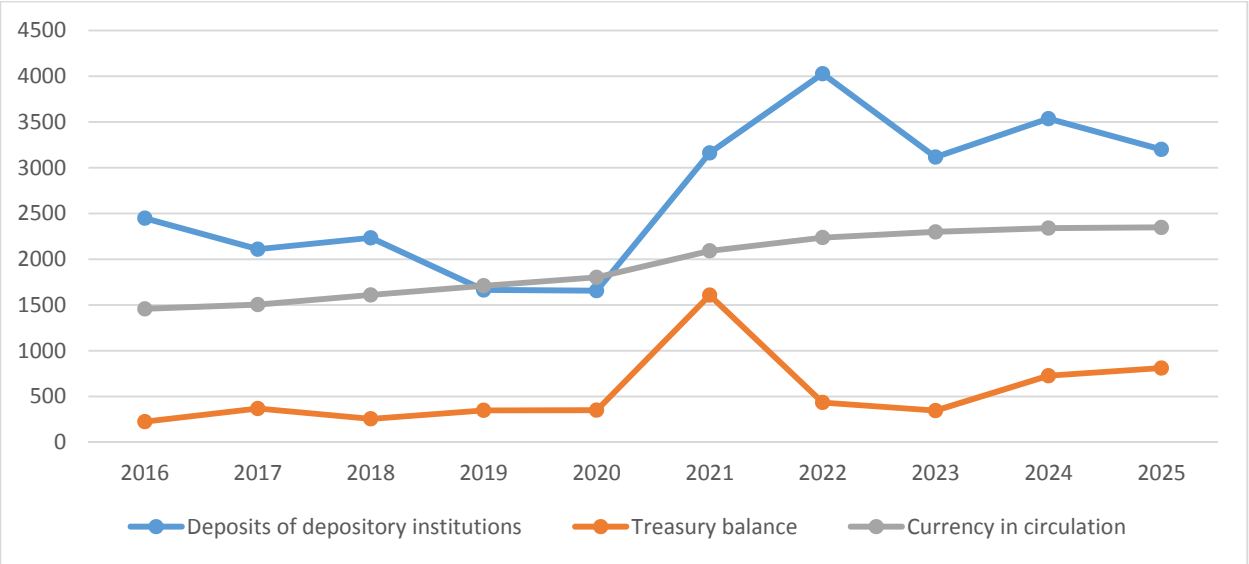

Fig. 9. **The Dynamics of the Change in the Fed's Liabilities, Billions of Dollars**

Source: Author's calculations based on the database FED. URL: https://www.federalreserve.gov/monetarypolicy/bst_recenttrends.htm (accessed on 05.09.2025).

first time in the history of the Fed. Interest income of central banks is the main source of income that allows you to effectively earn on the difference in the yield of loans issued to commercial banks and securities. So in 2021, the Fed earned $ 122.5 billion in interest income and incurred $ 5.7 billion in losses. as an interest expense.[9] Note that at the end of 2021, the Fed's liabilities amounted to $ 8.7 trillion. Obviously, different types of obligations have different repayment rates. But an increase in interest rates increases interest expenses proportionally. For example, an increase in the interest rate to 5% resulted in an increase in interest expenses of about $ 300 billion for 2022. Calculations were made taking into account the reduction in the Fed's obligations for 2022, which are shown in *Fig. 9*.

Using a simple general equilibrium model, as stated in the study [17], it would be appropriate for a Central bank with a large balance sheet consisting of long-term nominal assets to have access to a financial authority and be prepared to request support for its balance sheet. Otherwise, its ability to control inflation may be compromised.

Monetary policy practices have improved significantly over the last couple of decades; as a result, hyperinflation has been extremely rare. The global financial crisis challenged traditional monetary policy, which was based on a single instrument approach (the benchmark interest rate) and a single objective (price stability). It is obvious that the global economy needs a new approach to monetary policy and international coordinationof the monetary policy of central banks is needed [18]. As indicated in [19], neither monetary policy nor the fiscal support program have the necessary effect during balance sheet crises. As we can see, the situation with unrealized losses is a vivid illustration of the situation of a crisis in the balance sheets of commercial banks, which can lead to a recession in the global economy. It should be noted that the instruments for curbing inflation of a country that issues the world currency and a country that supplies energy resources cannot be identical. The fact that for the US Federal Reserve it is only a deterrent to economic growth, but at the same time reduces the level of inflation, for another economy it can be a very painful blow to the standard of living

[9] The official website of the US Federal Reserve System. Annual report of the Board of Governors of the Federal Reserve. URL: https://www.federalreserve.gov/publications/annual-report.htm (accessed on 28.05.2023).

of the population and the profitability of industrial production.

CONCLUSIONS

The US Federal Reserve implements a mixed monetary policy that includes various tools, such as increasing the key rate, decreasing the balance sheet, and expanding reverse repos. These actions lead to a crisis in commercial banks' balance sheets, problems with refinancing government debt, and force the Fed to expand its balance sheet again. An increase in the Fed's balance and government debt may cause additional imbalances in the future, as confirmed by Fed Chairman J.R.R. Powell at the last meeting of the Board of Governors. Powell stated that he does not know how to solve this issue. A higher level of government debt results in higher interest payments on loans, increasing government spending and eventually leading to higher taxes.

Thus, we can draw the following conclusions:

1. The Federal Reserve's monetary policy appears to be inconsistent, as it includes decisions aimed at both increasing the value of money and reducing inflation, as well as decisions that lead to an increase in the money supply and stimulate the economy. It is worth noting that these two groups of actions occur simultaneously.

What is the Federal Reserve's monetary policy? On the one hand, it maintains a high key rate, and on the other hand, it actively injects liquidity into the system through reverse repo transactions. This monetary policy could be described as "situational", meaning it is neither quantitative easing (QE) nor quantitative tightening (QT).

2. How long can you maintain a high key rate? In the short term, the maximum impact on reducing inflation has been achieved, but it still doesn't meet its target. Looking ahead to 2025, the Fed is taking the right approach with its current strategy. A high interest rate level will help maintain confidence in the system and inflation targeting remains an effective tool for price stability in all countries studied [20].

However, in the longer term of 2026–2027, the accumulated imbalances in the system will be even more significant. This is because, firstly, it will become more expensive to service the national debt. Secondly, a new wave of inflation will start; associated with an increase in the balance sheet, as the reverse repo volumes will be exhausted. Rates are not likely to be significantly lowered in 2025 or 2026 either.

3. The current situation of rate hikes is a "gold mine" for the largest players in the US financial market. On the one hand, they earn more than 4% per annum on overnight reverse repo loans. On the other hand, they also earn on short-term US Treasury bonds, which are inexorably declining throughout the year.

Interested banks and financial institutions have started making the necessary trading operations ahead of the Federal Reserve's rate hike. However, all these preventive measures will not be able to overcome the impending crisis of the US financial system in the long run.

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ABOUT THE AUTHOR

Elvira N. Belozorova — Cand. Sci. (Econ.), Assoc. Prof. of the Department of General and Project Management, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0009-0001-2355-858X
enbelozorova@fa.ru

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Credit in the Model of the Infrastructure Industry Ecosystem of the Agro-Industrial Complex

D.A. Korobeynikov
Volgograd State Agrarian University, Volgograd, Russian Federation

ABSTRACT

The development of the FinTech, AgTech and GovTech industries and the digital ecosystems that are emerging around them, the prospects for their convergence and the emergence of hybrid architectural solutions based on them are the subject of active scientific discussion. The purpose of the study is to develop the concept of a hybrid solution for the agro-industrial complex, incorporating industry value chains and public administration functions in a single digital platform, as well as the subsequent development of an ecosystem model of the functioning of agricultural credit. The methodology of this work is based on the hypothetico-deductive approach, and the hypothetical design of the study is formed by assumptions about the feasibility of developing ecosystem forms of government functions implementation in the agro-industrial complex. These include the need to integrate elements of the credit mechanism within the agro-industrial industry into the value chains that form the business models of industry ecosystems, as well as the possibility of creating a digital infrastructure ecosystem that combines commercial and government services on a single platform. Based on cases existing in the agro-industrial complex and financial sphere of digital ecosystems, we have developed a model of an infrastructure industry ecosystem. The model is structured into object, environmental, process, and project subsystems. Organizationally, the ecosystem will have a modular structure, and the Russian Ministry of Agriculture will act as its coordinator and IT integrator. Within the proposed model, we outline directions for incorporating elements of the industry credit mechanism into the ecosystem value chains, and for preferential loans, government support measures will become an element of a new ecosystem form of implementing public administration functions in the agro-industrial complex. The credit segment of the infrastructure industry ecosystem is implemented as a client-centered system based on digital technologies and FinTech, elements of the environmental subsystem and credit infrastructure. This system ensures seamless interaction between all participants and cost savings through the automation of transactions and the exchange of information.

Keywords: digital economy; ecosystems; platforms; ecosystem business models; agricultural credit; agro-industrial complex; preferential loan; digital state

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INTRODUCTION

Digital business ecosystems are becoming a “new systemic actor” [1] in the economy and social life of modern society, especially in the field of e-commerce and in the financial industry, where three basic models have developed: American-Chinese, Russian and European. In the former, bigtech prevails, with a secondary role for financial services and institutions. In Russia, the core of ecosystem business is mainly traditional financial institutions (banks and neobanks). The European model is characterized by the niching of services, the active role of customers and fintech startups. Despite these differences, credit is an integral part of all business models in the ecosystem, which makes research into changes in the form and content of credit relationships relevant.

In the agro-industrial sector, ecosystem formation occurs through the creation of private industry ecosystems by major players and banks in order to promote their own services, product markets, and logistics solutions. This includes the formation of industry databases and the development of online consulting services. At the same time, the specific features of loan operations are determined by the operational characteristics of the industry and by preferential measures provided by the government.

The ecosystem concept has also penetrated the field of public administration, which is associated

with the growth of GovTech industries developing technological solutions for the state. Government information systems and services form a digital ecosystem that provides citizens and businesses with remote access to public services, but its architecture is "patchwork" in nature, where each agency invests in its own GIS, data centers, software and staff, which complicates interdepartmental interaction and creates a trend towards creating interdepartmental platforms. Within the framework of the state program "Information Society", a single state cloud platform GosOblako, the national data management system GosData, and the GOSTECH platform have been created, allowing the transfer of disparate IT solutions into a single cloud infrastructure.

The development of AgTech, FinTech, and GovTech technologies and the ecosystems emerging around them make it possible for them to converge with the advent of hybrid ecosystem solutions. Therefore, the hypothesis of the study is formed by a number of interrelated assumptions: firstly, about the expediency of an ecosystem model for the implementation of government functions in the field of support and regulation of the agro-industrial complex, in particular, in the field of preferential bank loans and other preferential elements of the credit mechanism.; Secondly, about the need to incorporate elements of the credit mechanism of the agro-industrial complex and complementary functions of state support into industry ecosystem business models; thirdly, about the possibility of forming an infrastructural industry ecosystem (IOE), providing access to industrial services (including credit) for industry actors within value chains, proactively complemented by government support measures.

The hypothesis put forward: a) corresponds to the general trends towards the modernization of traditional business models in the agro-industrial complex based on ecosystem solutions integrating financial and non-financial services; b) is characterized by a variety of applied implementation options; c) provides an opportunity to extend the practice of proactive provision of public services to agricultural support programs and, in particular, to the mechanism of preferential lending; d) assumes obtaining a synergistic effect as a result of synchronization of the functions of the credit and economic mechanism, as well as public administration within the framework of a single organizational and managerial solution. In addition, certain elements of the proposed ecosystem are already being implemented in practice. In particular, the Agribusiness Digital Services Information System, integrated with the Unified Identification and Authentication System, the Gosuslugi portal and other industry GIS, will start operating in 2025. By 2028 the service will ensure a 100% transition to remote, targeted and proactive provision of state support measures and reporting on subsidies received. It is logical to assume that after the unification of all public services into a single industry information system, its development will continue towards convergence and interaction with private platforms, and the IOE model describes the likely scenario of these processes.

The detailed description of research tasks in accordance with the hypothesis suggests:

1) development of a model of an infrastructural industry ecosystem that integrates tools and mechanisms for interaction between industry business structures in value chains into a single platform solution and proactive implementation of government management and industry support functions (potentially such an ecosystem may become the largest, but obviously not the only ecosystem solution in the agro-industrial complex);

2) determining the location of a preferential loan and other elements of the credit mechanism of the agro-industrial complex in terms of their integration into the object, environment and process subsystems of the digital ecosystem of the industry.

Within the framework of the study, the application of the hypothetical-deductive method will have features related to the impossibility of a complete empirical verification of the consequences deduced from the hypotheses put forward, since the model of the agro-industrial complex infrastructure ecosystem is conceptual and implemented only in fragments. The application of the analogy method will partially solve this problem by identifying similar structures in existing ecosystems and policy documents of the industry department.

A MODEL OF THE DIGITAL INFRASTRUCTURE INDUSTRY ECOSYSTEM OF THE AGRO-INDUSTRIAL COMPLEX

The relative novelty and applicability of the term "ecosystem" to a wide range of phenomena, as well as the variability of organizational models associated with it, lead to a variety of interpretations of this concept. L. Thomas and E. Autio classify ecosystems into innovative, entrepreneurial, and knowledge ecosystems by product type, and business ecosystems, modular ecosystems, and platform ecosystems are distinguished within innovation [2]. I.M. Stepnov and Yu.A. Kovalchuk identifies industrial and service ecosystems [3] (the latter, according to the authors, dominate in Russia — Sber, Yandex, VK, MTS), but a more common option is to identify three basic areas of research in this area [4]: 1) business ecosystems, focusing on the environment in which it operates a firm; 2) innovative ecosystems focused on a specific innovation and a value proposition based on it; 3) platform ecosystems that consider the organization of participants around the platform.

In accordance with the initial concept of J. Moore [5], a business ecosystem is understood as a network of interconnected economic entities formed around the main technology [6] or platform [7]. Subsequently, as scientific interest in the problems of business ecosystems grew, a multiplicity of research approaches developed. Today, business ecosystems are considered as:

- "cooperation mechanisms that allow firms to combine individual proposals into a single customer–oriented solution" (author — the value of which is higher than the sum of the usefulness of individual proposals) [8];
- "a group of firms ... that have mutual joint specialization at the group level and are not unilaterally hierarchically managed" [9];
- "a spatially localized complex of hierarchically uncontrolled organizations, business processes, innovative projects and infrastructural systems interacting with each other during the creation and circulation of material and symbolic goods and values" [10];
- "an interdependent set of entities that are regulated in such a way that they allow taking actions" [11];
- "a set of interrelated business entities, business organizations, institutions, and business processes that formally and informally come together to communicate" [12];
- "based on modularity rather than hierarchical management ... a set of organizations producing complementary components of value that form a specific structure of relationships and coordination without the need for vertical integration" [13].

In the second area, the focus is on the central role of innovation in ecosystems [14], more precisely, "systemic innovations created and commercialized through ecosystems ... whose value proposition is supported and expanded through continuous innovation" [15]. Ecosystems themselves are considered as the "main organizational consequence of digital innovation|" generated by the "digital technological revolution" and best adapted to new ways of creating and preserving value" [16]. At the same time, unlike cluster formations, the center of innovative ecosystems can be a digital platform that reduces the transaction costs of interacting actors [17], which actually blurs the boundaries between innovative and platform ecosystems.

Ecosystems formed around platforms (platform ecosystems) are considered as "multilateral markets" that enable transactions between different user groups [18], and interaction and transaction management between related parties are provided by a special type of technology — the platform (in fact, the result of innovation, produced and controlled by its owner or "sponsor") [19].

Another theoretical concept that often appears in research on ecosystems is "digital ecosystems|", considered as "a set of economic entities that are closely connected to a key company based on a digital platform or digital infrastructure and interact with it and with each other based on a hybrid transaction management mechanism" [19]. That is, in this context, "digital ecosystems" are considered as "digital in terms of the infrastructure on which they are built", while retaining all the features of ecosystems "in terms of how they are organized" [20].

Thus, the results of even a brief theoretical review indicate the absence of generally accepted definitions and classifications of existing ecosystems, therefore, in the framework of further research, we will talk about them in line with the subject area united by

the term "digital platform ecosystems", considering them as multilateral markets implemented on a digital platform infrastructure that go beyond the traditional understanding of the market, industry or a vertical hierarchy based on the complementarity of actors in the process of creating the final value.

In this context, J. Rietveld, J. N. Ploog, D. B. Nieborg note the critical dependence of multilateral platforms on complementary parties and user support on both sides of the market [21], which highlights the complementarity of platform ecosystems, which affects their ability to dominate the market. Complementarity is one of the key properties of platform ecosystems, often mentioned in the context of additions, components, modularity, interdependence and synergy [22], which is understood as dynamic combinations of resources, processes and participants that are beyond the hierarchical control of the platform owner, but complement each other in the process of creating value on the platform [23], and being a source of network effects [24].

An important aspect of research on ecosystems is the assessment of the role of the state, which is often limited to "regulating and supporting competition" [25], but there are often studies where the role of the state is interpreted more broadly, for example, in the context of heterogeneity of participants, manifested not only in "covering several industries, but also in attempts to overcome the boundaries between the public and private sectors" [2]. As a result, ecosystems can be interpreted subjectively more broadly than just a set of interconnected business structures, and include government agencies and financial authorities as ecosystem participants [12], considered as "the basis for public-private partnership in the digitalization of various sectors of the economy" [26] or "forms and environments of partnership of organizations, authorities and citizens who ensure the constant interaction of their digital platforms" [27]. That is, allowing for any form of government involvement in ecosystems of various kinds.

The considered approaches to defining ecosystems as a new organizational entity of the digital economy reveal their main properties — the network nature of interaction around a value proposition, the interconnectedness and interdependence of a large group of participants, the emergence of a proposal (the value of a complex product exceeds the value of the sum of individual proposals), the lack of a clear hierarchy in organization and management, the modularity of architecture, the asymmetry of the position of actors relative to the central the participant (the owner of the platform). These theoretical provisions, taking into account the cases of actually functioning ecosystems, form the basis for further research related to modeling promising options for convergence of elements of the credit mechanism and industry ecosystem solutions in the agro-industrial complex.

Noting the trend towards the dominance of digital ecosystems in many markets (network effects and economies of scale lead to monopolization or oligopolization according to the winner-takes-all principle), M. Treiber, T. Theunissen, S. Grebner, J. Witting, H. Bernhardt conclude that such dominant solutions are not yet available in the agricultural market, being replaced by a multitude of digital solutions inside its segments [28]. There are many digital platforms of different scales and ecosystems formed around them in the industry, which determines the tendency towards convergence and integration of platform and ecosystem solutions implemented in practice [29, 30].

At the same time, one should agree with the opinion that "the tasks of industry digitalization are too big for one company... Therefore, we should not talk about disparate systems and services, but about a platform that provides the opportunity for disparate systems and organizations to work together" [26], that is, a single ecosystem solution implemented across the industry, including with government participation. In relation to the agro-industrial complex, such ideas about the need to "form a unified digital ecosystem of the agro-industrial complex" based on the integration of "scientific and industrial information resources ... and systems" are still of Soviet origin [31].

We will outline approaches to the formation of an infrastructural industry ecosystem and the development of business models based on it, integrating business processes and government support mechanisms in the agro-industrial complex. *IOE can be defined as a digital community of independent actors offering complementary components of value linked by a common industry*

chain of its creation, forming a modular, client-centered organizational structure devoid of hierarchy and coordinated by the owner of the digital platform (the Ministry of Agriculture of Russia) for effective interaction of technological platforms, Internet services and information systems of the state, business and rural population.

The proposed concept of an infrastructural industry ecosystem is a new type of platform ecosystem that has common features with traditional business ecosystems. It is distinguished from existing practices by:

- the absence of the asymmetry of participants characteristic of private ecosystems, since its technological core is formed by the state digital platform, and the central actor is the Ministry of Agriculture of Russia.;
- proactive provision of state support measures through the convergence of government and commercial (including financial) platforms in a single digital shell, which is especially important in the agro-industrial complex, where the role of the state in creating added value is traditionally high;
- the value proposition goes beyond the boundaries of the traditional understanding of the industry (for example, seamless interaction with financial platforms) and its formation around industry value chains (production, financial and information needs of industry manufacturers).

Functionally and organizationally, IOE will combine the capabilities of existing digital platforms and ecosystem solutions in the agro-industrial complex at the technological, information and legislative levels, but at the same time its development should be based on the "one of many" principle. In other words, it will not replace existing ecosystem and platform solutions in the industry, but will function in parallel, competing with other market participants, on the one hand, and forming a public infrastructure for their interaction, on the other hand.

Ecosystem architecture is understood as "a set of fundamental principles of an organization, which are embodied in a set of its components, the relationships of components with each other and with the external environment, as well as the principles of design and development" [27]. A distinctive feature of ecosystem architecture is "its modular and interdependent system of basic and additional components interconnected by design rules and a common value proposition." At the same time, in organizational terms, ecosystems are "less formal and less hierarchical structures than firms, but more closely related than traditional markets" [32]. With regard to the proposed digital IOE model, its architectural solution is based on the actual cases of existing ecosystems in the agro–industrial complex, but differs from them organizationally — the state will become the founder and system actor, which will determine its functional and elemental differences [33].

The development of the digital IOE architecture was carried out within the framework of the methodology proposed by G.B. Kleiner [10], according to which a "full-fledged" ecosystem combines the features of the main types of economic systems — objects, environments, processes and projects that form its subsystems: 1) an object subsystem (or an organizational component) in the form of a cluster; 2) an environmental subsystem (or an infrastructure component) in the form of a digital platform that implements interaction; 3) a process subsystem (or a communication and logistics component) that provides network communications; 4) the design subsystem (or the innovation component) as a mechanism for implementing innovations (*Fig. 1*). Systemic economic theory considers the balance of the internal structure of economic entities (proportionality of the named subsystems) as a prerequisite for their sustainable functioning, and the "consolidation of the interests of participants" as a mechanism for overcoming the asymmetry "causing systemic deformations" [34], which determines the essence of economic ecosystems and the relevance of a systematic approach to their study.

1. The object subsystem is an association of financial and non-financial businesses that implement separate business processes within the ecosystem, the distinctive features of the component will be: the participation of the state represented by the Ministry of Agriculture as a system actor and IT integrator, the extraterritoriality of the interaction of business structures, clustering based on the industry community of value chains, proactive complementation of business requests of industry customers complementary measures of state support, access of the rural population to

a remote channel for the implementation of social policy in rural areas. The ecosystem will have a modular organizational structure based not on hierarchy, but on coordination carried out within the framework of the implementation of the functions of public administration of the Ministry of Agriculture of Russia, with full economic independence of the actors in the process of interaction. The Agency, as the leader of the ecosystem, will determine its final architecture, establishing common rules and methods of interaction, standards and interfaces for coordinating the activities of participants. The formation of an ecosystem on a public platform, equidistant from all business actors, will avoid the main ecosystem problems that arise around private digital platforms — "economic dominance", "abuse of economic power", "consolidation of control and ... value" in the hands of the platform owner [16]. In other words, IOE will provide common and equal access to the multilateral market for all industry participants, while private platforms and the ecosystems formed around them primarily serve the economic interests of their owners.

2. The environmental subsystem is a digital technology platform (marketplace) on which the services of the participants are available. Technically, the digital technology platform of the Russian Ministry of Agriculture will be "a set of technological reusable components at each level of architecture (infrastructure, data storage, technology services, business logic, application solutions, channel applications) ... development and operation tools, integration tools, analytics tools, security tools to increase speed.[1] The distinctive features of the component will be a combination of functions: user interface, aggregator site, accumulation and processing of financial and non-financial information, marketplace and payment system, implementation of budget subsidy mechanisms in the form of smart contacts, online access to government services, an open database of best practices and online consulting.

As a distributed information system, technically the platform will also have a hybrid architecture combining the principles of centralization and decentralization. Centralized, managed segment of the platform (decision-making, data storage and processing, transaction management, security) The

[1] The concept of general regulation of the activities of groups of companies developing various digital services based on a single ecosystem (approved on 14.04.2021 No. 3760p–P10).

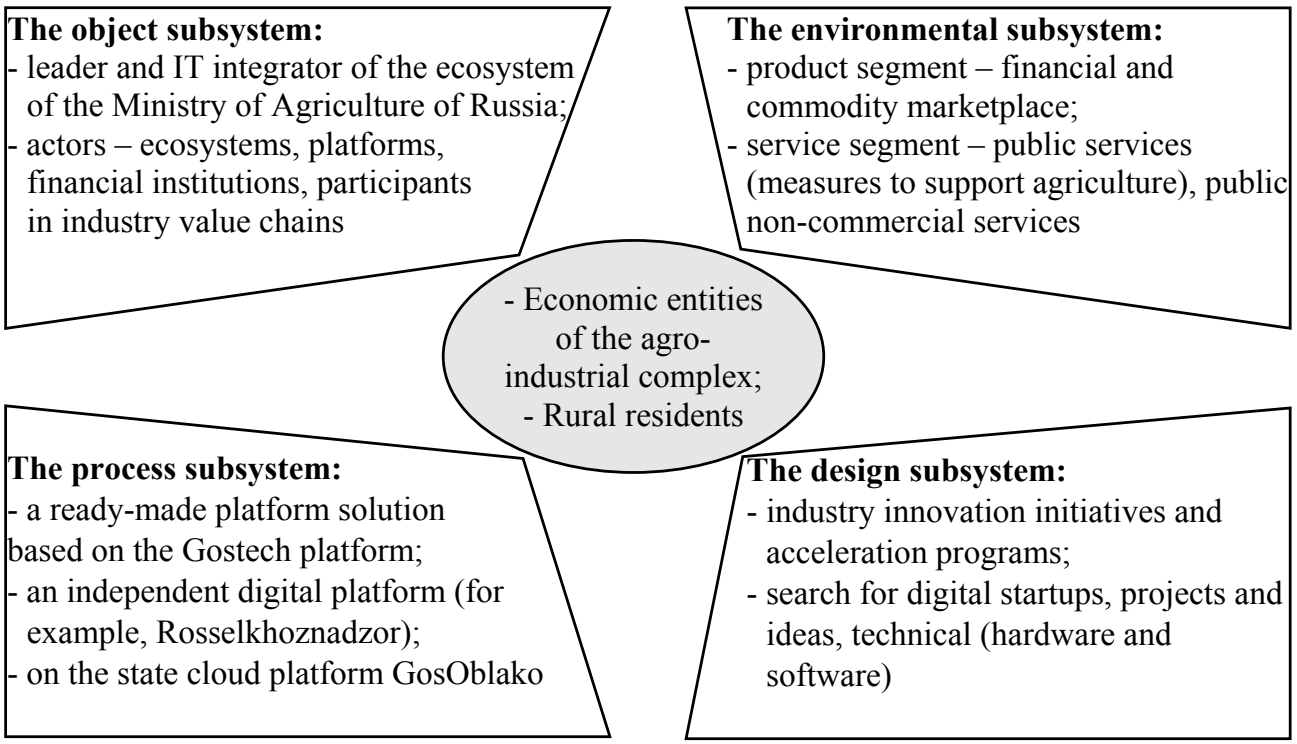

Fig. 1. **A Model of the Digital Infrastructure Ecosystem in the Agro-Industrial Sector**

Source: Author's development.

Ministry of Agriculture of Russia, will be a virtual platform for participants to communicate through secure interfaces. It will house a closed part of the ecosystem's service segment, designed to provide public services to agribusiness (G2B) and rural populations (G2C), as well as other segments of the ecosystem at the initial stage of its development. In the future, the product and service segments of the ecosystem that ensure the interaction of business participants (B 2B) will move to a decentralized segment of the platform, operating on the basis of peer-to-peer networks and blockchain. The main advantages of decentralization are associated with a higher level of information security and the ability to automate transactions.

3. The process subsystem is a stable network structure for the interaction of ecosystem members, supported by an IT integrator. The distinctive features of the component will be: the simultaneous implementation of technological solutions underlying the functioning of digital platforms and e-government, the variability of technological options for applied implementation, and the need for regulatory changes. The development of digital technologies, software and hardware complexes, regulation and unification of approaches to the formation of state digital platforms make it possible to implement this component: a) on the Gostex platform; b) on the existing digital platform of the Rosselkhoznadzor (in this case, it is difficult to ensure equidistance for all actors); c) on the cloud platform of GosOblako (in fact, in GIS Ministry of Agriculture of Russia in the cloud infrastructure).

4) The project subsystem is a set of innovative initiatives and acceleration programs. The distinctive features of the component will be: the involvement of departmental universities and research institutes in the search for startups, projects and ideas, the creation of business incubators and a competence center in the field of scaling industry innovations.

THE CREDIT SEGMENT OF THE INFRASTRUCTURE INDUSTRY ECOSYSTEM

Since the proposed ecosystem's functionality is broader than that of existing financial platforms, it is essential to determine the role and scope of concessional loans and other components of the credit system for the agro-industrial sector in terms of their potential integration into the ecosystem's object, environment, and process subsystems. Additionally, it is crucial to explore new technological possibilities underlying the ecosystem model for non-financial and financial transactions between industrial borrowers, banks, and the Ministry of Agriculture of Russia.

Within the framework of the proposed IOE creation model, *elements of the industry's credit mechanism and credit system are incorporated into value chains that form the ecosystem's business model. And in terms of preferential bank loans, government support and regulatory measures are becoming an element of a new ecosystem model for implementing public administration functions in the agro-industrial complex. Accordingly, the ecosystem model of agricultural credit functioning can be defined as a form of implementation of credit relations within the framework of ecosystem (platform) business models, which is characterized by participation in the intermediation of information and financial flows of a new type of intermediaries — financial ecosystems (platforms), with varying degrees of variability involved in the conclusion and implementation of a loan transaction and creating for its participants additional competitive advantages as a result of network, information and other ecosystem effects.*

Due to the customer–centricity of digital ecosystems, the organizational, infrastructural and service elements of the IOE, interacting with elements of the credit system and the credit mechanism of the agro-industrial complex, subordinated to the needs of different groups of industry borrowers, essentially form a model of the credit segment of the ecosystem, or more broadly, an ecosystem model of the functioning of industry credit, focusing the loan offer on borrowers (*Fig. 2*).

The possibilities of embedding elements of the credit mechanism of the agro-industrial complex into the environmental and process subsystems of the ecosystem are due to the development of end-to-end digital and FinTech technologies that allow maintaining a stable network structure of interaction between actors (lenders and borrowers) and the functioning of a digital platform (marketplace) that

ensures the availability of loans and related services. Therefore, the main technological components of the IOE credit segment model can be attributed:

- End-to-end digital and FinTech technologies. Their development, along with the improvement of hardware, creates the necessary technological conditions for the creation of an infrastructural industry ecosystem, as well as the incorporation and functioning of elements of the credit mechanism of the agroindustrial complex in its structure.
- User interface. As an element of the organization of credit relations, it solves the following tasks: 1) search for and compare credit products for the needs of a specific user (the ecosystem platform operates in the credit marketplace mode); 2) communications, including through closed channels, providing

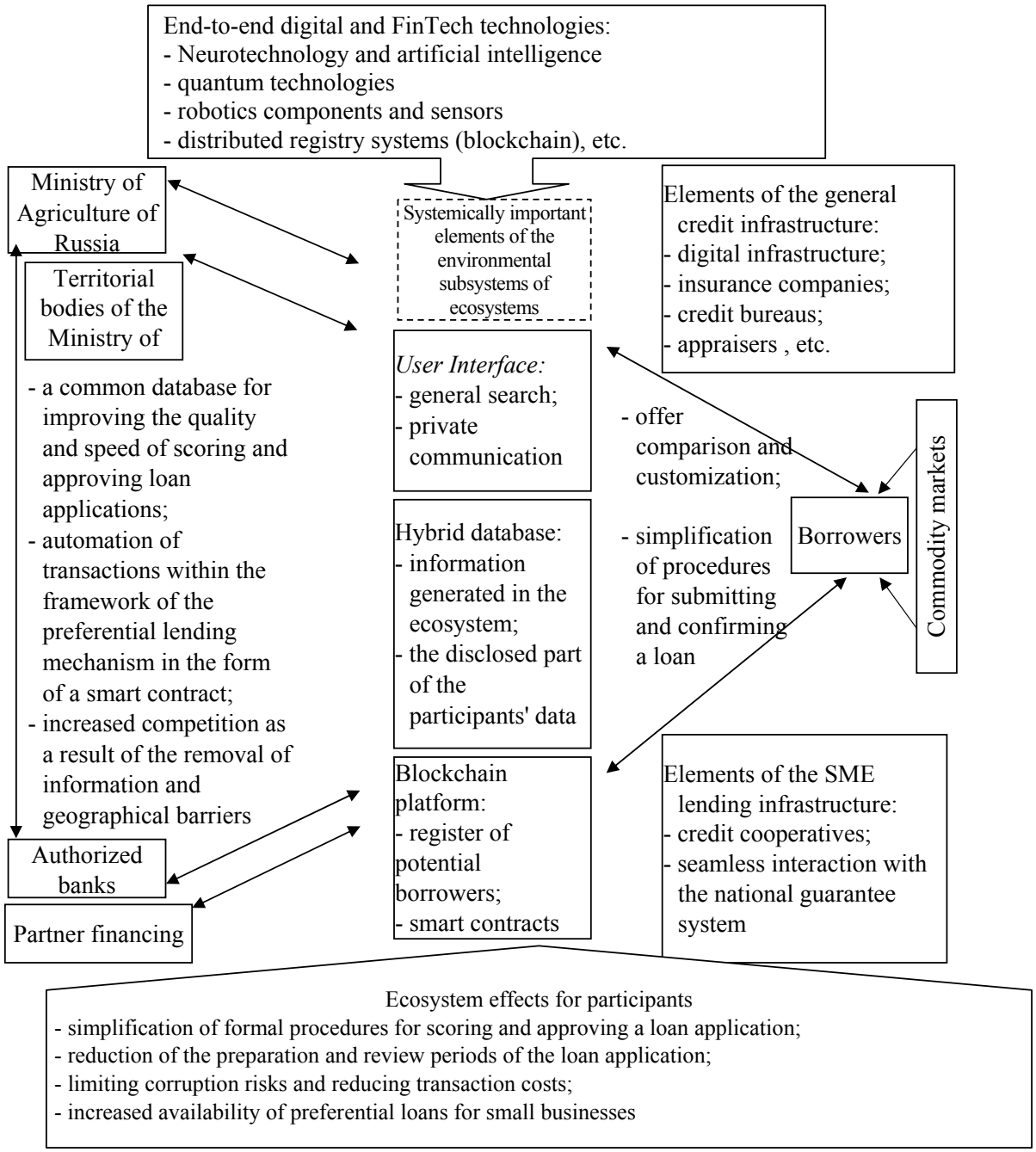

Fig. 2. **The Model of the Credit Segment of the Infrastructure Industry Ecosystem**

Source: Author's development.

financial transactions in different variants (B 2B, B 2G, B 2C, G2C). The formation of multiple product and service segments of the ecosystem, the absence of restrictions on the number of participants in each segment, the development of interdepartmental electronic interaction and the functioning of the platform in aggregator mode will expand the list and ensure the convenience of choosing and receiving digital credit products and services, including those accompanied by a complementary list of government services and subsidy (co-financing) programs. In terms of communications between subjects of credit relations, the functionality of users' personal accounts on the ecosystem platform should ensure seamless, remote interaction and payments between borrowers, lenders, credit infrastructure and the state.

- Hybrid database. Digital IOE will generate large amounts of data that can be used not only to realize the economic interests of actors, but also in the interests of society and the state for the integrated development of rural areas. Of particular value to lenders will be data on search queries, transactions, payments, and other information about potential customers accumulated and disclosed by the ecosystem in compliance with legal requirements. An additional information advantage of the ecosystem model may be the partial access of creditors to the information resources of the Federal Tax Service and the Ministry of Agriculture of Russia for automatic confirmation of constituent and accounting data used to assess creditworthiness.
- A blockchain platform. As part of the IOE, it can be implemented as an independent technological solution (in the longer term) or in collaboration (which is more likely in the short term) with existing or under development blockchain platforms (for example, Masterchain, developed by the Fintech Association or the digital ruble platform being developed by the Bank of Russia). Regardless of the implementation option, blockchain technology will allow automating various forms of credit relations in the form of smart contracts.

In terms of embedding elements of the credit mechanism of the agro-industrial complex into the IOE object subsystem, its credit segment is a collaboration of various groups of actors — direct and indirect participants in credit relations, building communications using the technological capabilities created by the ecosystem. The following groups of actors are identified within the framework of the proposed model:

- The state is the Ministry of Agriculture of Russia and its territorial bodies. The preferential nature of agricultural loans is ensured by subsidizing bank loans, recapitalizing development institutions, creating a national guarantee system, and other measures. Consequently, the ecosystem model of implementing the mechanism of preferential lending to the agro-industrial complex assumes active government participation. In this group of actors, the main role is assigned to the branch agency that performs the functions of: 1) defining and legislating areas and measures of support, setting limits on budget expenditures and target parameters for their effectiveness; 2) working out the conditions and procedures for legally significant actions and transactions that constitute the content of specific support mechanisms and form the basis for their algorithmization and automatic execution in the digital shell of the ecosystem (in the form of smart contracts); 3) transfers of subsidies to creditors; 4) control of target parameters and effectiveness of budget expenditures.
- Lenders are banks and partner financing institutions. This group of actors forms the offer of credit products for industry borrowers. At the same time, along with banks, innovative digital partner financing services can be involved in the credit and financial contour of the industry ecosystem, actively developing under the influence of FinTech technologies and forming a loan offer outside the traditional loan capital markets. In particular, in its forecasts,[2] the Bank of Russia expects to strengthen the role of partner financing in such areas as gratuitous loans (a pilot of Islamic banking was launched in Chechnya and Dagestan in 2023), financial leasing, factoring, installment payments under purchase and sale agreements, loan guarantees, and equity participation programs on partnership terms, microfinance. Online P2P services (crowdlanding — online platforms for direct communication between lenders and borrowers without the participation of a financial intermediary)

[2] The draft dated 28.11.2022 of the main directions of development of the financial market of the Russian Federation for 2023 and the period 2024 and 2025.

and P2B lending (crowdfunding — investment platforms that accumulate and provide small amounts of financing) are developing.

The potential for the development of these debt financing channels is largely attributed by the Bank of Russia to "the entry into the financial market of large e-commerce companies (in fact, they have been building an ecosystem business model for a long time) that have the necessary information about the activities of enterprises, on the basis of which assessment systems (rankings) of their investment and debt attractiveness can be created.".[3] Such ratings will significantly simplify the assessment of the creditworthiness of small and medium-sized enterprises, reduce transaction costs associated with its implementation, and create conditions for automating procedures that constitute the content of credit relations in the form of smart contracts.

The equidistance of the ecosystem platform from any group of actors will remove information and administrative barriers for new entrants to the industry credit market, including in the concessional lending segment, and the remote nature of credit operations will remove geographical barriers due to the lack of the need for the physical presence of structural divisions of banks and other lenders in regions and rural areas. As a result, a qualitative and quantitative increase in the supply of loan capital is possible with the formation of a full-fledged financial marketplace on the one hand, and an increase in the competitiveness of the industry credit market on the other.

The incentives for lenders to participate in the ecosystem will be related to the simplification of admission to concessional lending programs involving budget subsidies, as well as the previously mentioned information capabilities of the ecosystem to increase the efficiency and reduce the cost of credit scoring and marketing procedures, and to customize the offer.

- The credit infrastructure of the modern credit market primarily performs informational functions, forming an institutional, organizational, technological and legal environment for the development of credit relations to minimize credit risks and transaction costs. The main infrastructure elements of the IOE credit segment can be insurance, auditing and consulting companies, credit bureaus, rating and collection agencies, credit brokers, appraisers, IT companies, banking associations, law firms, notaries, services for state registration of rights and real estate transactions, etc. Along with traditional institutions, a digital credit infrastructure is being actively developed. In particular, projects of the Bank of Russia, such as the Digital Profile and the Unified Biometric System, can be noted as examples.

Simultaneously with the incorporation of elements of the general credit infrastructure, specialized institutions are needed as part of the IOE, focused on meeting the growing demand for loan capital in the segment of small and medium-sized enterprises. In this area, the prospects for the development of the credit segment of the industry ecosystem may be related: a) with the involvement of credit cooperatives, which initially evolved as a microcredit institution and are able to function not only as an independent type of financial intermediaries, but also as a consolidated borrower (on behalf of its shareholders) in relations with banks; b) with ensuring seamless interaction of borrowers belonging to the category of SMEs in the agricultural sector through a personal account on the platform of the industry ecosystem with the institutions of the national guarantee system.

CONCLUSIONS

The study contributes to the theory of ecosystems by developing a model for a new type of platform ecosystem, which is based on a state-owned digital platform. This platform aggregates public services and private platforms within a single industry, providing a single IP address for automating the distribution of government support measures. It also ensures equal access for all actors, eliminating asymmetries and supporting competition in various segments of the agricultural market. Additionally, it forms a supply chain around the production, financial, and other needs of agricultural producers, increasing their value by complexity and coordination with government support programs.

At the same time, the proposed model contributes to the theory of credit by studying ecosystem forms

[3] The draft dated 28.11.2022 of the main directions of development of the financial market of the Russian Federation for 2023 and the period 2024 and 2025.

of credit relations and considering the possibilities of their transformation, primarily in the field of preferential lending to industry. This is based on the new technological and communication opportunities created by ecosystem forms of commercial and government interest in the agro-industrial complex.

Among the possible ecosystem forms of credit relations, the infrastructure industry ecosystem will provide the longest seamless customer path possible between financial and commodity markets, commercial services that allow actors to realize various economic interests, and government services that proactively provide government support measures available to industry entrepreneurs. In other words, it will maximize the potential of this ecosystem form of credit by absorbing and expanding the functionality of both government and financial digital platforms.

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ABOUT THE AUTHOR

Dmitry A. Korobeynikov — Cand. Sci. (Econ.), Assoc. Prof., Department of Economic Security, Volgograd State Agrarian University, Volgograd, Russian Federation
https://orcid.org/0000-0003-4499-1566
korobeinikov77@yandex.ru

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ORIGINAL PAPER

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Impact of Anchoring, Herding and Loss-Aversion on Working Women's Investment Decision-Making

H. Srivastava[a], S. Moid[b], N.J. Rushdi[c]
[a] IILM Academy of Higher Learning, Lucknow, Uttar Pradesh, India;
[b] Amity University, Lucknow, Uttar Pradesh, India;
[c] Mashwarah Investeducation, Lucknow, Uttar Pradesh, India

ABSTRACT

The area of behavioral finance integrates economic and psychological concepts to comprehend and elucidate the decision-making process involved in personal finance. The **purpose** of this paper is to determine the impact of anchoring, herding, and loss aversion on influencing working women investors' investment decision-making. The sample size consists of 196 working women investors who are trading in the Indian Stock Market from Uttar Pradesh, India. A structured questionnaire is used for the collection of data, which is based on a five-point Likert scale. The SPSS (Version 22) software is used to **analyze** data employing the linear regression function. The **result** of this study confirmed that anchoring, herding, and loss aversion bias have a significant positive impact on working women investors' investment decision-making. Based on the data obtained, this paper concludes that anchoring has the most influence on working women investors' investment decisions, followed by herding, while loss aversion has the least influence on working women investors' investment decision-making. The findings of this study have significant **implications** for working women investors, researchers, policymakers, and financial advisors. Awareness of these behavioral biases is vital for empowering working women to make informed and rational investment choices. It is important for financial advisors and policymakers to acknowledge these behavioral biases in order to offer customized counselling and support for working women investors. Even though these biases affect people of both genders equally, this research concentrates on how they particularly affect working women since they frequently deal with particular socio-cultural settings and expectations.

Keywords: anchoring; herding; loss-aversion; investment decision-making; working women investors; Indian stock market

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INTRODUCTION

Due to the changing environment, women have discovered the potential of investing and adopting a disciplined and careful approach to it. Mainly because women are becoming financially independent. Their interest in finance and business has grown significantly [1]. Working women are becoming more active participants in the equities and mutual fund markets. The Indian stock market also takes proactive measures to encourage more female investors to participate in the stock market [2]. India is among the top five largest stock markets in the world. The main objective of this study is to explore the role of anchoring, herding, and loss-aversion in affecting the investment decision-making of working women investors trading in the Indian Stock Market.

Traditional financial theories assume that after carefully weighing a range of options from various situations, investors make rational investment decisions. The efficient market hypothesis (EMH) contends that all information is represented in security prices and that no one can consistently outperform the market to generate excess profit [3]. However, behavioral finance research has emerged to contradict classical finance theories by proving that humans do not always show rational behavior. The study of behavioral finance examines how emotions and cognitive mistakes impact an individual's behavior. The Prospect hypothesis claims that psychological variables affect investors'decision-making and cause them to diverge from rationality [4]. Behavioral biases are dependent on individual gender which means that males and females have different attitudes towards investment in the stock market [5, 6].

Anchoring is when people base their decisions on the first piece of information they learn and then act accordingly. Anchoring bias is found in the behaviour of women investors who are investing in the capital market [7]. The herding behavior of investors refers

to the situation where investors act in the group in contrast to their own beliefs [8]. Herding has a significant influence on investors' trading behavior [9]. Female investors are found to be more prone to follow the investment behaviour of their family and friends than male investors [10]. The loss-aversion means that people's response to losses is stronger than their response to their corresponding gains. Women investors realize fewer capital losses, and they, when compared with men, are found to be more loss-averse[11].

This research primarily focused on analyzing the behavior of women investors while making financial decisions due to the following reasons: First, women investors are generally considered to be more risk-averse than men investors because, for them, safety is more important than return. Second, female investors lack knowledge or less confidence about available market opportunities because they have a fear of stock market investments. Thirdly, when it comes to making financial investments, women investors primarily rely on the counsel of others. Lastly, male and female investors follow distinct approaches while choosing stocks. Various researchers have studied the impact of behavioral biases on the financial decision-making of individual investors in India [12–15]. However, this research attempts to study the role of three psychological biases, i.e., anchoring, herding, and loss-aversion, in influencing working women investors' decisions who invest in the stock market and belong to Uttar Pradesh, India. There is a dearth of study in this area concerning Indian women investors from the northeast region. The practical implications of this paper will help working women investors, financial advisors, and researchers become aware of the following three biases that prevent women investors from making irrational investment decisions.

LITERATURE REVIEW

In this study, literature has been searched based on the keywords working women investors, anchoring bias, herding behaviour, loss-aversion bias, and investment decision-making.

Working Women Investors

Men and women have different approaches toward investment in the stock market. Behavioral finance studies the reason behind the irrational behavior of investors. Women in the workforce who possess financial literacy are inclined to invest their surplus funds and make necessary financial plans prior to making purchases in order to generate substantial investment returns [16]. However female entrepreneurs believe that investment is a long-term instrument because they are conservative and risk-averse [17]. Women are typically less confident, less knowledgeable about finance, and reliant on advice from others when it comes to making investing decisions [18]. In terms of risk-tolerance capacity, women have less risk-tolerance ability than their male counterparts [19]. Behavioral biases play a significant role in influencing the investment behavior of working women investors [20].

Anchoring and Investment Decisions

Anchoring bias consists of cognitive shortcuts adopted by people [21]. The first piece of information investors receive determines the extent of anchoring bias. Investors are prone to anchoring, particularly when they base their decision on the basis of 52 high and low prices of the stocks [22]. A maximum number of investors buy the shares when the value of stocks decreases than their intrinsic value [23]. Anchoring bias negatively influences the investment behavior of investors [24]. Individual investors get impacted by anchoring bias for the lowest price rise in the equity market [25]. When equities are trading close to their 52-week high, investors are able to maintain a low level of expectation for their future gains [26]. Anchoring bias also leads to the price moment of cryptocurrencies [27]. It has been noted that women anchor more frequently than men do [28].

H1. Anchoring significantly affects the investment decision-making of working women investors.

Herding and Investment Decisions

Herding while investing in the stock market refers to mimicking the investment pattern of other investors. Factors that encourage investors to copy other investors are negative news sentiments towards stocks, market uncertainty, rise in interest rates, currency depreciation, and some economic crisis [29]. Herding is noticeable in the Indian stock market when there are market upswings [30]. Investors with similar demographic factors tend to follow the same trend

in their investment behavior. The generation, gender, and matrimonial status of investors have a significant impact on their herding behavior. Herding behavior is found to be significant among women investors [31]. Male and female investors significantly differ in their behaviour to herd in the market. Female investors are portrayed as having more herding bias than male investors [32]. Herding has a strong positive impact on the financial decisions of investors [33]. Herding effects and market factors play significant and influential roles in helping people make well-informed decisions [34].

H2. Herding significantly affects the investment decision-making of working women investors.

Loss Aversion and Investment Decisions

The demographic variable, which includes gender, age, income, and the number of dependents, has an impact on investors being loss-averse in nature [35]. Loss-aversion bias has a major impact on the investing decisions made by investors [36]. The loss-aversion bias of investors negatively affects the market performance of the companies [37]. Women investors are loss-averse when it comes to their investment in the capital market. Lack of financial literacy may be the reason for the low-risk behavior of women investors [11].

H3. Loss aversion significantly affects the investment decision-making of working women investors.

The Figure represents a conceptual model to understand the relationship between behavioral biases in influencing the decision-making process of working women investors.

MATERIAL AND METHOD

Research Design and Survey Procedure

A cross-sectional research design has been used in this study, which aims for collective measurement of the effects of loss-aversion, anchoring, and herding on investment decision-making. The study is based on a survey research design. The population of the present study is the working women investors investing in the Indian stock market who live in Lucknow, Uttar Pradesh, India. According to the report given by the Labour Bureau, the maximum number of women are employed in the education, health, IT, and financial sectors [38]. So, working women investors who are employed in these four sectors and investing in the Indian stock market are taken as the sample of this study.

Working women investors are sampled using convenience and snowball sampling methods as the total population of the study is unknown [39]. Data has been collected from the period of April to June 2023. For the unknown population, the sample size is determined using the following formula:

$$SS = [Z^2\, p\, (1 - p)] / C^2, \quad (1)$$

where SS — Sample size; Z — Given Z value; p — Percentage of population; C — Confidence level.

By taking the confidence interval as 95%, population proportion as 50%, and a margin of error as 7%, the required sample size is 196.

Survey Instruments and Measurements

A self-administered questionnaire has been built to obtain responses from the selected population. The questionnaire is divided into three parts and comprises 20 close-ended questions that collect information regarding the demographic profile, factors determining herding, anchoring, and loss aversion, and their impact on investment decision-making. The first section sought demographic information on the variables of age, marital status, occupation, monthly income, monthly savings, frequency of trading, and years of investment experience of working women investors in the stock market. This helps in getting information about working women investors' demographic profiles. The second part includes situation-based questions that help in evaluating the anchoring bias, herding behavior, and loss-aversion bias of working women investors. Each behavioral bias is measured using 2–4 items and includes 8 items of the questionnaire, which is based on a Likert scale. The final section consists of five Likert-scale-based questions about factors that affect investment decision-making. *Table 1* displays the construct, source, and measurement.

Data Analysis

After the collection of data, descriptive statistics and inferential statistics are applied for analyzing the result. SPSS version 22 software has been used for statistical calculation. A reliability test is performed

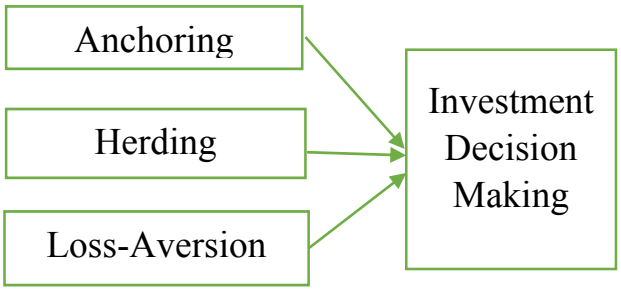

Fig. **Conceptual Framework**

Source: Authors' compilation.

on the measured construct (loss aversion, anchoring, herding, and investment decision-making). Frequency and percentage calculations have been used for the allocation of data on demographic profiles. Multiple regression analysis has been performed to determine the impact. This test is used to determine which bias has the most and least influence on the investment decision-making of working women investors. The following regression equation is used for the study —

$$IDM = \beta_0 + \beta_1 A + \beta_2 H + \beta_3 LA + \varepsilon, \quad (2)$$

where *IDM* — Investment Decision-Making; β_0 — Constant; β_1, β_2, β_3 — Regression Coefficient; *A* — Anchoring; *H* — Herding; *LA* — Loss Aversion; ε — error term.

RESULTS AND DISCUSSION

Reliability Test

Cronbach's alpha test has been performed to test the reliability of the data. The range from 0.70 to 0.90 is considered good for further analysis of data. The reliability test is performed on 4 variables, i.e., herding, loss-aversion, anchoring bias, and investment decision. *Table 2* shows the result of the reliability test. The value of Cronbach's alpha of all the constructs is above 0.7, which makes the data reliable for further analysis.

Demographic Profile of Working Women Investors

The total number of working women investors who have successfully filled out the questionnaire is 196. Based on age classification, working women aged 20–30 years old are 32.7%, 31–40 years old have the highest proportion in the sample, i.e., 39.3%, and 41–50 years old are 28.1%. In terms of educational qualification, under-graduated women are 10.2%, 37.75% of women are graduated, 39.28% are post-graduated and women holding professional qualifications are 12.8%. 43.4% of women are single, 49.5% are married, and 7.1% are separated. About 39.8% of working women investors are employed in government jobs, 43.4% are working in private jobs, and 16.83% are involved in business. Furthermore, the highest number of respondents are earning a monthly salary of Rupees 50 000 to 100 000 (33.67%) followed by those who are earning between Rupees 100 000–150 000 (28.57%), women earning less than 50 000 (18.36%), getting a monthly salary of Rupees 150 000–200 000 of 12.75% and those who are earning more than Rupees 200 000 are 6.65%. They also believe in saving a considerable amount of income with monthly savings of Rupees 20 000 of 37.75%, monthly savings of Rupees 20 000–40 000 of 44.89%, monthly savings of Rupees 40 000–60 000 (12.24%), and monthly saving Rupees 60 000–80 000 of 5.1%. Data also reveals that most women do not prefer trading regularly (13.77), they mostly invest in the stock market on a monthly basis (48.97%) or annually (37.75%). The percentage of female stock market investors has been rising over the past few years. Of these, 56.12% of women have invested for a maximum of one to five years, followed by 18.36% who have trading experience of less than a year, 17.85% who have trading experience of six to ten years, and 7.6% who have invested for a period exceeding ten years.

Regression Result

The Multiple Regression model is used to analyze the degree of relationship between the dependent variable and the independent variable. In this case, variable investment decision-making is the dependent variable, and Behavioral biases (loss aversion, herding, and anchoring) are the independent variable. To evaluate the model's fitness, the outcomes of the model summary are evaluated. *Table 3* shows that the estimated coefficient of correlation indicates a value of 0.696, which means that a relatively high linear correlation exists between a dependent variable and an independent variable. The model summary result demonstrates that R Square shows 0.485 variations in investment decision-making due to anchoring, herding, and loss aversion. The value of adjusted R squared is 0.477, which stands near to r squared. The adjusted R square result suggests that all independent variables (Herding, loss-aversion, and anchoring) together account for 47.7% variation in investment decision-making. It also indicates that the remaining 52.2% of this variation in investment

Table 1

Construct, Source, and Measurement

Construct	Measurements
Anchoring [40]	In trading, the purchase price of stocks serves as a reference point
	Recent market experience affects your investing decisio
Herding [41]	While investing, you seek guidance from brokers
	Your investing decision depends on the suggestions of a well-known analyst
	You consult your friends and family for their opinions
	News about the firm affects your investing decisions
Loss-Aversion [40]	You avoid danger when there is a guaranteed profit
	You are a risk-taker when there is a certain loss
Investment Decision-Making [42]	Your recent stock purchase has yielded a rate of return that fits your expectations
	Your decision-making assists you in achieving your investment goals
	You are satisfied with the volume and frequency of your trades
	You considered your feelings about the company's products and services
	Before investing, you consider the stock's prior performance

Source: Authors' compilation.

Table 2

Reliability Test

Construct	Items	Cronbach's Alpha
Anchoring	2	0.79
Herding	4	0.84
Loss- Aversion	2	0.78
Investment Decision-Making	5	0.91

Source: Authors' compilation.

decision-making is due to other factors that are not included in this study. Hence, it is considered a reliable model as it includes the right variables, which show almost 50% variation.

F- Statistics show the model's overall fitness. Given that the associated value is less than 0.05, *Table 4* shows that the overall model significantly defines the dependent variable. It also suggests a linear relationship between the independent and dependent variables.

The data is suitable for developing a regression model. The variance inflation factor (VIF) analysis is used to determine the degree of connection between independent variables. In this study, *Table 5* shows that the VIF value of all independent constructs is below 5, indicating that variables are moderately correlated and that multicollinearity is not present in the regression model [43].

The following regression equation:

$$IDM = 0.661 + 0.433A + 0.231H + 0.175LA + \varepsilon. \quad (3)$$

From the above regression equation, taking all the independent variables (Anchoring, Herding, and loss aversion) to be constant at zero, the investment decision-making would be 0.661. If all the variables are kept constant, a unit increase in the anchoring variable will lead to a 0.433 unit increase in investment decision-making as vice-versa. Secondly, a unit increase in herding will lead to a 0.231 unit increase in investment decision-making. Lastly, taking all variables as constants, a unit increase in loss aversion will lead to a 0.175 unit increase in investment decision-making as vice-versa. This finding

Table 3

Model Summary Results

Model Summary				
Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.696[a]	.485	.477	.6687
a. Predictors: (Constant), Loss Aversion, Anchoring, Herding				

Source: Authors' compilation.

Table 4

Anova Result

ANOVA[a]						
Model		**Sum of Squares**	**Df**	**Mean Square**	**F**	**Sig.**
1	Regression	80.854	3	26.951	60.265	.000[b]
	Residual	85.866	192	.447		
	Total	166.720	195			
a. Dependent Variable: Investment decision-making						
b. Predictors: (Constant), Loss Aversion, Anchoring, Herding						

Source: Authors' compilation.

Table 5

Coefficient a

Model		B	T	Sig	VIF
1	(Constant)	.661	2.731	.007	
	Anchoring	.433	8.276	.000	1.293
	Herding	.231	3.680	.000	1.394
	Loss Aversion	.175	3.207	.002	1.129
Dependent Variable — Investment Decision-Making					

Source: Authors' compilation.

suggests that working women investors mostly get affected by anchoring, followed by herding, and loss aversion, which has the least influence.

Hypothesis Testing

For the anchoring factor, its significance value is 0.000, which is significant at the 0.05 level, given in *Table 5*. This means that anchoring bias has a significant positive impact on the investment decision-making of working women investors. So, working women investor's get affected by the first piece of information they receive about the stock they are willing to buy or sell. This finding is consistent with the result obtained by [23, 28, 41, 44, 45].

For the herding factor, its significance value is 0.000 which is less than the 0.05 level given in *Table 5*. In this case, this means that herding bias has a positive impact on investment decision-making of working women investors. The herding instinct of women investors will affect their ability to make investments in the stock market. The finding is similar to the results given by [12, 13, 33, 46–48].

Loss-aversion bias also has a significant positive impact on the investment decision-making of working women investors with a significant value of 0.002 less than the 0.05 value given in *Table 5,* which means that on incurring fewer returns on investment, women investors would like the sale of their stocks. The result is consistent with [45, 49].

CONCLUSION

The goal of this study is centered on assessing the impact of anchoring, loss aversion, and herding on the investing decision-making of working women investors

who are trading in the Indian stock market. Working women investors in four different sectors (education, hospital, IT, and financial) from Lucknow district, Uttar Pradesh, India, are selected as samples for the research. A structured questionnaire is used for the collection of data. The findings of regression analysis illustrate that anchoring, herding and loss-aversion have a significant positive impact on the investment decision-making of working women investors. Anchoring has the most influence on working women investors' investment decisions, followed by herding, while loss aversion has the least influence on working women investors' investment decisions. Results are similar to the findings obtained by [12, 13, 23, 28, 41, 45, 49].

This study does, however, have certain restrictions, much as other studies. In the Indian state of Uttar Pradesh, this study is carried out. If the experiment is done in a different place, the results may be different. The sample size chosen is based on a limited sample drawn from a specific region that truly reflects the complete population; this is regarded as another restriction of this study, despite the fact that this sample size is relevant for doing statistical computations. As shown in *Table 5*, the data is suited for developing a regression model since the variance inflation factor (VIF) of all independent constructs is equal to one, indicating the absence of multicollinearity. The information gathered for this study is also subjective, meaning that it depends in part on each person's attitude, motivation, willingness, and consent. As a result, the information may not accurately reflect the genuine sentiments or beliefs of the respondents.

IMPLICATIONS AND FURTHER RESEARCH

Women have an important role in boosting the global economy, yet they are still viewed as underutilized assets [50]. The participation of women investors has started increasing in the stock market. It is certainly important to study the behavior of women investors while investing. Females are gaining more control over their finances and wealth management. Stock investment for women investors is about meeting their long-term goals using appropriate investment strategies. But while investing in the stock market, they are influenced by various behavioural biases that prevent them from making rational investment decisions [51–54].

The findings of the study have significant implications for working women investors, financial advisors, and researchers. Awareness of these behavioral biases is vital for empowering working women to make informed and rational investment choices. It is important for financial advisors and policymakers to acknowledge these behavioral biases in order to offer customized counselling and support for working women investors. Scholars will get an idea of new areas of research that are available in the field of behavioural finance.

For future research, more psychological biases can be considered in different market conditions, and the interrelationship between different psychological variables can also be analysed. This field seems profitable and engaging, as it provides an easy and interesting way to get benefits from the possibilities present in the market.

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ABOUT THE AUTHORS

Harshita Srivastava — Assist. Prof., IILM Academy of Higher Learning, Lucknow, Uttar Pradesh, India
https://orcid.org/0009-0007-4961-7094
Corresponding Author:
harshita.srivastava@iilmlko.ac.in

Sana Moid — PhD, Assist. Prof., Amity Business School, Amity University, Lucknow, Uttar Pradesh, India
https://orcid.org/0000-0003-4768-6508
smoid@lko.amity.edu

Naela Jamal Rushdi — PhD, Founder, Mashwarah Investeducation, Lucknow, Uttar Pradesh, India
https://orcid.org/0000-0001-6113-8319
naelarushdi@gmail.com

Authors' declared contribution:
H. Srivastava — Defining the Research Problem, justification of hypothesis, and assessing the theory.
S. Moid — critical analysis of the literature and methodology validation.
N.J. Rushdi — verification of results.

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Determinants of Vietnamese University Students' Saving Intention

H.L. Do, T.M.P. Vu, V.G. Nguyen, N.M. Vu, D.T. Nguyen, T.V. Tran
National Economics University, Hanoi, Vietnam

ABSTRACT

Saving, particularly saving money, has become a topic that has attracted a lot of public attention. Young people nowadays believe that enjoying the present is more important than worrying about the future, which contrasts with the perspective of previous generations. While there have been some studies on this topic in the past, little research has been done in the context of Vietnam. The purpose of this study is to identify the factors that influence the saving intentions of young people, specifically Generation Z university students in Vietnam. This study uses both quantitative and qualitative methods to collect data from 920 participants aged 18–25, from all regions of the country (Northern, Central, Southern), and currently university students from all three regions of the country. The data was processed using SPSS and AMOS software to create a Structural Equation Model (SEM). The results indicate that attitudes towards saving and financial knowledge have a positive direct impact on saving intentions, with attitude having the stronger impact. Additionally, risk aversion does not directly influence intention to save but has a positive influence through the mediation of attitude. These findings provide valuable information for governments, financial institutions, and universities in promoting the saving intentions of students and, more broadly, promoting saving behavior and financial well-being among young people.

Keywords: attitude towards saving; financial knowledge; Generation Z; risk aversion; saving intention; university students; theory of planned behavior; students' financial well-being model; theory of choice under uncertainty

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INTRODUCTION

The young generation has embraced saving and spending habits different from previous generations [1]. They have become more generous with their daily expenditures, aiming to fulfill their needs, and fit into their desired social circles. Particularly, in the era of Industry 4.0, the remarkable development of technology and marketing makes shopping very attractive and irresistible. Additionally, credit card services — buying now, paying later — are also rapidly increasing, meeting the diverse shopping needs of young people and making spending money easier. Furthermore, there are new perspectives on life, including enjoying the present and worrying less about the distant future. All these factors contribute to a decrease in emphasis on saving, and evidence shows that the savings rate in Vietnam has been declining in recent years. On average during the period 2016–2020, the savings rate as a percentage of GDP was 29.27%, lower than the period 2011–2015.[1] The proportion of savings rate in the economy has shown a decreasing trend. However, saving enhances economic growth by releasing resources that can be utilized to increase the economy's productive capacity. A study about the relationship between savings, investment, and economic growth conducted by Mason indicated that domestic saving plays a crucial role in economic growth [2].

The trend among young people of living for the moment is spreading across various social media platforms. While living without worrying about the future to fully enjoy the present entails many risks, especially in the financial aspect and also impacts the national economy and social well-being. In this research, our approach is to choose the saving intention as the dependent variable instead of saving behavior. The predominant reason for this decision is that intention is seen as an antecedent of behavior, therefore studying the research objects' saving intention is more likely to provide a more in-depth understanding of the research problem and create a firm foundation for future research into the actual saving behavior. Additionally, university students in Vietnam, typically between the ages of 18–23, do not usually engage in saving behavior systematically due to their lack of

[1] General Statistics Office. Statistical Yearbook of Vietnam. Hanoi: Statistical Publishing House; 2020. 23 p.

personal financial income and budget. Therefore, the purpose of this article is to explore the factors that may influence the saving intention of the youth by focusing on answering the following questions:

1. How can financial knowledge, attitude towards saving and risk aversion influence the saving intentions of Generation Z university students?

2. How can the financial knowledge and risk aversion impact saving intention through the mediation of attitudes towards saving?

LITERATURE REVIEW

Saving Intention and Related Theories

Personal saving is a behavior where individuals have the ability to effectively control their spending plans, striving to reduce expenses and cut regular costs to create a financial reserve for the future [3]. This accumulated amount can take various forms including deposits in banks, retirement funds, or life insurance policies. Ajzen pointed out that intention is a factor used to assess the likelihood of performing a behavior in the future, or in other words, intention is a motivating factor that encourages an individual to be willing to engage in a behavior [4]. Saving intention was defined as an individual's inclination to set aside financial resources in diverse forms, with the overarching aims of realizing future goals and mitigating potential risks [5]. There have been numerous theoretical frameworks used in the investigation of saving intention, with the Theory of Planned Behavior (TPB) by Ajzen as the most commonly used paradigm. According to Ajzen, the behavioral intention of an individual is determined by the combination of attitudes towards behavior, subjective norms, and perceived behavioral control. In other words, these three elements — attitudes towards behavior, subjective norms, and perceived behavioral control — are frequently employed to precisely signify behavioral intentions [4]. Satsios and Hadjidakis found that all three components of the TPB model are significant predictors of intention to save [6]. In the context of researching the intention to deposit money in banks, Co and Centeno found that while perceived behavioral control and subjective norms have a positive influence on saving intention, attitude towards saving is an insignificant determinant [7]. In general, the TPB significantly contributed to predicting saving intention [8, 9]. Building upon theTPB, Shim et al. constructed a model of financial well-being for young adults. In this model, the intention to engage in financial behavior is influenced by the three factors of the TPB and an additional factor which is financial knowledge [10]. The incorporation of financial knowledge into the TPB model for the study of saving intention has been undertaken by several prior studies [11–13]. Adopting the theory of choice under uncertainty, Guiso and Paiella clarified the role of risk aversion in predicting individual behavior. In the context of the research, the analysis results demonstrated that people have very different attitudes towards uncertainty, and that these attitudes cause people to sort themselves out so that those who are more risk averse choose lower returns in exchange for lower risk exposure when they invest their money, which is consistent with what the theory predicts [14]. A few later studies also took up risk aversion as an additional factor in predicting financial behavior [11, 15–17].

Attitude Towards Saving

In the Theory of Planned Behavior by Ajzen, attitude towards behavior is defined as the degree of favorable or unfavorable evaluation of the behavior in question [4]. An attitude is a lasting evaluation, such as a positive or negative, favorable or unfavorable opinion about a person, object, or issue [18]. Attitudes can be based on affective, cognitive, or behavioral information, and they can vary in their strength. The relationship between attitudes towards a particular behavior and the intentions to perform the actual behavior has been taken into account by several financial behavior-related studies. Regarding saving for retirement, research in the Malaysian settings has indicated that attitude towards the behavior of saving have a positive influence on the intention to save [19]. While several studies' results also support the relationship between attitude and intention to save [20, 21], Co and Centeno's research with their research into Filipino consumers reveals that the relationship between attitude and intention to save is insignificant [7]. With such conflicting results, and since previous studies have barely targeted younger individuals' saving intention, we propose a hypothesis to shed light on the undiscovered issue:

H1: Attitude towards saving has a positive impact on saving intention.

Financial Knowledge

While many researchers have regarded financial knowledge as one of the components that constitute financial literacy besides skills and attitude [22–24], Huston suggested that financial literacy and financial knowledge are similar, and it is difficult to differentiate them [25]. Eventually, we decided to conduct this research by considering financial knowledge from the perspective that financial knowledge and financial literacy are identical; in other words, financial knowledge includes people's understanding of financial concepts and terminology, financial skills, and confidence. A study on Indonesian university students discovered that there is a significant impact of knowledge, including understanding of banks' product mix, operating mechanism, and activities on their intention to save in Islamic banks [26]. More specifically, with students who have a firm foundation in the Islamic economic systems, the authors found a positive relationship between the two variables with the coefficient of 0.197. This result was similar to another study by Peiris (2019) [27], and in the Vietnamese context, Nguyen (2020) also found that financial knowledge exerts positive impacts on saving intention and, eventually, saving behavior [28].

However, the research conducted in the context of Indonesia has revealed that financial knowledge insignificantly affects saving intention [5]. Due to the conflicting results in these studies, we propose a hypothesis about the relationship between financial knowledge and saving intentions:

H2: Financial knowledge has a positive impact on saving intention.

In the study by Supanantaroek et al., the development of financial knowledge among the surveyed individuals through enhanced financial knowledge programs in developing countries positively influences attitude towards savings [29]. Attitude related to financial activities, particularly attitude towards saving behavior, is a psychological characteristic of an individual related to personal financial issues. Widjaja et al., as these authors agree with the significant relationship between the two variables [11], while a conflicting result was found by Rickwood et al. since these authors indicated that the relationship is significantly weak, particularly the impact of financial knowledge on saving for retirement plans [30]. Since there is no consensus among studies, we propose a hypothesis to investigate this issue further in the context of Vietnam.

H3: Financial knowledge has a positive impact on attitude towards saving.

There has been little research on the mediating role of attitudes towards saving in the relationship between financial knowledge and people's intention to save. Oladapo et al. in a study conducted in Nigeria on the mediating effects of attitudes on behavior when engaging in banking activities suggested that the attitudes towards using banking products, including savings deposits, are influenced by the level of financial knowledge that consumers possess [31]. The results also indicated that the attitude towards a certain behavior directly influences the intention to participate in it. This implies that the indirect impact of financial knowledge on financial behavioral intention occurs through the attitude towards the behavior. This has underscored the importance of financial knowledge in the decision-making process, as possessing a substantial amount of knowledge can lead to positive changes in attitude, thereby influencing the intention to engage in certain behaviors.

H4: Financial knowledge has a positive impact on saving intention through the mediation of attitude towards saving.

Risk Aversion

Each individual responds differently in a given risky situation. Among these responses, there is a fundamental attitude towards risk known as risk aversion [32]. This is a crucial concept in numerous disciplines, including marketing, economics, and finance. Menezes and Hanson note that an individual is considered risk-averse if, in relation to any potential risk, they seek a level of security that is equivalent to the risk's predicted value [33]. Mandrik and Bao define general risk aversion as the individual's degree of negative attitude towards risk arising from outcome uncertainty [34]. On this basis, the research group defines risk aversion as an individual's inclination to choose a certain outcome over probabilistic options. This indicates a tendency on the part of an individual to steer clear of high-risk financial activities.

A study conducted in Australia showed that risk aversion has a positive impact on the intention to save for retirement, although the level of this effect was not high, with a beta coefficient of 0.151 [30]. The

aforementioned result was also obtained by research in Indonesia, but with a much higher level of impact on saving intention, risk aversion has a 49.9% impact on generation Y's saving intention [35, 36]. Similarly, research in the Netherlands has measured saving intentions through risk aversion and concluded that risk aversion is closely related to saving intention and explained 56% of the saving intentions of students studying at Dutch universities, and those with higher levels of risk aversion have higher saving intentions [37]. A study on the intention to purchase life insurance as a form of savings in Bangladesh also found that risk aversion positively influences saving intention [38]. This means that people who typically seek to avoid taking risks, uncertain situations, and outcomes, and prefer situations that have foreseeable outcomes are more likely to form the intention to save. Similar results were also found in a study on engineering students in Malaysia [39]. However, the impact of risk aversion on saving intentions has not been investigated in the context of Vietnam. Therefore, we propose the fifth hypothesis:

H5: Risk aversion has a positive impact on saving intention.

A previous study conducted in Vietnam on the determinants of the intention to buy retirement plans as a form of savings pointed out that risk aversion positively navigated the attitude towards behavior, with a beta coefficient of 0.13 [17]. This can be explained by the fact that retirement plans seem to be a preferred option for a risk-averse individual, as they provide certainty and stability in terms of value compared to other long-term financial investment options. Research by Schmiege et al. on applying the variables anxiety and risk perception in the theory of planned behavior model has also shown research results that anxiety about the risks created by risk aversion has a positive impact on attitude towards behavior [16]. To explain this, the study explained that the impact of risk aversion on attitude towards behavior is through the level of an individual's subjective assessment of the results that risk can bring.

Therefore, being aware of the potential outcome brought by the risk taking on high-risk financial options can lead an individual to make a more positive judgment for saving due to its safeness and stability. In addition, the research group has reached the conclusions through extensive interviews with specific respondents that the majority of those interviewed stated they worry about potential hazards that might arise in their participating in high-risk decisions, which creates negative evaluations on those options and makes saving a more favorable option for them. Therefore, to eliminate the impact of those risks, they will choose to set aside money for the future saving. The research group then proposes the sixth hypothesis:

H6: Risk aversion has a positive impact on attitude towards saving.

Research conducted in the US suggested that an individual's intention to perform a behavior and attitude towards the behavior are influenced by the impact of that individual's risk anxiety [16]. The analysis showed that for non-health related behavior, risk anxiety has an indirect positive impact on the intention to perform a behavior through the attitude towards behavior, with a magnitude effect of 0.17. This is explained through the fact that risk aversion shapes the individual's subjective assessment of the consequences, thereby motivating the individual to make efforts in taking actions to avoid those consequences. In other words, an individual with a high level of risk aversion will have a more negative assessment of the consequences when intending to invest in a high-risk market, thereby navigating that individual to have a more favorable judgment for a safer and more stable kind of financial behavior like saving and motivate the intention to save. Therefore, the research group proposes the seventh hypothesis:

H7: Risk aversion has a positive impact on saving intention through the mediation of attitude towards saving.

This study proposes a conceptual model that investigates the influence of financial knowledge and risk aversion on saving intention, with attitude towards saving acting as a mediating variable (see *Fig.*).

MATERIALS AND METHODS

Research Design

For the qualitative method, we conducted in-depth interviews and observation techniques focusing on the majority of university students in the Northern, Southern and Central regions of Vietnam. The results of in-depth interviews would then be transcribed from recordings into written text, then thoroughly analyzed on the content. For the quantitative method, we identified that the target population of our research was university students between the ages of 18 and 25 from all three regions of Vietnam.

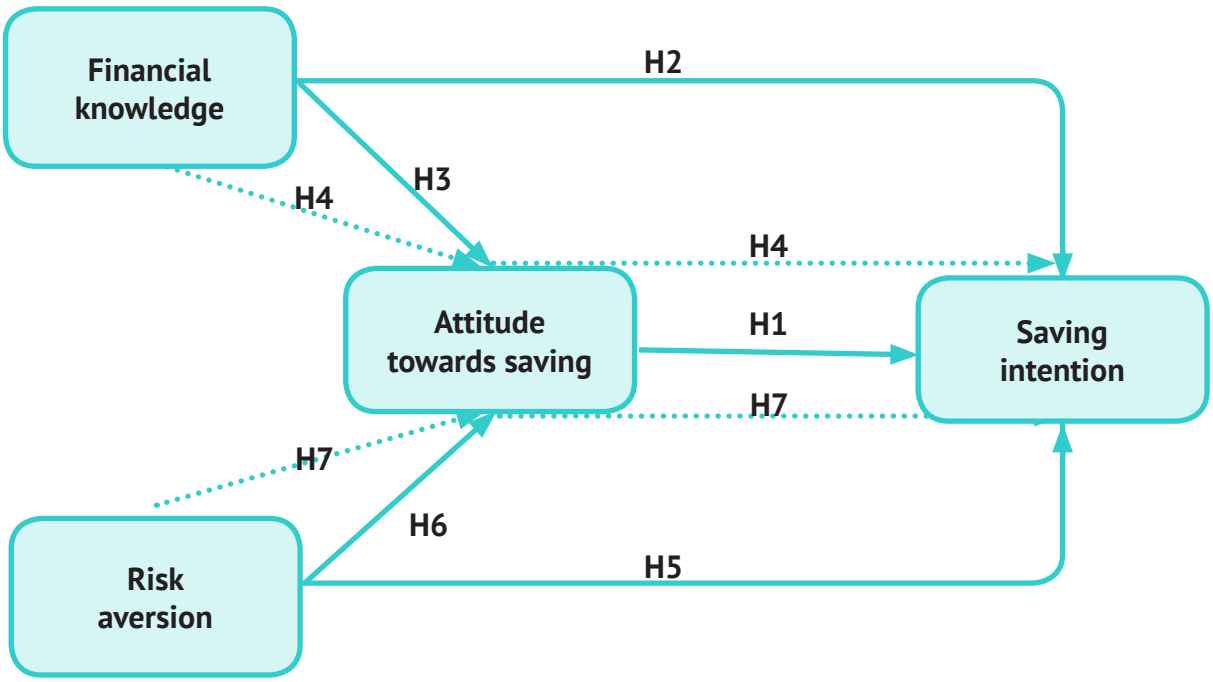

Fig. **Proposed Research Model**

Source: Compiled by the authors.

We collected a sample of 958 participants, but only 920 of them were eligible. The team carried out sampling by sending online questionnaires in the form of Google Forms through social networks to students who were living and studying in provinces across the country. In addition, the team delivered some questionnaires directly to students from universities in Hanoi. The respondents were from various universities in Vietnam, including the National Economics University, the Hanoi University of Science and Technology, the Ho Chi Minh City University of Economics and the Da Nang University. The data collected were analyzed using SPSS for the purpose of descriptive statistics and assessment of scale reliability, exploratory factor analysis, and confirmatory factor analysis. The structural equation model was constructed and analyzed by AMOS to test the hypotheses stated.

Questionnaire

The measurement scale used was a 5-point Likert scale, where 1 signifies strongly disagree and 5 signifies strongly agree.

The assessment questions were based on the research by Widyastuti et al., Zhang & Cain, Akhtar & Das, Mai, Zhao et al., Armitage et al., and Linan et al. [5, 40–45].

Research Sample

Table 1 presents the demographic characteristics of the respondents, including gender, academic major, region, household living arrangement, monthly income, and monthly allowance. The majority of participants in the survey were female, accounting for over 70% of the total. The number of students enrolled in the field of Business and Economics represented the largest proportion at 67.93%. Most students resided and studied in the Northern region of Vietnam, constituting 57.72% of the population. Additionally, most students lived with family members while living alone was the least common arrangement. More than 40% of students reported having no income, and nearly 40% had additional income from part-time jobs, typically less than VND 3 million (approximately equivalent to 125 USD). The majority of students received financial allowance from their families (more than 80%), with the most common amount was less than VND 2 million (32.5%) (see *Table 1*).

RESULTS AND DISCUSSION

Results

The Cronbach's Alpha reliability test was used to assess the reliability of observed variables within a latent factor. Hair et al. suggested that a measure was

Table 1

Demographic Characteristics of Respondents (N = 920)

	Count	Percentage (%)
Gender		
Male	219	23.8
Female	701	76.2
Major		
Economics and Business	625	67.93
Engineering and Technology	99	10.76
Laws, Humanities and Language Studies	89	9.67
Services and Social Studies	44	4.78
Others	63	6.86
Region		
Northern Vietnam	531	57.72
Southern Vietnam	284	30.87
Central Vietnam	105	11.41
Household living arrangement		
Living alone	161	17.50
Living with friends	255	27.72
Living with family members	504	54.78
Monthly income		
No monthly income	377	40.98
Below VND 1 million	135	14.67
VND 1 million to VND 3 million	226	24.57
VND 3 million to VND 5 million	75	8.15
VND 5 million to VND 7 million	51	5.54
More than VND 7 million	56	6.09
Monthly allowance		
No monthly allowance	135	14.67
Below VND 2 million	299	32.50
VND 2 million to VND 3 million	256	27.83
VND 3 million to VND 4 million	126	13.70
More than VND 4 million	104	11.30

Source: Compiled by the authors.

considered reliable if it achieved a Cronbach's Alpha value of 0.7 or higher [46]. Additionally, the Corrected Item-Total Correlation index indicated the correlation between each observed variable and the remaining variables in the scale. A reliable scale is characterized by Corrected Item-Total Correlation value of 0.3 or more. Moreover, the Cronbach's Alpha if Item Deleted could be considered, where a value greater than the original Cronbach's Alpha coefficient for the scale suggested that removing that specific variable may enhance the overall reliability.

Table 2 reports the results of the scale reliability analysis for the study constructs, including financial knowledge, risk aversion, attitude towards savings, and saving intentions.

The results of the reliability test indicated a high level of reliability for the scales measuring the four factors, namely financial knowledge, risk aversion, attitude towards saving, and saving intention. The Corrected Item-Total Correlation index for all observed variables exceeded 0.3 (see *Table 2*). Consequently, all observed variables within the four measurement scales were retained for further analysis.

Exploratory Factor Analysis (EFA) was used to reduce a set of interrelated dependent variables into a smaller number of factors. The criteria for assessment in exploratory factor analysis included the Kaiser-Meyer-Olkin (KMO), Bartlett's test of sphericity, total variance explained, and the factor of loading. According to Hair et al., it was inappropriate to mix dependent and independent variables in a single factor analysis and subsequently employ the derived factors to support dependency relationships [46]. Therefore, in the proposed model with mediating variables, our research team conducted three rounds of exploratory factor analysis sequentially for independent variables (financial knowledge and risk aversion), the mediating variable (attitude towards saving), and the dependent variable (saving intention).

Table 3 presents the results of the exploratory factor analysis (EFA) for the measurement scales, including the KMO values, Bartlett's test of sphericity and the total variance explained.

The results revealed that the KMO values for all the analyses exceeded the minimum threshold of 0.5. The significance level of Bartlett's Test was consistently 0.000, which is below the 0.05 threshold, indicating that factor analysis was appropriate for the data, and the observed variables are correlated within the factors. The independent, mediation, and dependent variables explained 59.83%, 69.489%, and 65.801% of the data variation, respectively. Factor loading coefficients for all observed variables were greater than 0.5 and did not simultaneously load onto two factors (see *Table 3*). Therefore, all observed variables were retained for confirmatory factor analysis. Confirmatory factor analysis was used to evaluate the suitability of the research model. The research team utilized cutoff criteria for fit indices as proposed by Hair et al. (2010) [46]. The results of the confirmatory factor analysis indicated that the proposed model fit the study data well.

Table 2

Analysis of Scale Reliability

Scale	Observed variable	Cronbach's Alpha of the scale	Corrected Item – Total Correlation	Cronbach's Alpha if Item Deleted
Financial knowledge	FK1	0.816	0.561	0.803
	FK2		0.691	0.743
	FK3		0.703	0.736
	FK4		0.594	0.788
Risk aversion	RA1	0.724	0.458	0.696
	RA2		0.511	0.664
	RA3		0.564	0.634
	RA4		0.523	0.657
Attitude towards saving	ATT1	0.890	0.720	0.869
	ATT1		0.756	0.861
	ATT3		0.746	0.863
	ATT4		0.721	0.869
	ATT5		0.717	0.870
Saving intention	INT1	0.896	0.717	0.877
	INT2		0.715	0.878
	INT3		0.700	0.880
	INT4		0.683	0.883
	INT5		0.778	0.868
	INT6		0.722	0.877

Source: Compiled by the authors.

Table 3

Exploratory Factor Analysis

Measurement Scale	KMO Value	Sig Bartlett's Test	Total Variance Explained (%)
FK – RA	0.802	0.000	59.830
ATT	0.873	0.000	69.489
INT	0.895	0.000	65.801

Source: Compiled by the authors.

Table 4 summarizes the model fit indices, including CMIN/df, CFI, GFI, and RMSEA, to assess the adequacy of the proposed research model.

The results of the confirmatory factor analysis indicated that the proposed model was entirely congruent with the study data (see *Table 4*).

A Structural Equation Model (SEM) was employed to examine the relationships between variables in the model, thereby testing the proposed research hypotheses. *Table 5* presents the results of scalar estimation, showing the direct and indirect relationships among financial knowledge, risk aversion, attitude towards saving, and saving intention.

Among the seven proposed hypotheses, four were supported due to having p-values less than 0.05. Hypotheses H3, H4 and H5 were rejected as their p-values exceeded 0.05. Attitude towards saving emerged as the most influential factor on saving intention with a beta coefficient of 0.837. Financial knowledge explained 14.3% of the variation in the dependent variable, saving intention, but did not affect attitude towards saving. The impact of financial knowledge on saving intentions through the mediating variable was insignificant. In contrast, while risk aversion did not directly affect saving intention, it significantly influenced attitude towards saving ($\beta = 0.634$). The influence of risk aversion on saving intention through the mediating role of attitude towards saving was also substantial ($\beta = 0.531$) (see *Table 5*).

Table 4

Model Fit

	Minimum Requirement	Test result
CMIN/df	CMIN/df ⩽ 5	2.957
CFI	CFI ⩾ 0.8	0.954
GFI	GFI ⩾ 0.9	0.968
RMSEA	RMSEA ⩽ 0.08	0.046

Source: Compiled by the authors.

Discussion

Our research shows that attitude towards saving has a significant influence on saving intention of university students. Numerous earlier results related to this influential relationship [19–21]. Individuals who have a favorable outlook on saving are frequently more inclined to implement this activity. Individuals who have higher awareness and knowledge of finance will tend to save money in order to fulfill their self-directed objectives. In addition, individuals with financial knowledge can recognize the significance of having an emergency fund, and thus are more likely to prioritize building an emergency fund to cover unexpected expenses, reducing financial stress in the future. This result is consistent with previous research [26, 27]. More significantly, in our study's findings, hypotheses 3 and 4 were not supported, with the p-values were greater than 0.05, showing that financial knowledge did not affect attitudes towards saving, nor does it affect intentions to save with attitude acting as a mediator variable.

Furthermore, the findings illustrated that attitude towards saving was significantly influenced by risk aversion.

Table 5

Scalar Estimation

Relationship	P-value	Standardized Regression Weights
ATT => INT	0.000	0.837
FK => ATT	0.086	0.062
FK => INT	0.000	0.143
FK => ATT => INT	0.080	0.052
RA => ATT	0.000	0.634
RA => INT	0.085	– 0.073
RA => ATT => INT	0.001	0.531

Source: Compiled by the authors.

This indicates that people have a more positive attitude towards saving when they are afraid of variance and unexpected outcomes. This is in line with the finding of prior studies [16, 17]. In other words, risk aversion may increase the perceived benefits of saving if individuals associate saving with security and stability, contributing to a positive attitude towards saving. However, the research results indicating that risk aversion increases saving intention have been found in many previous studies [30, 35–37], yet it is not in our case. With the mediator role of attitude towards saving, our research indicated that risk aversion has a notable indirect influence on the saving intentions, which is consistent with the findings of Schmiege et al. [16]. In other words, risk aversion can increase the perceived benefits of saving as individuals may associate saving with security and stability. This can lead to a more positive attitude towards saving, as people see it as a way to mitigate financial risks. If individuals perceive saving as a means to reduce risk, they may be more likely to save and feel motivated to do so.

CONCLUSIONS

This study has successfully investigated and indicated the factors that determine the intention to save of Generation Z university students in Vietnam, namely financial knowledge, risk aversion and attitude towards saving. More specifically, financial knowledge and attitudes towards saving have a direct influence on saving intentions. Risk aversion, on the other hand, affects saving intentions through the mediation of attitudes. We suggest that future research for this study should expand in the proposed research model as this study only uses one of the three main factors of the base theory — attitude towards saving but has not added the remaining factors — subjective norms and perceived behavioral control. Moreover, demographic variables were not included in this study. Future research could address this limitation to provide insights on whether there are differences in saving intention among genders, monthly incomes, financial support from families, regions and majors. Additionally, future studies could incorporate additional independent variables, such as future orientation or social influences, to gain a more comprehensive understanding of the topic.

RECOMMENDATIONS

For Depository Institutions

This study provides valuable insights for depository institutions that can help them create new high-tech

integrated campaigns and products to attract saving deposits from young consumers, as young people are among the first to adopt new products. So, it's important for these organizations to focus on their needs. To attract young customers, depository institutions should emphasize the risk-aversion aspect of their products. They should provide customers with certainty and security, which will positively shape their perceptions of savings and increase the likelihood of making deposits. Another approach for these organizations, especially commercial banks, is to offer young customers consulting services regarding high-risk investments and financial management. This can help customers make informed decisions and increase their confidence in the bank's products.

For Educational Facilities

This study's findings can be incorporated by universities to develop targeted programs, such as mandatory financial literacy courses for freshmen or specialized workshops for students. These programs, designed to foster positive perceptions of financial management and build practical skills, can strengthen students' saving intention and subsequent saving behavior[, promoting their long-term financial security and well-being.

For University Students

Due to their reliance on family for financial support, university students should learn how to save in order to build personal resources and future financial reserves. Therefore, we recommend that university students, regardless of their major, should equip themselves with adequate financial knowledge through online resources or workshops in order to create an effective saving and investing plan. In addition, before engaging in an investment strategy, students should be aware of the potential risks of their investment and find a contingency plan and an efficient capital management strategy to maximize their returns and minimize their risks.

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ABOUT THE AUTHORS

Hoai Linh Do — Dr. Sci. (Econ.), Assoc. Prof., School of Banking and Finance, National Economics University, Hanoi, Vietnam
https://orcid.org/0000-0003-0274-2422
linhdh@neu.edu.vn

Thi Mai Phuong Vu — student, School of Advanced Education Programs, National Economics University, Hanoi, Vietnam
https://orcid.org/0009-0006-9893-3782
Corresponding author:
vumaiphuong11032003@gmail.com

Van Giang Nguyen — student, School of Banking and Finance, National Economics University, Hanoi, Vietnam
https://orcid.org/0009-0005-5603-4175
giangnv0712@gmail.com

Ngoc Minh Vu — student, School of Banking and Finance, National Economics University, Hanoi, Vietnam
https://orcid.org/0009-0003-7851-823X
vuminh743@gmail.com

Duc Trung Nguyen — student, School of Advanced Education Programs, National Economics University, Hanoi, Vietnam
https://orcid.org/0009-0003-8712-1816
nguyenduct1234@gmail.com

Thanh Vinh Tran — student, School of Advanced Education Programs, National Economics University, Hanoi, Vietnam
https://orcid.org/0009-0005-4746-2274
thanhvinh21603@gmail.com

Authors' declared contributions:
H.L. Do — systematic reviews of research problems and theoretical frameworks.
T.M.P. Vu — conducting data analysis, summarizing the results and drawing the conclusions from the research.
V.G. Nguyen — proposing the questionnaires and assessing the validity of the methodology.
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D.T. Nguyen — constructing the theoretical framework and research model and editing the format.
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The Theoretical Foundations and Problematic Areas of the Contemporary Long-Term Financing Theory

K.V. Krinichansky
Financial University under the Government of the Russian Federation, Moscow, Russian Federation

ABSTRACT

The imperative of achieving a growth rate for the Russian economy that meets or exceeds the global average-grounded in the pressing issue of resource availability, particularly financial resources-stimulates significant academic interest in a thorough examination of this challenge. Given that financial resources are essential for addressing structural issues, including the establishment of advanced technological production and investments in infrastructure and human capital, these resources must be of a long-term nature; hence, the term "long-term finance" is frequently used in the literature. The **purpose** of this study is to elucidate the concept of long-term finance, identify the key areas of inquiry associated with it, and delineate the theoretical frameworks necessary for examining its various dimensions. The primary **methods** employed in this study include a content analysis of pertinent academic literature and a critical examination of case studies pertaining to the formation and utilization of long-term financial resources across various countries. **Results**: This study has led to the development of analytical approaches to long-term finance, emphasizing their supply, demand, and the mechanisms that facilitate the alignment of these two dimensions. Specifically, the analysis of the supply of long-term finance includes a critical examination of the concept of global savings glut. The measures that resulted in the freezing of Russian reserve assets undermine one of the primary drivers behind the migration of capital flows towards "safe haven" destinations, potentially affecting the incentives for various entities to accumulate substantial savings. In the analysis of the demand for long-term finance, it is demonstrated that the maturity structure of debt held by firms and governments is determined through a trade-off between the costs and the rollover risks. In the examination of the interaction between the demand on and supply of long-term finance, the critical importance of maintaining the functionality of mechanisms that facilitate the transformation of maturities is underscored. The study identifies five vehicles essential for the effective functioning of long-term finance. Furthermore, it demonstrates that regulatory errors can compromise these vehicles, hindering their capacity to supply the economy with necessary long-term financial resources.

Keywords: savings; investment; capital; financial system; financial markets; interest rates; long-term money; long-term financing; sovereign debt; macroeconomic interdependence

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INTRODUCTION

A theoretical perspective on the definition of "long-term money"

In modern economic science, there is no single, clearly defined theoretical field that summarizes the problems of "long-term money". Rather, there are separate areas of science where issues correlating with this problem are discussed. Broadly speaking, these areas belong to financial theory (more precisely — public finance, public debt, corporate finance, financial markets, banking) and to macroeconomics (including business cycle theory, economic growth theory, monetary theory). Since the data in this area cover different research objects, the same can be said about the "long-term money" theory. The object of research here is the economy of individual institutional units — households (as savers), firms and governments (as demanders of financial resources), and the international economy (its subjects, institutions, and organization).

Although the subject of research focusing on the "long-term money" problem can be formulated differently in various works, it contains a common core, for which it is more

accurate to use the term *"long-term financing"*.[1] By taking the national economy as a whole as the object, the subject matter corresponding to the "long-term money" issue will be its characteristics, which reflect the real processes and conditions of financial resource formation and mobilization, the potential for forming financial resources aligned with national development goals, and so on. Thus, *we associate the concept of "long-term money" with long-term financing resources formed primarily on a market basis, the sources of which are the domestic economy and the external world.*

When addressing this concept, it should be distinguished from the concept of money, given their significant semantic distance. The concept of "long-term money" is revealed thru the category of financial resources and therefore has no relation to money as a universal equivalent of exchange. "Long-term money" does not fulfill the functions of money (measure of value, medium of circulation, means of accumulation, etc.). "Long-term money" is also not a special type of money and is not reflected in any money classifications [1].

The basic criterion for "long-term money" as financial resources is their term.

Different thresholds are used here, but most often resources provided for a period of up to a year are considered short-term, while those provided for a period exceeding 1 year are considered long-term ("long"). Another common threshold is 5 years.

Let's propose a comprehensive approach to defining "long-term money". To do this, let's note that long-term financing is the result not only of accumulating a certain property of savings, but also of forming institutions and mechanisms that harmonize the supply of such savings and the demand for them. Building in part on the "Group of Thirty's"[2] vision of an "efficient and developed long-term financing market", we will propose our own expanded set of components that make up "long-term money": (1) household and corporate savings, which constitute the main source of long-term financing to meet the investment needs of the real economy, (2) mechanisms for transforming savings into investments thru banking intermediaries, the capital market, and collective investment schemes (including their infrastructure), (3) cross-border flows of long-term financing, and (4) the long-term financing regulatory system.

The list provided outlines the main directions in which theoretical thot and research methodology concerning the subject under discussion are developing. These directions are detailed and discussed below.

THE SUPPLY OF "LONG-TERM MONEY" IN THE CONTEXT OF SAVINGS RESEARCH

The "long-term money" theory is divided into two approaches: the first focuses on the supply of monetary resources, the second on demand.

The study of the money supply in the economy is projected onto the sources of savings and the development of institutions that facilitate their accumulation. The subjects of these relationships, as well as the institutions that arise in connection with the transformation of savings into long-term investments, are shown in *Fig. 1*.

Households are considered the dominant source of savings. Macroeconomic theory examines the typical one-act cycle of economic circulation, in which the net disposable income received by households is divided into two parts: that spent on consumption and that left at their disposal as savings. The proportions of this division depend on various conditions and motives — from macroeconomic to behavioral. Macroeconomic conditions are among the most important, especially when it comes to

[1] It should be noted that the concept of "long-term money" is not found in English-language academic literature; instead, expressions such as long-term finance, long-term financing, long-term saving, long-term investment sources, and long-term funding are used.

[2] Longterm Finance and Economic Growth. Washington, DC: Group of Thirty; 2013. URL: https://www.drsc.de/app/uploads/2017/03/17_04d_IFRS-FA_long-term_investment_Group_of_Thirty.pdf (accessed on 15.01.2025).

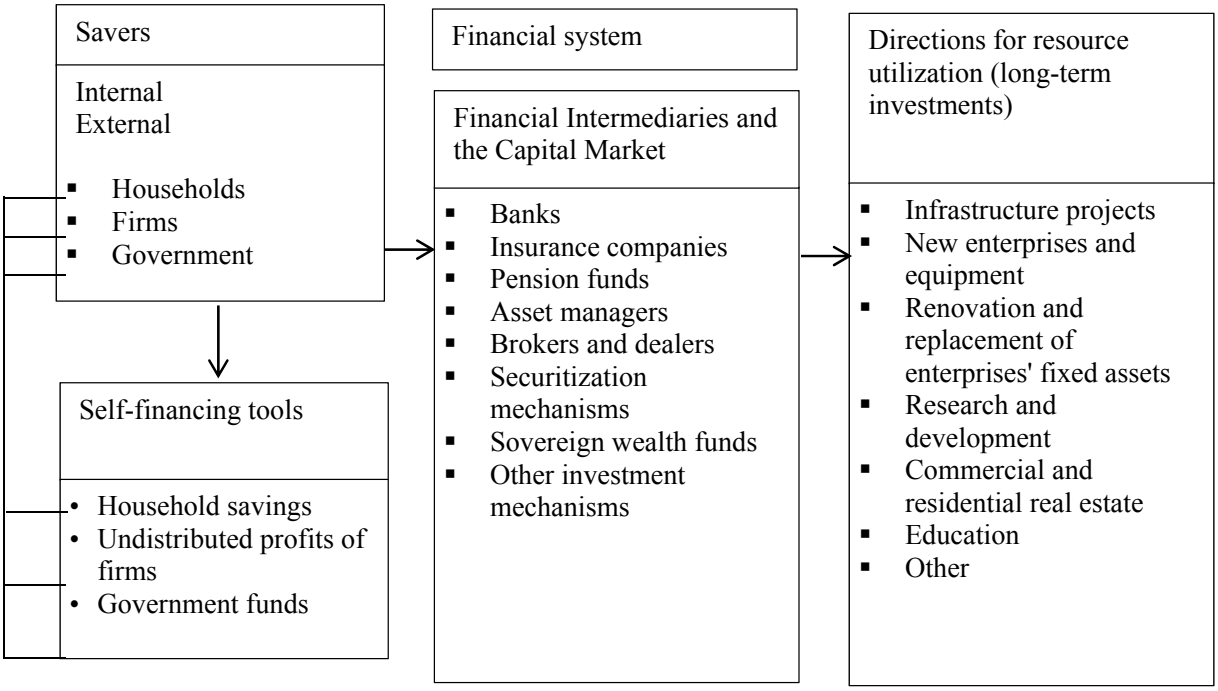

Fig. 1. **Counterparties and Mechanisms of the Long-Term Financing System**

Source: Author's development.

households' willingness to make long-term savings. It is crucial to be confident that such savings will provide the deferred consumption required. From this, the decisions made will depend on a number of parameters, the main ones being inflationary expectations, expectations regarding the yield on savings, confidence in maintaining the source of income, and an assessment of the reliability of the financial institution acting as the conduit for long-term savings.

One of the central subjects in the analysis of savings is saving behavior. Modern savings theory makes a significant contribution to the theory of "long-term money", revealing the characteristics of household savings behavior and analyzing the influence of various factors and driving forces on it. These include macroeconomic factors (income level and dynamics, inflation, inflation expectations, interest rate level and expectations, business cycle phase), uncertainty factors (largely correlated with macroeconomic factors, but also dependent on political and other conditions), cultural factors (education, level of financial literacy, etc.), as well as specific properties of economic behavior that manifest as individual time preferences, risk attitudes, which influence the savings horizon, the degree of discounting of future income streams, and the willingness to take risks.

Recent studies show that the study of saving behavior is linked to the study of a country's demographic conditions and gender structure. This is explained by the fact that such behavior varies significantly across different categories of families/households: single-person households; single-parent families with a child; childless families; two-parent families with children; female-headed households; large families; young families; households headed by elderly people, etc. An analysis conducted by Bank of Russia experts, based on data from the longitudinal survey "Financial Behavior of Russian Households",[3] revealed the following characteristics of savings formation in Russia. The likelihood of savings formation by female-

[3] See: Bank of Russia. All-Russian household survey on consumer finances. URL: https://www.cbr.ru/ec_research/vserossiyskoe-obsledovanie-domokhozyaystv-po-potrebitelskim-finansam/ (accessed on 15.01.2025).

headed households is lower among all age groups (especially when women are over 40 years old); the likelihood of single-person Russian households having savings is lower compared to other types of households. The authors of the report conclude that Russia is facing a growth in the "group of the population characterized by a short planning horizon and a high degree of discounting the future" [2]. Similar research findings on savings are important for determining the parameters and tools of economic policy. Specifically, strategies to encourage savings will be effective if they take into account the characteristics and habits of households.

Another important area of research when analyzing household savings is the distribution of savings among categories of citizens who differ in terms of disposable income level and accumulated wealth. Modern research in this field revolves around the concept of a *global savings glut theory*. In its original framework, traced, for example, in the works of B. Bernanke [3] and L. Summers [4], this concept explained important externalities of savings growth in certain countries against the backdrop of a current account surplus and targeted flows of these savings into safe assets, primarily US Treasury debt and other high-rated dollar-denominated bonds. The most important of these externalities was cited as the reduction and sustained maintenance of interest rates at low levels worldwide.

Initially, the emergence of excess savings was linked to an aging population. This phenomenon in several emerging market countries (the most striking example being the People's Republic of China) and a number of industrialized countries has transformed these countries from net borrowers in international capital markets into net creditors [5]. Later studies revealed the following characteristics. Firstly, the inflow of funds into safe assets in the US in recent decades has been explained not only by capital movement from abroad, but also by purchases by residents, primarily thru the expanding savings of the wealthiest 1% of citizens and households [6]. Secondly, the inflow of capital into the US from other countries was also ensured by the savings of the wealthy in those countries [7], which implies that the global savings surplus and the savings surplus of the wealthy are interconnected [8]. All of this is consistent with the position that the propensity to save increases with rising income inequality, while the propensity to consume decreases [4]. It should also be added that, at least in the US, the savings of the bottom 90% of the population have significantly decreased since the early 1980s to the present day [6].

Considering these results in the context of our subject, we note that the *source of "long-term money" is primarily concentrated in the savings of the wealthiest segment of the population*. In terms of policy, this implies two main strategies. One of these could involve encouraging the use of these savings in riskier long-term assets (reorienting the change in the savings structure toward riskier assets). Another could be based on the idea of reducing income inequality and gradually equalizing the savings rates of the wealthiest and the rest of the population. Given the findings that rising inequality contributes to increased savings because wealthy citizens have high savings rates [9, 10], this recommendation is aimed not so much at increasing savings as at making the system more sustainable and growth-oriented.[4]

The second most significant sector that saves is business. Corporate finance theory and macroeconomics traditionally view private companies not as suppliers of financial resources, but as an institutional unit that demands them. However, the development of financial markets, which allows for the blurring of maturity boundaries thru money market mechanisms, fluctuations in firm leverage, and the phenomenon of firms building up large holdings of liquidity

[4] Indeed, as shown in a deep study by Mian et al. [6], "significant increases in inequality generate excess savings among the wealthy, which can trap the economy in a debt trap characterized by low interest rates, high debt levels, and output below potential".

and financial assets, has recently renewed academic interest in studying firms as savers.

Typical corporate behavior involves "absorbing" savings accumulated by other institutional units to make investments that help companies implement their strategies and achieve their goals, although some companies may also engage in regular saving. Let's first consider the funds needed to keep the business running, cover its current expenses, and create reserves for self-insurance. Companies keep them in their own current accounts or invest them in the money market, and they can only be classified as savings with significant reservations. While the potential of such liquidity for use as a resource for long-term financing is initially quite limited, the improvements in money market mechanisms observed in recent years allow for the methodical redirection of these funds to borrowers by continuously rolling over their obligations. Thus, the money market in its current technological format, using short-term financial contracts, essentially contributes to the blurring of maturity boundaries, influencing the financial models of players in both the financial and real sectors.

In a stricter sense, corporate savings represent long-term resources, often serving strategic purpose, as they provide funds for investment projects, and for financing transactions in the market for corporate control, such as mergers and acquisitions of other firms [11]. Since the main source of such savings is undistributed profits, corporate savings have a significant disadvantage: they are procyclical [12]. Beside the business cycle, the determining factor in the dynamics of such savings is the stability of fiscal conditions, the easing/tightening of which significantly impacts companies' potential to increase savings.

The size and dynamics of corporate savings are highly dependent on the industry in which the company operates. High-tech sectors that invest significantly in research and development stand out here. The higher such expenses, the higher the value of company savings turns out to be [13]. A different logic for explaining the excess savings of companies in the high-tech sector was proposed by L. Summers [4]. She relies on the opinion that IT-related companies have a lower demand for capital. The increase in the share of such firms in output, along with the observed decline in the potential for innovation to boost productivity, is causing a reduction in the demand for investment in fixed capital and, while maintaining high profitability in the IT business, is leading to an increase in corporate savings.

Reliability of the company should be considered an important factor in corporate savings. Since external financing is more accessible for firms with higher credit ratings, it may not be advantageous for them to hold significant assets in the form of cash and financial investments. However, the actual situation with corporate savings in recent years has been different, contradicting the logic outlined. Giant corporations like Apple, Amazon, Microsoft, and others, with high credit ratings, accumulate savings and hold a significant portion of their total assets in liquid form [14]. This phenomenon is attracting corresponding research interest, in its own way complements the concept of a global savings glut [15][5] and enriches the theory of "long-term money".

Recent empirical studies show that the phenomenon of excessive corporate savings extends not only to the largest high-tech companies but also to players in other industries. An important addition to the emerging picture is provided by an analysis applied to Japan and the Federal Republic of Germany. It turns out that there is no increase in household savings in these countries, despite the fact that a significant factor contributing to this — the aging population — is very pronounced. Instead, business savings are growing. This significantly impacts

[5] In this projection, this concept is interpreted as an excess of corporate savings (corporate savings glut).

the savings model, making it shorter-term oriented (as a substantial portion of corporate savings is invested in money market funds), and also (considering corporations' preference for investing in bonds, mainly corporate bonds) [15] on the growth of the debt-to-equity ratio.

New research shows that in recent years, in addition to liquidity motives, there has been a growing desire among the largest non-financial companies to realize their advantages in financial asset management thru the use of cross-border tax incentives. At the same time, in Russia, against the backdrop of existing external restrictions, unstable macroeconomic conditions, and changing tax legislation, corporate savings often play the role of insurance funds, as well as a manifestation of a wait-and-see strategy, reflecting current uncertainty about the prospects for investment programs.

The third saving entity we are considering is the outside world. Views on the role of foreign investors as liquidity providers for national markets differ significantly. Within the framework of the global savings glut concept, according to B. Bernanke and other scholars, economies, primarily developed ones, have been operating at a lower average interest rate for the last three decades. At the same time, the benefits of the global savings surplus are clearly distributed unevenly around the world. The United States is the most successful in using them, although this country has also experienced negative consequences from global imbalances [16] (a chronic US current account deficit, while its largest trading partners have a surplus). Between 2003 and 2006, this led to the formation of a bubble in the American real estate and mortgage-backed securities markets [8]. Finally, it is necessary to note that the blocking sanctions imposed in 2022 on the Bank of Russia's foreign exchange reserves and the assets of the Government of the Russian Federation in US dollars undermine the basis of the processes interpreted as a global savings glut, as investments in American financial instruments are losing their status as a "safe haven". In this situation, countries generating excess savings may reconsider their view of safe assets and even change their savings strategy, reducing the supply of savings in the global market.[6]

The debate about the role of external savings and foreign investors is evident in connection with the analysis of the results of the large-scale financial liberalization of the 1970s-1990s [17]. During this era, governments in a large number of countries implemented reforms that included opening up their capital account and liberalizing the conditions for foreign portfolio investors to participate in their domestic financial markets. Unfortunately, this policy was not well thot out. Weak national capital markets, unreliable banking systems, vulnerable foreign exchange markets, and corrupt elites have been the basis for numerous cases where capital account openness has led not only to the desired inflow of foreign investment but also to increased volatility in financial and foreign exchange markets and has become one of the causes of deep crises.

The most recent studies, based on a wider range of available data, have allowed for a re-evaluation of the place and role of foreign portfolio investors for the host economy. Foreign investors, due to their portfolio diversification capabilities, are more likely to hold long-term domestic debt and equity than resident investors.[7] This conclusion should be supplemented by the following conditions: the country has a sufficiently mature financial market with the appropriate infrastructure; the government's efforts are clearly aimed at upholding and protecting investor rights. Russia's case, in general, fits this model and

[6] O'Neill J. The end of the global savings glut theory of low-interest rates. Project Syndicate. Apr 4, 2022. URL: https://www.project-syndicate.org/commentary/end-of-global-savings-glut-sanctions-inflation-by-jim-o-neill-2022–04

[7] Global Financial Development Report 2015/2016: Long-Term Finance. Washington, DC: World Bank; 2015. http://hdl.handle.net/10986/22543 (accessed on 21.01.2025).

shows that the outflow of foreign capital and the freezing of assets that occurred in 2022, which led to the isolation of the Russian market and marked its fundamental structural changes,[8] were one of the most important reasons for the negative dynamics in the government and corporate bond market and the increased volatility in the stock market. In our view, this is because foreign investors were not just one of the participants, but a necessary institution of the internal capital market, filling the niche of demand for assets, which provides independent professional expertise in the market, helps eliminate information asymmetries, and consistently and firmly defends the interests of debt instrument investors and minority shareholders.

Finally, governments are among the entities that engage in long-term savings. Here, as with corporations, it should be noted that the "standard" model of behavior views governments as pure consumers of financial resources. Cases where governments save money are characteristic of some countries with a sustained current account surplus that implement policies based on a fiscal rule that provides for the creation of long-term government reserves in the form of sovereign wealth funds. These funds play a significant role in ensuring macroeconomic stability, but their role as a source of resources for domestic investment may be limited (depending on diversification requirements).[9]

DEMAND FOR "LONG-TERM MONEY": THEORETICAL AND METHODOLOGICAL PROBLEMS

The demand for financial resources, including long-term ones, comes from the corporate sector, the household sector, and the government.

Corporate financing. External financing is an integral part of the business model that allows companies to be created, grow, and maintain their competitiveness. By demanding financial resources, companies offer their obligations in return, in the form of debt, equity, or hybrid instruments. Within the framework of corporate finance theory, a deep methodology for researching capital structure has been developed, meaning the ratio of self-financing to external financing and determining preferences for choosing specific financing instruments, primarily common stock or bonds. Thus, the subject of research that the works of F. Modigliani and M. Miller [18] drew attention to touches upon the problems of external financing and the contribution of instruments with different maturities to this financing.

Discussions surrounding the patterns of capital structure formation in companies have evolved as theoretical constructs have become more complex (weakening initial assumptions about the insignificance of institutional frameworks, information asymmetry, and transaction costs, as well as tax conditions[10]) and as the results of empirical studies have accumulated. Let's turn to some of the latest similar results. Claassen et al. found that when companies seek external financing for new projects or aim to achieve target capital structure ratios, they primarily resort to debt instruments. Analyzing US corporate sector net capital inflows and outflows from 1946 to 2019, the authors find that the supply of corporate debt is much more elastic than the supply of equity: changes in corporate equity average minus 0.6% per year with a standard

[8] While foreign investors dominated the Russian stock and derivatives segments in 2020–2021, accounting for approximately 47% and 48% of the turnover of these markets, respectively, and ranking 2nd or 3rd in terms of turnover in the debt securities market with a share of about 15%, foreign investor activity ceased in subsequent years; at the same time, the role of retail investors increased, whose share, particularly in the stock market, currently fluctuates around 75%. See: Investor Presentation, December 2021. Moscow Exchange, 2022. URL: https://www.moex.com/s865 (accessed on 21.01.2025); The number of private investors on the Moscow Exchange has exceeded 35 million. Press Release. Moscow Exchange, 2025. URL: https://www.moex.com/n76900 (accessed on 21.01.2025).

[9] A more detailed examination of the theoretical aspects of sovereign wealth fund management has been omitted due to the paper's length limitations.

[10] See hierarchy theory (pecking order theory), trade-off theory, and financial market friction theory.

deviation of 2%, while changes in corporate debt average 7.9% with a standard deviation of 4.3% [19]. Thus, over a long historical horizon, there has been a decrease in capital raised thru stock issuance, which, against the backdrop of good IPO statistics, is a consequence of even larger share buyback figures. At the same time, the role of bonds is growing.

While raising funds thru the issuance of shares is unequivocally classified as attracting "long-term money", a more granular classification is applied to debt financing. Companies raise funds both on a short-term and long-term basis. A significant question here is what the motives are for raising funds for different terms. The simplest answer to this question is the allocation of the funds raised. Short-term debt is appropriate for replenishing working capital, while long-term debt is suitable for financing the creation of fixed assets (capital investments). Attracting long-term debt is often associated with the need to finance large projects with long payback periods.

Additionally, it's important to consider the risks arising from the borrower or issuer. Since the terms offered by the market dictate the need for debt extension, companies are forced to take on this risk. In this sense, long-term financing allows the borrower to reduce the risk arising from extension [20]. This risk is almost entirely related to the probability of interest rate changes. Indeed, market conditions during the period required for the company to implement a project financed with borrowed funds may change and become more stringent than at the project's outset [21]. Furthermore, if firms relying on short-term debt to implement long-term projects face credit or financial crises, they experience extremely tight financial constraints, which can lead to forced restructuring, project delays, and bankruptcies, resulting in significant negative effects on the real economy [22].

The evolving structure of external resource attraction terms is largely a consequence of the development of the domestic financial market and companies' practice of accessing external markets. Using its own credit system and issuing domestic bonds create a basis in the economy for covering the demand for credit from borrowers, but in the case of emerging markets, the maturities are shorter than when issuing bonds on international markets [20].

An empirically observed pattern is that debt maturities increase as a larger share of debt in the economy is held by the bond market and the practice of syndicated lending expands. Another pattern concerns small firms that do not have access to a wide range of long-term external financing alternatives to pursue investment opportunities. This involves developing special mechanisms for access to finance for such players — from creating stock exchange platforms specializing in SMEs to promoting non-mortgage securitization.

Household financing. Although households in most countries have been net savers for most of history and therefore providers of financial funds for the entire economy, there are components within their life cycle that require long-term financing, which is covered by external sources. First and foremost, this concerns housing finance.[11]

The issue of housing finance is addressed in extensive literature. Most modern research is united by the understanding that the limitations of household savings, rising housing standards, the inability to meet the demand for appropriate credit thru standard banking products, and other features necessitate the development of mortgage financing mechanisms. V. M. Polterovich and O. Yu. Starkov traced the evolution of mortgage institutions, starting from the end of the 18th century. The authors showed that "with increasing prosperity, decreasing income differentiation, growing propensity to save, strengthening the rule of law, and a decrease in interest rates and banking margins" [23], the organization of the mortgage market shifts from an "accumulative" model (building

[11] Some other funding areas are also included here — for education and for purchasing cars. We are omitting their consideration due to the limited scope of the paper.

societies, savings and loan associations) to a debt-based model built on a two-tiered structure with securitization, where the borrower's risk is distributed among a potentially large number of investors in liquid, high-rated bonds, and the final cost of the loan for the borrower is significantly reduced.

Financing government expenditures. The state forms a significant portion of the demand for long-term financing. This demand is largely determined by the state's participation in infrastructure development and the implementation of large-scale projects in specific sectors where private business participation may be limited due to high capital intensity and risks (space exploration, nuclear industry, etc.). Such costs are covered in a budget deficit situation by establishing special mechanisms for protecting and encouraging capital investments (SPI) [24], as well as thru the issuance of government bonds. In this section, the problem of "long-term money" transitions into the problem of public debt and its management.

The issues addressed in this context partially overlap with those considered when studying corporate debt. This concerns, for example, a compromise in determining the urgency of obligations, the essence of which is as follows. Since normal yield curves slope upwards, the government could reduce its borrowing costs by shortening the maturities of new bond issues. However, such a reduction increases the risks of extension (refinancing) [25]. The threat of a rollover crisis motivates the government to prefer issuing "long" obligations, even if the interest rate on them is higher. However, this may conflict with investors' aversion to market risk (bond price fluctuations), who often prefer to buy short-term bonds.

Attracting long-term debt becomes more challenging during crisis periods as investors demand an additional premium. In this situation, it might be more advantageous for the government to issue short-term debt, despite the risk of rollover, thereby reducing the average cost of servicing it in the long-term [26]. However, outside of crisis periods, a long-term debt issuance strategy proves to be the most justified, allowing, above all, for a reduction in debt levels in the long-term [27].

It should also be noted that issuing only long-term bonds leads to uneven debt service payments. Short debt helps compensate for this by aligning service payments with tax revenues.

RESEARCH QUESTIONS ON THE INTERACTION OF DEMAND AND SUPPLY OF "LONG-TERM MONEY"

Despite the fact that the study of the "long-term money" problem was divided above into approaches addressing the demand and supply of financial resources, the most important question is how this market forces interact. In this context, it should be noted that the *term structure of such resources in a market economy is the result of risk distribution between the parties to financial contracts* — lenders (investors) and borrowers (issuers).

Therefore, the answer to the question of how much (and whether there is enough) "long-term money" in the economy involves not only an assessment of, for example, savings themselves, even if enhanced by an analysis of the legislation and infrastructure that ensure their accumulation, but also an assessment of the methods and components of the risk distribution system. This significantly determines the structure of the methodology for the theory of "long-term money", focusing research on areas such as the availability and effectiveness of interest rate risk transfer mechanisms, credit risk redistribution, the quality of the banking liquidity management system, and others.

The fundamental issues in the aspects addressed are the formation of economic mechanisms for transforming deadlines (*see Fig. 2*). The widely cited works of D. Diamond, P. Dybvig [28, 29], and other authors reveal the secret of how banks transform short-term liabilities into long-term assets. The same function belongs to highly liquid capital markets, which allow investors to freely dispose of their savings, thereby supporting the long-term

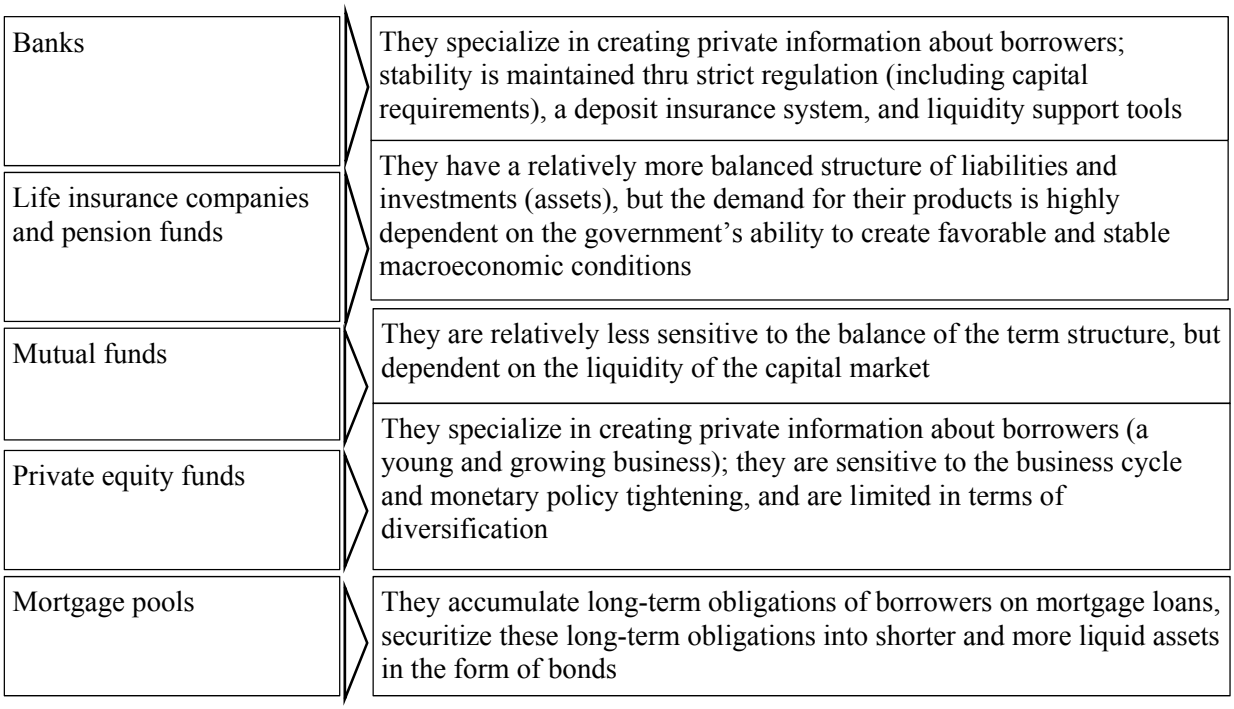

Fig. 2. **Economic Mechanisms of Maturity Transformation**

Source: Author's development.

investments of companies that offer their bonds and equity as liabilities [30].

A significant technology among those considered in *Fig. 2* is securitization. It allows not only for the transformation of terms, harmonizing the preferences of borrowers and a wide range of investors, but also for the distribution of risk to reduce the cost of credit.

Among the financial institutions presented in *Fig. 2*, the longest liabilities are accumulated by non-governmental pension funds and life insurance companies. Macroeconomic conditions and regulations related to their asset operations are crucial in filling such institutions with liabilities. The practices of various countries (particularly Germany, Chile, and Russia) show that the regulations being introduced, aimed at ensuring the safety of funds accumulated by these institutions, can in fact simultaneously disincentivize these players from making long-term investments.[12] Thus, regulatory errors in this sector cause a shift in investment goals toward less risky investments that provide more stable short-term returns, while a very small portion of the portfolio is left for more profitable long-term investments, as they are found to be more volatile.

In conclusion, let's consider the main aspects of the long money problem. Let's analyze how they relate to various theories and concepts discussed in scientific research and academic discussions (*Table*).

CONCLUSION

Modern "long-term money" theory is composed of a large arsenal of theoretical approaches and concepts, united by a focus on solving the problem of long-term financing. In the presented study, two approaches to defining long money were proposed. The first, narrow one, focuses on long-term financing resources as its main subject of study. The second, comprehensive, considers long-term investments in a broader context. It includes an analysis of their sources, mechanisms for conversion into long-term investments, and regulatory systems.

The unveiling of the theoretical foundations of the "long-term money" proposal has revealed several promising avenues for analysis —

[12] Global Financial Development Report 2015/2016: Long-Term Finance. Washington, DC: World Bank; 2015. http://hdl.handle.net/10986/22543 (accessed on 21.01.2025).

Table

Problematic Areas and Theoretical Directions for the Study of Long-Term Finance

Problematic areas	The principal theoretical directions of research and discussions
Supply of long-term financing	
Household savings behavior: long-term factors and drivers	Theory of household financial behavior theory
	The concept of a "global savings glut"
	The concept of preferring a "safe haven"
Distribution of accumulated financial wealth	The concept of a "global savings glut among the wealthy"
Firms' saving behavior: long-term factors and motives	Concepts of savings as a source of investment resources for firms
	Concepts of savings as a source of financing corporate control transactions
	The concept of "global corporate savings glut"
Foreign investor behavior: strategies, motives, long-term factors influencing national markets	Discussion on the long-term impact of foreign investors on national markets
The role of the collective investment industry, factors and conditions for its development	Theory of maturity transformation in the context of the collective investment industry
	Concepts of incentive alignment in the interaction of parties to financial contracts
Demand for long term funds	
Corporate capital structure: long-term factors and patterns	Theory of capital structure and sources of capital investment financing
	Concept of preferences for the choice of long-term financing instruments
	Concepts of dominant sources of financing applied to different categories of companies
Structure of firms' external resource attraction terms and its factors	Concept of the role of macroeconomic factors and long-term financing conditions
	Concept of the role of the domestic financial market and international financing
	Concept of the role of institutional factors in the formation of long-term financing
	Theory of special purpose vehicles for accessing finance (securitization)
Problem of housing finance	Theory of mortgage financing mechanisms
Problem of public debt	Theory of public debt management
The interaction of supply and demand for long-term money	
Structure of financial contract terms	Theory of risk distribution between parties to contracts
	Theory of economic mechanisms for transforming the terms of financial contracts
	Concept of transformation thru securitization

Source: Compiled by the author.

macroeconomic, including the fascinating field of international finance, and behavioral. It is shown that the central conditions for creating a supply of "long" money in the national economy are price stability and confidence in the reliability of financial institutions. At the same time, according to the "global savings glut" theory, international economic integration plays an important role, creating extra savings whose flows are directed primarily toward assets considered "safe havens", exerting downward pressure on interest rates worldwide. Additionally, it is noted that the source of "long money" is primarily concentrated in the savings of the wealthiest segment of the world's population. In the analysis of household saving behavior, the importance of time preferences and risk attitudes is highlighted, which in turn are significantly influenced by the gender and age structure of the population. An analysis of the corporate sector reveals a savings glut effect in a number of sectors. It is particularly pronounced in relation to the largest IT companies, as well as countries whose businesses are experiencing growth limitations. Important conclusions drawn from research on the role of foreign capital as a source of financial resources are that, despite its speculative nature, the long-term effect of the presence of foreign investors is positive and oriented toward long-term results.

The theoretical foundations of the demand for "long-term money" largely stem from the extensive discussion regarding the firm's capital structure. The modern view relies more on in-depth empirical research, which shows a weakening role for stocks, with net issuance being negative in developed economies in the long term, while the importance of debt instruments is growing. The choice of maturity for both corporate and government debt is decided thru a compromise between cost (longer-term debt is generally more expensive) and rollover risk (short-term debt, which requires refinancing, carries a significant interest rate risk).

An important part of the theoretical framework for the study of "long-term money" relates to the interaction between the supply and demand for long-term financial resources. The main focus here is on developing and maintaining the functionality of maturity transformation mechanisms. The paper identifies five such mechanisms. It is shown that regulatory errors can disrupt the functionality of such mechanisms, preventing them from working to provide the economy with "long-term money".

The paper systematizes the problem areas and theoretical directions of research on "long-term money". This helps guide research and shape the program for further action. The most promising research is that which addresses the problems of "long-term money" thru risk distribution. Policies aimed at addressing this problem should reduce risks and align the incentives of participants in financial relationships.

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ABOUT THE AUTHOR

Konstantin V. Krinichansky — Dr. Sci. (Econ.), Prof., Department of Financial Markets and Financial Engineering at the Faculty of Finance, Chief Researcher at the Institute for Financial Studies, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0000-0002-1225-7263
kkrin@fa.ru

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ORIGINAL PAPER

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The Role of the Energy Sector in Ensuring Financial Security of Russia

V.I. Loktionov[a], E.A. Loktionova[b]

[a] L.A. Melentiev Energy Systems Institute Siberian Branch of the Russian Academy of Sciences, Irkutsk, Russian Federation;

[b] Irkutsk National Research Technical University, Irkutsk, Russian Federation

ABSTRACT

Against the background of large-scale globalization processes, accelerated with the development of information technology, and the fragmentation of the world economy caused by growing geopolitical tensions and sanctions confrontations, interest in solving problems of ensuring national security has increased. Particular attention was paid to such components of national security as the financial security and energy security of the country, which is explained by the high importance of the financial sector and the energy industry in ensuring the stable functioning of the national economy. The interest of the Russian researchers in solving these problems is also due to the fact that most of the most severe anti-Russian sanctions were introduced against these sectors of the economy. The relevance of the challenges has stimulated the emergence of many studies in the field of development of assessment methods and ways to ensure financial and energy security, but these studies were carried out without an in-depth analysis of the phenomenon of interdependence of financial and energy security, whereas at present, achieving one state cannot be achieved without achieving the other. The **purpose** of this study is to theoretically understand and describe how to integrate financial and energy security, which will enable us to develop strategic solutions for the country's financial system while considering the energy sector's role in ensuring its sustainability and uninterrupted operation. The **scientific novelty** of this research is the development of a theory that explains how the national financial system functions by highlighting the interdependence between financial and energy security. The **result** of the study is methodological recommendations for ensuring national financial security in the context of the development of the energy industry.

Keywords: financial security; energy security; financial market; financial capital; economic systems

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INTRODUCTION

In recent decades, there has been an acceleration of globalization and technological development, which has led to a sharp increase in the complexity of local and global socio-economic systems, as well as an expansion of the boundaries of interaction between different sectors of the economy [1–5]. All of this was happening against the backdrop of growing geopolitical tensions, which have manifested in recent days as a sanction's standoff. The increasing importance of the financial sector in ensuring stable long-term economic and social development of the country leads to an increase in the number of factors determining the level of financial security [6, 7] and the complexity of methods for ensuring the country's financial security [8].

Many scientific papers have been written on the topic of expanding the semantic content of the concept of financial security [9–12]. A number of authors have analyzed the impact of financial security threats on the level of energy security in different countries. For example, using South Korea as an example, the authors of one article showed that the development of a national financial system can enhance national energy security in the face of growing uncertainty in the global energy market [13]. Another author, who conducted a similar analysis for several provinces in China, reached the same conclusion [14]. The role of the energy sector in enhancing the resilience of the national financial market and the financial system as a whole has been practically unstudied, while for Russia, with its energy sector dominance in the national

economy and sanctions restricting access to international financial markets, analyzing the consequences of integrating the phenomena of energy and financial security is becoming increasingly relevant.

FINANCIAL AND ENERGY SECURITY: THE PHENOMENON OF INTERDEPENDENCE

National financial security, in general, represents the state of the financial system in which it effectively and reliably performs its functions of distributing and redistributing financial resources within the country. There are quite a few different approaches that allow for a more specific definition of financial security [15–18]. In this paper, financial security is understood as "the stable and efficient performance by the national financial market of its functions in organizing the unimpeded 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 country's economic interests at the international level" [19]. The choice of an approach that emphasizes the role of the financial market in ensuring financial security is due to the characteristic interpenetration of the financial and real sectors in the modern economy. In his study of the characteristics of national financial market functioning, V.V. Ivanov notes that the structure and efficiency of financial market functioning, shaped by the peculiarities of the real sector of the economy's development, influence the development of the real sector of the economy through the financing of its needs [20]. Considering this, in order to ensure national financial security, it is necessary to develop a new approach to its assessment, according to which a country's financial security would be determined taking into account the existing interconnections between the real economy and the financial market.

To assess the degree of effectiveness with which the Russian financial market performs its macroeconomic functions and to clarify the specifics of its interaction with the real sector of the economy, it is necessary to have a clear understanding:

- about the sources of resources for the financial system as a whole and the financial market in particular as the main mechanism for capital redistribution in the economy;
- about the actor-network structure of the country's financial market and the institutional mechanisms of its functioning;
- about global trends shaping the current geopolitical agenda.

Sources of Resources for the Financial System as a Whole and the Financial Market in Particular, as the Main Mechanism for Capital Redistribution in the Economy

In modern conditions, any major national economy is deeply integrated into the global economic space, which means, among other things, the presence of intensive trade relations accompanied by the flow of currency between countries. Under these conditions, the national financial system (which can be metaphorically represented as a hub providing a "platform" and tools for organizing the flow of financial resources within the economy) effectively performs its functions only when it is infused with financial resources from foreign trade activities. For many years in Russia, the energy sector has been the most important source of foreign currency, allowing the financial market to function effectively [21, 22]. According to the Central Bank of the Russian Federation, in 2023, the total share of natural gas, LNG, oil, and petroleum products in the export structure was 49%.[1] This feature of the Russian economy, which determines the significance of the energy sector for ensuring the security of the national financial market's functioning, is one of the key factors for the existence of the phenomenon of the interdependence of financial and energy security.

Energy security has traditionally been understood by domestic scientists as the sufficient and uninterrupted availability of economically accessible energy resources. Energy security was defined as the alignment

[1] Website of the Central Bank of the Russian Federation. URL: https://www.cbr.ru/statistics/macro_itm/svs/export_energy/ (accessed on 18.06.2024).

of the energy sector's production capacity development with the needs of the national economy for energy resources, with this alignment extending not only to the volume of electricity produced but also to the quality of the energy resources supplied. This understanding of energy security prevailed in the Soviet Union until the mid-1960s, when the energy sector was viewed solely as a source of energy resources for the country's economy. However, starting in 1965, the USSR began rapidly increasing its exports of oil and petroleum products, and the energy sector became not only a source of energy resources but also a significant source of foreign currency. From 1965 to 1975, the volume of exported oil and oil products doubled — from 75.7 million tons to 150.5 million tons, while the share of Soviet oil and oil products in global oil consumption was around 5% in 1965 and 5.6% in 1975. Over the next 5 years, the volume of oil and oil product exports increased by another 32 million tons, reaching 182.5 million tons in 1980. The increasing role of oil and oil product exports in the development of the USSR's economy was due not only to the growth in the volume of energy resource production and exports, but also to the sharp rise in oil prices on global energy markets in 1973, when the world energy crisis occurred. Thus, between 1965 and 1975, the price of oil on the world market rose from 22.08 dollars/ton to 92.46 dollars/ton, which led to an increase in Soviet export revenues from 1.11 billion dollars in 1965 to 3.74 billion dollars in 1975 and 15.74 billion dollars in 1980 [23]. It was during this period that the Soviet economy became dependent on hydrocarbon exports.

After the collapse of the Soviet Union, the energy sector became the main driver of Russia's economic recovery and active growth in the early 2000s. During this period, the role of the energy sector was determined not so much by meeting domestic energy demand, as significant production capacity reserves created during the Soviet era significantly exceeded the growing needs of the national economy for energy, but rather by generating significant revenue from foreign trade activities. This circumstance is reflected in the expansion of the semantic content of the concept of energy security, which, among other things, has come to include national energy companies' access to international energy markets and their production and resource capabilities to meet the energy demand of foreign partners.

During this period, due to the overlap of some functions performed by the financial system and the national energy sector in terms of accumulating and distributing foreign exchange earnings from foreign trade activities, as well as protecting the country's interests at the international level, there has been an intersection of the concepts of financial security and energy security (*Table 1*).

Interestingly, in addition to a number of aspects concerning ensuring the effective functioning of the economy as a whole, the meanings of the phenomena under consideration also intersect with regard to the main function of the financial market, which concerns the accumulation and redistribution of financial resources, indicating the special role of the energy sector in ensuring the country's financial security. Indeed, the sharp decline in energy sector companies' revenues from foreign trade activities, occurring, for example, against the backdrop of unfavorable price dynamics in global energy markets or restrictions on access to them, generates a negative impulse that spreads throughout all sectors of the country's economy. In the short- and medium-term, a decrease in the country's foreign exchange earnings leads to a reduction in supply in the country's foreign exchange market, which manifests as a fall in the national currency's exchange rate and rising inflation. In the long term, a decrease in foreign currency earnings could lead to a decline in the investment attractiveness of energy companies and the economy as a whole, reducing the resource base of the national financial market and decreasing its effectiveness in performing its functions.

Thus, since the early 2000s, the sustainable development of major energy companies has become a critically important condition for

Table 1

Intersection of Semantic Contents of the Financial Security and Energy Security

Financial security	Accumulation and redistribution of financial resources in the economy		Energy security
	Sustainable and safe functioning of individual elements of the national financial system	Fulfilling the national economy's demand for energy resources	
	Ensuring the level of transaction costs necessary for the smooth flow of capital within the economy	The availability of production and resource capabilities to meet the energy demand from foreign partners	
	Transforming savings into investments to provide the economy with long-term domestic financial resources	Access to international energy markets	
	Ensuring the growth and development of the national economy		
	Ensuring the protection of the country's economic interests at the international level		
	Formation of key institutional mechanisms for the functioning of the national economy		
	Increasing the adaptability and resilience of the national economy		

Source: Compiled by the authors.

achieving the efficiency of the national financial system, and ensuring energy security has become a necessary factor in ensuring financial security.

The Actor-Network Structure of the Country's Financial Market and the Institutional Mechanisms of its Functioning

The energy sector affects a country's financial stability. It not only brings foreign currency into the economy but also shapes the functioning of the financial market.

According to field theory, any socio-economic system has a structure consisting of the following elements (actors): dominant players, dominated players, and transitional players [24]. Transient players are the most fluid, weak, unstable, and least significant part of any system. These players enter the market trying to survive, achieve their goals, and quickly exit the market for various reasons. Dominated players are a significant part of the system. They have been working in the market for a long time, have significant production, financial, and administrative resources, and hold a significant and stable market share. However, unlike dominant players, dominated players follow established institutional rules. They cannot determine the normative level of transaction costs in the system, set the dynamics of price changes and/or volatility, etc. Dominant players, on the other hand, determine market dynamics by setting customer interaction standards, shaping prices (within certain limits), and so on. The dominant position of such players is determined by the resources they possess, as well as their political and social capital. It is evident that the concentration of a large share of dominant players in a single sector of the economy exacerbates the internal strategic contradictions of the actors, which are determined by the dynamics of their hierarchical interactions. Meanwhile, the stability of the dominant players is primarily what the sustainability of the system as a whole depends on. If dominant players experience organizational, financial, or production problems due to the realization of systematic or unsystematic risks, these problems spread throughout the entire system in the

form of a decrease in its absolute performance indicators, an increase in asset price volatility, and an increase in transaction costs.

It can be confidently said that energy sector companies are the dominant players in the Russian financial market. As of March 2024, the share of companies in the fuel and energy sector in the structure of the Moscow Exchange Index was 49.28%, with 6 out of the ten companies with the largest capitalization belonging to the oil and gas sector.[2] Unlike the Russian financial market, the global financial market is more diversified. According to the MSCI World Index[3], the global financial market is dominated by high-tech companies, which account for 23% of the total market capitalization, and financial sector companies (15% of the total market capitalization). The market capitalization of energy sector companies accounts for only 5% of the total market capitalization of financial markets in 23 developed countries, including the US.

Since energy companies make up a significant portion of the capitalization of the Russian financial market, various problems faced by these companies are immediately reflected in the dynamics of the value of financial instruments issued by them. The level of price volatility for financial instruments is one of the characteristics of the degree of security of a national financial system. The higher the volatility, the greater the uncertainty about the future, which means a higher required rate of return, higher collateral requirements, lower investment activity in the real sector of the economy, and so on. A significant increase in volatility, especially occurring against the backdrop of a contraction in financial market capacity, is a clear signal indicating a decline in the country's financial security. This is because the financial market, being an important element of the national financial system, ceases to effectively perform its function of accumulating and distributing financial capital. Potential investors are less willing to invest their money in financial instruments because the increase in volatility corresponds to an increase in riskiness, which in turn raises investors' expectations for returns on investments.

The stress experienced by dominant players (energy companies) is initially transmitted to financial markets and then to the entire financial system. The mechanism by which stress spreads from companies through the financial market to the financial system as a whole is as follows: the realization of energy security threats against the backdrop of declining economic efficiency of dominant companies worsens their development prospects, which inevitably leads to a decrease in their intrinsic value, and subsequently, their market value. This in turn leads to a decrease in the average market yield of financial instruments, which is determined by both the yield of financial instruments and changes in their market prices. Since any negative information about dominant companies in one of the leading market segments leads to an increase in investor pessimism, the level of irrationality in the investment decision-making process also increases. Investors are starting to demand unreasonably high returns on financial assets from companies in other sectors and are making more pessimistic economic forecasts, which leads to a decrease in investment activity across the entire financial market, undermining the process of financial capital accumulation and its transformation into industrial capital.

Given the concentration of a large number of dominant players in a single sector of the economy, we can speak not only of structural imbalances in financial markets and the economy as a whole, but also of the presence of special institutional mechanisms that support these dominant players. A prime example is the situation that developed in the US financial market in the early 2000s, when the phrase "too big to fail" became applicable to a number of financial institutions (JPMorgan Chase & Co., Citigroup, Goldman Sachs, Barclays), meaning that in the event of the bankruptcy of such giants, not only the US financial system, but the

[2] Moscow Exchange. URL: https://www.moex.com/ru/factsheet (accessed on 28.06.2024).

[3] Morgan Stanley Capital International World Index. URL: https://www.msci.com/documents/10199/178e6643-6ae6-47b9-82be-e1fc565ededb (accessed on 17.06.2024).

entire global financial system could experience a profound crisis. That's why during the 2008 financial crisis, the US government allocated huge sums of money to prevent several banks from going bankrupt [25]. Another example: in Russia, after sanctions were imposed in 2014, several major energy sector companies received financial assistance from the state to support the economy during the initial decline in the ruble's exchange rate and the drop in oil prices. Despite the collapse of the national currency due to the misuse of the funds received, these companies continue to operate and hold leading positions in the industry and the country's economy.

As shown above, the sustainable development of energy companies has become a critical condition for achieving the efficiency of the national financial system's functioning. In other words, ensuring energy security has become a necessary factor in ensuring financial security. However, the opposite is also true: the high capital intensity of the energy sector means that a balanced and sufficient pace of energy development can only be achieved if the financial system fulfills its functions of providing energy companies with access to long-term capital. In other words, energy security can only be ensured if the country's financial market functions effectively, which means a stable and sufficient process of transforming financial capital into industrial capital for the development of the national energy system. Thus, one of the most important conditions for ensuring both financial and energy security for a country is the simultaneous effective and balanced development of both the financial system and the energy sector.

Global Trends Shaping the Current Geopolitical Agenda

The development of complex socio-economic systems is determined by the tension caused not only by the growing internal contradictions but also by the pressure of external circumstances, which include international economic integration, increasing geopolitical tension, the digitalization of the economy and energy, the transformation of the ideas that form the basis of the current concept of socio-economic development, and others. Currently, one of the global trends that sets the framework for the long-term development of energy systems is the system of ideas and views of the sustainable development paradigm. These ideas, by influencing the development of formal institutions that define the interaction of participants in the global energy sector, contribute to the implementation of the fourth energy transition.

The current (fourth) energy transition, characterized by a radical increase in environmental requirements for traditional energy facilities and an increase in the share of renewable energy sources in countries' energy balances, has significantly impacted the process of integrating financial and energy security phenomena at the global level, creating dual pressure on a country's financial system [26]. Firstly, the pool of financial resources is limited. In the case of free circulation of financial capital, financial resource flows are directed to the most efficient sectors of the economy. However, forcibly increasing funding for renewable energy facilities reduces the resource base for other sectors of the economy, thereby decreasing the efficiency of resource allocation, which leads to a slowdown in economic growth, a decrease in the size of industrial and financial capital, and, as a result, a reduction in the inflow of new capital into the financial market.

Secondly, countries with developed traditional energy sectors, focused on exporting hydrocarbon resources, are losing their investment attractiveness. The concept of sustainable development is influencing not only the process of developing government programs and development strategies but also the process of managerial decision-making through the inclusion of ESG criteria in the methods of investment assessment of individual projects and companies [27, 28]. According to the traditional approach to investment decision-making, in the process of selecting an investment object, the initial pool of available investment options is limited by the return on investment criterion, and further project selection is carried out in accordance with established efficiency

parameters, the main one being the net present value. According to the new approach, the initial pool of available investment options should be limited through the use of an environmental acceptability criterion, and the basic parameters for project implementation efficiency are socially and environmentally oriented parameters that assess the project's impact on reducing greenhouse gas emissions, the level of energy poverty, and others.

Society's adherence to the principles of the sustainable development paradigm has not only influenced the development of management decision-making methods but has also led to a moral transition, which, according to J. Gusfield's definition [29], means a shift in the understanding of what is socially normal and abnormal, i.e., deviant. The view of socially acceptable company activities that formed during the Industrial Revolution and the rapid development of capitalism assumed that the goal of any private enterprise lies in making a profit while adhering to business ethics standards. Business ethics encompassed a set of such informal institutional requirements for businessmen, managers, and investors, including compliance with all laws (including paying taxes), timely repayment of all debts, honest behavior with counterparties and employees. If company managers were distorting reporting information, using insider information for personal gain, evading taxes, etc., they were condemned by public opinion, and such activities were considered unacceptable (deviant) behavior that harmed society.

In the process of the sustainable development paradigm's formation, there was a shift from traditional business ethics to the ethics of socially responsible behavior [30]. Now all members of society and organizations, including big business, must contribute to the implementation of the principles of the new paradigm of socio-economic development. This representation places a moral obligation on energy companies to combat inequality and poverty, provide opportunities for local communities to preserve their cultural heritage, disseminate technologies that reduce the human footprint, and more. If a company does not actively participate in promoting the principles of sustainable development and does not incur additional costs for actions considered socially responsible, it will be stigmatized as an outsider, or in other words, a deviant. Public punishment for a company with such deviant behavior will be expressed in the form of society (possibly not all of it, but a part) refusing to purchase goods and services produced by that company, which will lead to a decrease in its economic efficiency.

For example, *Table 2* shows the absolute and relative costs of socially responsible activities for a number of large energy companies. It should be noted that in published reports, the costs of socially responsible activities are generally defined as "environmental protection costs", "green investments", "carbon footprint reduction costs", and so on. However, most often such events fall under the category of Sustainability Activities or Environmental, Social, and Governance (ESG), which means events that align with the principles and ethics of the sustainable development concept.

The process of establishing a new paradigm of socio-economic development has not left financial markets untouched. The implementation of the UN's developed principles of responsible investment has led to the use of "green" financial instruments, issued to finance environmentally friendly, energy-efficient, and low-carbon investment projects, becoming a popular way to stimulate investment in the development of a sustainable economy and energy in a number of countries. However, the conditions for their issuance, the additional obligations imposed on issuers, and the financial support provided by the government to issuers in some cases lead to their use also having a distorting effect on the free movement of capital in the economy.

When the energy sector plays a leading role in the national economy, production activity is poorly diversified, and many manufacturing firms operate with a low "margin of safety" (have a high break-even point), then the negative processes caused by the realization of energy security threats lead to a cascading

Table 2

Costs of Energy Companies on Socially Responsible Activities

Company	Characteristics of ESG cost
Rosneft	In 2020, Rosneft allocated 42 billion rubles to green investments*, which is 5.25% of total capital expenditures and 0.73% of revenue In 2021, Rosneft allocated 55 billion rubles to green investments, which is 5.2% of total capital expenditures and 0.625% of revenue In 2022, the company allocated 57 billion rubles to green investments, which accounted for 5.2% of total capital expenditures and 0.63% of revenue
Gazprom	In 2020, environmental protection expenditures amounted to 49.1 billion rubles, which was 3.29% of capital investments and 0.77% of revenue In 2021, environmental protection expenditures amounted to 97.5 billion rubles, which was 5% of capital investments and 0.95% of revenue In 2022, 89.1 billion rubles were allocated, which was 3.13% of capital investments and 0.76% of revenue
Saudi Aramco	Between 2010 and 2020, the company did not publish information about its ESG spending in its reports In 2021, the company announced that it had invested 15.5 billion dollars in the "GreenSaif" project, aimed at improving the environment, during 2021. This represents 23.48% of capital expenditures and 4.32% of revenue In 2022, the company allocated 1.5 billion dollars to ESG initiatives, which accounts for 1.7% of capital expenditures and 0.74% of revenue
ExxonMobil	In 2020, ESG spending reached 4.5 billion dollars, representing 21.03% of capital expenditures and 2.48% of revenue In 2021, ESG spending reached 4.6 billion dollars, representing 28.75% of capital expenditures and 1.63% of revenue In 2022, ESG spending reached 5.7 billion dollars, representing 25.11% of capital expenditures and 1.38% of revenue
Shell Global**	In 2020, ESG spending reached 4 billion dollars, representing 24.24% of capital expenditures and 2.22% of revenue In 2021, ESG spending reached 2.4 billion dollars, representing 12.63% of capital expenditures and 0.88% of revenue In 2022, ESG spending reached 4.3 billion dollars, representing 16.67% of capital expenditures and 1.12% of revenue

Source: Information on costs was collected by the authors from reports published on the official websites of companies.

Note: * What is understood by "green investments" was not presented in any of the company's reports; the company does not disclose the structure of its ESG spending; ** Shell has been disclosing data on socially responsible spending since 1997. Furthermore, between 2005 and 2014, the company presented this report in all major world languages, including Russian.

effect, expressed in a fall in aggregate demand and business activity. Considering the network structure of markets and the interconnectedness of the financial and real sectors, financial security should be viewed, among other things, as the ability of the financial market to localize crisis phenomena arising in the economy due to the realization of certain threats to energy security, prevent their spread through intersystem connections to other sectors of the real economy, and mitigate their negative impact on the quality of life of the population due to a decrease in both real disposable income and the rate of economic growth.

ENSURING NATIONAL FINANCIAL SECURITY IN THE CONTEXT OF ENERGY SECTOR DEVELOPMENT

The functioning of the modern state's economic system is based on the constant process of

transforming financial capital into industrial capital and back. Financial capital refers to monetary resources and their equivalents circulating within a country's financial system. Production capital represents the entire set of tangible and intangible assets that directly or indirectly participate in the production process. A country's financial security is determined, among other things, by the volume of available financial capital and its sufficiency to meet the needs of the economy, while energy security is determined by the intensity of the transformation of financial capital into industrial capital, as well as the comparative efficiency of energy companies. The comparative economic efficiency of energy companies determines whether the transformed financial capital will go into the energy sector or other sectors of the economy.

The intensity of the transformation of financial capital into industrial capital is a key process that actually determines not only the sustainable development of a particular sector of the economy, but also, to some extent, the level of financial security. The fact is that under certain circumstances (including an imbalance in economic parameters), financial capital can "settle" within a country's financial system, leading to the formation and growth of financial bubbles. Financial bubbles represent an excess of financial capital, leading to excessive overvaluation of financial assets, and ultimately to a financial market crash and an economic crisis.

To reveal the economic essence of the relationship between financial and energy security, it is necessary to analyze the economic parameters that determine the dynamics of change in financial capital and the intensity of its transformation into industrial capital. In this study, we limit our analysis to the natural processes that determine the dynamics of the financial and industrial sectors' development, without considering the volitional influence in the form of sanctions and other forceful disruptions of financial and economic processes. At the same time, understanding how the system works in a normal state will further enable the development of mechanisms to overcome the negative consequences of financial sanctions, contributing to the achievement of financial and economic security.

The following parameters can be identified as determining the accumulation and movement of capital in an economic system: the average market return on financial capital (RFC); the average market return on industrial capital (RIC); the average market return on industrial capital in the energy sector (RICE); and the GDP growth rate (RGDP).

The rate of return on financial capital (RFC) determines the attractiveness of the financial market as an investment object. Therefore, the intensity of financial capital accumulation in the financial system is largely determined by the average market yield of financial capital. The main parameters determining the intensity of the transformation of financial capital into industrial capital are the average market return on industrial capital (RIC) and the ratio of the average market returns on financial and industrial capital. RIC determines the investment attractiveness of the real sector of the economy as a whole. And the ratio of RFC to RIC determines how intensively financial capital will be transformed into industrial capital.

In the context of this study, it is necessary to introduce another parameter, namely the ratio of RICE to RIC. This parameter can characterize the investment attractiveness of the energy sector: a sufficiently high attractiveness will ensure investments in energy facilities, further growth of the fuel and energy complex's production potential, and, as a result, the generation of foreign currency flows.

The process of transforming financial and industrial capital is presented in *Figure*.

For clarity, the stage of transforming financial capital into industrial capital and the stage of distributing industrial capital across economic sectors are artificially separated. In reality, these two processes occur simultaneously. For the financial sector to grow steadily, which means an increase in available financial capital, the RFC must be above a certain minimum level, determined by factors such as the inflation

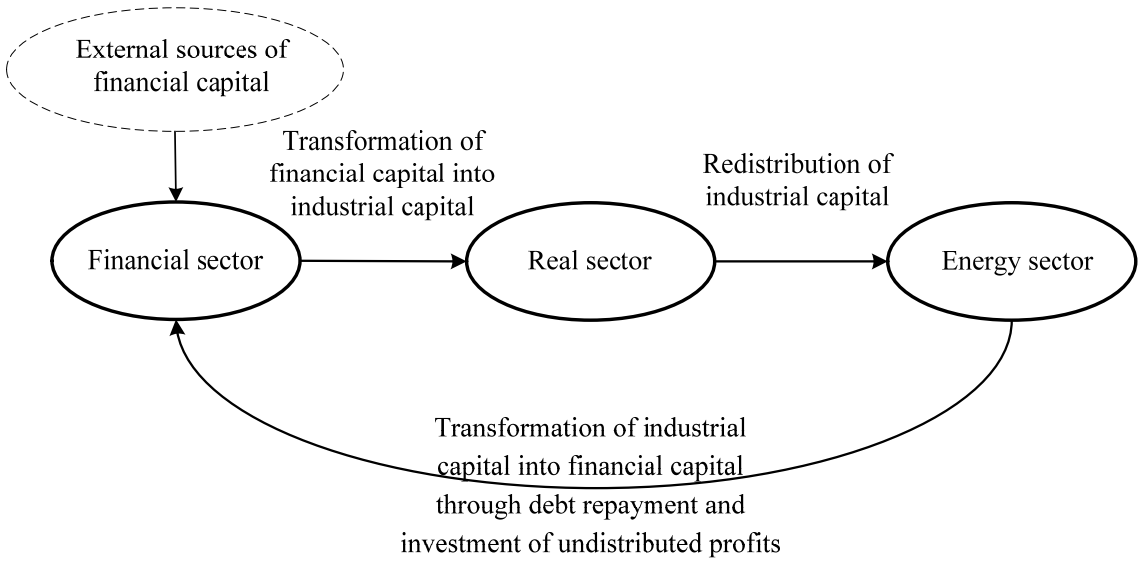

Fig. **Transformation of Financial and Industrial Capital**

Source: Compiled by the authors.

rate in the economy, the availability of free cash among investors, investor confidence in government institutions, the likelihood of a recession in the economy, and so on.

To ensure a stable flow of investment into the energy sector during the transformation of financial capital into industrial capital, the following ratio of the allocated parameters must be maintained:

$$i < RFC < RIC < RICE.$$

With this ratio of the parameters under consideration, the circulation of capital in the economy will create favorable conditions for both the accumulation of financial capital and the implementation of real investments in energy facilities. The process of financing the energy sector can be carried out not only through investments but also by attracting borrowed capital. However, in this case, just as with investments, loan capital will form more quickly the higher the rate of return for energy companies.

The yield on financial capital and the yield on industrial capital in the energy sector have different characteristics stemming from the different operational features of the energy industry and the financial market. As is known from the theory of managerial decision-making, investors make decisions not based on the current value of a particular economic variable, but on the forecast of its change. Therefore, the forecasting horizon and the reliability of the forecast play an important role in decisions about capital flows.

In general, the decisions made by investors in the financial market are based on the use of a shorter forecasting horizon in the analysis, due to the high volatility of financial instrument prices, the high liquidity of assets in the financial market, and so on. Regarding industry (and especially energy), the forecast is made for the long-term. Since the average construction and operation period of energy facilities significantly exceeds the 3-year period, which is the boundary between medium-term and long-term investments for the financial market, and due to the low liquidity of industrial capital, decisions on directing direct investments are made based on long-term forecasts (5 years or more). Thus, the simplified approach described above should be made more complex by considering the stability of indicators when solving real-world problems of developing strategies for the energy sector and the financial sector. Since the return on financial capital can be more volatile than the return on industrial capital in the energy sector, it is necessary to take into account that it is advisable to calculate RFC as the average

expected return on financial assets over the next, say, 3 years, while RICE should be considered as the average expected return over the next 10 years. At the same time, the reliability of the forecast and the increase in the required average return can be taken into account using a standard discounting procedure:

$$RFC = (\sum_{k=1}^{n} \frac{RFC_k}{(1+r)^k}) / n,$$

$$RIC = (\sum_{l=1}^{t} \frac{RIC_l}{(1+r)^l}) / t,$$

$$RICE = (\sum_{l=1}^{t} \frac{RICE_l}{(1+r)^l}) / t.$$

Under these conditions, financial and energy security can be achieved not just by fulfilling the inequality above, but also by maintaining this ratio of the average market returns on financial capital, the average market returns on industrial capital, and the average market returns on industrial capital in the energy sector over a prolonged period. In the financial market, this means the government should stimulate the development of efficient financial institutions that reduce the volatility of financial instrument yields. However, in the energy sector, this requirement can currently only be met through the implementation of a targeted state policy to promote national energy companies in the global energy market.

CONCLUSION

The financial system can effectively perform its functions only when there is an increase in the capitalization of the entire financial system, sufficient to meet the developing economy's demand for capital, accompanied by the stable and free movement of capital within the economic system, implying a continuous process of transforming financial capital into industrial capital and back. A lack of resources flowing into the financial market increases the capital deficit in the economy, thereby hindering economic growth and, in extreme cases, leading to crisis phenomena. The uneven flow of capital, where the inflow of resources into the financial system significantly exceeds the volume of financial capital transformation into industrial capital, leads to the formation of financial bubbles, the collapse of financial markets, and economic crisis. Excessive conversion of financial capital into industrial capital can lead to a decrease in the liquidity of the financial system, where suddenly arising capital needs (e.g., in the event of negative developments in global financial markets) will not be met due to insufficient liquid funds. Thus, financial security can only be achieved by ensuring the sustainability and balance of the process of accumulating financial capital and its transformation into industrial capital.

Achieving a stable, sufficient, and balanced flow of capital into the economy through the financial system is impossible in Russia without ensuring the effective and safe functioning of the energy sector, given its significance in the structure of the national economy and in the country's foreign trade activities. The energy sector is not just a source of resources for the financial system, but also one of its key players, fulfilling the function of consuming and increasing financial capital. The study showed that the main parameters determining the dynamics of capital movement are the average market return on financial capital, the average market return on industrial capital, the average market return on industrial capital in the energy sector, and GDP growth rates. Only a balanced ratio of these parameters can ensure an increase in the country's financial security in the context of the development of the national energy sector.

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ABOUT THE AUTHORS

Vadim I. Loktionov — Dr. Sci. (Econ.), Leading Researcher, L.A. Melentiev Energy Systems Institute of Siberian Branch of the Russian, Irkutsk, Russian Federation
https://orcid.org/0000-0001-8478-3222
vadlok@mail.ru

Elena A. Loktionova — Cand. Sci. (Econ.), Assist. Prof., Irkutsk National Research Technical University, Irkutsk, Russian Federation
https://orcid.org/0000-0003-0126-7930
Corresponding author:
loktionova_ea@mail.ru

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Transformation of the International Reserves in the Context of a Crisis of Confidence

L.V. Krylova
Financial University under the Government of the Russian Federation, Moscow, Russian Federation

ABSTRACT

International reserves as the most important component of the international monetary system (IMS) operate on the basis of their inherent basic principles and reflect the main systemic transformations. The use of international reserves as an instrument of pressure on sovereign states has caused uncharacteristic risks in the system and led to its significant transformations, manifested in the dynamics of reserve accumulation and the structure of reserve portfolios. The **purpose** of the study was to determine the causes, factors and transformation trends of the international reserve system and the **subject of the research** was international reservation in the context of fragmentation of the global economy. In the course of the research, the **methods** of comparative, logical and contextual analysis, systematization and generalization, statistical analysis of time series and extrapolation were used. The author's contribution was an analysis of the dynamics of accumulation of international reserves and their distribution by groups of countries for the period from 2000 to 2024, which revealed significant discrepancies between forecast and actual parameters, primarily for the group of developing countries. The differences in the policy of managing international reserves of developed and developing countries and the impact of geopolitical risks are shown. It is **concluded** that the replacement of major reserve currencies with gold in the international reserves of developing countries is aimed at reducing vulnerability to the risk of blocking by decreasing the volume of toxic currency assets. This process leads to the remonetization of gold, strengthening its role both in the international reserve system and in the IMS.

Keywords: international reserves; Official Foreign Exchange Reserves; reserve assets; gold; IMS; digital currencies; tokenization

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INTRODUCTION

The exacerbation of the geopolitical situation and global confrontation, accompanied by the freezing of a significant portion of the Russian Federation's international reserves, raised the question of the expediency and risks of using major reserve currencies within the structure of international reserves (IR). At the same time, international reserves are an inherent and very significant element of the modern international monetary and financial system (IMFS), and a radical transformation of the international reserve system without reforming the existing principles of the IMFS's functioning seems to be a non-trivial task. The disruption of the basic conditions for equilibrium in the global economy and global finance, in the absence of adequate world money and a contemporary crisis of confidence in the main reserve currency — the US dollar — is leading to fragmentation and a general systemic crisis in the IMFS. In this regard, the question of the effectiveness of both the entire IMFS complex and international reserves in particular is of particular interest, both practically and scientifically-theoretically.

Restricting the free disposal of reserve assets destroys the purpose of the IR's existence. The unconditional availability of all IR components and trust in the ability of reserve currency issuers to meet their international obligations are fundamental to the possibility of using national fiat currencies as world money.

The importance of IR as a key element of IMFS has necessitated their comprehensive study, leading to a significant number of scientific publications dedicated to various aspects of their functioning. Significant attention is paid to the purpose of IR and the analysis of factors determining their currency structure [1–4], as well as the reasons for the USD dominance [5–7]. Based on a study of the currency structure of the reserve portfolios of 58 countries, a direct relationship was identified between the currency structure of export settlements and international reserves [8]. Other studies also confirm the correlation between the functions of a means of

payment and the accumulation of reserve currencies [9], which helps explain a number of recent trends in international reserves. While the relative return on reserve assets, whether traditional or non-traditional currencies, is not a key factor in the process of dedollarizing foreign exchange reserves [6].

Specialists' attention has been drawn to the volume of funds held as part of IR, particularly by developing countries, which has led to a number of studies exploring the reasons for the accumulation of foreign exchange reserves, as well as the opportunity costs of holding them [10], which can reach 1% of annual GDP [11].

The freezing of a portion of the foreign exchange reserves of one of the largest of the international reserve system participants could not help but attract the attention of researchers who attempted to assess the potential consequences of this phenomenon for the IMFS. Discrediting such an important element not only undermines the foundations of global finance but also indirectly indicates an underestimation of the role of international reserves in the IMFS. Russian scientists state that the blocking of Russia's foreign exchange reserves prevents the established concept of international reserves from being maintained [12]. Western experts also note that the precedent of imposing sanctions targeting Russian foreign exchange reserves will lead to a decrease in demand for key reserve currencies and will change the format of reserves [13].

In this regard, there is a need to determine the adequacy of existing principles of international reserve management, as well as to identify the factors and directions of its transformation in the changing IMFS, which defined the goal and objectives of this study.

PROBLEM STATEMENT

The current IR concept and its main provisions are outlined in the IMF document "Guidelines. International reserves and foreign currency liquidity. Data Presentation Format". Paragraph 9 of this document states that a country's international reserves are "...external assets that are readily available to and controlled by monetary authorities for the purpose of meeting balance of payments financing needs, intervening in foreign exchange markets to influence the exchange rate, and for other relevant purposes (such as maintaining confidence in the currency and economy, and as a basis for external borrowing)".[1] The concept is based on understanding reserve assets as foreign liabilities. Simply put, these are the requirements of monetary authorities for non-residents in foreign currency. At the same time, p. 11 specifically emphasizes that "the indispensable components of the concept of international reserves" are their free disposal by monetary authorities.[2]

Reserves are formed from four main types of reserve assets: monetary gold, holdings of special drawing rights (SDRs), a country's reserve position in the IMF, and foreign exchange reserves (FXR). The latter constitute the main part of IR.

The volume of international *currency* reserves (FXR) varies significantly across countries. For example, in 2023, 90% of the 205 countries for which the IMF has relevant information held less than 100 million in their currency portfolios, while the top five countries accumulated almost 7 trillion US dollars, or over half of the total global currency reserves (China — 3.3 trillion, Japan — 1.2 trillion, Switzerland — 756 billion, India — 575 billion, and Taiwan — 564 billion).

The structure of IR is also different because the priorities of those who manage them do not align. The potential uses of reserves, determined by the degree of economic development and the monetary and financial system of countries, their integration into the global economy, the monetary policy pursued by regulators, and other factors, define the priority of either the transaction motive or the precautionary motive in managing reserve portfolios. The first is primarily followed by developing countries with export-oriented economies, which are forced to maintain undervalued national currencies, for which they need substantial reserves with a large foreign exchange component. Furthermore, many developing countries have limited access to crisis financing from the Global Financial Safety Net (GFSN), which means they primarily have to rely on their own reserves [14].

[1] Guidelines. International reserves and foreign currency liquidity. Data presentation format. URL: https://www.imf.org/external/np/sta/ir/irprocessweb/pdf/guideRUS.pdf (accessed on 21.11.2024).

[2] Guidelines. International reserves and foreign currency liquidity. Data presentation format. URL: https://www.imf.org/external/np/sta/ir/irprocessweb/pdf/guideRUS.pdf (accessed on 21.11.2024).

The second motive is followed by the managers of the central banks of the most advanced economies (further — AE), who do not conduct active currency interventions, typically hold small reserve portfolios, often with a predominant share of monetary gold. At the end of 2023, the share of gold in the composition of MR exceeded 72% for the USA and Germany, 68% for Italy, and 70% for France.[3] On average across the countries of the European Union's Economic and Monetary, including the European Central Bank, the share of gold in the IR composition was higher than 60%. If necessary, in crisis situations, they have access to foreign exchange from all GFSN sources, as well as from capital markets. These IR portfolio management policy priorities influence the distribution of aggregate global foreign exchange reserves across country groups and the structure of reserve portfolios.

Under the gold standard and the emergence of paper money in circulation, the MR existed as a state gold reserve, which secured the state's national currency, external obligations, and international settlements.

Within the framework of the Genoa International Monetary System, a currency component appeared in the IR, but as a proxy for gold. National currencies (the US dollar, the British pound, and the French franc) became part of the reserves because they were convertible to gold. Similarly, in the Bretton Woods system, the dollar as a reserve currency was significant because it was exchangeable for gold.

After the gold standard was abolished, gold's role in IR began to diminish in the context of its "demonetization", but this metal never left the IR composition, increasing its presence during crisis periods and thus demonstrating its reserve, collateral, and protective potential.

The development of globalization processes, followed by the formation of a unipolar world, led to the transformation of the role of IR, shifting the focus from their security and collateral function to a transactional one and embedding them in the system of global currency liquidity redistribution. The role of gold in the international reserve system has been declining.

In 1999, European central banks concluded the Washington Agreement on Gold (Central Bank Gold Agreements, CBGA), which coordinated their sales of monetary gold to prevent imbalances in the global precious metal market and a collapse in world prices. This was reflected in the structure of total global international reserves, where the gold component began to decrease while the currency component became dominant. International foreign exchange reserves have become "external assets" that have literally become external both in an economic sense (as obligations of reserve currency issuing countries to non-residents, holders of foreign exchange reserves) and physically, as they were held in accounts and financial assets abroad under the control of their issuers. The sanctions potential of reserve currencies has been formed, but it was not in demand until recently because the leading issuing countries were the main beneficiaries of the global monetary and financial system operating under the Washington Consensus.

In the modern international financial system, international reserves are a crucial element ensuring the interconnection between the official and private components of global liquidity[4] within the framework of its redistribution in the international and national monetary systems. The current model of international reserve accumulation provokes the reproduction of global imbalances [15], unequal exchange, and the redistribution of savings from developing countries in favor of reserve currency issuing countries. The dominance of the transactional motive for reserve formation and management over the precautionary motive, along with the increasing share of their currency component and volumes that are clearly excessive for fulfilling their inherent functions, indicates a loss of the main purpose of reserves as a factor of reliability for international obligations and the stability of monetary and financial systems at the national and international levels.

The idea of securing the debts of some countries with the debts of others, given the debt nature of fiat reserve currencies and the Triffin dilemma, is

[3] URL: https://www.rbc.ru/quote/news/article/5ae098a62ae5961b67a1c4ba (accessed on 22.11.2024).

[4] Global liquidity — concept, measurement and policy implications. Committee on the global financial system. Bank for International Settlements, 2011. CGFS Papers. No. 45. URL: https://www.bis.org/publ/cgfs45.pdf (accessed on 20.10.2024).

becoming increasingly questionable. The global monetary system, which is not gold-backed but operates under the Bretton Woods framework, can exist only with unconditional trust in the reserve currency issuing countries that have assumed the corresponding international obligations. These obligations also apply to the international reserves of countries in the global community.

The fact that a sovereign state's currency reserves have been blocked is by no means an isolated incident, which indicates that this tool has become systematically considered as a means of influencing the behavior of sovereign states and punishing them. In addition to the foreign exchange holdings of the Bank of Russia, the United States has blocked the reserve assets of the central banks of North Korea, Iran, Venezuela, Libya, and Syria. In 2021, Afghanistan's foreign exchange reserves have been frozen since 2021 till now, and they have not been unfrozen to this day. The US practice of freezing foreign reserves has been adopted by its other Western allies. The EU and the UK have also blocked the reserve assets of the Russian Federation, Libya, and Syria.

The United States has managed to extend sanctions restrictions to such an IR component as SDRs, prohibiting its Treasury Department from exchanging SDRs held by Russia and Belarus for dollars.

The expansion of the practice of blocking reserve assets in the IMF system could not go unnoticed, which was reflected in both the statistics on total global foreign exchange reserves and in the portfolio management policies of many countries around the world.

DISTRIBUTION AND DYNAMICS OF INTERNATIONAL RESERVES

Analyzing the dynamics of aggregate international currency reserves is of particular interest, given the speed and scale of their accumulation, especially before the global crisis of 2008–2009.

IRS' statistics show their growth until 2015, after which their volume stabilized at 11–12 trillion in 2015–2024. Minor price fluctuations during this period are mainly related to changes in the currency structure and exchange rate dynamics. The peak volume of total foreign exchange reserves was reached in the fourth quarter of 2021 (12.9 trillion), but by the second quarter of 2022, it had decreased again to 12.0 trillion. The latest IMF data for Q1 2025 indicates that total reserves amount to 12.54 trillion.[5]

Let's analyze the dynamics of foreign exchange reserves from 2000 to 2021.

Before the global crisis, from 2000 to 2007, total global foreign exchange reserves grew at an average annual rate of 18.5%. In the following 7 years, they increased at an average rate of 9.8%, and from 2015 to 2021, the average annual growth rate decreased to 0.5% (*Fig. 1*). In 2022–2024, the average annual growth rate, calculated quarterly, became negative (–0.145%).

An analysis of the distribution of reserves across major country groups shows that between 2000 and 2014, reserves in AE increased 3.3 times, while those in developing countries increased 11.6 times. As a result, by the beginning of 2015, two-thirds of global currency reserves were concentrated in developing countries: the average annual amount of reserves held by developing countries in 2014 was twice that of developed countries (7.9 trillion US dollars compared to 3.9 trillion US dollars in Q1 2015). At the same time, while the reasons for the concentration of reserves in the group of developing countries are quite understandable, given their export orientation, the sudden change in their growth rates requires further study. It was decided to make a projected forecast of the dynamics of global foreign exchange reserves by developed and developing countries and compare the obtained data with the actual figures.

Official IMF data from 2000 to 2014 inclusive were used to forecast the dynamics of the ICR and extrapolate the indicators. The actual figures for 2019 and 2021 are taken from World Bank statistics, as the IMF stopped providing data for these country groups from the beginning of 2015.

The cumulative absolute increases and growth rates for AE and emerging markets & developing economies (EMDEs) differed significantly over the analyzed period: annual increases in absolute increases were observed in the group of developing countries, while growth was linearly stable in AE.

[5] Currency Composition of Official Foreign Exchange Reserves (COFER), International Financial Statistics (IFS). URL: http://data.imf.org/ on: 10/09/2025 (accessed on 10.09.2025).

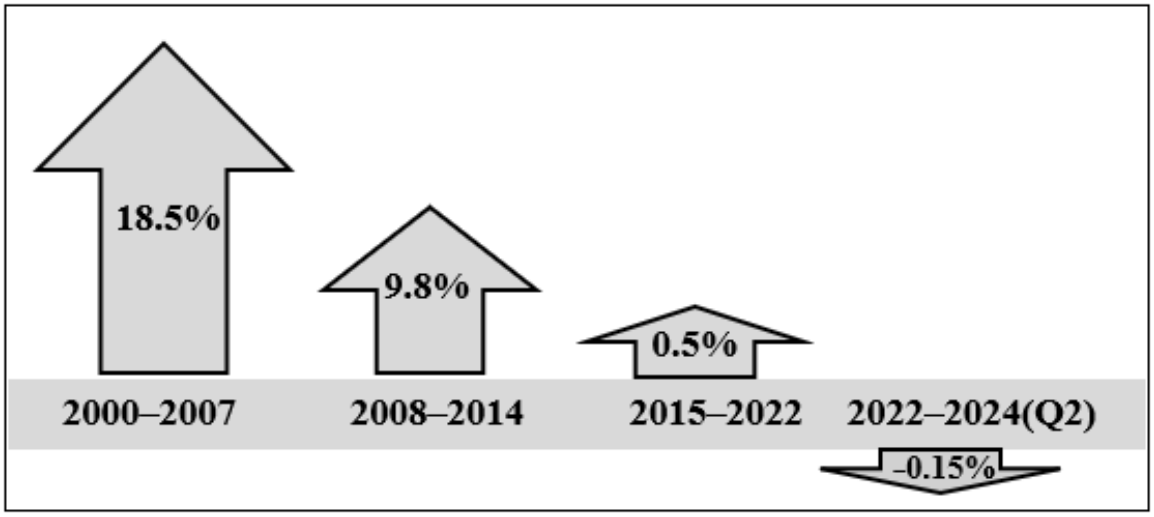

Fig. 1. **Changes in Average Annual Growth Rates of Total International Currency Reserves for the Periods Indicated**

Source: Compiled by the author based on Currency Composition of Official Foreign Exchange Reserves (COFER), International Financial Statistics (IFS).

Therefore, the analysis and forecasting calculations were made for AE based on the linear trend $Y = a + bt$.

A 2nd order parabola $Y = a + bt + ct^2$ was used to forecast the indicators of EMDE.

After calculating the parameters of the corresponding trend equations and smoothed (theoretical) levels of the time series, point forecasts for the reserve sums for 2019 and 2021 were made. The results obtained are presented in the *Table*.

Let's supplement our calculations by also making an interval forecast. The root mean square deviations of the trends were calculated, which amounted to ± 827 323.5 million for developing countries and ± 106 440.54 million for AE

Next, taking into account the Student's t-test for a probability of 0.95 and the corresponding degrees of freedom, prediction intervals were calculated: ± 229 954.15 million for AE and ± 1 787 349.68 million for EMDE.

The resulting forecast results differ significantly from the actual ones, primarily for the group of developing countries (*Table*). For this group, the trend broke after the 2008–2009 crisis, causing their annual increases in total ICR to slow down and stabilize to a linear trend. The distribution of reserves across country groups has also changed; in 2023, developing countries accounted for 58.5% of global reserves excluding gold.

The dynamics of aggregate FXR indicate significant transformations in the global economy and finance after the global crisis, as their dynamics are driven by the nature and intensity of cross-country interaction.

The shift in the balance of power in the global economy in favor of countries that have consistently developed long-term national development strategies, such as China and India, has disrupted the fragile balance that was established after the collapse of the Soviet Union. Following the global financial crisis of 2008–2009, financial globalization gave way to deglobalization processes associated with the restoration of the role of nation-states and the strengthening of interstate barriers to various types of exchanges. The sanctions policy and trade wars of the United States and its Western allies, which intensified after 2015, strengthened the objective deglobalization trend and led to the fragmentation of the global economy. According to the IMF, the share of countries subjects only to financial sanctions increased from 22% to 57% of their total number between 2010 and 2022. The number of new trade barriers imposed annually has almost tripled since 2019, reaching 3000 in 2022.[6]

[6] Global financial stability report: Safeguarding financial stability amid high inflation and geopolitical risk. April. 2023. Washington, DC. URL: https://www.imf.org/en/Publications/GFSR/Issues/2023/04/11/global-financial-stability-report-april-2023 (accessed on 12.11.2024).

Table

Forecast and Actual Data on the Volume of Total International Currency Reserves, Million US Dollars

Indicator / Year	Point forecast		Interval forecast		Actual Data*	
	AE	EMDE	AE	EMDE	AE	EMDE
2019	4884150.29	12557705.55	–	-	4998117.03	7197893.88
2019 всего	17441855.84		15424552.0–19459159.67		12196010.91	
2021	5289846.02	14443974. 49	–	–	6119965.76	7829807.08
2021 всего	19733820.51		17716516.68–21751124.34		13949772.84	

Source: author's calculations based on: Currency Composition of Official Foreign Exchange Reserves (COFER). International Financial Statistics (IFS). International Liquidity selected indicators.

Note: AE — advanced economies, EMDE — emerging market and developing economies. * Total Reserves excluding Gold.

The increasing instability and crisis-proneness of the global economy has necessitated a revision of the global development paradigm, a rejection of the deregulation concept, and a difficult choice between efficiency based on the optimal use of global economic resources and ensuring sustainability to protect against external shocks, disruptions in value chains, and economic and geopolitical risks [16]. The priority of ensuring the sustainability of trade and production links is evident in the trends of reshoring and "friend-shoring" (relocating value chains to friendly countries). Changing national development strategies involves shifting the focus from export orientation to domestic markets, which reduces the need for foreign exchange reserves. Trade and investment flows are being redirected along new geopolitical lines within allied blocs.

In the financial sector, the tightening of Basel capital and liquidity requirements for banks has negatively impacted the growth rate of bank assets and their lending potential. All of this has led to a slowdown in the growth rate of global GDP and world trade. Before the global financial crisis of 2008–2009, the growth rate of world trade was almost twice that of real GDP, but after the crisis, they have converged. During 2000–2005 the average annual growth rate of global exports was 11.4%, in 2005–2010–6.3%, 2010–2015–1.5%, and in 2015–2020–2.7%. The corresponding figures for imports were 11.3%, 5.9%, 1.5%, and 2.8%, respectively.[7] These aspects of global development have led to a slowdown in the accumulation of total international reserves.

TRANSFORMATION OF THE STRUCTURE OF INTERNATIONAL RESERVES

The fragmentation of the global economy and finance, deglobalization processes, and the intensification of geopolitical tensions, especially after 2015, have affected not only the dynamics but also the structure of international reserves. Let's note the following main trends:

- dedollarization and diversification of international reserves;
- orientation toward geopolitical allies when determining the currency structure of the reserve portfolio;
- the influence of the reserve management policies of major holders on the structure of total international reserves;

[7] UNCTAD website. URL: https://unctadstat.unctad.org/insights/theme/11#indicator-45 (accessed on 12.11.2024).

• an increase in the share of monetary gold while the currency component of total international reserves stagnates.

The decrease in the share of the US dollar in total FXR by 13 percentage points, from 71% in 2000 to 57.7% in Q1 2025, did not lead to a corresponding increase in the share of other major reserve currencies — the euro, yen, and British pound — but was accompanied by a growth in the share of such non-traditional currencies as the Australian, Canadian, and Singaporean dollars, the Chinese yuan, the South Korean won, and Scandinavian currencies. While the combined share of the US dollar, euro, British pound, and Japanese yen decreased from 96.5% (Q1 2010) to 88.1% (Q1 2025) after the Global Crisis. Significant diversification of foreign exchange reserve portfolios toward alternative currencies has been observed in about fifty countries, including both developed and developing ones [17]. In 2022, investments in US Treasury securities decreased in Japan, China (including Hong Kong), Taiwan, South Korea, and Brazil. The dedollarization of global currency reserves, reflecting the weakening of the US position in the global economy and trade, accelerated after the freezing of part of Russia's currency reserves, when objectively forming global trends were exacerbated by geopolitical risk.

About a quarter of the dollar's share reduction was due to the yuan, whose weight increased from 1.08% in 2016 to 2.18% by the end of 2024. At the same time, countries show a significant direct correlation between the volume of trade with China and the share of the yuan in their reserves. Globally, the ratio of the total volume of reserves in yuan to the volume of international trade in yuan (the currency of invoice denomination) is close to the ratio of the total volume of foreign exchange reserves in euros to the total volume of global trade in euros [17]. As international trade using the yuan expands, its share in international reserves is likely to grow. This is facilitated by the policy of the People's Bank of China, which has concluded swap agreements with 39 central banks for a total amount of about 3.7 trillion yuan (550 billion US dollars) to increase the scale of trade in its national currency.

The influence of geopolitics on the structure of the IMF was first noted in 2017. Researchers [18] identify two main strategies: forming reserve portfolios from the assets of political and military allies, or based on trade and financial ties, the reliability, and liquidity of the main reserve assets. The first strategy is designed to protect against geopolitical risks, such as the blocking of reserve assets, and is favored by Eastern Bloc countries, allies of China and Russia. The second strategy is characteristic of the Western bloc countries, the United States and their allies. Geopolitical fragmentation is causing a *structural transformation of international reserves*, including thru the policies of their main holders.

The Bank of Russia has been taking "non-economic risks" into account in its IR management policy since 2018. Two portfolios were identified within their structure: one to protect against financial and currency shocks, and another to protect against geopolitical pressure and non-economic sanction risks. The first contained traditional reserve currencies (the dollar, the euro, the British pound), while the second included the yuan, SDRs, and monetary gold. Subsequent events proved the correctness of this approach; the Bank of Russia managed to protect the reserve assets of the second portfolio.

The transformation of the IR structure is influenced by their high degree of concentration among a specific group of countries. As mentioned earlier, over half of the total FXR is accounted for by China, Japan, Switzerland, India, Taiwan, and Russia. It is evident that a change in the policy of IR formation by these countries alone can trigger a general structural transformation of aggregate global reserves. For example, the decrease in the share of dollar reserves held by China, Russia, and Switzerland (from 42% in 2000 to 39% at the end of 2021), and maintaining them at a level significantly below the global average, influences the overall picture [19].

The potential threat of blocking foreign exchange reserves has prompted central banks to diversify their reserve portfolios not only in favor of the currencies of geopolitical partners but also in favor of gold, which is a traditional, politically neutral safe-haven asset and can be stored within national territory under the control of monetary authorities. Against the backdrop of stagnating dynamics in total foreign exchange reserves, the increase in the gold component is happening at a noticeable pace.

GOLD AS A PROTECTIVE RESERVE ASSET IN CONDITIONS OF A TRUST CRISIS

The share of gold in IR began to increase after the global crisis of 2008–2009. Throughout the entire post-crisis period in the global gold market, central banks have been net buyers. As a result, they now own a fifth of all the gold ever mined in human history.

At the same time, the policies of developed and developing countries differed. While the former gradually sold off part of their gold reserves, especially before the Global Financial Crisis, the latter increased their acquisition of it. As a result, by the beginning of 2022, approximately 60% of monetary reserve gold was held in the reserves of developed countries (including 50% by the US and the EU), 30% by developing countries and emerging markets, and 10% by international organizations (primarily the IMF and the Bank for International Settlements (BIS)). On average, the gold component accounted for 19.2% of the developed countries' reserves and 7% of the developing countries' reserves during this period. Over the past 20 years, 14 developing countries have increased the share of gold in their reserves by 5 percentage points or more, with research showing that half of the largest annual increases in central bank gold reserves since the beginning of the 21st century have been linked to the risk of sanctions. At the same time, the proportion of the gold component of the reserves of the Western bloc countries as a whole did not change [20].

The directions of IR transformation in the Eastern Bloc are clearly demonstrated by China, which increased the share of gold from 2% of its world's largest reserves to 5.9% between 2015 and 2025, while the share of American securities (treasury and agency bonds) consistently decreased in 2024 and 2025 from 44% to 30%. Central banks in India and Turkey are actively acquiring gold. The Bank of Russia accelerated its gold purchases after the annexation of Crimea in 2014, and in 2025 its share in reserves reached 37%.[8]

The escalation of the geopolitical situation in 2022–2024 has boosted central banks' net gold purchases to record levels: 1082 tons in 2022 and 1037 tons in 2023. According to the WGC,[9] a third of the 70 central banks planned to continue acquiring this precious metal in 2024,[10] which they did, collectively purchasing 1045 tons. As a result, the share of gold in total global international reserves has reached 20% over the past three years.

Interest in gold is fueled by the rise in its global prices (*Fig. 2*).

The upward price dynamics result in an increase in the value share of gold in reserves, including due to revaluation. Additionally, the annual return of this IR component reached 15% in 2023. In September 2025, spot gold prices on the global market exceeded 3600 US dollars.

The trend toward replacing major reserve currencies with metallic gold in the IR of developing countries is further confirmation of the crisis in the international reserve concept due to a loss of confidence in major reserve currencies and the exacerbation of geopolitical risks.

RESULTS AND DISCUSSION

The repeated practice of blocking reserve assets has undermined confidence in the major reserve currencies and their issuers. Any country that, in the opinion of the United States and its allies, behaves improperly is at risk. In Western literature, an attempt has been made to provide a theoretical justification for such actions. The authors supplemented the functionality of the IR with new content, stating that US dollars are used in them as *security deposits* for foreign investments in developing economies, which can be withdrawn if these countries do not abide by the rules of the game [21].

Restricting the free access of monetary authorities in a number of countries to their foreign exchange reserves has discredited the entire concept of international reserves, creating specific risks within the system that cannot be diversified or reduced by any risk management methods [22, p. 196]. The peculiarity of these reserve blocking risks is that while their probability of realization is relatively low, they are fraught with a very significant

[8] URL: https://www.cbr.ru/hd_base/mrrf/mrrf_m/#highlight=%D0%BC%D0%B5%D0%B6%D0%B4%D1%83%D0%BD%D0%B0%D1%80%D0%BE%D0%B4%D0%BD%D1%8B%D0%B5%7C%D1%80%D0%B5%D0%B7%D0%B5%D1%80%D0%B2%D1%8B (accessed on 12.11.2024).

[9] World Gold Council, WGC.

[10] 2024 Central Bank Gold Reserves Survey. URL: https://gold.org/goldhub/data/2024-central-bank-gold-reserves-survey (accessed on 12.11.2024).

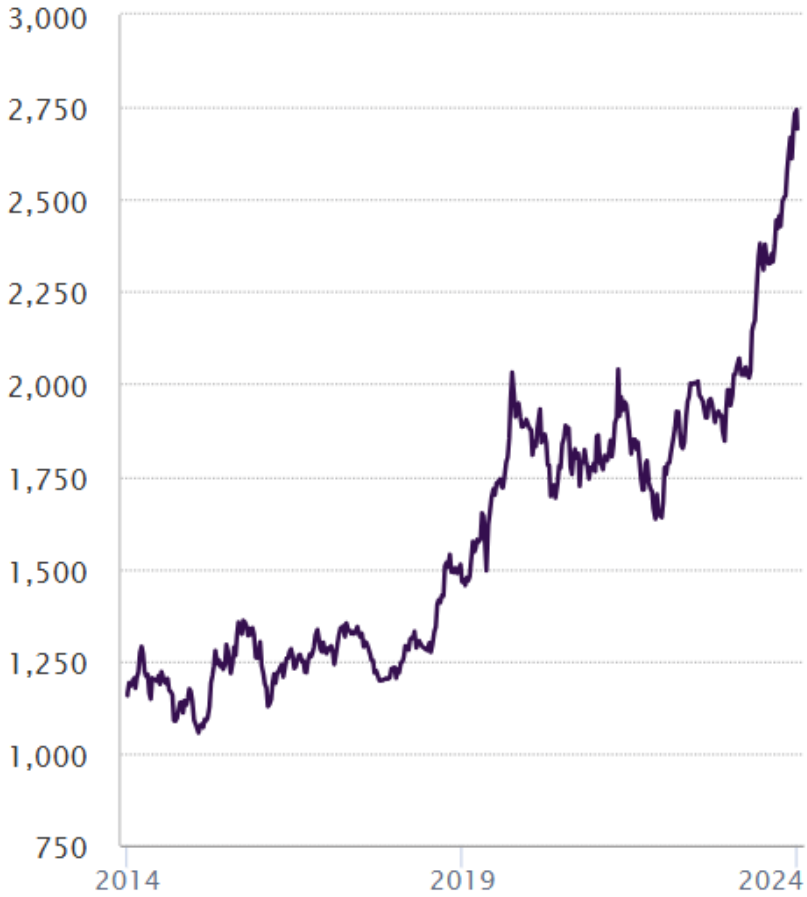

Fig. 2. **Spot Gold Price 2014–2024 US Dollars Ounce**

Source: World Gold Council. URL: https://www.gold.org/goldhub/research/library (accessed on 12.11.2024).

negative impact. The potential damage can only be reduced in one way — by *decreasing the degree of vulnerability* to it thru a reduction in the volume of toxic foreign currency assets. Developing countries, and particularly Eastern Bloc states, have to take this risk into account first and foremost, although it potentially exists for all countries, perhaps except for the United States.

The use of this tool of pressure on sovereign states gives the US the ability to control their behavior across all aspects of geoeconomics, geopolitics, and global finance. The trends in IR transformation identified thru the analysis indicate that countries are aware of this risk and are striving to reduce their vulnerability. This moment became one of the significant factors influencing the rate of accumulation and structural changes in IR in recent years. The problem is that it's not easy for the US dollar to find an alternative within the existing international monetary and financial system, so central banks are forced to act situationally, gradually replacing toxic assets with alternative currencies, primarily trade currencies, and monetary gold.

The search for ways out of the crisis is taking place in consideration of the strategic interests of the participants in the Western and Eastern blocs.

Western elites see the future of the IMF in digital format, and their main efforts are aimed at *maintaining the dominance of fiat reserve* currencies and countering the creation of alternative monetary and financial systems outside the dollar framework [23]. The platform architecture of a digital IMFS allows for the regulation of access to digital currencies thru controlled international institutions, and the programmability of digital tools — the direction of their use and the residency of holders.

Currently, two options for a future digital IMFS have been made public, both of which involve the use of tokenization technology.[11]

[11] Tokenization is the process of recording claims on financial or real assets on a programmable digital platform and representing and circulating them as tokens.

The BIS sees the future of the IMFS in the replacement of fiat money with central bank digital currencies (CBDCs), and their international interaction — either based on national/regional platforms by connecting new jurisdictions and currencies to them, or by creating a new global multilateral platform that facilitates international connections.[12] The international reservation system is not specified in this project, but the tokenization technology and the creation of a unified global programmable ledger allow it to be integrated into the supranational platform.

The IMF project involves central banks tokenizing their FXRs on a single programmable digital platform managed by the Fund [24].

Eastern Bloc countries are seeking to create an alternative to the dollar-based monetary and financial system within the framework of intergovernmental bilateral and multilateral agreements. They prefer to use national currencies and develop projects concerning backed reserves assets.

Currently, this search is leading to an increased role for gold as a reserve asset. The reserve function of monetary gold seems quite understandable, and its qualitative characteristics meet international requirements.

The volatility of global gold prices, which creates corresponding risks for investors, is not that high. In 2021, it was 14.4%, and for securities market instruments, it was 14.8% for the S&P500 and 16.8% for the MOEX.[13] The average daily volatility of the gold price over a five-year period was less than 20%, and the weekly volatility in 2024 was 13.83%, with gold showing a positive correlation in rising markets and a negative correlation in falling ones. Assessing the risk-return ratio, the WGC modeled the impact of adding gold to a portfolio with an allocation ranging from 2.5% to 10% and concluded that gold reduces volatility and improves returns, even with an increased allocation.[14] At the same time, gold's long-term returns have significantly outpaced inflation for over 50 years.[15] From 2004 to 2024, the average annual return on gold was 9%.

Gold's lower liquidity compared to reserve currencies makes it difficult to use for transactional purposes. However, the gold swap[16] mechanism can largely solve this problem.

Thus, a solution that allows for the protection of sovereign countries' reserves in the current geopolitical conditions leads to the *remonetization of gold*, strengthening its role both in the international reserve system and in the IMFS as a whole. Moreover, the capabilities of tokenization technology allow this reserve asset to be converted into digital form as well.

CONCLUSION

The contradiction between the unsecured, fiat nature of the US dollar and its functions as the world's reserve currency, as the balance of power in the global economy shifts, has led the US leadership to aggressively defend its dominance and unilaterally abandon its international commitments in the monetary and financial sphere. The unresolved problem of global money is becoming increasingly prominent and demands the attention of the international community. The US dollar's sanction potential and the increasing practice of blocking sovereign states' international reserves have created unusual and unhedgeable risks in the international financial system. The response was a natural desire by international reserve managers in many countries to reduce risk exposure and protect reserve portfolios from the arbitrary actions of the US and its allies. Today, this task is linked to ensuring the national financial sovereignty and independence of states. Her decision requires a rethinking of both the practice of managing international reserves under

[12] BIS Annual Economic Report 2023. III. Blueprint for the future monetary system: improving the old, enabling the new. URL: https://www.bis.org/publ/arpdf/ar2023e3.pdf (accessed on 22.11.2024).

[13] Cryptocurrencies: Trends, Risks, and Measures. Report for public consultation. Bank of Russia. 2022. P. 12. URL: http://www.cbr.ru/content/document/file/132241/consultation_paper_20012022.pdf (accessed on 10.10.2024).

[14] World Gold Council website. URL: https://www.gold.org/goldhub/gold-focus/2024/08/why-bitcoin-isnt-new-gold (accessed on 12.11.2024).

[15] World Gold Council website. URL: https://www.gold.org/goldhub/research/golds-long-term-expected-return (accessed on 12.11.2024).

[16] A gold swap is an operation between two central banks, one of which sells gold for the national currency of the other with a reverse transaction at an agreed-upon date in the future. However, there is no physical movement of the gold; only ownership of the gold is transferred during the swap period.

the proposed circumstances and the scientific and theoretical justification of the role and functions of international reserves in the existing and future international monetary and financial system, as its deep systemic crisis is no longer doubted by anyone. These are precisely the aspects that could be the subject of further research into the issue of international reserves.

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ABOUT THE AUTHOR

Lyubov V. Krylova — Dr. Sci. (Econ.), Prof., Department of World Economy and World Finance, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0000-0002-9950-8060
LVKrylova@fa.ru

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Digital Transformation of Regional Banks: The Role of AI and Open API

T.N. Zverkova
Orenburg State University, Orenburg, Russian Federation

ABSTRACT

The subject of the study is the process of digital transformation of regional banks within the framework of integrating artificial intelligence (AI) and open APIs (Open API). The impact of these technologies on the competitiveness of banks, the transformation of their business models, and their adaptation to the modern challenges of digitalization are considered. **The purpose of the study** is to determine the advantages of using AI and Open APIs in a regional bank, identify obstacles, and develop practical approaches that facilitate the integration of these technologies into banking operations. **Methods** such as system analysis, the logical method, and process and empirical approaches were applied. Special attention is given to assessing the costs of implementing AI and Open APIs. The study allowed for the formation and justification of directions for the digital transformation of banks through the integration of AI and Open APIs. The costs associated with digitalization are presented, and ways to minimize these expenses are proposed. An important outcome of the study was the identification of areas for cooperation between regional banks and FinTech, which allows them to reduce costs when using open APIs. **The novelty of the study** lies in analyzing the specifics of AI and Open API integration in regional banks, unlike most studies that focus on examining the digitalization practices of large credit institutions. The author proposes approaches to integrating innovative solutions, taking into account limited IT budgets. This allows us to view AI and Open APIs not only as tools for process optimization, but also as factors for the survival of regional banks in the digital age. The research findings can be used by regional banks in developing digital transformation strategies and optimizing business processes. The proposed directions will allow banks to reduce costs associated with AI and Open APIs, as well as identify the most promising partnership models for collaboration with technology companies.

Keywords: artificial intelligence; AI; Open API; regional banks; digital transformation; FinTech; digital ecosystems; innovation

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INTRODUCTION

The modern financial intermediation industry is on the verge of large-scale transformations driven by the development of artificial intelligence (AI), open APIs, and the integration of algorithmic solutions into banking processes. Traditional banking business models are gradually giving way to intelligent digital ecosystems based on automated solutions, big data analysis, and predictive risk management mechanisms. The development of cognitive financial systems, API 3.0, and global Open Finance marketplaces is shaping a new product and service architecture in which banks can either occupy a unique niche or, conversely, face a loss of position.

These theses are supported by a large number of scientific studies. Specifically, in the papers [1, 2] emphasize that AI is becoming a key element of the digital transformation of the banking sector, improving forecasting accuracy, risk management, and the personalization of financial services. At the same time, in the work [3], the author points out that despite the positive impact of AI in Russia, its potential is being realized less effectively than abroad, which is explained by insufficient investment and non-systematic use.

In the papers [4, 5] explore how AI is changing the traditional model of banking interaction with FinTech by developing new technologies and services, forming dynamic systems. Foreign research [6] also confirms that AI and Open APIs are capable of optimizing banking processes and changing the way customers interact with banks.

Some researchers demonstrate how the traditional banking model, based on closed systems, is gradually giving way to Open Banking and Open Finance, which involve the free exchange of financial data between banks, FinTech companies, and third-party service providers. Using Open API allows financial market participants to develop new services and integrate external platforms. Among them, we can highlight the paper of [7–10]. However, despite the promise of AI, its implementation is accompanied by a number of barriers. So, D.A. Kochergin [11], K. Bagrationi and T. Thurner [12] identify among them a shortage of qualified AI specialists and employee resistance to technological changes. In works [13–16], the authors point out that successful AI integration requires large-scale investments in IT infrastructure for strategic interaction between banks and technology companies.

Despite the diversity of research directions in digitalization, it should be noted that works dedicated to the application of AI and Open APIs in regional banks are not very common at present. Among them, we can highlight papers [17–20].

O. S. Petrova and A. S. Fedorov [17] emphasize that the lack of telecommunications infrastructure and insufficient material resources hinder the use of electronic service channels in local banks. The authors also highlight concerns about the security of electronic systems, as any cyberattack quickly undermines trust, especially in regions with low levels of digital literacy. According to S.V. Shkodinsky and co-authors [18], a large volume of data is needed for scoring models and transaction analysis to work correctly, and credit institutions in the regions rarely have a large customer base. A. Yu. Anisimov and co-authors [19] take a similar position, noting that the lack of well-established internal processes and the need to comply with new Open API standards already increase the workload on personnel responsible for IT procedures. O.S. Petrova and A.S. Fedorov [17] point out that it is extremely difficult to find specialists in small towns who are capable of deploying secure digital platforms and analyzing potential vulnerabilities. Additionally, S.V. Shkodinsky and his colleagues [18] note socio-territorial differences: in remote areas, network speed is low or completely absent, which prevents mobile applications from loading quickly. N. Yu. Lukyanova et al. [20] note that under such conditions, any serious application failure can create a negative reputation for remote banking in the province. The situation is also complicated by the incompatibility of IT systems. The article [21] highlights that the lack of unified data exchange standards hinders

interbank operations, and updates to internal platforms often lead to technical issues. Almost all researchers agree that without attracting investment in server upgrades and without high-quality data analytics, local banks cannot fully implement complex solutions like AI and Open API.

Despite the obvious technological and operational advantages, the integration of AI and Open APIs into regional banks faces a number of limiting factors. These include insufficient investment resources, a shortage of qualified IT personnel capable of developing and maintaining complex analytical solutions, and the technological backwardness of the infrastructure used, which hinders the modernization of internal systems. This leads to banks being unprepared to implement large-scale digital transformation projects, which will inevitably deepen the technological gap and result in a loss of market position in the long-term.

The unresolved nature of these issues underscores the relevance of this study and highlights the need for further research aimed at identifying the potential of AI and Open APIs in the regional banking sector. It is also necessary to consider that within the framework of the Bank of Russia's concept for implementing Open API in the financial market, all banks will be required to use open API standards starting in 2026.[1] The study analyzed the economic and technical aspects of integrating AI and Open APIs into banking processes. Special attention is given to cost optimization issues when implementing AI and Open APIs.

METHODOLOGY

In this study, we assume that the digitalization of banking inevitably leads to changes in traditional business models, and the ability to integrate new technological standards becomes a decisive factor in their competitiveness. The methodological basis of the work is systems analysis, which allows for the study of the interaction of various elements of the banking sector, including API infrastructure, AI algorithms, and customer services. Process and empirical approaches are also used, which allow for structuring the stages of AI and Open API integration and determining the overall costs for banks. The research is based on analytical reports and publications from the Central Bank of Russia, the FinTech Association, as well as articles from leading scientific journals dedicated to the digitalization of the banking sector over the past 5 years. The empirical basis used includes data on the cost of AI and Open API,[2] as well as data on the cost structure associated with the digital transformation of banks. Particular attention is given to assessing the total costs of developing AI solutions and training personnel. This approach allows us to assess how regional banks can transform from traditional institutions into flexible, self-learning structures capable of operating within automated financial ecosystems and offer specific measures to reduce costs when integrating AI and Open API.

DIRECTIONS FOR INTEGRATING AI AND OPEN APIS IN BANKS

Traditionally, credit institutions operated within closed systems where access to data and services is strictly regulated by internal rules. This model provided a high level of security, but at the same time, it limited opportunities for innovation and collaboration with external partners. With the development of digital technologies and changing consumer expectations, there has been a need for a more open and flexible architecture.

The transition to Open API is supported at the level of the Central Bank of the Russian Federation. The Bank of Russia has developed a concept for implementing Open API in the financial market and standards for banking interfaces,[3] the application of which

[1] The concept of implementing Open APIs in the financial market. URL: https://cbr.ru/Content/Document/File/142114/concept_09–11–2022.pdf. (accessed on 20.03.2025).

[2] The Evolution of banking. how and why big businesses are switching to Open APIs. URL: https://sber.pro/publication/evolyutsiya-bankinga-kak-i-pochemu-krupnii-biznes-perehodit-na-open-api/ (accessed on 20.02.2025).

[3] Website of the Bank of Russia. URL: https://www.cbr.ru/fintech/acts/?la.search=&la.tagid=3&la.vidid=26&la.date.time=any&la.date.datefrom=&la.date.dateto= (accessed on 20.02.2025).

contributes to the development of products and services in the financial market. These standards create uniform rules for market participants to interact and allow banks and FinTech companies to set up customer data exchange with their consent.[4]

For a clear understanding of the processes of AI and Open API integration in the banking sector, let's combine the main development directions in *Table 1* and assess the possibilities of their implementation. The proposed table requires a more detailed explanation of each direction:

1.1. Cognitive Financial Systems. In the future, AI in banking will transform into cognitive financial platforms [22] that will combine three key technologies:

- *Hybrid machine learning*. Banks will have the opportunity to combine classic decision-making algorithms with probabilistic models.
- *Meta-learning*[5] *and autonomous integration*. Thanks to the self-learning ability of AI systems, banks will be able to operate in conditions of uncertainty, where traditional statistical models are insufficient.
- *AI-based financial self-regulation*. The use of self-regulating AI systems will allow banks to automatically maintain liquidity by allocating assets based on predicted customer behavior and market conditions.

1.2. Quantum AI and Forecasting. Unlike traditional AI models, quantum algorithms are capable of analyzing multidimensional correlations and working with probabilistic states, which will provide banks with a deeper level of analytics and predictive accuracy. By using quantum AI, banks will be able to process large volumes of market data, taking into account the influence of numerous macroeconomic factors and complex non-linear relationships between different financial instruments.

1.3. API 3.0 — fully integrated and self-regulating APIs. APIs 3.0 are significantly different from today's solutions, which require strict standardization. API 3.0 will function based on: automated adaptation, where APIs can adjust to client requests in real-time; autonomous machine learning elements; and instant cross-data analysis, where the API infrastructure can exchange information between banking, insurance, and investment services in real-time.

1.4. Global Open Finance Marketplaces. Open APIs are going beyond banking services and becoming the foundation for global Open Finance marketplaces where users will be able to customize financial services in real-time. Unlike modern models where the client needs to independently search for the best offers, analyze the terms, and request approval, the Open Finance marketplace completely eliminates manual selection.

1.5. AI ecosystems in finance will develop in three possible scenarios:

1.5.1. Centralized AI ecosystems. In this scenario, major banks and the Central Bank will begin to control the AI infrastructure, ensuring transparency and security. In such a case, AI will be able to perform centralized financial flow analysis and automated AML control.

1.5.2. Decentralized AI ecosystems. This scenario involves the use of autonomous AI platforms that can operate without the involvement of banks, integrating with DeFi. In this case, users will receive financial services without intermediaries, and decentralized APIs will allow them to use any financial services without the permission of traditional banks.

1.5.3. Hybrid AI ecosystem. The most likely scenario is a combination of centralized and decentralized solutions. In such a model, banks would retain control over the regulation of AI solutions while also beginning to use DeFi tools that combine traditional banking services with blockchain technologies.

Certainly, not all of the aforementioned promising directions can be implemented in the practical activities of regional banks.

[4] The concept of implementing Open APIs in the financial market. URL: https://www.cbr.ru/Content/Document/File/142114/concept_09–11–2022.pdf. (accessed on 20.02.2025).

[5] Meta-learning. Applications in AutoML and Data Science. 9785937002006, 9783030670238. URL: https://dokumen.pub/automl-9785937002006–9783030670238.html (accessed on 20.02.2025).

Table 1

Directions for the Development of AI and Open API in the Banking Sector and the Possibilities of Their Implementation by Regional Banks

Direction	Description of the direction	Advantages for banks	Real possibility of implementation by the bank
1. 1. Cognitive Financial Systems	Hybrid machine learning, meta-learning, self-adjusting investment strategies	Personalization of banking products, dynamic pricing, reduction of operational risks	Medium — requires significant investment in AI infrastructure, but is possible through partnerships with FinTech companies
1.2. Quantum AI	Automatic interest rate adjustment, AI analysis of macroeconomic indicators	Advantages in credit scoring and investments	Very low — high implementation cost, only available to the largest bank
1.3. API 3.0 — Adaptive and Self-Regulating APIs	Forecasting multidimensional correlations, probabilistic analysis of banking risks	Flexibility of new banking services, simplification of interaction with FinTech	High — most API solutions can be integrated through partner programs and cloud technologies
1.4. Global Open Finance Marketplaces	Automatic adaptation to customer requests, integration with various FinTech services	Easier integration with other banks and FinTech, development of cross-products	Medium — requires digital transformation but is accessible through Open Banking cloud platforms
1.5.1. Centralized AI Ecosystems	Creating platforms for automated selection of banking products	Ensuring compliance, reducing banking risks	High — requires compliance with Central Bank standards, but is accessible to most banks
1.5.2. Decentralized AI Ecosystems	Government regulation of AI financial management, AML control	The ability to work directly with clients without intermediaries, simplifying lending	Low — requires legislative changes and a bank's high digital maturity
1.5.3. Hybrid AI Ecosystems	Autonomous AI platforms, DeFi tools	The ability to adapt to new technologies without losing control	Medium — partial implementation is possible using third-party AI platforms

Source: Compiled by the author.

Quantum AI remains inaccessible to small and medium-sized banks due to its high cost and complexity of implementation. Unlike him, APIs 3.0, which use multidimensional correlations and probabilistic analysis of banking risks, can be integrated relatively easily thanks to cloud technologies and partnership programs. Hybrid AI ecosystems, combining traditional and decentralized approaches, can be partially implemented, provided third-party AI platforms are used. Thus, the most realistic directions for banks

are API integration, centralized AI ecosystems, and partial digitalization using Open Finance.

We have listed only a small part of the directions for AI and Open API development. Considering the aforementioned innovations, it is necessary to start thinking today about how the role of banks will change and what place they will occupy in the market of the future. How will their position change if banking services are fully integrated into global decentralized platforms, stripping banks of their monopoly on financial transactions? What consequences will the disappearance of traditional bank accounts and cards have if funds take the form of smart contracts? If banks are unable to adapt to these changes, will they face a mass exodus of customers and lose their role in the financial intermediation system?

To secure their future in the new landscape, banks need to assess the financial and technical resources required to implement AI and Open APIs. This requires a detailed cost analysis, including infrastructure upgrades, integration with existing systems, staff training, and support for new technological solutions.

Let's consider the main cost items that need to be taken into account during the digital transformation of regional banks in *Table 2*.

As the cost calculation in *Table 2* shows, their volume for regional banks is quite significant. Total investments can range from 3 million to 8 million dollars, and in large banks, up to 0 million and higher.

In conditions of insufficient resources, regional banks can take advantage of the FinTech Association's initiatives for Open API integration.[6] These documents allow banks to optimally change their business model, transitioning from costly traditional processes to an ecosystem model with minimal investment. By using standardized Open API interfaces, banks can integrate with existing external platforms, leveraging ready-made solutions and advanced technologies. This ensures process automation, reduced operating costs, and a quick return on investment. Additionally, participation in the Association's pilot projects and educational programs allows banks to avoid costly mistakes and utilize funds as efficiently as possible.

The following can be considered as directions that could potentially contribute to the integration of AI and Open APIs into banking processes:

1. *Technical infrastructure: transitioning to cloud computing and abandoning capital-intensive solutions*. Traditionally, banks use closed IT systems with limited integration with external services. In new digital strategies, this approach needs to be completely rethought, and an API infrastructure should be created that allows customers, partners, and third-party developers to integrate banking services into their systems. Banks transitioning from closed IT infrastructure to APIs allows them to reduce their operational and investment costs. Firstly, using cloud solutions allows you to minimize initial capital investments in server capacity and specialized equipment, replacing them with relatively inexpensive subscription services. This reduces the costs of purchasing and maintaining your own IT infrastructure. Secondly, Open APIs eliminate the need to develop complex software solutions independently, allowing you to use existing digital platforms and third-party developer services. As a result, the costs of maintaining and updating their own systems are reduced (a total of 230 000 dollars — see point 1.1 of *Table 2*), and the integration of innovative products is accelerated, leading to a faster return on investment.

2. Open interfaces provide banks with a simple and cost-effective way to expand their product and service lines without the expense of their own research and development. The bank is becoming a platform where partners independently create and maintain in-demand customer services, which reduces the financial burden and allows freed-up resources to be directed towards other areas of development. This opens up the possibility of transitioning from a service provider format to a "bank as a

[6] The FinTech Association has developed open API standards. URL: https://fintechru.org/press-center/publications/assotsiatsiya-fintekh-razrabotala-standarty-otkrytykh-api/ (accessed on 20.03.2025).

Table 2

Approximate Calculation of Costs for the Implementation of AI and Open API in the Context of Digital Transformation of Regional Banks

Direction	Description	Approximate costs, US dollars
1. Initial costs of implementing AI and Open API		
1.1. Technical infrastructure	Banks often operate on outdated software, which requires upgrading servers, databases, and network equipment. Implementing AI requires high-performance computing power, such as cloud solutions or on-premise data centers with graphics processing units (GPU)	Server equipment:200 000–500 000 Cloud services: 10 000–50 000 per month Data storage systems: 50 000–150 000 Network infrastructure upgrade: 30 000–100 000
1.2. Open API licensing and subscription	Many API platforms operate on a subscription model, the cost of which varies depending on the level of personalization and data processing volume	Basic API access: 5 000–20 000 per month Corporate licenses: 100 000–500 000 per year
1.3. Integration with existing systems	Most banking systems are built on outdated architectures. Integrating OpenAI requires APIs and developing new data exchange gateways	API gateway development: 100 000–300 000 Internal software updates: 200 000–500 000 IT infrastructure consulting and auditing: 50 000–100 000
1.4. Developing API models for banking	If a bank is developing its own API models, it needs machine learning and data analytics specialists. Large datasets are also needed to train the models	Data science team (5–10 people): 500 000–1 000 000 per year AI model development and testing: 300 000–700 000 Data preparation and processing: 100 000–250 000
1.5. Staff training	Training employees to work with AI solutions and APIs. IT Department Training and Development	Courses and certifications for AI and API specialists (from 5 000 to 20 000 per employee) Training staff on how to work with new customer services (50 000–200 000 depending on the number of employees) Hiring AI and API experts. The average salary for AI specialists is 120 000–250 000 per year
1.6. Business process change	Re-evaluating traditional processes. Implementing predictive analytics for forecasting customer needs	Restructuring business processes requires additional time and financial investment (from 100 000 to 1 000 000 depending on the scale of the transformation)
2. Post-implementation operational costs		
2.1. IT infrastructure support	API solutions require constant updates, monitoring, and improvements. This includes server maintenance, monitoring API performance, testing, and adjusting AI models	Server infrastructure maintenance (50 000–200 000 per year) Subscriptions to AI platforms and software updates (100 000–300 000 per year) Quality control of AI models and APIs (10 000–100 000 per year)
2.2. Staff training	APIs require employee retraining because customer interaction, data processing, and risk management are changing	Front-office employee training: 10 000–50 000 Compliance department training: 10 000–30 000
2.3. Cybersecurity	The integration of AI and APIs increases banks' vulnerability to cyberattacks. This requires new data protection mechanisms, multi-factor authentication, activity monitoring	Deploying cybersecurity systems: 200 000–500 000 Monitoring API traffic: 50 000–150 000 Implementing multi-factor authentication: 100 000–300 000

Table 2 (continued)

Direction	Description	Approximate costs, US dollars
3. Advanced stage: full ai optimization and autonomous APIs		
3.1. Creating a fully digital bank powered by AI and APIs	Hyper-adaptive APIs (API 3.0). Fully automated machine learning APIs. Integration with DeFi platforms, use of smart contracts. Centralized AI analytics for dynamic risk management	AI cash flow driving (500 000–1 500 000) Hyperadaptive APIs (300 000–1 000 000) AI risk analysis (500 000–1 500 000)
3.2. Risks of non-compliance with the requirements of the Central Bank of the Russian Federation	Ensuring compliance with the regulatory requirements of the Central Bank of the Russian Federation, international AML standards, and GDPR	Legal Expertise (50 000–150 000) Compliance systems (100 000–500 000) Internal audit of AI solutions (50 000 per year)

Source: Compiled by the author.

platform" model, enabling seamless integration with financial and non-financial services.

3. *AI Licensing and Subscription: Choosing the Optimal Level of Integration.* Using a hybrid licensing and subscription model allows for cost optimization. Corporate licenses for proprietary AI solutions require investments in development, infrastructure, and maintenance, which often exceed the capabilities of banks. An alternative to this is the application of a hybrid approach: less expensive and safer internal solutions can be used to process data and processes related to internal security and the requirements of the Central Bank of the Russian Federation. At the same time, less critical functions (customer preference analytics, marketing forecasts, scoring, processing standard inquiries) are being transferred to more accessible cloud platforms. Banks gain the ability to flexibly scale the use of AI technologies based on current needs and IT budget, avoiding unnecessary capital expenditures and minimizing the risks of confidential data leakage (reducing costs by up to 200 000 dollars in total — see point 1.2 of *Table 2*).

4. *Integration with existing systems: phased implementation of APIs and abandonment of expensive infrastructure-dependent IT solutions.* For banks with outdated IT systems, phased integration of APIs is the most rational and economically justified way to digitally modernize. A complete replacement of IT solutions requires investments that are often impossible for local banks to make. Using a gradual API gateway implementation strategy allows for minimizing upfront costs, as it doesn't require an immediate abandonment of existing infrastructure, but rather provides a smooth and cost-effective transition. Using API gateways in the first stage allows banks to quickly establish data exchange with external services and partners without a capital-intensive overhaul of their internal architecture. Then, as financial resources and technological maturity allow, the bank gradually transitions to a modular structure, replacing individual components of the outdated IT system with new, more functional solutions. This approach allows investment costs to be spread over a longer period, avoiding the need for large and expensive upgrades (totaling from 200 000 dollars — see point 1.3 of *Table 2*).

5. *Developing AI models for banking: using ready-made solutions instead of building from scratch.* Creating own AI models requires, as we calculated above, significant investments in attracting highly qualified specialists (data scientists), acquiring or renting computing power, as well as a lengthy period of model testing and training. In the context of budget constraints, such a strategy is economically disadvantageous. Instead, banks can apply

market-proven solutions offered as cloud services or licensed AI products, adapting them to their specific needs. Using ready-made AI models reduces costs, ensures rapid integration, and allows for the quick launch of new services (totaling from 300 000 dollars — see point 1.4 of *Table 2*). This also shortens the time to profitability and lowers the risk of failures associated with insufficient experience in independent development.

6. *Business process change: implementing dynamically integrated API-based models*. Traditional banking processes require lengthy setup, approval, and regulation. Using API 3.0 and intelligent automated solutions will allow for more flexible business models. Classic approaches involve strict internal rules and the need to reconfigure systems with any changes in the requirements of the Bank of Russia or market conditions. The use of API and AI technologies allows banks to quickly change internal processes, responding to changes in the market environment without costly modifications and reconfiguring the entire operating model (totaling from 100 000 dollars — see point 1.6 of *Table 2*).

7. *Optimizing IT infrastructure support costs through AI monitoring*. Banks can reduce IT infrastructure support costs through automated AI solutions for server capacity monitoring, API testing, and AI model lifecycle management. Standard approaches to infrastructure maintenance require continuous monitoring, periodic inspections, and servicing. The application of AI-based intelligent monitoring allows for the automatic real-time identification and prediction of potential equipment failures, deviations in interface operation, and degradation in AI model performance. This approach minimizes the number of routine operations and prevents downtime and failures, reduces maintenance costs, and decreases the need for additional personnel (totaling from 50 000 dollars — see point 2.1 of *Table 2*).

8. *Development of autonomous APIs and the transition to decentralized financial services*. In the long-term, banks will need to evolve from traditional centralized architecture to autonomous APIs and DeFi services. Static banking platforms that require regular intervention, maintenance costs, and upgrades will be replaced by a fully API-oriented infrastructure based on service architecture and distributed ledger technology. Such infrastructure implies the use of autonomous APIs capable of automatically interacting with external systems, quickly exchanging data, and dynamically changing product parameters. This eliminates the need for constant reprogramming and recalibration of systems, reducing the costs of keeping them up-to-date and operational.

PROMISING DIRECTIONS FOR THE DIGITAL TRANSFORMATION OF REGIONAL BANKS

In the context of the digital transformation of the banking industry, traditional forms of partnership with FinTech are no longer providing a sustainable advantage, as major market players have already put the potential of Open APIs, platform systems, and AI into practice. Under these conditions, regional banks will no longer be able to compete effectively simply by copying or catching up with existing technologies and strategies. Their future directly depends on their ability to develop fundamentally new models of interaction with FinTech, involving the creation of joint products, technology exchange, mutual integration, and going beyond traditional banking activities.

Regional banks should actively utilize the opportunities of joint innovation labs themselves, forming alliances based on the shared use of neurotechnology's, IoT solutions, blockchain platforms, and other innovative tools. As a result, they will be able to move beyond the classical banking paradigm and become full participants in the modern financial ecosystem, organically integrated into the rapidly changing conditions of the digital economy.

One of the promising directions for banking transformation is participation in AI-native banking alliances, where credit institutions are moving away from the role of centralized information repositories and transitioning to fully distributed, AI-driven digital structures.

In such alliances, AI functions not just as a tool for automating individual operations, but as an agent capable of independently analyzing market and credit risks in real-time, generating optimal lending decisions, and dynamically managing liquidity. At the same time, local banks become an integrated part of a self-learning global AI network, which ensures continuous improvement of algorithms and the prompt adaptation of banking services to changing market conditions and customer demands.

Another promising direction for the digital transformation of banks could be their integration into decentralized autonomous organizations (DAOs) that operate based on smart contract technology. Within such a model, banks lose their traditional functions as centralized intermediaries, transferring decision-making regarding lending operations, investment activities, and payment management to specialized systems. The algorithmic nature of DAO banking[7] completely eliminates the influence of the human factor on critical processes. Banks interact with customers and partners using digital tokens, which radically changes transaction costs, speeds up settlements, and enables fully automated reporting. The application of DAO banking fundamentally changes the infrastructure of banks transitioning to a decentralized network business organization that doesn't require a physical branch network or traditional bank branches.

At the same time, financial "metaverse" banking can be identified as the next evolutionary step in digital customer interaction. In this concept, the bank is no longer limited to the classic mobile app or web platform format, but is integrated directly into virtual financial spaces ("metaverses"). Banks' virtual offices in the "metaverses" are becoming points of direct and interactive contact where customers receive consultations from intelligent AI assistants, take out loans, make payments, and conduct investment transactions in a fully virtualized environment. Tokenization of assets and the application of distributed ledger technology in the "metaverses" allow banks to execute instant transactions and settle between different jurisdictions with minimal transaction costs.

Another future scenario is the disappearance of classic banking interfaces and a transition to the Embedded Finance 3.0 post-banking model.[8] In this concept, banks "dissolve" into user ecosystems, and financial transactions occur automatically within social networks, marketplaces, and digital platforms. Bank accounts, cards, and mobile apps are becoming redundant as AI agents begin to operate in the background, independently analyzing a user's financial needs and automatically executing necessary transactions. As a result of this transformation, banks lose their visible independence, becoming invisible providers of financial services, deeply integrated into digital platforms and online services. This fundamentally changes the role of banks in the financial infrastructure, transforming them from traditional financial intermediaries into infrastructure service providers that ensure seamless, convenient, and fully automated execution of all financial transactions in users' daily lives.

The interaction between banks and FinTech opens up the prospect of participating in neural network credit DAOs, where credit decisions are formed not by banking structures, but by distributed AI algorithms. In such an architecture, traditional scoring approaches are replaced by dynamic AI models that assess creditworthiness based on a comprehensive analysis of a customer's social behavior, transactional activity, and cognitive patterns.

The final stage in the evolution of alliances between regional banks and FinTech companies could be the utilization of the capabilities of companies that possess quantum computing and data encryption technologies. The use

[7] Decentralized Autonomous Organization (DAO): Definition, Purpose, and Example. URL: https://www.investopedia.com/tech/what-dao/ (accessed on 20.02.2025).

[8] Embedded Finance and BaaS: reflections on 2024 and what lies ahead. URL: https://thepaypers.com/expert-opinion/embedded-finance-and-baas-reflections-on-2024-and-what-lies-ahead-1271178 (accessed on 20.02.2025).

of such systems will allow for an increase in the security level of banking transactions, ensuring complete invulnerability to any hacking attempts and unauthorized access. Simultaneously, this will ensure instant processing of the vast amounts of data needed for risk analysis, liquidity management, and real-time interbank settlements.

Thus, banks need to not just adapt to existing digital standards, but completely rethink their strategy for interacting with FinTech. The application of AI, decentralized platforms, "metaverses", neurointerfaces, IoT banking, and quantum financial networks will allow them not only to maintain their role in the market but also to reach a completely new level of digital transformation, evolving from traditional financial intermediaries into dynamic elements of the future global financial ecosystem.

CONCLUSION

The changing architecture of the banking sector today is dictated by digital transformation, which is based on AI and Open APIs. Major banks are actively implementing AI models to solve tasks such as predictive data analysis, automated detection of anomalous transactions, and improving the accuracy of financial forecasting, which gives them a high speed of response to changes in the market situation and personalization of customer services. Unlike them, banks in the regions predominantly continue to use traditional approaches, including static scoring models and analytical procedures limited by the capabilities of the software they use. At the same time, the application of Open API provides local banks with the opportunity to bridge the technological gap. Open APIs allow small banks to integrate with external digital platforms and FinTech companies, gaining access to modern data processing technologies, new products, and customer service channels without significant investment.

To overcome these challenges and successfully implement AI and Open APIs, such banks require a fundamentally different approach to organizing digital transformation. The optimal strategy becomes a phased modernization of the IT architecture with a gradual transition to cloud and modular API-based solutions, which allows for minimizing capital expenditures and reducing the workload on in-house specialists. Partnerships and strategic collaboration with FinTech companies and external technology providers offer the opportunity to utilize ready-made digital solutions, avoiding the costs of independent development.

Participating in hybrid AI ecosystems and alliances, where traditional financial services are closely integrated with third-party digital services, will allow banks to quickly bridge the technological gap and minimize innovation implementation costs. The application of AI and Open APIs should become not just a trend, but a priority task for regional banks, ensuring their sustainability and competitiveness.

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ABOUT THE AUTHOR

Tatyana N. Zverkova — Cand. Sci. (Econ.), Assoc. Prof., Department of Banking and Insurance, Orenburg State University, Orenburg, Russian Federation
https://orcid.org/0000-0002-6540-6154
tnzverkova@mail.ru

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Short-Term Forecasting and Investing in Russian Oil and Gas Companies Taking into Account Benchmark Markers

D.A. Aksenov, V.V. Toropov, T.M. Mazurchuk
Financial University under the Government of the Russian Federation, Moscow, Russian Federation

ABSTRACT

The Russian oil and gas complex is closely integrated with global financial markets and has been building trade and logistics links with foreign trade partners throughout the 21st century, as the main flow of produced hydrocarbons and their derivatives is exported. The oil and gas complex plays a key role in generating state budget revenues, replenishing the country's foreign exchange reserves and ensuring the country's balance of payments. As of 2024, the share of the oil and gas complex in the structure of the Russian stock market is 45%, and the market price of equity capital reaches 50% of the capitalization of the Russian securities market. Despite the economic shocks caused by the consequences of the COVID-19 pandemic, special military operations, large-scale sanctions restrictions, and military and political conflicts in the Middle East, the Russian oil and gas complex is a steadily growing industry with high macroeconomic indicators. Also, the investment potential of Russian oil and gas companies is revealed in their ability to provide not only the safety of savings, but also significant financial benefits from rising share prices and attractive dividend income under the strict monetary policy of the Bank of Russia and high inflation. The presence of risks, volatility of quotations together with other factors create uncertainty for investors on the stock market. It is difficult and, in some cases, impossible to determine to what extent one or another parameter influences the change of derivative price. As a consequence, the main purpose of the article is to create statistically significant models for analysing and investing in securities of oil and gas companies, taking into account benchmark markers, to form a relevant investment portfolio in the Russian oil and gas market in the current turbulent conditions. The results of the scientific research reflect the obtained multifactor regression equations and relevant investment portfolio of securities of oil and gas companies in Russia.

Keywords: investment; oil and gas sector; multifactor regression equations; forecasting; vertically integrated oil and gas companies; stock market

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INTRODUCTION

In the context of high volatility in global energy markets, short-term forecasting of oil and gas prices and the prices of oil and gas company securities becomes a key tool for making investment decisions. Russia, with its significant hydrocarbon reserves and developed vertically integrated oil and gas companies, presents a unique platform for studying the influence of benchmark markers on investment strategies. Effective use of data on the state of companies and markets allows investors to more accurately assess the risks and opportunities associated with investing in the Russian oil and gas sector.

This study aims to create multiple regression equations for short-term stock price forecasting for public joint-stock companies such as Lukoil, Rosneft, Gazpromneft, Novatek, Surgutneftegaz, and Tatneft, as well as to create an investment portfolio based on the analysis conducted, with recommendations for interacting with it.

Special attention is also given to the correlation between foreign benchmark markers, such as WTI and Dubai crude oil, and the market price of derivatives, which will allow for the identification of patterns and the offering of recommendations for investors. Thus, analyzing the components of the mechanism for forming market prices for company assets will contribute to optimizing investment strategies in the Russian oil and gas sector, increasing investment activity, protecting savings, and their potential growth in the context of high inflation, which is particularly relevant in the current period of financial market turbulence, accompanied by regular increases in the key rate.

The issues of forecasting and investing in the securities of oil and gas companies have been reflected in the research of both foreign and domestic scientists. Among Russian authors, the works of R.M. Nureev and E.G. Busygin [1], E.E. Petrova and S.V. Arapov,[1] and A.V. Troitsky [2], and S.V. Bryukhovetskaya [3] should be highlighted, as they reveal the fundamentals of investment analysis and financial markets. This study examined O. Yu. Rudzeyt's ideas on stock price forecasting using regression analysis [4], as well as on forecasting stock value considering various factors [5] and sensitive stocks with a high correlation dependence [6]. Many authors and experts have studied the behavior of stock prices using econometric models in response to changes in internal and external financial and production factors [7, 8]. Scientific articles are actively researching the problems of forecasting the performance indicators of oil and gas companies. They discuss gradient analysis for estimating oil production volumes and machine learning for predicting production at specific wells [9, 10]. In foreign scientific literature, the study of oil price forecasting using nonlinear dynamic regression modeling was conducted by P. Moreno and I.F. Ferretti [11]. In the works of Zilin Xu, Hooman Abdollahi, and Jiaxin Yuan, econometric and machine learning models are considered to create a more accurate system for forecasting global oil prices [12–14].

An analysis of works on the research topic showed that the main principles of analyzing joint-stock companies, investment methods, and forecasting techniques have currently been established. Despite the abundance of scientific papers, little attention is paid to forecasting the prices of shares of Russian oil and gas companies and investing in oil and gas sector securities using econometric models. Financial and economic mechanisms are usually considered using global examples or under free market conditions, without taking into account factors such as sanctions, military-political conflicts, reorientation toward new sales markets, and diversification of logistics routes.

The application of econometric models based on benchmark markers with multi-factor analysis and a comprehensive assessment of companies will provide sufficiently accurate predictive data on securities values with minimized errors, taking into account the specifics of the activity of a separately selected company, as well as an assessment of its profitability drivers.

[1] Petrova E.E., Arapov S.V., Bikezina T.V. Investment Analysis: A Textbook. St. Petersburg: Russian State Hydrometeorological University; 2021:220.

The purpose of the paper is to create statistically significant models for analyzing and investing in oil and gas company securities, taking into account benchmark markers, and to form a relevant investment portfolio in the Russian oil and gas market under current turbulent conditions.

The subjects of this study are the securities market of Russian oil and gas companies and global indicators of the oil and gas industry.

METHODOLOGY

The tasks set in the work were solved based on the application of general scientific research methods within the framework of comparative and statistical analysis, as well as thru the analysis of the dynamics of financial and economic indicators.

1. Multifactor regression equations applicable for short-term investment and forecasting in Russian oil and gas companies, taking into account benchmark markers.

In the first stage of the study, the quotes of all major Russian oil and gas companies, macroeconomic parameters, and global stock indices were selected. The time range for the study was taken from 1 January 2019 to 24 January 2024. Subsequently, correlation matrices were constructed to build multifactor regression equations, and the best correlation pairs were selected with R > 0.4. To clarify, a value of 0.4 became optimal for building predictive models. Firstly, according to the calculations performed, the model's approximation error has decreased. Secondly, the forecast error improved significantly compared to when a smaller number of regressors were selected. It was also important to examine the correlations between the selected parameters.

In the second stage of the work, it was important to evaluate: the quality of the resulting model using the adjusted coefficient of determination; the adequacy of the model using the F-test; the statistical significance of the regression coefficients; and the approximation error. Thus, after verification, the securities of Gazpromneft, Lukoil, Rosneft, Novatek, Tatneft, Surgutneftegaz, and Transneft were selected. For each security, key benchmark markers were identified, meaning those that best describe the movement of stock quote prices for the purpose of calculations within the desired model.

As an analysis and further verification of the models for adequacy, a regression model calculated for Gazpromneft quotes was considered. The parameter quotes presented in *Table 1* are used as reference marks for forecasting. Parameter selection was based on:

1) economic and rating assessment of internationally recognized indicators in the oil and gas industry;

2) assessment of the statistical significance of the correlation between quotes (see *Fig. 1*). For example, T[observed], calculated using Pearson's formula (2), for the Gazprom Neft and Oil & Gas MOEX pair is 22.3, and T[critical] = 3E — 97, thus the null hypothesis of no association between the observed events is rejected;

3) assessment of the statistical significance of regression coefficients using the t-statistic,[2] calculated by formula (1). For example, the T-statistic for the X_1 Oil & Gas MOEX coefficient in the model is 37.02, and the critical T-value is 1.96, thus H_0: $X_1 = 0$ is rejected.

$$t = \frac{r\sqrt[2]{n-2}}{\sqrt[2]{1-r^2}}, \qquad (1)$$

where r — correlation coefficient; n — number of observations.

$$t = \frac{\hat{b}}{s.e.\hat{b}}, \qquad (2)$$

where $\hat{b}$ — regression coefficient; $s.e.\hat{b}$ — standard error of the regression coefficient.

[2] Babeshko L.O. Econometrics and Econometric Modeling: Textbook by L.O. Babeshko, M.G. Bich, I.V. Orlova. 2nd edition, revised and expanded. Moscow: INFRA-M, 2023. 387 pages: ill.— (Higher Education: Bachelor's Degree). DOI: 10.12737/1141216

Table 1

Correlation Matrix Between Shares of Oil and Gas Companies of the Russian Federation and Benchmark Markers

Quotes	Gazprom Neft	Lukoil	Rosneft	Tatneft ordinary shares	Novatek	Surgutneftegaz preferred shares	Transneft preferred shares
MOEX RTS Index		0.824	0.890		0.847	0.569	0.588
Oil & Gas MOEX	0.464	0.951	0.905	0.559	0.857	0.707	0.737
MOEX Finance Index	0.393	0.751	0.896		0.892	0.521	
MOEX transport Index	0.415	0.769	0.620	0.756	0.568	0.757	0.706
Brent	0.393			−0.510			−0.453
Usd & Rub	0.453						
Natural gas futures				−0.551			−0.451
FED	0.638						−0.370
CB of RF	0.594						
RTS		0.597	0.620		0.553		0.623
WTI	0.434						
S&P 500	0.597		0.542	−0.555	0.579		
Dow Jones Industrial Average	0.599		0.550	−0.504	0.579		
The MOEX index of blue chips		0.832	0.867		0.820	0.550	0.654
NASD	0.560		0.580	−0.536	0.604		
EURO STOCK 50	0.711	0.428	0.615		0.646		
Dubai crude oil	0.454			−0.399			−0.408
Tadawul All Share	0.473			−0.566			−0.419
QETF				−0.468			−0.387

Source: Complicated by the authors based on the data: Investing.com. 2024. URL: https://www.investing.com (accessed on 06.09.2024).

The multiple regression equation for short-term forecasting of Gazprom Neft quotes is presented in formula (3):

$$Y = -108,828 + 0,090X_1 - 0,006X_2 - 0,128X_3 - 0,251X_4 - 0,358X_5 + \\ + 52,199X_6 + 13,516X_7 + 1,635X_8 + 0,132X_9 + 0,002X_{10} - 0,092X_{11} - 2,588X_{12} - 0,019X_{13}, \quad (3)$$

where $X_1 \ldots X_{13}$ are respectively: Oil & Gas MOEX, MOEX Finance Index, MOEX Transportation Index, Brent, USD & RUB, Federal Reserve, Central Bank of Russia Rate, WTI, S&P 500, NASDAQ, EURO STOXX 50, Dubai Crude Oil, Tadawul All Share.

To verify the significance of the obtained model, a regression analysis3 was conducted, which showed:

- adjusted R-squared ≈ 0.92 meaning the obtained model has high statistical significance;
- approximation error ≈ 5.74% meaning the model fits the original data well.

An identical analysis of the parameters of the company Gazpromneft was conducted for the Rosneft model and other studied quotes. Based on the data obtained, equations and regression analyze for the resulting models will be presented.

The multiple regression equation for short-term Rosneft price forecasting is presented by the formula (4):

$$Y = -136,0528 + 0,0632X_1 + 0,0163X_2 - 0,0091X_3 - 0,0192X_4 - \\ - 0,1551X_5 + 0,0202X_6 - 0,0060X_7 + 0,0149X_8 - 0,0247X_9, \quad (4)$$

where $X_1 \ldots X_9$, are respectively: Oil & Gas MOEX, MOEX Finance Index, MOEX Transportation Index, RTS Index, S&P 500, Dow Jones Industrial Average, MOEX Blue Chip Index, NASD, EURO STOXX 50.

To verify the significance of the resulting model, a regression analysis [15] was conducted, which showed:

- adjusted R-square ≈ 0.95 meaning the resulting model has high statistical significance;
- approximation error ≈ 3.76% meaning the model fits the original data well.

To check the adequacy of the constructed models for short-term forecasting, we will evaluate the forecast error of the models: Gazpromneft and Rosneft. Data for 2 February 2024, were taken for the control sample. After substituting the values of the reference markers for 2 February 2024, the following results were obtained from the multivariate regression models:

- For Gazpromneft:

Y = 108.828 + 0.09 × 9152.710.006 × 10438.890.128 × 1896.360.251 × 77.330.358 × 91.05 + 52.199 × 5.5 + + 13.516 × 16 + 1.635 × 72.28 + 0.132 × 4980.25 + 0.002 × 15628.950.092 × 46692.588 × 77.360.019 × 11914.29 ≈ ≈ 821.98, the value of the endogenous variable from the control sample = 816.36. The relative deviation was 0.69%. Thus, the model is adequate and suitable for short-term forecasting. To accurately predict data, you need to regularly update the model with new information and adjust the regression coefficients.

- For Rosneft:

Y = −136.0528 + 0.0632 × 9152.71 + 0.0163 × 10438.890.0091 × 1896.360.0192 × 1117.310.1551 × 4980.25 + + 0.0202 × 38654.420.0060 × 20472.18 + 0.0149 × 15628.950.0247 × 4669 ≈ 577.05, the value of the endogenous variable from the control sample = 583.95. The relative deviation was 1.18%. Thus, the model is adequate, relevant/has been tested, and is suitable for short-term forecasting. To improve the forecast, the model can be supplemented with fresh data. This will

[3] Babeshko L.O. Econometrics and Econometric Modeling: Textbook by L.O. Babeshko, M.G. Bich, I.V. Orlova. 2nd edition, revised and expanded. Moscow: INFRA-M, 2023. 387 pages: ill. - (Higher Education: Bachelor's Degree). DOI: 10.12737/1141216

help clarify the coefficients and the relationship between the indicators, taking into account the specifics of the external conditions.

Calculations were also performed for other company quotes, such as: Lukoil, Tatneft, Novatek, Surgutneftegaz preferred shares, and Transneft preferred shares (see equations 5–9).

The multiple regression equation for short-term forecasting of Lukoil quotes is represented by the formula (5):

$$Y = 982,863 - 2,71X_1 + 0,809X_2 + 0,221X_3 - 0,891X_4 + 0,333X_5 - 0,184X_6, \quad (5)$$

where $X_1 \ldots X_6$, are respectively: MOEX Index, MOEX Oil & Gas Index, MOEX Finance Index, RTS Index, MOEX Blue Chip Index, NASD, EURO STOXX 50.

The multiple regression equation for short-term Tatneft stock price forecasting is presented by the formula (6):

$$Y = 226,3534 - 0,2675X_1 - 0,0277 - 0,0337X_3 + 0,0179X_4 + 0,0536X_5, \quad (6)$$

where $X_1 \ldots X_5$, are respectively: Brent, S&P 500, NASD, Tadawul All Share, Oil & Gas MOEX, MOEX Transport Index.

The multiple regression equation for short-term Novatek price forecasting is presented by the formula (7):

$$Y = 233,950 - 1,247X_1 - 0,134X_2 - 0,131X_3 + 0,293X_4 + 0,2629X_5 + 0,1526X_6 - 0,40X_7 - 0,108X_8, \quad (7)$$

where $X_1 \ldots X_8$, are respectively: MOEX Index, MOEX Oil & Gas Index, MOEX Finance Index, RTS Index, S&P 500, MOEX Blue Chip Index, NASD, EURO STOXX 50.

The multiple regression equation for short-term forecasting of Surgutneftegaz preferred stock prices is presented by the formula (8):

$$Y = -8,617 + 0,098X_1 + 0,004X_2 - 0,004X_3 + 0,01X_4 - 0,013X_5, \quad (8)$$

where $X_1 \ldots X_5$, are respectively: MOEX Index, MOEX Oil & Gas Index, MOEX Finance Index, MOEX Transport Index, MOEX Blue Chip Index.

The multiple regression equation for short-term forecasting of Transneft preferred stock prices is presented by the formula (9):

$$\begin{aligned} Y = 988,77 - 0,91X_1 + 0,16X_2 + 0,17X_3 + 0,18X_4 + 0,1X_5 + 1,27X_6 - \\ - 39,46X_7 - 67,7X_8 + 0,51X_9 + 0,03X_{10} - 62,52X_{11}, \end{aligned} \quad (9)$$

where $X_1 \ldots X_{11}$ are respectively: MOEX Index, MOEX Oil & Gas Index, MOEX Transport Index, MOEX RTS Index, MOEX Blue Chips Index, Brent, Natural gas futures, Federal Reserve, Dubai crude oil, Dubai crude oil, Tadawul All Share, QETF.

As a result, multifactor regression equations have proven their suitability for short-term stock market price forecasting. The average forecast error for the month across all equations is less than 1.5%. To use the obtained models, it is necessary to supplement the model with new inputs and data to achieve the smallest error. It should also be noted that the developed model does not account for a number of parameters that are necessary for long-term forecasting under the conditions of the created volatility. The use of models is only effective if additional assessments of companies' financial results and dividend policies are conducted; other indicators of commodity

markets and oil and gas companies' investment projects that may affect financial results, as well as adjustments to the forecast taking into account geopolitical conditions.

2. Investment portfolio for short-term investing. Based on the analysis conducted, recommendations for investing in Russian oil and gas companies were developed. An investment portfolio consisting of shares from four key Russian industry issuers — Lukoil, Rosneft, Novatek, and Surgutneftegaz — has been developed. This portfolio is formed specifically from securities because the stocks of these companies have a strong positive correlation both with each other and with selected benchmark markers (*Table 1*). This indicator allows for forecasting portfolio returns based on changes in benchmark values and current trends in the oil and gas industry as a whole.

Lukoil, Rosneft, and Surgutneftegaz are the largest independent oil companies in Russia, which influences the formation of their portfolios. However, due to the reorientation of oil exports from Europe to the Middle East and Asia-Pacific countries after 2022, the market capitalization and net profit figures of companies have decreased compared to previous years. In 2021, Russia exported 263.6 million tons of crude oil, and by the end of 2023, it exported 240.8 million tons.[4] At the same time, 80% of oil supplies are directed to India and China at a significant discount.[5]

The study collected data on the main markets where the companies in question operate, as the quality and profitability of trading operations in sales markets influence economic development. To form a detailed overview, it becomes necessary to analyze each company.

Analysis of Novatek: Novatek is the largest independent natural gas producer in Russia. Gazprom is the sole company with the exclusive right to export natural gas, but according to a decision by the State Duma, Novatek has the right to export LNG,[6] starting in 2023, which creates enormous potential for the development of foreign trade. Additionally, Novatek's three existing projects, namely "Yamal LNG", "Kryogaz-Vysotsk", and "CSKMS", are viewed extremely positively due to the demand for LNG in the global market..[7] Novatek's main natural gas supplies to the domestic market go to the industrial and energy sectors. These industries are stable and solvent clients.[8]

Analysis of Lukoil: until 2022, Northwest Europe, as well as the Black and Mediterranean Sea countries, accounted for the largest share of the company's export revenue[9] by 2024, supplies to Europe had significantly decreased. However, despite the sanctions, Lukoil was able to redirect oil supplies to China and resume seaborne oil deliveries to Slovakia and Hungary. Lukoil is also successfully entering new markets in Central America and the Middle East.[10] Lukoil is a significant player in the domestic market. The company produces oil products, operates a network of gas stations, and implements promising projects.

Analysis of Rosneft: Rosneft supplies 3/4 of its exported oil to China, with the majority of settlements conducted in yuan; it is a key shareholder in PJSC ANK "Bashneft"[11] and PJSC NGC "Slavneft" thru the companies LLC "Invest Oil" and TOC Investments Corporation Limited,[12]

[4] Tadviser. Russian oil exports. URL: https://www.tadviser.ru/index.php (accessed on 06.09.2024).

[5] FORBES. "Sanctions Success Indicator": What the discount on Russian Urals oil to Brent means. URL: https://www.forbes.ru/finansy/487942-indikator-uspeha-sankcij-cto-oznacaet-diskont-rossijskoj-nefti-urals-k-brent (accessed on 06.09.2024).

[6] The State Duma Committee on Energy. The State Duma passed a bill aimed at liberalizing LNG exports. 2023. URL: http://komitet-energo.duma.gov.ru/novosti/6af5c2ce-fd95–4a70-bf13–0af97847b246 (accessed on 06.09.2024).

[7] Novatek. LNG projects. URL: https://www.novatek.ru/ru/about/lng-projects/ (accessed on 06.09.2024).

[8] Institute of Energy and Finance, according to Rosstat and PJSC Gazprom. Natural Gas Supply Structure to the Domestic Market, 2021, in billion cubic meters. URL: https://energypolicy.ru/wp-content/uploads/2023/09/ep-maket-%E 2%84%969–2023–14–25.pdf (accessed on 06.09.2024).

[9] Lukoil. Foreign Projects. 2023. URL: https://lukoil.ru/Business/Upstream/Overseas (accessed on 06.09.2024).

[10] Lukoil. Oil trading. 2022. URL: https://lukoil.ru/Products/business/oiltrading (accessed on 06.09.2024).

[11] Bashneft. Shareholder equity structure. 2021. URL: https://www.bashneft.ru/information/struktura-aktsionernogo-kapitala/ (accessed on 26.02.2024).

[12] CBONDS. TOC Investments Corporation. 2024. URL: https://cbonds.ru/company/290709/ (accessed on 06.09.2024).

Table 2

Traded Multiples of the Stocks of the Portfolio Companies

Indicators		Lukoil	Rosneft	Surgutneftegaz preferred shares	Novatek
EV/Revenue	Tradable Multiplier	0.40	0.60	0.67	2.74
	Min	0.25	0.25	0.16	0.91
	Median	0.67	0.57	0.48	3.24
	Max	0.75	0.75	0.70	5.56
EV/EBITDA	Tradable Multiplier	3.49	1.92	3.54	3.89
	Min	1.21	1.21	0.75	4.36
	Median	1.99	2.55	1.88	8.36
	Max	3.03	3.49	2.85	12.37
P/E	Tradable Multiplier	3.63	2.62	1.23	24.14
	Min	1.86	1.86	0.69	23.23
	Median	3.18	3.68	1.88	23.69
	Max	5.08	5.08	4.79	24.14

Source: Complicated by the authors based on the data: Investing.com. 2025. URL: https://www.investing.com (accessed on 09.09.2025).

respectively; changes in the dividend policy and market prices of shares of the controlled companies will continue to affect the price of Rosneft shares. It sells over 40 million tons of oil products on the domestic market.[13] Rosneft also supplies to India and is implementing major projects in the Middle East.

Analysis of Surgutneftegaz: Surgutneftegaz is a leading oil company in Russia, selling its oil both domestically and abroad. State-owned companies like Rosneft are the main buyers of Surgutneftegaz's oil. Additionally, the company has regular buyers, including Lukoil and Gazpromneft.[14] It is actively working in the Asian market, particularly in China and India, and also exports oil to Western Europe. The company is also finding buyers in the Middle East and North African markets. Surgutneftegaz continues to expand its presence in the global market, aiming to strengthen its relationships with partners and ensure stable oil supplies.

To determine the investment attractiveness of forming this portfolio, the fair values of the companies' shares were assessed using the multiplier method with EV/Revenue, EV/EBITDA, and P/E, using the minimum, median,

[13] Rosneft. Igor Sechin expects energy resource supplies to China to grow. 2023. URL: https://www.rosneft.ru/press/news/item/220321/ (accessed on 06.09.2024).

[14] Khazanov L. Surgutneftegaz — a giant with many unknowns. Finam. 2024. URL: https://www.finam.ru/publications/item/surgutneftegaz-gigant-so-mnogimi-neizvestnymi-20240516–0900/ (accessed on 27.02.2024).

Table 3

Fair Valuations of Shares of Portfolio Companies

Indicators		Lukoil	Rosneft	Surgutneftegaz preferred shares	Novatek
Current price		6484,5	467.7	45.515	1250.8
EV/Revenue	Min	4552.63	90.28	12.50	386.92
	Median	10151.58	442.54	33.47	1489.17
	Max	11182.44	636.60	47.65	2591.42
EV/EBITDA	Min	3013.43	226.63	11.53	1407.57
	Median	4197.82	684.80	25.26	2743.86
	Max	5780.22	1008.90	37.04	4080.16
P/E	Min	3320.11	331.54	25.63	5096.99
	Median	5667.73	655.88	69.59	5196.96
	Max	9069.12	905.62	177.41	5296.93

Source: Complicated by the authors based on the data: Investing.com. 2025. URL: https://www.investing.com (accessed on 09.09.2025).

and maximum traded multiples of comparable companies (*Table 2*).[15] It should also be noted that in addition, the intrinsic value of the companies' shares could have been calculated, as presented in Marek Chrascina's paper [16]. When making investment decisions, different valuation methods should be used in combination, but not limited to just one. To assess the company's fair value, multiples were calculated for comparable companies (*Table 3*). The final valuation was calculated by multiplying the multiplier by the Revenue or EBITDA figure, depending on the multiplier. The P/E multiplier was estimated by multiplying the multiplier by the target company's net profit value.

Comparable companies for analysis:

- Lukoil: Rosneft, Tatneft, Gazprom Neft, Bashneft;
- Rosneft: Lukoil, Tatneft, Gazprom Neft, Bashneft;
- Surgutneftegaz preferred shares: Bashneft preferred, Tatneft preferred shares, Russneft, Rosneft;
- Novatek: Gazprom, YATEK.

Based on the calculations, it can be concluded that Rosneft, Novatek, and Lukoil shares are currently undervalued, while Surgutneftegaz is overvalued. For long-term investment, it is recommended to purchase them at a fair price, based on the median valuation of three multiples: EV/Revenue, EV/EBITDA, and P/E, within a range from the minimum to the maximum value.

Recommendations for buying securities:

- Lukoil — hold, fair price — 5667.73 rubles,—12.60% to current quotes;
- Rosneft — buy, fair price — 655.88 rubles, 40.24% to current quotes;
- Surgutneftegaz preferred shares — hold, fair price — 33.47 rubles,—26.46% compared to current quotes (the main profit from the security will come thru dividends, not thru stock price growth);
- Novatek — buy, fair price — 2743.86 rubles, 119.37% above current quotes.

[15] Kiseleva O.V., Makeeva F.S. Investment Analysis. 5th ed. Knorus, 2024. 246 p.

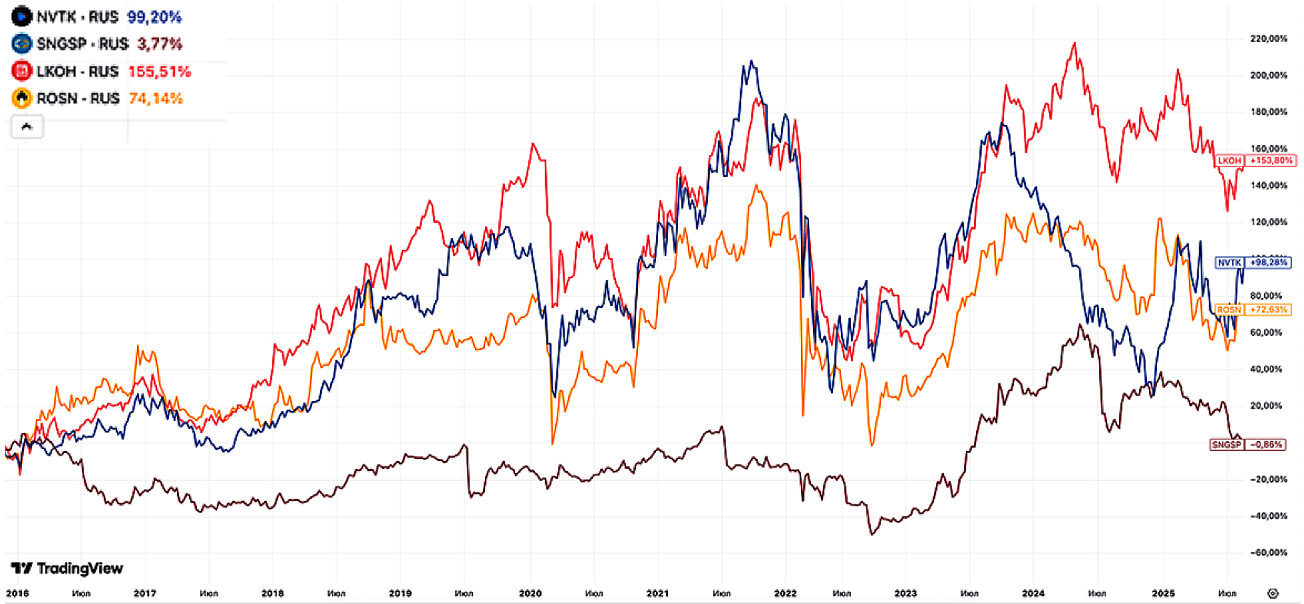

Fig. **Share Prices of "Lukoil" (Red), "Rosneft" (Orange), "Novatek" (Blue), "Surgutneftegaz" Preferred Shares (Brown)**

Source: Complicated by the authors based on the data: Investing.com. 2024. URL: https://ru.tradingview.com (дата обращения: 06.09.2024) / (accessed on 06.09.2024)

It's worth noting that these issuers regularly pay dividends, so the portfolio strategy is aimed not only at stock price growth but also at generating passive income from dividends. Fair value information does not form a low-risk model for the future movement of company stock prices; fair value only shows how the market values securities at a given point in time. Understanding the basis of revenue and what drives a company's profit is crucial when investing; this information allows an investor to rationally assess and predict the movement of securities prices.

Based on the analysis of the dynamics of quotes for Lukoil, Rosneft, Surgutneftegaz, and Novatek, it can be concluded that the change in market price has a moderately pronounced cyclicality (*Fig. 1*), which can be explained by various factors. The cyclical nature is largely explained by: companies' dividend policies; market trends in the oil and gas industry (for example, there has been a global trend of rising oil prices from March to September over the past 10 years); export periods; and the state's tax and financial policies toward oil and gas companies. Analyzing the stock price dynamics of Lukoil and Rosneft over the past 8 years (*Fig. 1*), excluding the volatile years of 2020 and 2022, it can be concluded that the period of stock price growth for Lukoil and Rosneft falls in July and October. Surgutneftegaz and Novatek shares are also starting to rise in price, following the oil giants, but with a slight time lag. As mentioned earlier, dividend policy has a significant impact on the current and future stock value. For example, the Lukoil company has been consistently paying dividends twice a year for several years, mainly in July and December.[16] A similar situation exists at Rosneft, which also pays dividends twice a year, but primarily in July and January.[17] Surgutneftegaz pays dividends on preferred shares once a year in July,[18] while Novatek pays twice a year — in March and October.[19] *Fig. 1* clearly illustrates the price changes before and after the dividend payment. This information needs to be taken into account. An interesting approach is disciplinary analysis, within which an investor can build investment strategies using charts [17–19]. Understanding charts and possible combinations is also successfully used by many traders to make a profit [20].

[16] Lukoil. Dividends. URL: https://lukoil.ru/InvestorAndShareholderCenter/Securities/Dividends (accessed on 06.09.2024).

[17] BCS World of Investments. Rosneft Dividends.— URL: https://bcs.ru/markets/rosn/tqbr/dividends (accessed on 06.09.2024.

[18] BCS World of Investments. Surgutneftegaz Dividends. URL: https://bcs.ru/markets/sngsp/tqbr/dividends (accessed on 27.02.2024).

[19] Novatek. Dividends. URL: https://www.novatek.ru/ru/investors/dividends/ (accessed on 06.09.2024).

The reorientation toward the Middle East and Asian countries has resulted in a decrease in oil and gas revenues and an increase in the tax burden on companies. In Russia, the oil and gas sector is subject to the highest tax burden among all sectors of the economy. Rosneft and Surgutneftegaz have the highest burden — 79% and 77% of EBIT, respectively.[20] The share of mineral extraction tax in oil and gas revenues is around 70%, and in recent years there has been a trend toward increasing the mineral extraction tax rate. For example, Rosneft and Lukoil's shares in oil and gas payments are 36% and 16% respectively. However, Novatek has the lowest tax burden in the oil and gas sector because over 50% of the company's profit is generated from purchasing and processing gas condensate at the Ust-Luga refinery, as well as from reselling LNG, which is taxed significantly less harshly compared to oil production and gas exports. For example, the Yamal LNG project benefits from zero rates for mineral extraction tax, export duty, and property tax. The K_p, coefficient, which characterizes the dynamics of world oil prices, is used to calculate the mineral extraction tax for oil companies. In 2023, K_p was equal to 11.6461, and in 2024, it was 18.4154.[21] Based on the analysis conducted, the mineral extraction tax rates are highly likely to increase until 2026. K_{kg} is similar to K_p but it applies to gas companies starting in 2023. K_{kg} will also grow from 134 units to 300 units by the end of 2026. It is necessary to analyze the given ratios, as they will significantly influence the net profit margins of companies, and consequently, the dividend yield.

CONCLUSION

Thus, based on the analysis conducted, a strategy for interacting with the portfolio can be formed. Combined with the seasonal fluctuation in natural resource prices (oil and gas), the market price of the shares has pronounced volatility. All the companies issuing securities in the portfolio are "dividend aristocrats", meaning they regularly pay dividends to shareholders. To receive annual dividends and income from stock price growth, it is recommended to purchase portfolio securities in May or October of each year, as the main dividends and stock price growth period occur in the third and fourth quarters of the year. At the same time, to implement a long-term investment strategy, it is necessary to acquire shares at fair value or below. As the main multiplier, based on whose value we will make decisions, we will choose EV/EBITDA. Thus, the fair price for the stocks in the portfolio will be:

- Lukoil — 5 667.73 ₽.
- Rosneft — 655.808₽.
- Surgutneftegaz preferred — 33,47 ₽.
- Novatek — 2 743.86 ₽.

In accordance with the portfolio's objective (investing in companies in the Russian oil and gas industry), the share of each issuer in the portfolio is evenly distributed at 25%.

To make a decision about investing in the portfolio in May 2026, we need to determine expectations for benchmark indicators. This needs to be done based on the dependencies found and the econometric models constructed. Such models will help predict stock prices more accurately.

Inflationary pressure in the Russian economy continues to decline steadily. This is evidenced by the decisions of the Bank of Russia's Board of Directors, which reduced the key rate from 21%, set in November 2024, to 20%[22] on 9 June 2025, and then again to 18% on 25 July 2025.[23] According to the Bank of Russia's medium-term macroeconomic forecast dated July 25, 2025, the average annual key rate for 2026 is expected to

[20] Romanova T. Experts have called oil workers the industry with the highest tax burden. Lenta. 2024. URL: https://lenta.ru/news/2024/05/21/neftyanikov/ (accessed on 23.02.2024).

[21] Letter from the Federal Tax Service of Russia dated July 10, 2024, No. EA-4–3/7851@ "Data Required for Calculating MET for Oil, Additional Income Tax, and Excise Tax on Crude Oil for June 2024".

[22] Bank of Russia. Decision of the Bank of Russia Board of Directors on the Bank of Russia key rate. URL: https://www.cbr.ru/rbr/dir_decisions/rsd_2025–06–06_20_05 (accessed on 09.09.2025).

[23] Bank of Russia. The Bank of Russia has decided to lower the key rate: Press Release No. 25 / Bank of Russia. URL: https://cbr.ru/press/pr/?file=25072025_133000key.htm (accessed on 09.09.2025).

be within the range of 12–13%. Monetary easing is a key factor in the recovery of the Russian stock market. The reduction of the key interest rate by the Bank of Russia will have a positive impact on all major stock indices.

Based on the analysis conducted, the peak of the decline in oil and gas company quotes to their annual lows occurred in July — August 2025. This period is optimal for buying stocks within the established portfolio. However, it should be noted that there are growth constraints in the market, so significant price increases are unlikely to be expected by the end of 2025. It is necessary to analyze the companies' reports for the first three quarters of 2025, as many companies' financial results for the first half of the year are comparatively lower than for 2024. In this regard, the oil and gas sector will undergo changes in its export, logistics, personnel, and financial policies by the beginning of 2026. International political instability will also significantly impact the energy market. Therefore, the trends observed in 2025 will continue into the first half of 2026. Thus, based on the conclusions drawn, it can be assumed that the stock prices of oil and gas companies may reach their annual lows during the specified period. This time interval, if the forecast is realized, could become an optimal point for building long positions and replenishing the portfolio.

Simultaneously with the overall Mosbir index, growth is expected in the sectoral benchmark indices: MOEX Oil & Gas, MOEX Finance, MOEX Transport, MOEX Blue Chips. Despite the World Bank's forecast of a decline in global oil prices to five-year lows, oil-exporting countries will continue to adjust their oil production levels to maintain current prices for Brent, WTI, and other grades, which will also have a positive impact on the financial performance of Russian oil companies.

Positive dynamics are expected in the US stock market in 2025, linked to monetary policy. At its last meeting, the US Federal Reserve cut its key interest rate by 50 basis points. Analysts expect further rate cuts throughout 2025, reaching a target of 2% by the end of 2026. This is having a positive impact on the US securities market, including the key indices that make up the portfolio's benchmark markers: the S&P 500, Dow Jones, and NASDAQ. As the values of these indices increase (and consequently, as the US stock market strengthens), the shares of the portfolio companies grow, which is also an important factor in the attractiveness of forming the portfolio by May 2026.

The dynamics of the EURO STOXX 50 index are not expected to be negative, but should remain in confidently positive or neutral values. The main positive scenario for the value is a decrease in geopolitical tensions in Europe, possibly a relaxation of sanctions restrictions. This article does not consider a scenario analysis of the geopolitical situation, but it does take into account a possible reduction in sanctions restrictions by EU countries, which, in turn, will have a positive impact on both the European stock market and the shares of Russian companies, especially those in the formed portfolio.

Thus, the most effective period for forming and updating a portfolio of LUKOIL, Rosneft, Surgutneftegaz, and Novatek shares is the end of the first and the beginning of the second quarter, as during this time frame it will allow for future dividend payments and price growth due to improved macroeconomic conditions to be taken into account, which ensures a fundamental increase in share value.

Based on the analyzed data, it can be noted that when creating an investment portfolio, the proposed information can be supplemented with current external environmental factors and conditions to minimize risks and increase portfolio returns. Overall, the fuel and energy market remains quite turbulent, which makes many decisions appear high-risk for investors. That's why creating similar econometric models, supported by calculations and external factors, are optimal forecasting tools in conditions of uncertainty.

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ABOUT THE AUTHORS

Denis A. Aksenov — student, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0009-0002-2679-5414
Corresponding author:
denis.kopylov.1987@gmail.com

Vitaly V. Toropov — student, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0009-0000-3581-4715
vitas481@gmail.com

Timofey M. Mazurchuk — Cand. Sci. (Econ.), Assoc. Prof. of the Department of Industrial Markets, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0000-0002-6209-5055
tmmazurchuk@fa.ru

Author's declared contribution:
D. A. Aksenov constructed a correlation matrix using a multifactorial regression equation, analyzed the data obtained.
V. V. Toropov proposed the composition of a short-term investment portfolio, determined the tradable multipliers of selected companies and the fair value of shares on the basis of which investment decisions should be made.
T. M. Mazurchuk identified and described the cyclical nature of changes in stock prices of selected companies and based on the analysis, he offered recommendations for compiling an investment portfolio.

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ORIGINAL PAPER

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JEL G11, G15, F15, F21

Integration Among the Socially Responsible Investment, Green, Dirty, and Energy Cryptocurrencies: A Portfolio Diversification Perspective

H.P. Singh[a], A. Sharma[b], M. Patel[c]
[a] Institute of Management, Nirma University, Ahmedabad, India;
[b] Birla Institute of Technology and Science Pilani, Pilani, India;
[c] S V Institute of Management, Kadi Sarva Vishwavidyalaya, Gandhinagar, India

ABSTRACT

The paper investigates the association between various green, dirty, energy cryptocurrencies and socially responsible investment markets. **The purpose of the study** is to identify the potential benefits of portfolio diversification for socially responsible investment markets from green, dirty and energy cryptocurrencies using three alternative methodologies for portfolio construction (1) the equally weighted portfolio, (2) the least variance portfolio, and (3) the maximum Sharpe portfolio thus contrasting it with the alternative of home investing. **The research Methodology** used in the study are, correlation analysis, used to investigate short-term association, and subsequently, network analysis, to investigate the long-term connectedness between the socially conscious investment markets and the different green, filthy, and energy cryptocurrencies. **The study is unique** to focus on the interlinkages of socially responsible investment and the green, dirty and energy cryptocurrencies while evaluating the possible portfolio diversification benefits. **The results of the study** suggest that the investors in all other SRI assets, except green bonds, can benefit from the least variance technique. The maximum Sharpe portfolio is beneficial to all investors who make socially conscious investments. **The study has consequences** for asset allocation and investment decisions for investors and portfolio managers.

Keywords: socially responsible investment; green cryptocurrencies; dirty cryptocurrencies; energy cryptocurrencies market integration; portfolio diversification strategies; sharpe ratio

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INTRODUCTION

Stock market integration specifically refers to the degree to which different stock markets move about each other and provide similar risk-adjusted returns. When markets are integrated, movements in one market tend to influence movements in other markets, leading to a more interconnected global financial system. Due to the portfolio diversification benefits and asset allocation, market integration has become important for investors, researchers, and academicians. Researchers like Ibrahim [1] and Patel [2] highlight a key point regarding the benefits of the lack of integration in equity markets, namely, risk diversification. When markets are not fully integrated, investors can achieve greater diversification benefits by allocating their funds across different markets or regions [3]. If markets have a lower correlation, investors have an opportunity to reduce risk with portfolio diversification. If markets have no or weak integration, investors can enjoy risk reduction with portfolio diversification. Weaker integration among markets can offer a portfolio diversification opportunity which will disappear soon with strong integration [4, 5]. Investors are always looking after their wealth in each investment decision [6]. The inherent proven inefficiencies in the markets also make them further vulnerable to be exploited using appropriate strategies [7–9].

Initially, such studies were conducted on developed and emerging countries. However, the studies have not focused on socially responsible investment and green, dirty, and energy cryptocurrencies. The present study focuses on socially responsible investment and green, dirty, and energy cryptocurrency linkages and possible portfolio diversification benefits.

LITERATURE REVIEW

Review of Past Studies

During the initial years of the 1970s, research into financial market integration indicated a reduced correlation between markets. Grubel [10], influenced by the principles of Harry Markowitz [11], elucidated the advantages of diversifying portfolios across international markets. Subsequent studies by Subrahmanyam [12] and Kenen [13] confirmed the presence of financial market integration. Nevertheless, financial markets have progressively witnessed greater integration, with inter-market co-movements on the rise over time [14].

The European markets are closely integrated. As a result, the markets have a high level of systematic risk [15]. According to Bekaert & Urias [16], emerging markets have closed-end funds that can be invested by the investors at a relatively low cost, whereas the IFC investable does not consider the investment costs or restrictions. The effect of the sector increased with the increase in global integration. The investor needs to consider the role of industrial sectors in global strategies [17].

Since the early 2000s researchers have explored the Integration with other assets. Real estate showed a non-linear correlation with the stock market, but the process of mean reversion between stock and real estate markets is notably gradual, with discrepancies between the two markets potentially enduring for extended periods [5]. According to Gravelle et.al. [18] the markets are integrated and hence the long-term shocks are transferred to other markets. Such shocks cannot be reduced with temporary efforts. Real estate exhibited a non-linear relationship with the stock market, yet the mean reversion process between stock and real estate markets is characterized by a notably slow pace, allowing discrepancies between the two markets to persist for prolonged periods [5]. The opening of the stock market increases the demand for equities and either reduces or unchanged the demand for bonds. The opening up of small and undeveloped markets in emerging economies increases the diversification opportunities across the emerging markets [19]. The onset of war initially disrupts the correlation between oil prices and stock markets, while terrorist attacks have influenced the relationship between oil price returns in France and Germany. The diminished correlation between stock markets and oil suggests significant diversification advantages for investors [20].

Multiple researchers [21–24] have utilized methodologies like correlation-based networks, network structure analysis, and VAR-BEKK

frameworks to explore market integration and shifts in market dependence. Initially observing no correlation between oil and stock markets, Ghosh & Kanjilal [25] noted integration between these markets post the global financial crisis. Additionally, Ftiti et al. [26] found that global oil price shocks impact stock markets

Here, past studies have examined the linkage and portfolio diversification among stock markets and other investment alternatives. The domain of socially responsible investment and cryptocurrencies is yet to be explored in detail. Hence, the present study explores the linkages between socially responsible investment and Green, Dirty, Energy cryptocurrencies.

EMPIRICAL FRAMEWORK

The aims of the study are 1) to examine the connectedness between the Socially responsible investment markets and various green, dirty, and energy cryptocurrencies, and 2) to examine the possible portfolio diversification benefits for the Socially responsible investment markets from various green, dirty, and energy cryptocurrencies. For which the study uses Descriptive Statistics and Correction Analysis methods. Market integration is assessed through correlation analysis, while asset interconnection is investigated using network analysis. The study then evaluates portfolio diversification benefits by constructing three distinct portfolios: 1) Equally weighted, 2) Minimum variance, and 3) Maximum Sharpe portfolios, comprising selected assets from March 5, 2018, to October 13, 2023. To ensure the reliability of the findings, the analysis employs daily returns. The study utilizes the following indices for returns

A) Socially Responsible Investment (S&P Kensho Clean Power Index, S&P Global Water Index, S&P Global Clean Energy Index, and S&P Green Bond Index)

B) Green cryptocurrencies (Cardano, Stellar, XRP)

C) Dirty cryptocurrencies (Bitcoin, Ethereum, Ethereum Classic)

D) Energy Cryptos (Powerledger, Energo)

The data for all the indices is collected from the investing.com database and USD is kept as the standard currency for all purposes. As every market experiences public holidays, resulting in missing observations, this absence of data can have adverse effects on the outcomes and implications. Jeon and Von Furstenberg [27] proposed in a study that utilizing data from the previous day could address this issue. Therefore, in line with this recommendation, missing values in the current study are replaced with the previous day's price. To explore the possible advantages of diversifying portfolios, the study employs the Equally Weighted Portfolio, Minimum Variance Portfolio, and Maximum Sharpe Portfolio. In the Equally Weighted Portfolio, the investment amount is divided equally among all the stock markets. The equally weighted portfolio expected return ΣR is calculated using the following formula:

$$\Sigma R = R1W1 + R2W2 \ldots\ldots\ldots RnWn, \qquad (1)$$

where W — weight on investment; R — return of index; n — number of markets.

Those securities that aren't correlated with each other hold the minimum variance portfolio. A minimum variance portfolio is a well-diversified portfolio of risky securities, which are traded in such a way that can result in the lowest possible risk for an expected level of return.

The Maximum Sharpe Portfolio is chosen based on the following formula:

$$\max SR = \frac{wE(r) - R_f}{\sqrt{wVw}}, \qquad (2)$$

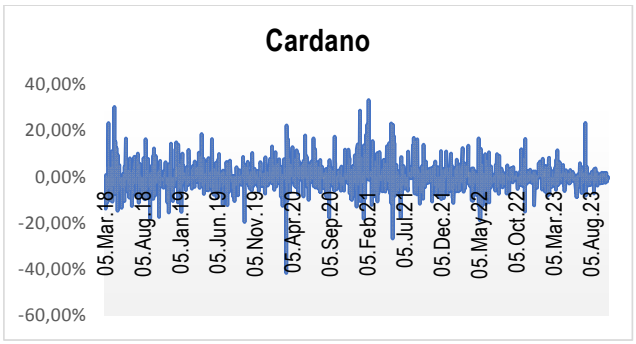
where w — portfolio weights; $E(r)$ — expected return on each stock market; R_f — the risk-free rate.

Based on the formula, the data is examined and the results of various tests are reported in the empirical findings section.

DATA ANALYSIS

Return on Selected Investments

Figure shows the Return trend for the selected socially responsible investment indexes and the green, dirty, energy cryptocurrencies. All the selected investment shows a fluctuating trend during the COVID-19 period. The returns of all the securities show varied returns and high ups-down during the breakout of the COVID-19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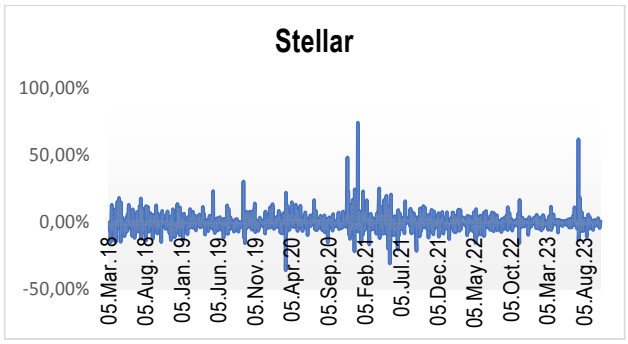
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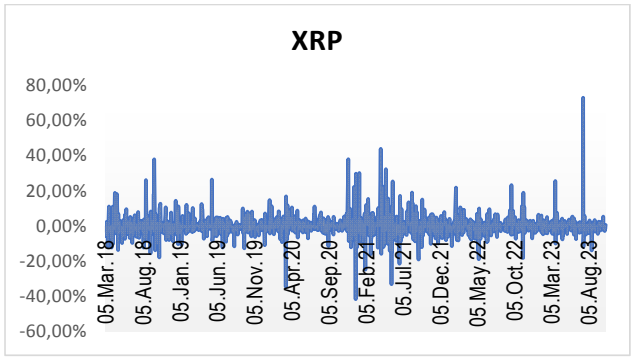
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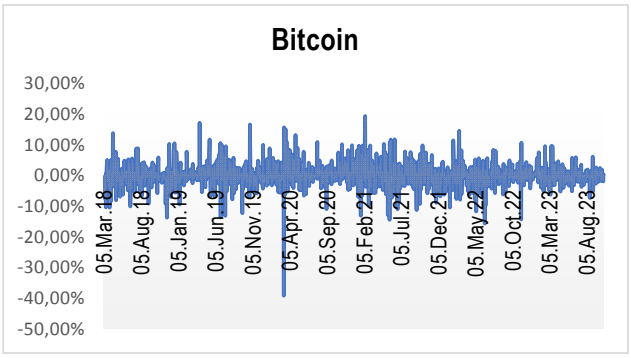
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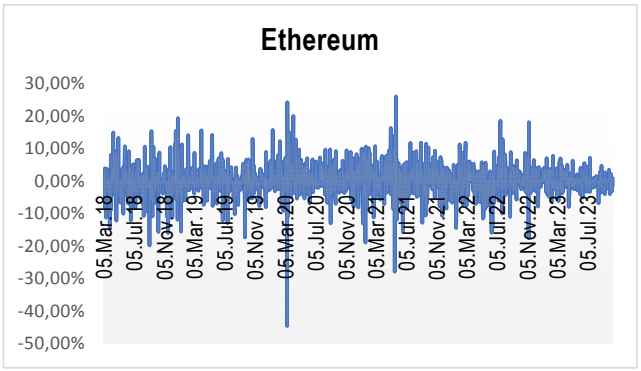
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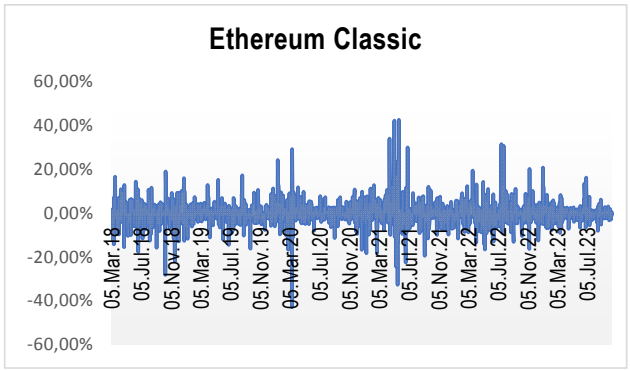
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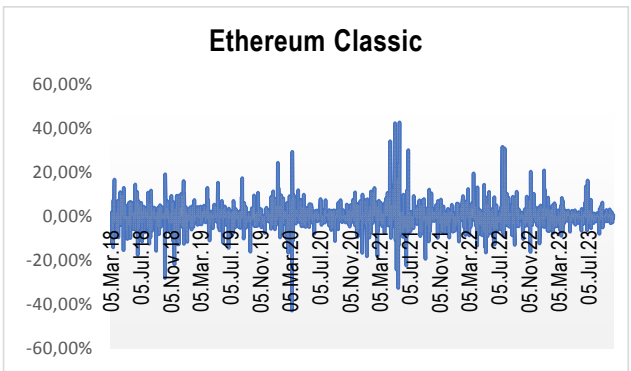
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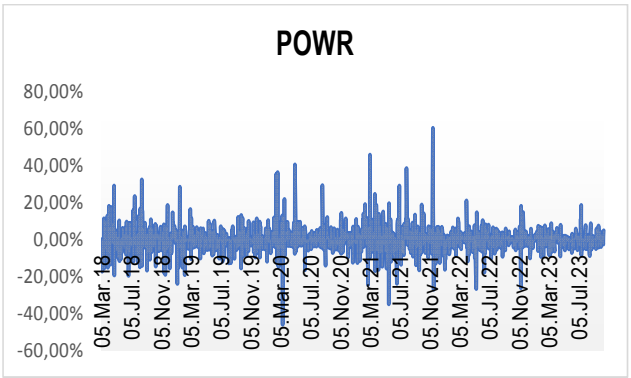
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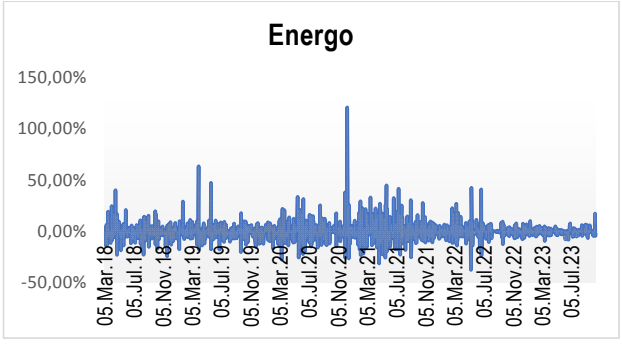
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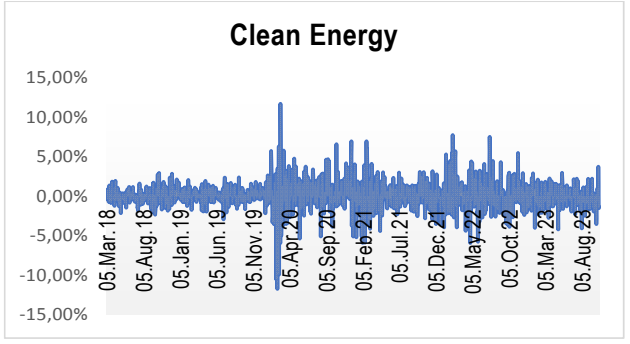
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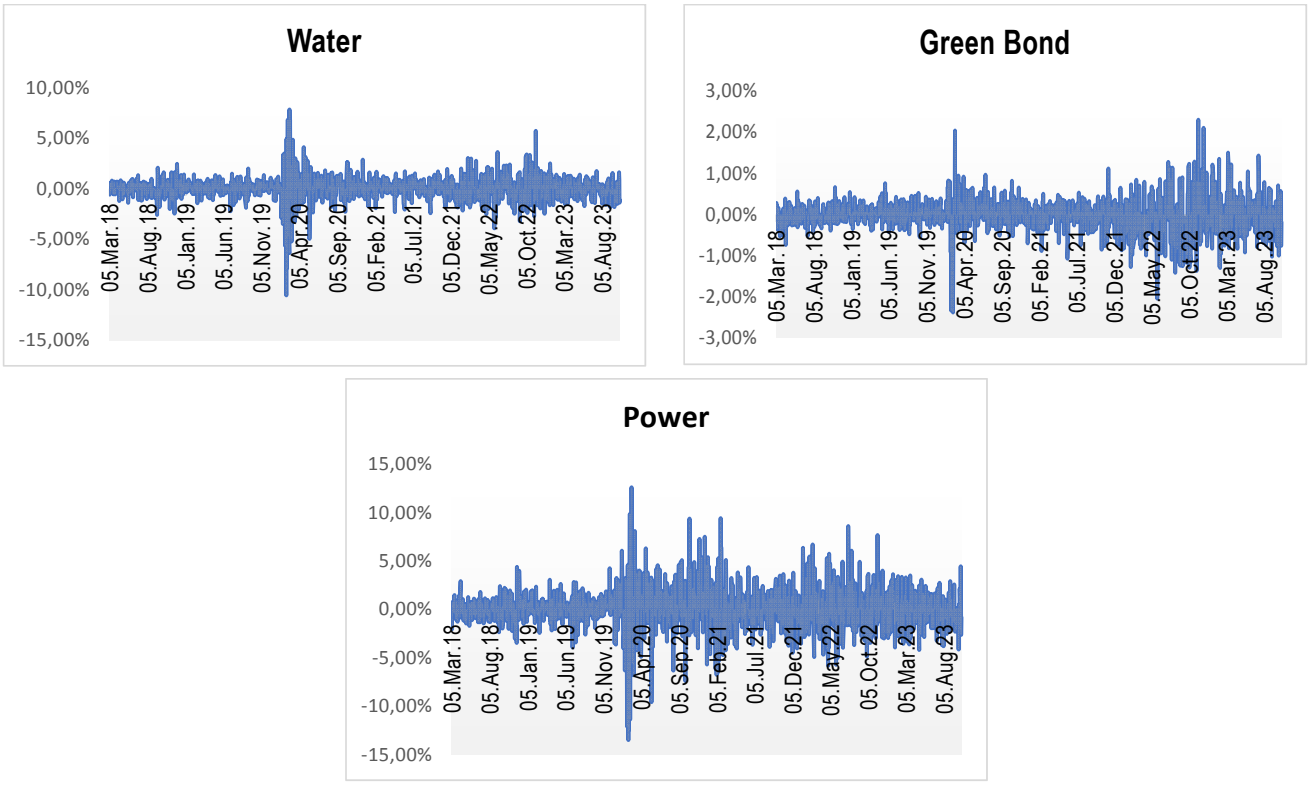

Fig. **Return Trends**
Source: Author's Calculation based on the closing price data downloaded from investing.com.

period. This reveals that the COVID-19 breakout has affected all the investment indexes negatively with the increase in the risk level.

MARKET INTEGRATION ANALYSIS

Here, in *Table 1,* except for Green Bond and Energo, all the markets show positive returns during the entire period. The markets' average daily returns were 0.0002%, 0.0005%, 0.0016%, 0.0010%, 0.0008%, 0.0012%, 0.0008%, 0.0004%, 0.0005%, and 0.0009% respectively for Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, Power, Water, Clean Energy, and POWR. Among all the investments, Energo has the highest standard deviation whereas Green Bond has the lowest standard deviation. The present results do not support the theory of finance which says the higher the risk, the higher the return. The difference between minimum and maximum is also significant indicating the return on the investment is highly fluctuating. The skewness and kurtosis reveal that the data are fit to perform further tests.

Table 2 shows the correlation between Socially responsible investment and green, dirty, energy cryptocurrencies. It is observed that Clean Power, Global Water, Global Clean Energy, and Green Bond have a low positive correlation with Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, POWR, and Energo. The lack of significant correlation among the selected securities indicates weak integration. Due to weak integration, these securities offer portfolio diversification opportunities to investors. The opportunities to diversify this investment are examined using three different diversification strategies: 1) Equally weighted portfolio, 2) Minimum variance portfolio, and 3) Maximum Sharpe portfolio.

PORTFOLIO DIVERSIFICATION ANALYSIS

Table 3 presents the diversification advantages for socially responsible investors derived from green, dirty, and energy-related cryptocurrencies. Each investment portfolio is created using daily return data (converted to annual returns) spanning from March 5, 2018, to October 13, 2023. Utilizing the correlation findings, potential diversification opportunities for investors are identified. Subsequently, portfolios are constructed for both non-diversified (home market) and diversified approaches (such as Equal Weighted Portfolio

Table 1

Descriptive Statistics

Investment Asset	Mean	Standard Deviation	Kurtosis	Skewness	Minimum	Maximum	Count
Cardano	0.0002	0.0590	4.6701	0.3528	−0.4149	0.3323	1389
Stellar	0.0005	0.0625	25.4083	2.3783	−0.3562	0.7395	1389
XRP	0.0016	0.0626	21.3393	1.7862	−0.4178	0.7301	1389
Bitcoin	0.0010	0.0393	9.3453	−0.4601	−0.3918	0.1941	1389
Ethereum	0.0008	0.0504	6.9729	−0.4177	−0.4455	0.2596	1389
Ethereum Classic	0.0012	0.0623	9.6063	0.8120	−0.4296	0.4264	1389
POWR	0.0009	0.0720	9.3877	0.8059	−0.4603	0.6037	1389
Energo	−0.0008	0.0909	27.0082	2.5530	−0.3747	1.2074	1389
Clean Energy	0.0005	0.0176	6.4432	−0.1744	−0.1175	0.1166	1389
Water	0.0004	0.0116	11.7861	−0.4886	−0.1054	0.0781	1389
Green Bond	−0.0001	0.0041	4.6563	−0.1501	−0.0238	0.0229	1389
Power	0.0008	0.0220	4.8613	−0.1623	−0.1348	0.1260	1389

Source: Author's calculation.

Table 2

Correlation

Investment Asset	Cardano	Stellar	XRP	Bitcoin	Ethereum	Ethereum Classic	POWR	Energo	Clean Energy	Water	Green Bond	Power
Cardano	1.000											
Stellar	0.764	1.000										
XRP	0.674	0.762	1.000									
Bitcoin	0.717	0.640	0.617	1.000								
Ethereum	0.785	0.690	0.683	0.847	1.000							
Ethereum Classic	0.680	0.615	0.589	0.665	0.742	1.000						
POWR	0.543	0.484	0.458	0.539	0.560	0.486	1.000					
Energo	0.259	0.207	0.244	0.210	0.244	0.248	0.243	1.000				
Clean Energy	−0.028	−0.003	0.012	0.053	0.022	0.042	−0.008	0.018	1.000			
Water	−0.028	−0.005	−0.002	0.010	−0.009	0.016	0.008	0.030	0.671	1.000		
Green Bond	−0.023	−0.017	−0.024	−0.012	−0.018	0.002	−0.002	0.009	0.287	0.393	1.000	
Power	−0.011	0.003	−0.001	0.061	0.029	0.029	−0.010	0.005	0.898	0.660	0.187	1.000

Source: Author's calculation.

(EWP), Minimum Variance Portfolio (MVP), and Maximum Sharpe Portfolio (MSP). This analysis aims to assess the presence of diversification benefits.

It is observed that Clean Power, Global Water, and Global Clean Energy do not benefit the portfolio diversification as per the equally weighted portfolio. Green Bond, on the contrary,

Table 3

Portfolio Diversification with Different Strategies

Security	Investment in respective security only				Equally Weighted Portfolio			
	Return (%)	SD (%)	Sharpe Ratio	Asset Allocation (%)	Return (%)	SD (%)	Sharpe Ratio	Asset Allocation (%)
Clean Power	28.60	8.03	3.56	Clean Power – 100	25.11	15.21	1.65	11.11% in each security – Clean Power, Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, POWR and Energo
Global Water	13.10	4.23	3.10	Global Water – 100	23.40	15.18	1.54	11.11% in each security – Global Water, Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, POWR and Energo
Global Clean Energy	17.96	6.41	2.80	Global Clean Energy – 100	23.93	15.20	1.57	11.11% in each security – Global Clean Energy, Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, POWR and Energo
Green Bond	–3.58	1.48	–2.42	Green Bond – 100	21.54	15.17	1.42	11.11% in each security – Green Bond, Cardano, Stellar, XRP, Bitcoin, Ethereum, Ethereum Classic, POWR and Energo
Security	**Minimum Variance Portfolio**				**Maximum Sharpe Portfolio**			
	Return (%)	SD (%)	Sharpe Ratio	Asset Allocation (%)	Return (%)	SD (%)	Sharpe Ratio	Asset Allocation (%)
Clean Power	29.34	7.12	4.12	76.68% in Clean Power, 18.92% in Bitcoin, 2.44% in Energo, 1.11% in XRP, 0.83% in POWR, 0.02% in Stellar, 0% Cardano, Ethereum & Ethereum Classic	33.70	7.46	4.52	71.56% in Clean Power, 16.43% in Bitcoin, 12.01% in XRP, 0% in Cardano, Stellar, Ethereum, Ethereum Classic, POWR & Energo
Global Water	14.60	4.06	3.59	92.08% in Global Water, 6.86% in Bitcoin, 0.64% in Cardano, 0.42% in Energo, 0% in Stellar, XRP, Ethereum, Ethereum Classic and POWR	19.57	4.63	4.23	79.80% in Global Water, 13.08% in Bitcoin, 7.12% in XRP, 0% in Cardano, Stellar, Ethereum, Ethereum Classic, POWR & Energo
Global Clean Energy	19.67	5.93	3.31	84.25% in Global Clean Energy 12.20% in Bitcoin, 1.45% in Cardano, 1.43% in Energo, 0.53% in POWR, 0.14% in Stellar, 0% in XRP, Ethereum, Ethereum Classic	26.15	6.61	3.95	70.45% in Global Clean Energy, 18.34% in Bitcoin, 11.22% in XRP, 0% in Cardano, Stellar, Ethereum, Ethereum Classic, POWR & Energo
Green Bond	–3.06	1.47	–2.08	98.83% in Green Bond, 1.03% in Bitcoin, 0.13% in XRP, 0% in Cardano, Stellar, Ethereum, Ethereum Classic, POWR, Energo	44.87	15.51	2.89	66.17% in Bitcoin, 33.83% in XRP, and 0% in Green Bond, Cardano, Stellar, Ethereum, Ethereum Classic, POWR, and Energo

Source: Author's calculation.

benefited and gained significantly on the Sharpe ratio. The Minimum variance portfolio (MVP) helps to reduce the portfolio risk for Clean Power, Global Water, and Global Clean Energy. Clean Power can have a standard deviation of 7.12% with an asset allocation of 76.68% in Clean Power, 18.92% in Bitcoin, 2.44% in Energo, and 1.11% in XRP. Global Water can have the lowest risk of 4.06 with MVP with the asset allocation of 92.08% in Global Water, 0.42% in

Table 4

Gains from Portfolio Diversifications

Market	Equally Weighted Portfolio		Minimum Variance Portfolio		Maximum Sharpe Portfolio	
	Δ SR	Δ SR%	Δ SR	Δ SR%	Δ SR	Δ SR%
Clean Power	–1.91	–54	0.96	27	0.56	16
Global Water	–1.56	–50	1.13	36	0.49	16
Global Clean Energy	–1.10	–39	1.15	41	0.51	18
Green Bond	3.84	159	5.31	219	0.34	–14

Source: Author's calculation.
Note: The Δ in Sharpe Ratio (SR) and the Δ% in Sharpe ratio (SR) indicate changes relative to the home portfolio.

Energo, 6.86% in Bitcoin, and 0.64% in Cardano. As per MVP, Global Clean Energy has the lowest standard deviation of 5.93% with asset allocation of 84.25% in Global Clean Energy, 12.20% in Bitcoin, 1.43% in Energo, 0.301.45% in Cardano 0.53% in POER. Green bonds can have the lowest risk with MVP but it generated a negative Sharpe ratio due to negative return.

The Maximum Sharpe Portfolio (MSP) strategy gives the maximum Sharpe for the investment. The Clean Power can have a Maximum Sharpe of 4.52 with the asset allocation of 71.56% in Clean Power, 16.43% in Bitcoin, and 12.01% in XRP. Global Water can make the asset allocation of 79.80% in Global Water, 13.08% in Bitcoin, and 7.12% in XRP to have the Maximum Sharpe ratio of 4.23. Global Clean Energy can have a Maximum Sharpe of 3.95 with an asset allocation of 70.45% in Global Clean Energy, 18.34% in Bitcoin, and 11.22% in XRP. The green bond can have a Sharpe ratio of 2.89 with an asset allocation of 66.17% in Bitcoin and 33.83% in XRP. *Table 4* illustrates the advantages of portfolio diversification for investors. It compares the Sharpe ratios of the equally weighted portfolio, minimum variance portfolio, and maximum Sharpe portfolio with those of the home market to evaluate the degree of gains. Importantly, investors in Green Bonds and other Socially Responsible Investments (SRI) do not find benefits from the Equally Weighted Portfolio. Similarly, Global Water investors do not see gains from the minimum variance portfolio. Conversely, Clean Power, Global Water, Global Clean Energy, and Green Bond investors can potentially achieve gains of 16%, 16%, 18%, and –14%, respectively, by adopting the maximum Sharpe ratio strategy. Among all the strategies, the maximum Sharpe ratio strategy proves to be the most advantageous for investors.

CONCLUSION

The current study aims to attain two objectives: (1) to assess the interconnectivity among Socially Responsible Investment markets and various cryptocurrencies categorized as green, dirty, and energy-related; and secondly, to evaluate the potential portfolio diversification benefits for SRI markets derived from these cryptocurrencies. Correlation analysis indicates an insignificant integration among the markets, suggesting a diversification possibility for investors. Investors in Clean Power, Global Water, and Global Clean Energy stand to benefit from the minimum variance portfolio, offering the lowest risk. However, green bond investors may not reap advantages from the MVP strategy. Conversely, all SRI investors can potentially benefit from the maximum Sharpe portfolio, leading to significant gains in the Sharpe ratio, reduced investment risk, and increased portfolio returns. Green, dirty, and energy cryptocurrencies present a promising avenue for Socially Responsible investors seeking diversification.

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ABOUT THE AUTHORS

Harsh Pratap Singh — PhD, Assist. Prof., Department of Accounting and Finance, Institute of Management, Nirma University, Ahmedabad, India
https://orcid.org/0000-0002-4634-164X
harsh.singh@nirmauni.ac.in

Aditya Sharma — PhD, Department of Economics and Finance, Birla Institute of Technology & Science Pilani, Pilani, India
https://orcid.org/0000-0002-1437-8157
Corresponding author:
aditya.bits@gmail.com

Mitesh Patel — PhD, Assist. Prof., Department of Accounting and Finance, S V Institute of Management, Kadi Sarva Vishwavidyalaya, Gandhinagar, India
https://orcid.org/0000-0001-5190-1915
patel4mitesh@gmail.com

Authors' declared contribution:
H. P. Singh — contributed to the conceptualisation of the study and the development of the introduction and background sections of the manuscript.
A. Sharma — was responsible for developing the research framework, conducting the analysis, and preparing the final draft of the manuscript.
M. Patel — carried out the interpretation of results, data collection, and the literature review to support the research.

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Assessment of the Participation of Foreign Capital in the Russian Energy Sector

A.V. Vavilina[a], A.A. Firsova[b], T.V. Komarova[c]
[a, b, c] Peoples' Friendship University of Russia (RUDN University), Moscow, Russian Federation;
[b] Saratov National Research State University named after N.G. Chernyshevsky, Saratov, Russian Federation

ABSTRACT

The increased sanctions pressure on Russia in recent years has significantly altered the current situation and economic landscape in the energy sector, increasing the risks to the stability of companies with foreign capital involvement. Due to the significant importance of the energy sector to the Russian economy, it is essential to examine the structure of its funding sources. The purpose of this study is to analyze the extent of foreign capital investment in the Russian energy sector by examining its dynamics and structural changes. We will examine the main owners in the sector and focus on the share of foreign investment in 2023 compared to 2021 for key industries such as electric power, coal mining, oil production, natural gas extraction, and uranium mining. Sanctions risks are also analyzed in the report. The findings show that, despite the years of sanctions, foreign investment continued to flow into the Russian economy. Since 2022, domestic businesses have not shown a significant decline in interest in offshore jurisdictions, and foreign multinationals still own assets in the Russian energy sector. The share of foreign capital in the electricity industry is 44%, coal mining — 38%, oil production — 40%, gas production — 19%. Sanctions risks for the energy sector have been identified due to the presence of foreign investors in companies' capital. However, despite the apparent feasibility of transferring these companies to Russian jurisdiction, processes of redomiciling Russian businesses within the country are currently not actively developing. In the context of the transformation of the global energy landscape and the reorientation of Russian companies towards new markets, it is crucial to develop mechanisms for redomiciling, explore new investment strategies, and create favorable conditions for investors in the Russian energy industry.

Keywords: foreign investment; foreign capital; redomiciliation; ownership structure; energy; energy sector; sanctions risks

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INTRODUCTION

The relevance of the study of the financing of the Russian energy sector is due to its high importance in the Russian economy. In 2024, investments in the energy sector accounted for 30% of total investments in the country, and represented approximately 20% of the country's GDP[1].

In the last 30 years, in the era of globalization, foreign capital has actively penetrated the Russian economy. He was particularly attracted to raw materials and low-tech industries [1]. The Russian energy sector has always been the object of close attention from foreign capital. With high capital intensity and a long return period, the return on investment was high [2]. Foreign investments were considered as a stable source of development of the Russian economy and an influx of financing for the modernization of worn-out and creation of new fixed assets in the energy sector [3–5]. So, in 2006–2010. More than 10 billion US dollars of foreign investments were attracted to the electric power industry [6].

The presence of foreign capital in the Russian energy sector, due to its export potential, was large — scale, partly due to the interest of foreign partners in meeting their own energy needs [7], partly due to the relatively low unit costs of international companies in US dollars for resource extraction with high availability of proven Russian reserves [8].

The experience of "foreign registration" of Russian companies was also widespread due to access to foreign investments and the possibility of using mechanisms to optimize the fiscal burden and management processes in export-oriented corporations of the Russian energy sector. Management companies were largely or entirely withdrawn to offshore jurisdictions, mainly to Cyprus, less to Luxembourg, England or the Virgin Islands [9]. And, as our research will show further, offshore companies still form the bulk of the visible presence of foreign capital in the Russian energy sector.

This structure of financing the energy sector of the Russian economy persisted until 2014, when the first signs of a cooling of transnational capital towards investing in Russia appeared [10–13]. However, although the mutual exchange of capital has decreased, it has not completely stopped. Foreign corporations have not stopped their presence in the Russian economy.

The intensification of sanctions on Russia since 2022 has significantly changed the current economic situation and landscape, particularly in the energy sector. These sanctions have effectively prevented cross-border capital movement, which has impacted the dynamics and volume of foreign investment in the energy industry.

The unfriendly actions of several foreign countries have significantly increased the risks to the stability of companies with foreign capital. As a result, the transfer of these organizations to Russian jurisdiction has become a condition for their continued operation. However, the process of relocating Russian businesses to the country is not currently actively developing.

The purpose of this study is to assess the extent of the presence of foreign capital in the Russian energy sector and analyze its dynamics and structural changes in 2021–2023. The study established the share of foreign companies in key energy sectors of the Russian economy. The assessment of the participation of foreign capital in the Russian energy sector for 2021 was carried out, the last of the periods when the reports of public companies were available in full. However, in most cases, it was possible to establish the ownership structure of companies in the energy sector for 2023. The study also draws parallels with estimates of the presence of foreign capital in the industry 10 years ago.

MATERIALS AND RESEARCH METHODS

The concept and methodology for assessing the presence of foreign capital in the Russian energy sector are based on research [14] and [15]. They showed that in 2012, about 30% of the capital in the electric power industry accounted for companies from abroad (code "E" according to the previous OKVED classification).

[1] Ministry of Energy of the Russian Federation: the share of fuel and energy complex in Russia's GDP is about 20%. URL: https://www.eprussia.ru/news/base/2024/492819.htm (accessed on 12.06.2024).

The key source of data for this study was government reports on the state and use of the mineral resources of the Russian Federation, on the volume of electricity production and extraction of natural resources in Russia as a whole, as well as for some companies individually[2].

The results of the companies' activities and their ownership structure are presented in annual reports and lists of affiliated companies published on the Interfax[3] corporate information disclosure website. For enterprises in forms of ownership other than public companies, data on the founders are obtained from the Globalstat[4] and List-Org.com[5]. Data on the owners of Moscow Exchange PJSC[6] companies was also used. In addition, the work of I. E. Petrenko [16] provided significant assistance in filling out the section on coal mining.

This analysis is complicated by the fact that a significant part of the country's energy sector enterprises have not published annual reports for 2022, which excludes the possibility of a comprehensive study of the industry for this year. Therefore, in our work we turn to the companies' reporting for 2021, so that the data for the analysis of all aspects of the study are relevant and comparable. The lists of affiliated individuals for the column "Key owners" are considered for the period from 31.12.2021 and as of 30.06.2022, providing an objective assessment of the presence of foreign capital in the Russian energy sector at the beginning of 2022. We note that most companies limit the publication of their lists of affiliated companies to this period, without disclosing reports in later periods.

Companies directly controlled by the Russian Federation are designated in the tables as "Rosimushchestvo" for brevity, to indicate individual legal entities that are 100% controlled by it in one way or another.

In the columns "Foreign capital" for 2021 and 2023, only reliably established shares of companies in a foreign jurisdiction are indicated. Otherwise, the ambiguity of the final indicator is indicated as "...", which means the lack of objective and reliable data. The companies in the tables are ranked in descending order of scale by the volume of production of the corresponding energy resources. Due to the fact that most companies have so far suspended the publication of data, for 2023 the data of not all the studied companies are presented in the table, companies with missing data are given to assess the scale of the study sample.

The paper examines the structural changes in the share of foreign capital in 2023 in relation to 2021 in five areas of the Russian energy sector: electric power, coal, oil, natural gas and uranium production. As a result, the results of the study are presented in five subsections and five tables with analytical conclusions and comments.

THE RESULTS OF THE STUDY AND THEIR DISCUSSION

The Share of Foreign Capital in the Electricity Generation Sector

The key owners of the Russian energy sector and their shares in the electricity generation sector are presented in *Table 1*.

In 2012, foreign capital provided only about 30% of electricity generation [15]. As can be seen from table 1, by the beginning of 2022, this share had increased to 44%. Moreover, according to the available relevant data, this share should be regarded as the lower threshold of the real state of affairs, since we excluded small companies from the review. The shares of foreign companies in the capital of RusHydro, Inter RAO and T Plus are also not reliably known. Based on this, it can be assumed that the real share of offshore

[2] State report on the state and use of mineral resources of the Russian Federation. FSBI "VIMS". URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi / (accessed on 24.03.2024).

[3] The Corporate Information Disclosure Center is a specialized information disclosure agency for issuing companies accredited by the Bank of Russia. Interfax. URL: https://www.e-disclosure.ru / (accessed on 24.03.2024).

[4] Globalstat – Russian legal entities. Globalstat. URL: https://globalstat.ru / (accessed on 24.03.2024).

[5] List-Org. Information about Russian companies. List-org. URL: www.list-org.com (accessed on 24.03.2024).

[6] Smartlab is a community of investors and traders. Moscow Stock Exchange. URL: https://smart-lab.ru/q/VTGK/shareholders / (accessed on 24.03.2024).

Table 1

The Ownership Structure in the Electricity Generation Sector in Russia in 2021 and 2023, in Billion kWh

No.	Company name	Bln kWh	Key owners, 2021	Share of foreign capital, 2021, %	Share of foreign capital, 2023, %
1	JSC Rosenergoatom Concern	22.,4	Rosimushchestvo – 100%	0	0
2	PJSC RusHydro	143.8	Rosimushchestvo – 74.79%	…	2.76
3	PJSC Inter RAO	120.8	Shares in free circulation (free float) – 34.24%	…	…
4	Eurosibenergo LLC	82.2	Cyprus offshore companies – 100%	100	50
5	Siberian Generating Company LLC	68.7	JSC SUEK – 100%	100	100
6	JSC Mosenergo	62.0	Gazprom Energoholding – 100%	16,16	6.63
7	PJSC T Plus	54.6	KES-Holding – 32.34	44.31	…
8	OGK-2 PJSC	49.8	Gazprom Energoholding – 100%	16.16	6.63
9	PJSC Unipro (Formerly JSC E.HE IS Russia)	45.2	Uniper SE – 83.73%	83.73	83.73
10	PJSC Forward Energy (formerly Fortum)	30.4	Fortum – 98.23%	98,23	98.23
11	JSC TGC-1	30.1	Gazprom Energoholding – 100%	16.16	6.63
12	JSC Enel Russia (now EL5–Energo)	22.6	Enel S.p.A – 56.43%	56.43	7.41
13	JSC Quadra	12.0	ONEXIM Group LLC	0	0
	TOTAL:	945		44.3	32.9

Source: Compiled by the authors based on the data: URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi/; https://www.e-disclosure.ru/; https://globalstat.ru/; www.list-org.com; https://smart-lab.ru/q/VTGK/shareholders/ (accessed on 24.03.2024).

companies and foreign investors in the industry by 2022 was more than 60%.

During 2022–2023, the apparent share of foreign capital decreased to 33%. There is a lack of data on Inter RAO and T Plus, so perhaps the final estimate of the share of foreign capital in this sector will be 45%.

Of the significant events in the electric power industry over the past period, we note:

- 50% of Eurosibenergo LLC was transferred to EN+ GROUP, where O. V. Deripaska (35%) is listed as the main owner. However, no information has been provided about the rest of the founders, which may also conceal a certain proportion of offshore jurisdictions;
- despite frequent reports about Fortum's exit from business in Russia, for which the company was even renamed PJSC Forward Energy, Fortum Russia B. V. and Fortum Holding B. V. with shares of 69.88% and 28.34%, respectively, are still listed in the list of affiliated companies as of 31.12.2023, although there is a note: "subject to the restrictions established by Decree of the President of the Russian Federation dated 25.04.2023 No. 302 "On the temporary Management of certain Property";
- Uniper SE's share in PJSC Unipro (previously called E.HE IS Russia") unchanged at 83.73%;

• Enel S.p.A.'s share in Enel Russia (later renamed EL5–Energo) was bought out by Lukoil. However, the share in the Cyprus-based UROC LIMITED remained (7.41%). Lukoil itself, which had 42.6% of foreign shareholders at the beginning of 2022, has not yet published data on the share capital structure, which makes it difficult to accurately assess the impact of the purchase on the structure of electricity production in terms of the presence of foreign capital.;

• JSC Quadra was sold by ONEXIM Group to Rosatom in January 2022.

In general, according to the results of the analysis of the data in *Table 1*, there is a decrease in the share of foreign capital in the Russian electric power industry, which is mainly caused by a decrease in the ADR share in Gazprom Neft's capital (through the parent company — from 16.16% to 6.63%) and the transfer of a maximum of 50% of Eurosibenergo LLC to the Russian jurisdiction.

The Share of Foreign Capital in the Coal Mining Sector

The key owners of the Russian energy sector and their shares in the coal mining sector are presented in *Table 2*.

Based on the data in *Table 2,* the share of foreign participation in the capital of Russian coal mining is slightly lower than in the electric power industry in 2021, amounting to more than 50% in 2023. It should be noted that for 2023, the capital structure of Stroyservice, Kuzbass Fuel Company, Mechel and MMK, Kolmar and VGK is not presented in open sources. Therefore, the real share of offshore companies and foreign jurisdictions is likely to approach 50%, taking into account the incomplete coverage of small producers in the presented rating.

It should be noted that among the founders of Mechel there is a significant number of Cypriot offshore companies, but they are not listed among the owners of shares. The nationality of Vorkutaugol shares managed by mutual funds is also unknown.

Among the key events determining changes in the capital structure of companies engaged in coal mining in Russia, it is worth highlighting the following:

• transfer of 50% of En+ Group to Russia;

• the redomicilation of the company to the Kaliningrad region at the end of 2023 by the Cypriot Claverley Holding, which is a key figure in the share capital of HC Russian Coal.

Over the past two years, there has not been a noticeable trend in Russian coal mining towards an export-oriented approach that would be significant in terms of foreign exchange earnings. Foreign companies in this industry are almost exclusively represented by Cypriot offshore companies, which differ from the electric power industry where there is a much larger presence of "real" foreign investors.

The Share of Foreign Capital in the Oil Production Sector

The key owners of the Russian energy sector and their shares in the oil production sector are presented in *Table 3*.

British Petroleum is still a shareholder of Rosneft, as it cannot find a buyer for its stake in the company. Therefore, the share of foreign capital in oil production in Russia has not decreased significantly. However, it is significant that large manufacturers do not publish data on the share capital structure for 2023, whereas in 2021 a number of offshore companies and multinational companies appeared in their reports. In particular, this applies to PJSC Lukoil, PJSC Surgutneftegaz and PJSC Novatek. If we assume that for them the share of foreign jurisdictions has remained unchanged, then the indicator of foreign presence in the industry as a whole will be approximately at the level of 45%.

Among the significant events in Russian oil production, we can single out the following:

• Novatek Equity (Cyprus) Limited was redomiciled in Russia in 2023, but its share is an insignificant 1.34% of Novatek's capital. It is also known that the French Total has written off its stake in the company (16.5%);

• According to some reports, British Shell is close to selling its stake in Sakhalin Energy (Sakhalin-2) to Novatek. However, data on the

Table 2

The Ownership Structure in the Coal Mining Sector in Russia in 2021 and 2023, in Million Tons

No.	Company name	Mln tons	Key owners, 2021	Share of foreign capital, 2021, %	Share of foreign capital, 2023, %
1	JSC SUEK	102.5	Donalink Limited (Cyprus) — 100%	100	100
2	Kuzbassrazrezugol	38.8	Temare Consultants Limited, (Cyprus) — 100%	100	100
3	A–Property Holding JSC	36.7	Avdolyan A.A.— 100%	0	0
4	EvrazHolding LLC	23.3	EVRAZ plc (London) through Sibmetinvest LLC — 100%	100	100
5	HC SDS-Ugol	19.3	Russian citizens --100%	0	0
6	STROYSERVICE JSC	16.7	No data available	…	…
7	JSC Russian Coal	14.7	Claverley Holding (Cyprus) — 100%	100	0
8	En+ Group	14.5	Eurosibenergo — 100%	100	50
9	PJSC KTK	12.8	Cyprus offshore companies — 99.65%	99.65	…
10	PJSC Mechel	11.3	Russian citizens — 100%	0.16	…
11	Kolmar Management Company LLC	11.0	No data available	…	…
12	Vostochnaya Mining Company LLC	10.3	No data available	…	…
13	TALTEK JSC	8.9	Russian citizens — 100%	0	0
14	JSC Vorkutaugol	8.8	Intento Management Limited (Cyprus) — 10%, mutual funds –90%	10	10
15	LLC Resource	7.1	Russian citizens — 100%	0	0
16	MMK PJSC	5.0	Mintha Holding Limited (Cyprus) — 81.26%	81.26	…
17	LLC Management Company Razrez Mayrykhsky	4.9	Russian citizens — 100%	0	0
18	LLC Arshanovsky Section	4.5	Zimber Investments Ltd. (Cyprus) — 100%	100	100
	TOTAL:	351		52.7	38.3

Source: Compiled by the authors based on the data: URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi/; https://www.e-disclosure.ru/; https://globalstat.ru/; www.list-org.com; https://smart-lab.ru/q/VTGK/shareholders/ (accessed on 24.03.2024).

Table 3

The Ownership Structure in the Oil Mining Sector in Russia in 2021 and 2023, in Million Tons

No.	Company name	Mln tons	Key owners, 2021	Share of foreign capital, 2021, %	Share of foreign capital, 2023, %
1	PJSC Rosneft	191.9	Rosimushchestvo — 50.2%; BP (England) — 19.75%; QH Oil Investments LLC (Qatar) --18.46%	38.21	38.21
2	PJSC Lukoil	73.4	Citibank, N.A. 30.6%; Grindale Investments Ltd 6.6%; Cyproman Services Limited 5.4%	42.6	…
3	PJSC Surgutneftegaz	54.8	ADR, the rest are not specified	8.91	…
4	PJSC Gazprom Neft	38.9	Gazprom PJSC	16.16	6.63
5	PJSC Tatneft named after V.D. Shashin	26.0	Rosimushchestvo — 29.07%; Colima Associated S.A. (Cyprus) — 0.388%; Vamolero Holdings Co. Limited (Cyprus –) 3.08%; Citibank N.A. (THE USA) — 26.07%	29.538	13.078
6	Sakhalin-1	18.6	ExxonMobil (The USA) — 30%; SODECO (Japan) — 30%; Rosneft — 20%; ONGC (India) — 20%	87.642	87.642
7	PJSC Slavneft	9,9	Toc Investments Corporation Limited (Cyprus) — 43.3%; Gazpromneft — 43.3% (both through Invest Oil LLC)	51	46.46
8	PJSC Novatek	8.1	Novatek Equity (Cyprus) Limited — 1.34%; SWGI Growth Fund (Cyprus) Limited — 14.39%; Levit LLC — 7.39%; Total E&P Holdings Russia (France) — 16.5%; The Bank of New York Mellon — 18.25%	50.48	…
9	PJSC NK RussNeft	6.9	Cyprus and Swiss offshore companies — 100%	100	100
10	Sakhalin Energy (Sakhalin-2)	4.2	Gazprom — 50%; Shell (England) — 27.5%; Mitsui (Japan) — 12.5%; Mitsubishi (Japan) — 10%	58.9	26.15
11	JSC Rus-Oil	3.1	No data available	…	0
	TOTAL:	436		48.3	39.8

Source: Compiled by the authors based on the data: URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi/; https://www.e-disclosure.ru/; https://globalstat.ru/; www.list-org.com; https://smart-lab.ru/q/VTGK/shareholders/ (accessed on 24.03.2024).

final completion of the transaction has not yet been received;

- in 2023, to repay the debt, 100% of Rus-Oil JSC became the property of the Federal Property Management Agency.

In general, according to the results of the analysis of Table 3, it should be noted that there has been no active withdrawal of foreign companies from Russian oil production in recent years. Significant assets still belong to a number of multinational corporations and offshore jurisdictions.

The Share of Foreign Capital in the Gas Production Sector

The key owners of the Russian energy sector and their shares in the gas production sector are presented in *Table 4*.

Table 4

The Ownership Structure in the Natural Gas Production Sector in Russia in 2021 and 2023, in Billion Cub. m

No.	Company name	Bln cub. m.	Key owners, 2021	Share of foreign capital, 2021, %	Share of foreign capital, 2023, %
1	PJSC Gazprom	482.9	Rosimushchestvo –50.23%	16.16	6..3
2	PJSC Novatek	113.8	Novatek Equity(Cyprus) Limited – 1.34%; SWGI Growth Fund (Cyprus) Limited – 14.39%; Levit LLC – 7.39%; Total E&P Holdings Russia (France) –16.5%; The Bank Of New York Mellon –18.25%	50.48	…
3	PJSC Rosneft	43.7	Rosimushchestvo – 50.2%; BP (England) – 19.75%; QH Oil Investments LLC (Qatar) – 18.46%	38.21	38.21
4	PJSC Gazpromneft	29.7	Rosimushchestvo – 50.23%	16.16	6.63
5	Sakhalin Energy(Sakhalin-2)	29.1	Gazprom – 50%; Shell (England) – 27.5%; Mitsui (Japan) – 12.5%; Mitsubishi (Japan) – 10%	58.9	26.15
6	PJSC Lukoil	19.0	Citibank, N.A. 30.6%; Grindale Investments Ltd 6.6%; Cyproman Services Limited 5.4%	42.6	…
7	PJSC Surgutneftegaz	9.0	8.91% – ADR. The other shareholders are not specified	8.91	…
	TOTAL:	763		33.1	19.4

Source: Compiled by the authors based on the data: URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi/; https://www.e-disclosure.ru/; https://globalstat.ru/; www.list-org.com; https://smart-lab.ru/q/VTGK/shareholders/ (accessed on 24.03.2024).

Based on the data in *Table 4*, the following significant changes occurred in gas production in 2021–2023:

- for Gazprom, the share of holders of the American Deposit Receipt decreased from 16.16% to 6.63% (latest data as of December 2022);
- redomicilation of Novatek Equity (Cyprus) Limited;
- the planned buyout of Shell's stake by Novatek.

Otherwise, the reduction in the share of foreign capital from 33% to 19% is mainly due to a lack of data on the share ownership structure for 2023. Therefore, we estimate the remaining share of foreign companies in Russian gas production in the range of 20–25%.

The Share of Foreign Capital in the Uranium Mining Sector

The key owners of the Russian energy sector and their shares in the uranium mining sector are presented in *Table 5*.

As can be seen from *Table 5*, all of Russia's uranium production is concentrated in one person — JSC Atomredmetzoloto (Rosimushchestvo). There are no sanctioned risks of reducing production in this production area. Over the past 2 years, the structure of mining and ownership of mining companies has remained unchanged.

CONCLUSIONS

In general, this study found that despite the long history of Russia's sanctions confrontation with the countries of the collective West, foreign investment continued to flow into the domestic economy. Even after 2022, there has been no significant decrease in the interest of domestic businesses in offshore jurisdictions and foreign multinational companies have not been in a hurry to part with their assets in the Russian energy sector.

So, if in 2012 the share of foreign capital in the electric power industry was estimated at 30% [16], in 2017 – 35%[7], then by 2022 it reached 44%, as shown by this study. Only a

[7] The share of foreign investors in fuel and energy sector projects in the Russian Federation has grown to 37% during the crisis. URL: https://finance.rambler.ru/business/38236128 / (accessed on 24.03.2024).

Table 5

The Ownership Structure in the Natural Gas Production Sector in Russia in 2021 and 2023, in Tons

No.	Company name	Tons	Key owners, 2021	Share of foreign capital, 2021, %	Share of foreign capital, 2023, %
1	PJSC Priargunsky Industrial Mining and Chemical Association|	1135	JSC Atomredmetzoloto — 96.88%	0	0
2	JSC Hiagda	901	Atomredmetzoloto JSC — 100%	0	0
3	JSC Dalur	585	Atomredmetzoloto JSC — 100%	0	0
4	JSC Lunnoye	19	Atomredmetzoloto JSC — 100%	0	0
	TOTAL:	2640		0	0

Source: Compiled by the authors based on the data: URL: https://vims-geo.ru/ru/activity/iacn/russia/gosdokladi/; https://www.e-disclosure.ru/; https://globalstat.ru/; www.list-org.com; https://smart-lab.ru/q/VTGK/shareholders/ (accessed on 24.03.2024).

new round of sanctions in 2022 reduced this figure to 32%. Although these data also seem to be a minimal estimate, the actual share of the presence of foreign jurisdictions can be estimated as higher.

From 2021 to 2023, the share of foreign (mainly offshore) capital in coal mining decreased from 53% to 38%, partly due to a reduction in companies' published information about their activities. In oil production, the figure decreased from 48% to 40% with the same caveats.

The foreign presence in gas production decreased from 33% to 19%. However, due to the lack of up-to-date lists of affiliated companies for the largest representatives of the industry, these data seem to be greatly underestimated. The actual estimate of the share of foreign individuals and companies in gas production is likely to be more than this value.

Only among the companies involved in uranium mining are there no foreign companies. This ensures the reliability of domestic nuclear energy and acts as a favorable factor for its future development.

Today, the sanctions risks for the energy sector due to the presence of foreign jurisdictions in the capital of energy companies are very high. However, despite the obvious expediency of transferring such companies to Russian jurisdiction, the processes of redomiciling Russian businesses in the country are not actively developing today. Of the companies analyzed in this paper, only JSC Russian Coal transferred its parent company to the Kaliningrad Region from unfriendly Cyprus, and PJSC Novatek redomiciled Novatek Equity (Cyprus) Limited, which owned a small part of the company's shares (1.38%), also to Kaliningrad.

In the context of the ongoing process of reshaping the global energy landscape, the need for Russian companies to explore new energy markets and enhance the economic diversity of the Russian economy [17], has become increasingly important. This includes the development of strategies for further relocation of companies, innovative approaches to investment, and structural transformations. Additionally, it is essential to establish a framework for identifying priority factors that contribute to creating a favorable investment climate within the Russian energy industry.

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ABOUT THE AUTHORS

Alla V. Vavilina — Cand. Sci. (Econ.), Head of the Department of Management, Faculty of Economics, RUDN University, Moscow, Russian Federation
https://orcid.org/0000-0003-4827-1056
vavilinaalla@mail.ru

Anna A. Firsova — Dr. Sci. (Econ.), Prof., Prof. of the Department of Management, Faculty of Economics, RUDN University, Moscow, Russian Federation; Prof. of the Department of Finance and Credit, Saratov National Research State University named after N.G. Chernyshevsky, Saratov, Russian Federation
http://orcid.org/0000-0002-8906-6326
Corresponding author:
a.firsova@rambler.ru

Tatiana V. Komarova — Senior Lecturer, Department of Management, Faculty of Economics, RUDN University, Moscow, Russian Federation
https://orcid.org/0000-0002-5101-5873
komarova-tv@rudn.ru

Author's declared contribution:
A. V. Vavilina — problem statement, concept development, results description and research conclusions formation.
A. A. Firsova — concept development, research methodology, critical literature analysis, analysis and systematization of research results, formation of conclusions and proposals.
T. I. Komarova — statistical data collection, calculations, tabular and graphical presentation of results, results description and research conclusions formation.

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On Managing the Risks of the Russian Crowd-lending Market

Yu.S. Evlakhova
Rostov State University of Economics, Rostov-on-Don, Russian Federation

ABSTRACT

In 2021–2023, the volume of investments in the crowd-lending market showed more than threefold growth, but the corresponding volume of unfulfilled obligations doubled. Global and Russian experience confirm that the crowd-lending market has great potential, which depends on effective risk management. The purpose of the study is to propose measures to regulate the risks of the Russian crowd-funding market. Research hypothesis: the mechanism of operation of the crowd-lending market is similar to the exchange-traded corporate bond market, which suggests the possibility of adapting individual regulatory mechanisms of the corporate bond market to the crowd-lending market. The scientific novelty of this research lies in the fact that it is the first time an analysis of the Russian crowd-lending market by level of credit risk has been conducted. The comparison of the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market is also original. Furthermore, new measures for managing the risks associated with the Russian crowd-lending market have been proposed. Research methods: grouping, FOREL clustering, comparative analysis. Main results: 1) in the Russian crowd-lending market, 2 groups of participants were observed annually: with zero and moderate risk, groups with high credit risk were present sporadically. When using FOREL clustering, it was revealed that the group of investment platform operators with zero and moderate credit risk is heterogeneous; 2) the common features and differences between the regulation of the exchange-traded corporate bond market and the crowd-lending market are discussed; 3) risk management measures in the crowd-lending market are proposed (quarterly reporting by the platform operator on the share of outstanding obligations in the total volume attracted investments with the establishment of a recommended threshold value for such an indicator; the introduction of a representative of borrowers among the participants of the investment platform to protect their rights and interests; the inclusion of the procedure for dealing with overdue debts in the rules of the investment platform).

Keywords: investment platform operator; P2P-lending; loan; corporate bonds exchange market; clustering; overdue debt

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INTRODUCTION

The structural changes in the financial market due to digitalization have various manifestations. One of the most significant is the emergence of new institutions, such as banking ecosystems and fintech companies. These institutions are different from traditional financial market players in that they do not involve financial intermediation. Instead, they act as information systems for market participants, allowing them to conclude investment contracts.

Investment platforms are used by investors to manage their investments. Operators of these platforms facilitate the attraction of funds, but do not directly participate in the transformation of risks and deadlines. Instead, they contribute to the redistribution of capital by providing a platform for investors to find suitable investment opportunities.

According to the Bank of Russia, 78 legal entities are listed in the register of investment platform operators as of 31.12.2023, which is 56% more than two years ago as of 31.12.2021. Among the operators of investment platforms are individuals engaged in various investment methods provided for by law, including loan provision activities. At the same time, the volume of attracted investments using the platform by providing loans has more than tripled over the past 3 years: 2021–8.07 billion rubles, 2022–12.16 billion rubles, 2023–26.25 billion rubles[1]. And this is despite the fact that there is a legal limit on the amount of an individual's investment within one calendar year using investment platforms of no more than 600 thousand rubles[2].

Unlike other investment methods on investment platforms, crowd-lending involves lending by attracting funds from a large number of individuals, carried out on a digital platform, without the participation of a financial intermediary.

Based on this definition, we believe that crowd-lending includes so-called P2P lending (from an individual to an individual), P2B lending (from an individual to a legal entity), and B2B lending (from a legal entity to a legal entity). The term P2P lending also refers to peer-to-peer or peer-to-peer lending, which emphasizes the absence of a financial intermediary in lending. But this concept is broader than crowd-lending, as it also includes offline lending outside of investment platforms. The relative novelty of investment platforms and crowd-lending as financing mechanisms for the Russian financial market, as well as the absence of a legal definition in regulatory acts, contributes to the controversy surrounding these terms. Alternative points of view are presented in the works of A. Golikova [1], O. L. Chulanova [2], A. A. Grakhov [3], I. V. Pashkovskaya [4] and others.

Crowd-lending is interesting because it is an alternative to bank lending to small and medium-sized businesses. It also operates on the principles of repayment, urgency, and payment, but differs in that funding is carried out primarily at the expense of individuals (bank funding includes funds from individuals and legal entities). There is also no insurance of individuals' funds on the platforms (banks have insurance of individuals' deposits). Therefore, the main factor in the operation of crowd-lending platforms is trust, which simultaneously appears to be its consumer advantage (A. N. Zubets [5]) and vulnerability (I. D. Kotlyarov [6], E. V. Popov et al. [7]). There are also specific advantages of crowd-lending, such as speed of operations, flexibility, simplicity and transparency of the process (E. Maier [8]). It should be noted that these advantages are more pronounced due to the features of the organization of digital platforms, such as "the ability to scale activities ..., minimizing costs by involving external users in the process of creating added value" (V. P. Bauer, V. V. Eremin, M. V. Ryzhkova [9]).

In the crowd-lending market, there are separate mechanisms for attracting and placing funds, which are implemented without

[1] Calculated by the author on the basis of annual reports of investment platform operators.

[2] Article 7. Paragraph 1 of Federal Law No. 259–FZ dated August 2, 2019 "On Attracting Investments using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation".

a financial intermediary through investment platforms. Operators of investment platforms conclude contracts for the provision of investment attraction services and investment assistance (placement of funds). As a rule, legal entities and individual entrepreneurs (mainly SMEs) attract funds by submitting an application for financing. In case of passing the examination, an application in the form of an investment proposal is placed on the platform and fundraising from several investors in the form of loans is launched. Upon completion of the fundraising, the platform transfers the money to the borrower. Investors (creditors) in crowd-lending are legal entities and individuals whose mechanism of funds placement depends on the business model of the platform.

Each of the participants in crowd-lending is exposed to different risks. Among the risks of the crowd-lending platform operator are: the risk of inconsistency between the urgency of loans and investment proposals (gap risk) (S. A. Barykin [10]), the risk of bankruptcy (T. G. Bondarenko [11]), the risk of incorrect assessment of the borrower's solvency, including due to a lack of information about the borrower (V. K. Shaidullina [12]).

Individuals who attract investments face investment risk, that is, the risk that the project will not be funded or will result in a cash flow below the planned volume, for example, due to errors in project management. In addition, individuals who attract investments are carriers of credit risk, since they may fail to fulfill the terms of the investment attraction agreement for various reasons (incorrect assessment of solvency, dishonesty, opportunistic behavior, and others). The risk of default is significant for them. In [13], the authors found out that the borrower's creditworthiness, debt-to-income ratio, and FICO (Fair Isaac Corporation) rating play an important role in loan defaults during crowd-lending, as well as the fact that higher interest rates charged to high-risk borrowers are not enough to compensate for the high probability of default. In article C. Serrano-Cinca et al. [14] found that the factors explaining the default of a person attracting investments on a crowd-lending platform are the purpose of the loan, annual income, current housing situation, credit history and debt. The pricing mechanism on the platforms is also one of the default factors. Thus, it was shown in [15] that loans financed at advertised prices are more likely to lead to default than loans whose prices are formed as a result of an auction.

At the same time, investors (creditors), who are mainly individuals, may face the risk of non-repayment of their invested funds [16]. This is also confirmed by the calculations carried out in [17]. The researcher determined the average credit risk for P2P lending based on calculating the average probability and evaluating the results obtained according to a binary scenario ("paid" and "default"), and it turned out to be higher than that of traditional banks. At the same time, this risk falls directly on the lending platform participants. The paper [18] talks about the attractiveness of P2P lending for unscrupulous borrowers, which is also a risk for owners of financial resources involved in credit transactions. The article [19] noted that crowd-lending platforms decentralize credit risks, shifting them to investors (creditors), that is, the risk that the borrower will eventually default on his loan obligations falls on investors (creditors), and not on the platform as an institution. At the same time, investors (lenders) face serious problems choosing who to provide their funds to on a fee basis, and the issue of matching the income offered to investors to the risk profile of crowd-lending projects becomes important [20].

Thus, one of the most significant risks of crowd-lending is credit risk, the absence or low efficiency of which management can lead to undermining the overall confidence in this financing mechanism. However, the question arises: how to manage credit risk in crowd-lending if its source is individuals who attract investments and need to be protected from risk; investors are individuals, and the crowd-lending platform is not responsible for the risks of borrowers?

In foreign literature, credit risk management is mainly assigned to investors (creditors). In particular, in the article [21], a system

for making investment decisions for each individual loan is proposed for lenders, which makes it possible to optimize risk and profitability in P2P lending using an artificial neural network and logistic regression to assess the internal rate of return and the probability of default. The expediency of using a portfolio approach by creditors is substantiated in [22]. The researchers proposed a two-stage scoring approach that integrates credit scoring (predicting the probability of default) and profit scoring (predicting profitability) to make decisions for lenders about the allocation of funds in the crowd-lending market. We believe that the use of scoring, portfolio, and other evidence-based approaches may pose significant difficulties for a wide range of individual investors.

It is also recognized that the activities of investment platform operators are of some importance for managing credit risk. For example, the article [23] shows that investment platform operators can improve payment discipline on platforms by introducing a mechanism for assessing borrowers' reputation, since there is a reputation effect where borrowers with a better history can receive loans with a higher probability and lower costs. In [24], it was found that the availability of audit mechanisms for the crowd-lending platform has a direct impact on reducing credit risk.

The problem of prudential risk management of participants in crowd-lending platforms has been relatively little studied. Perhaps this is due to the small size of this market, the level of its development, the stage of formation and formation, the attitude towards self-regulation of this market, or other reasons. At the same time, prudential regulation of crowd-lending is practically in demand, since in such a financing mechanism, lenders, mainly individuals, are exposed to credit risks, for whom organized legal protection or self-organization to develop common risk management tools is quite difficult, and also since the operator of the investment platform, not being a financial intermediary, does not perform risk transformation functions.. In other words, effective risk management of crowd-lending is impossible without the participation of the state regulator.

The aim of the study is to suggest measures to manage the risks associated with the Russian crowd-lending market. In order to achieve this goal, several tasks have been completed:1. To conduct a quantitative analysis of the Russian crowd-lending market in terms of credit risks;2. To compare the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market;3. To develop prudential regulation measures for crowd-lending market participants.

Research hypothesis: the mechanism of operation of the crowd-lending market is similar to the exchange-traded corporate bond market, which suggests the possibility of adapting/transferring risk management mechanisms of corporate bond market participants to the crowd-lending market.

The scientific novelty of this research lies in the following:

- for the first time, an analysis of the Russian crowd-lending market has been conducted in terms of credit risk, based on clustering and grouping.
- the comparison of the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market is original and has not previously been found in scientific publications;
- the proposed measures to regulate the risks of the Russian crowd-lending market are also new, different from those considered in the studies of other authors.

The theoretical significance is determined by the deepening of scientific ideas about the disintermediation of financial markets, about regulating the risks of financial market participants in the absence of financial intermediaries who performed the functions of capital transformation, timing, and risks. The results of the study can be used as a theoretical basis for further scientific work on the problems of P2P lending and crowd-lending.

The practical significance of this study lies in its potential to use the proposed measures to regulate crowd-lending and thereby regulate

the activities of investment platform operators in Russia.

MATERIALS AND METHODS

The article uses various methods of analysis. For a quantitative analysis of the Russian crowd-lending market in terms of credit risks, the FOREL method was used, which allows clustering of objects without a predetermined number of clusters. The mechanisms of regulation of the exchange-traded corporate bond market and P2P lending have been compared using methods of analysis, synthesis, grouping, and generalization.

The information base for the study included scientific articles and papers by Russian and international scholars on crowd-lending issues, as well as relevant regulatory legal acts from Russian legislation.

The empirical base of the study is based on the annual reports of all operators of investment platforms providing loans[3] and included in the relevant register of the Bank of Russia on 17.06.2024, for 2021–2023.

The article is structured as follows. Section 2 provides a quantitative analysis of the Russian crowd-lending market in terms of credit risks. Section 3 provides a comparison of the regulatory mechanisms of the exchange-traded corporate bond market and P2P lending. Section 4 is devoted to measures of prudential regulation of crowd-lending market participants. Section 5 presents a discussion of the results and conclusions.

RESULTS AND DISCUSSION

The Russian Crowd-lending Market

The intensive growth of the Russian crowd-lending market raises questions about the risk management of crowd-lending participants, primarily about credit and default risks. The volume of unfulfilled obligations in the Russian crowd-lending market reached the following values: 2021–245.9 million rubles, 2022–266.9 million rubles, 2023–493.96 million rubles[4] (a twofold increase in 3 years). A high proportion of unfulfilled obligations in the total volume of attracted investments negatively affects the attractiveness of the platform for new investors, leads to a loss of funds and trust from individual creditors, ultimately leading to the bankruptcy of the operator of the investment platform or its takeover by a more successful competitor.

This article proposes to carry out a quantitative analysis of the Russian crowd-lending market in terms of credit risks, namely: to group and cluster the Russian crowd-lending market according to the indicator "the share of unfulfilled obligations in the total volume of attracted investments of an individual crowd-lending investment platform operator,%". This will allow us to determine the structure of this market by the level of credit risk.

The indicator values were obtained for all crowd-lending platforms included in the register of investment platform operators of the Bank of Russia as of 17.06.2024, and in accordance with Federal Law No. 259-FZ dated 02.08.2019 "On Attracting Investments using Investment Platforms and on Amendments to Certain Legislative Acts of the Russian Federation", which have made their annual reports publicly available. A total of 72 annual IPR reports were analyzed. At the same time, IPOs dealing only with crowd investing, which were excluded from the period from 2020 to 2024, were not included in the information base, from the register of the Central Bank, who did not publicly disclose information about their annual report, as well as submitted completely zero reports. In particular, during the period under review, 8 legal entities were excluded from the IPR register (2021–1, 2022–4, 2023–3), 17 IPR submitted zero reports for different years, and 14 IPR reports were not found in the public domain.

The grouping of the Russian crowd-lending market by the level of credit risk was carried out in accordance with the gradation of credit risk

[3] In other words, crowd investing platforms were excluded from the sample.

[4] Calculated by the author on the basis of annual reports of investment platform operators.

Table 1

Grouping of the Russian Market for Lending by the Level of Credit Risk

No.	Risk level	The volume of attracted investments using the platform through the provision of loans, million rubles			The number of crowd-lending platforms, units		
		2021	2022	2023	2021	2022	2023
1	Lack of credit risk	351.14	1177.0	2213.27	7	7	12
2	Moderate credit risk (probability of financial losses ... in the amount of 1–20%	15712.75	10781.37	50276.0	13	13	14
3	Significant credit risk (probability of financial losses in the amount of 21–50%)	0	194.39	17.6	0	2	1
4	High credit risk (probability of financial losses ... in the amount of 51–100%	74.25	3.78	0	1	1	0
5	There is no possibility of a refund.	0	8.12	0	0	1	0

Source: Compiled by the author.

levels set out in the Regulation of the Bank of Russia dated June 28, 2017 No. 590–P "On the procedure for the formation of reserves by credit institutions for possible losses on loans, loans and equivalent debt" (*Table 1*).

An analysis of the data in *Table 1* shows that in 2021, Russian crowd-lending platforms were divided into three groups according to the level of credit risk: zero risk, moderate risk, and high risk. The group with moderate risk was the largest (both in terms of the number of platforms and the volume of attracted investments). In 2022, as a result of the external events that affected the Russian economy, the situation changed. Platforms with all levels of credit risk have become available on the crowd-lending market. The moderate-risk group, however, retained its advantage. For 2023 According to the level of credit risk, Russian crowd-lending platforms were again divided into three groups: zero risk, moderate risk, significant risk, and moderate risk groups. An analysis of the dynamics of each risk group over three years shows that in groups with zero and moderate risks, the volume of attracted investments is growing, accounting for the crowd-lending platforms included in them. This allows us to cautiously conclude that the main increase in crowd-lending platforms is made up of legal entities with a "moderate" or lower credit risk level.

Despite the practical value of such a grouping of crowd-lending platforms, the use of gradations of credit risk applied to the banking sector seems acceptable, but still does not take into account that individuals,

Table 2

Statistical Metrics of the Sample for the Indicator "The Share of Unfulfilled Obligations in the Total Volume of Attracted Investments by an Individual Operator of an Investment Platform Involved in Crowd-lending" on the Russian Crowd-lending Market for 2021–2023

Metrics	2021	2022	2023
Arithmetic mean	6.52	12.60	3.66
Average squared deviation	16.61	30.78	7.22
Median	1.58	1.66	1.00
Minimum value	0.00	0.00	0.00
Maximum value	74.86	100	34.96

Source: Compiled by the author.

not credit organizations, are exposed to credit risks in crowd-lending, and, therefore, the gradation of credit risk proposed for banks may not correspond to the specifics of the activity, crowd-lending platforms.

Therefore, the determination of the structure of the crowd-lending market by the level of credit risk was carried out in the second way — using clusterization. The possibilities of using clusterization to structure the object of research were mentioned in the work of Yu. S. Evlakhova, N. A. Amosova [25].

For clustering, the FOREL method is used, which allows you not to lay a certain number of clusters in advance. The obtained values of the indicator "the share of unfulfilled obligations in the total volume of attracted investments of an individual operator of an investment platform engaged in crowd-lending,%" are ranked in ascending order, and each resulting sample was checked for outliers (anomalies). First of all, the sample of each year was checked for symmetry.

It was determined that this condition is fulfilled for the sample of each year, that is, each of the presented samples is symmetrical. To find outliers in symmetric samples, a rule was used to determine the outlier. As a result, outliers (anomalies) were found in the samples, which were the maximum values of the indicator in each year. *Table 2* shows some statistical metrics of the sample.

An analysis of the data in *Table 2* allows us to come to the following conclusions. First of all, during the analyzed 3 years, the range of values of the indicator underwent serious changes, starting from zero and reaching a maximum of 100. Both the arithmetic mean and the median show the same dynamics: in 2022, they are significantly higher than the levels of 2021 and 2023. However, the median, which does not depend as much as the arithmetic mean on the inclusion of abnormally large or small values of the trait in the sample, was not much higher in 2022 than in 2021.

Next, the Euclidean metric was used to determine the distance between the values of the indicator. Input parameters for FOREL clustering: F = 2, R = 2. The clustering results are presented in *Table 3*.

An analysis of the data in *Table 3* shows the annual change in the number of clusters. In comparison with the grouping shown in *Table 1*, the heterogeneity of crowd-lending platforms in terms of credit risk within the moderate risk group becomes obvious.

Thus, the structure of the Russian crowd-lending market in terms of credit risk can be described as follows. Using the credit risk gradation developed for the banking sector, two groups were observed in the Russian crowd-lending market in each of the years under review: with zero risk and with moderate risk. Groups with higher credit risk were also present in the analyzed period, but with different gradations of high risk and in different numbers. When using the FOREL

Table 3

Clustering of Russian Crowd-lending Platforms by Credit Risk Level, 2021–2023

Cluster number	Value range	Number of crowd-lending platforms, units
2021		
1	(0–0)	7
2	(0.12–3.44)	7
3	(4.98–5.64)	2
4	(7.93–8.12)	2
5	(16.46 or more)	1
2022		
1	(0–0)	7
2	(1.2–3.16)	10
3	(24.91)	1
4	(28.81 or more)	2
2023		
1	(0–0)	12
2	(0.01–1.52)	5
3	(3.98)	1
4	(4.42–5.41)	3
5	(6.26–7.56)	2
6	(9.69 or more)	2

Source: Compiled by the author.

clustering method, which, unlike the previous grouping, does not involve a predetermined number of clusters, a different, more detailed picture of the structuring of the Russian crowd-lending market was obtained. It shows that the maximum values of credit risk from a statistical point of view are sampling anomalies, and the groups of operators with zero and moderate credit risk are heterogeneous. We believe that in the future, structuring techniques and the results of calculations can be useful for managing the credit risk of crowd-lending platforms.

A Comparison of Regulatory Mechanisms for the Exchange-traded Corporate Bond Market and the Crowd-funding Market

Let's discuss why we consider it possible to compare the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market. First of all, in each case there is a borrower (a legal entity on the corporate bond market, a legal entity or an individual entrepreneur on the crowd-lending market) who applies for funds not to a financial intermediary, but to a wide range of people who have excess funds and want to invest them. Indeed, in the exchange-traded corporate bond market, such creditor investors are a wide range of legal or individual bondholders. In the crowd-lending market, investors are lenders, mainly individuals. One of the differences is the fact that in the bond market, the credit relationship between the borrower and the lender is securitized and formalized with a security (bond) and, accordingly, a purchase and sale agreement. There is no securitization in the crowd-lending market, and the loan relationship is formalized by a three-way agreement to attract/place investments. Otherwise, there are many similarities: borrowers issuing bonds, as well as those seeking funds in the crowd-lending market, seek to attract investors by managing the profitability, liquidity and risks of their projects.

Next, let us compare the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market in terms of such parameters as: requirements for the borrower, the borrower's assessment procedure, access to financing, the number of intermediary institutions, control over the borrower's activities, default management and restructuring mechanisms, disclosure of information by the borrower, and the secondary market (*Table 4*).

Table 4

Comparison of Regulatory Mechanisms for the Exchange-traded Corporate Bond Market and the Crowdlanding Market

№	Comparison criterion	Exchange-traded corporate bond market	Crowd-lending market
1	Availability of requirements for the borrower	The requirements for the borrower are present and are specified in the bond listing rules approved by the exchange	The requirements for persons attracting investments are present and are specified in Federal Law No. 259-FZ
2	Availability of the borrower's assessment procedure	The borrower's assessment is carried out — the issuer's assessment (KYC) on a number of corporate and financial parameters	It is not regulated by law. Each IPO independently establishes the procedure and methods for assessing the borrower
3	Admission to financing	There is an admission of bonds to trading	There is an admission of the application for financing
4	Number of intermediary institutions and their functions	Intermediaries: exchange, rating agency, auditor, organizers, underwriter, central securities depository, market maker. The functions of the exchange are to establish requirements for the issuer (borrower), evaluate the issuer (borrower), and monitor information disclosure by issuers whose securities are included in the quotation list	Intermediary: operator of the investment platform Functions: implementation of investment attraction activities, development and implementation of investment platform rules, disclosure of information about the investment platform and IPR
5	The bodies of control over the borrower's activities	The regulator (central bank), the representative of the bondholders	Missing
6	Default management and restructuring mechanisms	There are different types. The concept of a representative of bondholders and a general meeting of bondholders is used. Restructuring mechanisms: overcoming default, changing the terms of the securities issue	There are no overdue debt policies in individual IPOs
7	Disclosure of information by the borrower	Information is disclosed before and after the placement of securities. The disclosure method is publication in the news feed of an accredited news agency	The borrower provides information about himself and his investment proposals to the operator of the investment platform. The IPO is required to provide all investors with information about borrowers and their investment proposals in the investment platform (except for closed investment proposals)
8	Secondary market	Yes	Not at the level of the entire market. Some platforms provide an opportunity for an investor (lender) to promptly receive funds by ceding (selling) the lender's (investor's) claim rights to the borrower to a third party, organizing a secondary market of claim rights

Source: Compiled by the author on the basis of the Federal Law of the Russian Federation of August 2, 2019 No. 259-FZ "On attracting investments using investment platforms and on amending certain legislative acts of the Russian Federation" and the Federal Law of the Russian Federation of April 22, 1996 No. 39-FZ "On the Securities Market".

Thus, the common features of the regulation of the exchange-traded corporate bond market and the crowd-lending market are: the existence of requirements for borrowers, a process for assessing borrowers (whether legally established or not), access to financing, and intermediary institutions (as a link rather than a financial intermediary, as defined in financial intermediation theory), as well as disclosure of information by borrowers.

Let's list the differences in the regulation of these markets:

a) the number of intermediary institutions and their functions; we believe that this difference is due to the level of complexity of the market and its scale, therefore, there are seven or more intermediaries in the bond market, and one in the crowd-lending market.;

b) the bodies of control over the borrower's activities: the regulator controls the issuer's bond market (through state registration of securities issues and state registration of the report on the results of the issue, as well as the accompanying verification of the reliability of information), as well as a representative of the bondholders, who represents the interests of bondholders to the issuer and other persons; in the crowd-lending market, the supervisory authorities: there are no loans for borrowers;

c) default management and restructuring mechanisms are present in the bond market, but they are not available in the crowd-lending market. As indicated in [26], there are two ways to protect creditors in the Russian crowd-lending market: obtaining a power of attorney from each of several hundred or thousands of individual creditors to represent their interests in court or to redeem overdue IPR debt, and conducting collection procedures by the crowd-lending platform itself.

As for the secondary market that exists in the corporate bond market and is absent from the crowd-lending market, we believe that with the growth of the crowd-lending market and the introduction of appropriate legislative changes, the formation of a secondary market for claims rights is quite possible.

Proposed Risk Management Measures for Crowd-lending Market Participants

First and foremost, we support the concept that crowd-lending investment platform operators should have control over which borrowers are granted access to their platform. This idea could be implemented in various ways. For instance, a system for assessing the credibility of borrowers on the crowd-lending platform could be introduced. [23]; the use of collateral and guarantees by borrowers (Yu. S. Ezrokh [26]). In contrast to the one proposed by us, it is recommended to introduce a quarterly IPR report on the share of unfulfilled obligations in the total volume of attracted investments[5], while setting the recommended threshold value for such an indicator. The size of the threshold value of the share of unfulfilled obligations in the total volume of attracted investments is difficult to imagine on the basis of available observations. The paper suggests two approaches to assessing the credit risk of crowd-lending platforms, but further recommendations should be based on the analysis of a larger number of observations. At the same time, when conducting quarterly monitoring and having the recommended threshold value, the operator of the investment platform, we believe, will strive to comply with it, which means it will improve the risk assessment of the investment project and borrowers, trying to avoid obviously unprofitable projects.

Two other proposals on risk management measures stem from a comparison of the regulatory mechanisms of the exchange-traded bond market and the crowd-lending market. We consider it very useful to reduce risks in the crowd-lending market by introducing the concept of a representative of bondholders and a general meeting of bondholders, which in terms of crowd-lending can be interpreted as the concept of a representative of investors (creditors) of the crowd-lending platform. The main function of the representative of investors (creditors) of the crowd-lending platform is to protect the rights and legitimate

[5] Currently, this IPR indicator is required to be indicated in the annual report.

interests of creditors (investors) — individuals. A representative of investors (creditors) of a crowd-lending platform should only be a legal entity specializing in law. In order for a representative of investors (creditors) of a crowd-lending platform to become a mandatory participant in crowd-lending, he should be legally introduced into the circle of participants in the investment platform, indicating his presence as a prerequisite for the implementation of crowd-lending activities.

Finally, the issues of managing overdue debts and defaults need to be resolved. In case of default of the operator of the investment platform, we support the proposal of Yu. Reinhimmel[6] spoke about the appropriateness of appointing an interim administration, which will be responsible, among other things, for debt management to creditors (investors), and the termination of the powers of all management bodies of the platform.

As for the borrower's default, the literature identifies a variety of risk factors that are important for the occurrence of default, including: the level of creditworthiness, debt-to-income ratio and rating of the borrower, as well as the purpose of the loan, annual income, current housing situation, credit history and debt, and even the pricing mechanism used on the crowd-lending platform. But it is obvious that the first step should be the work of the operator of the investment platform with overdue debts, which should be fixed as legally binding (for example, in the form of an appropriate Policy or Procedure, etc.) and legislatively included in the rules of the investment platform, the requirements for which are listed in Art. 4 of Federal Law No. 259-FZ.

DISCUSSION AND CONCLUSIONS

The Russian crowd-lending market has great prospects both as an alternative mechanism for attracting investments in small and medium-sized businesses, and as an attractive investment object for individuals. However, the growth of funds raised and the investment attractiveness of crowd-lending to a certain extent depend on risk management, primarily credit risk.

An analysis of the structure of the Russian crowd-lending market by the level of credit risk leads to the following conclusions. When grouping the operators of investment platforms according to the scale of credit risk levels used for the banking sector, it was determined that:

a) IPR groups with zero and moderate risk are recorded annually, in dynamics for 2021–2023, the volume of attracted investments attributable to these platforms has increased (for the zero-risk group — more than 6 times, for the moderate-risk group — more than 3 times);

b) IPO groups with significant, high credit risk are found sporadically in the market structure. The share of such assets in the structure of the crowd-lending market is low, but it tends to grow against the background of unfavorable economic conditions (as shown by 2022). Thus, in 2021 this share amounted to 0.46%, in 2022–1.72%, in 2023–0.03%.

The clustering carried out in FOREL's work made it possible to determine that IPR groups with zero and moderate risk are heterogeneous, which may be important for risk management.

Risk management in the crowd-lending market is complicated by two circumstances. Firstly, the source of credit risk is the borrower, a legal entity or individual entrepreneur, and the investor, an individual, is at risk. At the same time, the crowd-lending platform is engaged in organizing investment attraction, rather than financial intermediation with its transformation of terms, capital and risks. Secondly, investment and credit relations are intertwined in the crowd-lending market, which makes it difficult to apply traditional risk management mechanisms for these relations. One example where investment and credit relations are intertwined is the corporate bond market. Despite the fact that there are financial intermediaries in the corporate bond market, the mechanisms of its regulation can be used in the search for regulatory analogies for the crowd-lending market.

[6] Reinhimmel Y. A little bit about fintech. The risks of crowd–lending investment platforms for investors (lenders) and possible measures to reduce them. URL: https://zakon.ru/blog/2024/06/30/nemnogo_pro_finteh_riski_kraudlendingovyh_investicionnyh_platform_dlya_investorov_zajmodavcev_i_vozm (accessed on 08/13/2024).

A comparison of the regulatory mechanisms of the exchange-traded corporate bond market and the crowd-lending market made it possible to identify common features and areas in which regulation can be adapted to the crowd-lending market. These areas include the organization of control over the borrower's activities, default management and the development of restructuring mechanisms.

On this basis, the article develops different risk management measures for participants in the crowd-lending market. Thus, it is proposed to adapt the concept of a representative of bondholders to the crowd-lending market, which can be interpreted as a representative of investors (creditors) of the crowd-lending platform. As for the mechanisms of restructuring and default management, it is difficult and impractical to fully adapt them to the crowd-lending market in modern conditions. At the same time, this area in the crowd-lending market needs regulation, the development of requirements for financial indicators, and a risk management system. The first step may be to require each IPO to develop a policy or procedure for dealing with overdue debts (by the way, an analysis of Russian IPO websites has revealed isolated cases of such a document).

In general, we believe that it is important for operators of investment platforms to monitor the activities of borrowers, as they are responsible for selecting and evaluating borrowers in order to provide them with access to the platform.

The purpose of this article is to propose measures to manage the risks of the Russian crowd-lending market based on a quantitative analysis of credit risks in this market, as well as by comparing regulatory mechanisms in the exchange-traded corporate bond market and the crowd-lending market. The results obtained confirm the achievement of the research goals. At the same time, the conclusions drawn allow us to formulate future directions for research, such as the development of a secondary crowd-lending market, the establishment of requirements for financial indicators and a risk management system, as well as the promotion of disintermediation in the financial market with risk management in mind.

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ABOUT THE AUTHOR

Yulia S. Evlakhova — Dr. Sci. (Econ.), Prof., Head of the Financial Monitoring and Financial Markets Department, Rostov State University of Economics, Rostov-on-Don, Russian Federation
https://orcid.org/0000-0002-2561-6165
evlahova@yandex.ru

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Financial Statements of Large Companies: An Empirical Study of Russian Catering and Hotel Companies

S.V. Kolchugin
Novosibirsk State Technical University, Novosibirsk, Russian Federation

ABSTRACT

The **object** of the study is the ownership structure of large companies in food service and hotel businesses in Russia. The **subject** of the study is the financial statements of these companies. The **purpose** of the study is to investigate large companies in the fields of food service and hotel businesses, and to determine how their structures affect the preparation of financial reports. To achieve this goal, we solved the following tasks: we analyzed the individual financial statements as the main report for a commercial organization. The sufficiency of financial statements to disclose financial position and results have been verified. The consolidated financial statements and their limitations for the formation of aggregate indicators for a group of companies have been considered. The article examines the features of combined financial reporting as a new type of financial reporting and its opportunities at the present time. The author analyzed the ownership structures of large organizations in the fields of food service and hotel businesses. The author assessed the extent to which current approaches to the preparation of financial indicators reveal information about financial situations and results. The empirical basis of the study is information disclosed by large companies on the unified state registry of legal entities and voluntary disclosures made in appendices to their financial statements. The study reveals that existing approaches do not fully facilitate the disclosure of aggregated indicators for a group of companies. As a recommendation, we propose a new type of financial accounting and reporting — additive. The additive financial accounting system focuses on the formation of individual financial statements, consolidated financial statements, and combined financial reports, regardless of the number of companies in the group or ownership structure.

Keywords: financial reporting; consolidated financial statements; combined financial statements; economic entity principle; additive financial accounting; additive financial reporting

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INTRODUCTION

The main source of information about the financial and economic activities of organizations is their financial statements. Financial reporting is based on the information needs and objectives of users [1, p. 163]. Several groups of users with their specific information needs can be distinguished: investors (actual and potential), creditors, managers, the state represented by tax and statistical authorities, personnel, society as a whole, etc. In this case, the first problem arises in the preparation of financial statements: "... the first problem is defining the *primary* user group" [2, p. 128]. Since the purposes and information needs of different user groups vary, the question arises as to which user group's information needs should be met most fully.

As Kenneth Most notes, there are two alternatives for addressing this problem: "providing information for unknown users with multiple decision objectives, or providing information for specific user groups with a known decision objective" [3, p. 147].

In the first case, "general purpose financial reporting" is formed, while in the second, "special purpose financial statements" are prepared [3, p. 129–130].

The lack of a common basis for understanding the information needs of financial statement users, and consequently, the lack of a foundation for developing accounting principles, allowed AICPA[1] President Marshall Armstrong to announce the establishment of two study groups in 1971: the Study Group on the Objectives of Financial Statements, chaired by Robert M. Trueblood[2], and the Study Group on the Establishment of Accounting Principles, chaired by Francis M. Wheat[3].

The result of the Trueblood Committee's work was the publication in October 1973 of the Report of the Study Group on Objectives of Financial Statements "Objectives of Financial Statements"[4]. In March 1972, the Wheat Committee released its Report of the Study on Establishment of Accounting Principles "Establishing Financial Accounting Standards"[5]. The Trueblood Committee report gained widespread recognition, which intensified discussions about the objectives and information needs of the main user groups of financial reporting.

In the article "Problems of Implementing the Trueblood Objectives Report" [4], Richard M. Cyert and Yuji Ijiri identify three parties whose interaction results in the emergence of financial reporting: corporations, users of financial statements, and the accounting profession[6].

Corporations are understood by the authors as follows: "Corporations are not only the subjects whose status and activities are reported in financial statements; they are also the sole suppliers of financial statements. Without actions by corporations there is no way for an outsider to prepare financial statements with a satisfactory degree of reliability" [4, p. 29].

Financial statement users are understood to include "... not only past, present, and future shareholders and creditors but also financial analysts, governmental agencies, and the public in general" [4, p. 29].

Finally, by the accounting profession, the authors mean: "...not only individual accountants and auditors but also the system that influences the activities of accountants and auditors" [4, p. 29].

When studying the theory and methodology of accounting as the basis for financial statement preparation, the main focus was on two interacting parties in the reporting process: users of financial statements and

[1] American Institute of Certified Public Accountants (AICPA.

[2] Known as "The Trueblood Committee".

[3] Known as "The Wheat Committee".

[4] Report of the Study Group on Objectives of Financial Statements "Objectives of Financial Statements". American Institute of Certified Public Accountants. 1973. 71 p.

[5] Report of the Study on Establishment of Accounting Principles "Establishing Financial Accounting Standards". American Institute of Certified Public Accountants. 1972. 105 p.

[6] The viewpoint that the interests of three main parties – corporations, users of financial statements, and the accounting profession – intersect in the preparation of financial reporting has been recognized and widely adopted in the Anglo–Saxon school of accounting. See papers [1, p. 117; 5, p. 169].

the accounting profession. Corporations were perceived as the passive side of the process or as the object towards which the interests of financial statement users and the interests of accountants and auditors are directed.

DESCRIPTION OF THE OBJECT OF THE STUDY. BASIC CONCEPTS

The object of the study is large organizations in the Russian Federation whose main activity is the operation of hotels and catering establishments (OKVED code 56). To identify large organizations, one of the following criteria was used:

1. The company's revenue for the financial year is over 2 billion rubles;
2. The average number of employees for the preceding calendar year is over 1 500 people[7].

The study period is fiscal year 2022.

Based on these criteria, 91 organizations were selected (*Table 1*).

The first 90 organizations met the first criterion, and BUSINESS ONLINE LLC (1157746772193) met the second criterion.

For further analysis of the research object, it is necessary to define the basic concepts.

Group — includes a controlling person or group of persons and controlled entities. The controlling person in a group can be either a natural or a legal person. The controlling group of persons can include both natural and legal entities. A government body can act as the controlling entity.

Control — is the ability of the controlling person (or group of persons) to influence the controlled organizations. Control can be shared or not shared.

Equity control — the participation of a controlling person (or group of persons) in the capital of a controlled organization.

Non-equity control — control by a controlling person (group of persons) over a controlled organization that is not related to equity control.

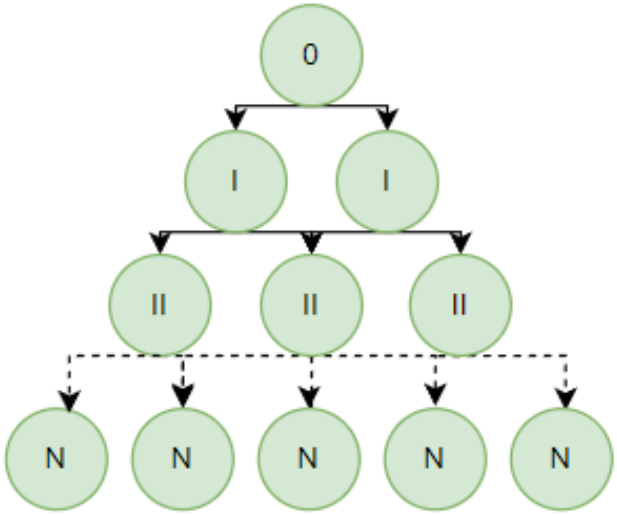

Fig. 1. **Hierarchical Levels in the Ownership Structure of a Group**

Source: Compiled by the author.

Ownership structure within the group — control of some group members over other group members.

Hierarchical levels in the group ownership structure — control structure where some organizations control others in a strictly ordered manner (*Fig. 1*). At the "zero" level, the controlling person can be either a natural person or a legal entity, or a group of persons, or a state body. Starting from the first level, the group's ownership structure includes only legal entities. The numbering of hierarchical levels in the group's ownership structure starts from the "zero" level.

The group's financial reporting perimeter — is a list of the group's organizations that prepare financial statements (consolidated financial statements; combined financial statements; additive financial statements).

The ownership structure within the group is determined from two sources:

- extracts from the Unified State Register of Legal Entities (section "Information about participants / founders of the legal entity");
- information disclosed in the notes to the company's financial statements.

[7] When selecting the criteria for classifying an organization as large, the provisions of Federal Law No. 209 from 24 July 2007 "On the Development of Small and Medium–Sized Enterprises in the Russian Federation" (Article 4: Categories of Small and Medium–Sized Enterprises) and Government Decree No. 265 from 4 April 2016 "On the Maximum Values of Income Received from Entrepreneurial Activities for Each Category of Small and Medium–Sized Enterprises" were applied.

An analysis of the ownership structure of large companies in the hotel and catering business (*Table 1*) shows that individual financial statements are prepared in 20 out of 91 cases, or 22% of all large companies in the industry under consideration. In the remaining 71 cases, or 78% of all large companies, individual financial statements are insufficient to determine the financial position and financial performance of a large company.

The fact that some large organizations belong to the same group deserves special attention. For example, TEREMOK-RUSSKIE BLINY LLC (1027809178363) and TEREMOK-CONFECTIONERY LLC (1097847225772); MAYREST LLC (1027809227050) and UNIREST LLC (1057749069839); RBE LLC (5147746269039) and NTS LLC (1117746210647); OLIMPPLYUS LLC (1082312008954) and MOSTOVIK DEVELOPMENT LLC (1117746404885); FILIAS LLC (1027739493594) and MENARDI LLC (1117746785925).

Let's take a closer look at the ability of existing financial reporting to reflect the financial position and results of large companies in the hotel and catering business.

CONSOLIDATED FINANCIAL STATEMENTS AND THEIR LIMITATIONS

Theoretical and practical problems of consolidated financial reporting are widely represented in the spectrum of accounting academic research. Scientific research in this field covers the specifics of national, regional, and international consolidated reporting regulations [6–8], the history of the development of consolidation ideas in different countries [9–12], the problems of consolidation methodology and technique [13–17], and the analysis of consolidation criteria [18–21]. Additionally, narrow issues are being studied, such as deferred taxes in consolidated financial statements [22], consolidation in inflationary conditions [23], the specifics of consolidated financial statements in individual industries [24], assessing the factors influencing borrowing cost changes after domestic mergers and acquisitions [25], modeling the bankruptcy of companies associated with a business group [26], and others.

The financial statements of the group of companies (consolidated financial statements) have been prepared for quite some time. "The first consolidated reports were prepared for the American Cotton Oil Trust in 1886 "[27, p. 85][8]. The need for consolidated financial reporting was driven by the possibility of companies holding common stock and the problem of its valuation. Describing the prerequisites for the introduction of consolidated reporting in the USA[9], R. Walker notes: "Shortly before the passage of the Sherman Act, changes in state legislation had enabled the formation of business combinations through the medium of the "holding company" [28, p. 123].

The problem with valuing common stock was that an investment in a subsidiary was reflected in the investor's financial statements at cost, which did not allow for determining the true value of the investment and distorted information about the financial position and financial performance in the investor's reporting. To address this problem, it was proposed to prepare consolidated financial statements as a fundamentally new type of supplementary financial reporting.

It should be noted that consolidated financial statements are a new type of financial reporting, distinct from individual financial statements. The fundamental difference is that in consolidated financial statements, the principle of the organization's separate legal personality is abandoned, or the "fiction of a legal entity" is rejected [29]. For individual financial reporting, the principle of organizational segregation of assets is fundamental.

The second fundamental characteristic of consolidated financial statements is their

[8] Robert G. Walker offers a more streamlined definition: "Consolidated reports were first prepared in the United States as early as 1894. They were widely discussed in early American texts and periodicals and were widely used long before British companies began experimenting with this form of reporting in the early 1920s" [28, p. 120].

[9] Section III "U. S. Background to the Introduction of Consolidated Reporting".

Table

Analysis of the Ownership Structure of Large Catering and Hotel Companies

No	Company	Registration number	Revenue in rubles for 2022	Number of organizations in the group	Hierarchical levels in the group's ownership structure	Hierarchical level at which the organization is located	Number of individual owners (identified)	Organizations with sufficient individual financial statements	Organizations with sufficiently consolidated financial statements	It is advisable for organizations to prepare consolidated financial statements	It is advisable for organizations to prepare aggregated financial statements
1	SYSTEM PBO LLC	1027700251754	73 486 322 000	6	4	4	-	No	No	No	Yes
2	MEDVED LLC	1157627034597	71 617 930 000	1	2	2	-	Yes	No	No	No
3	BURGER RUS LLC	1097746274009	68 805 048 000	5	4	3	-	No	No	No	Yes
4	INTERNATIONAL RESTAURANT BRANDS LLC	1187746120044	33 959 172 000	3 / 4	4 / 5	4 / 4	-	No	No	No/No	Yes
5	UNIKSTAR 3	1127847404442	27 619 549 000	2 / 2	2 / 2	2 / 2	2	No	Да	Yes / Yes	No
6	TECHNOLOGY	1147847384343	22 441 861 000	2	3	3	-	No	No	No	Yes
7	MAIREST LLC	1027809227050	18 897 093 000	86 / 26	5 / 4	3 / 3	2	No	No	Yes / Yes	No
8	UNIREST LLC	1057749069839	17 224 285 000	86 / 26	5 / 4	3 / 3	2	No	No	Yes / Yes	No
9	SPP LLC	1167746195011	14 977 980 000	4	3	2	1	No	No	Yes	No
10	IFCM GROUP LLC	1027739281888	13 786 562 000	3	3	3	1	No	No	No	Yes
11	PARTNERS NOYABRSK LLC	1068905015354	12 568 746 000	42 / 5	4 / 3	2 / 2	2	No	No	Yes / Yes	No
12	RUSSOTSKAPITAL LLC	1077759881660	12 185 046 000	3	3	3	-	No	No	No	Yes
13	AEROMAR JSC	1025006171409	11 368 056 000	3	3	2	-	No	No	No	Yes
14	GAZPROM PITANIE LLC	1027739284968	10 242 079 000	602	8	3	-	No	No	No	Yes
15	ROZA KHUTOR LLC	1037702012952	9 524 607 000	55	9	5	-	No	No	No	Yes
16	VERONA LLC	1097746738275	9 135 703 000	3	3	3	-	No	No	No	Yes
17	KRASNAYA POLYANA NJSC	1022302937062	8 815 047 000	9	4	2	-	No	No	No	Yes
18	PROFSERVICE-KAZAN LLC	1101690055862	8 700 621 000	1	2	2	-	Yes	No	No	No
19	RADIUS LLC	1167847417594	8 590 116 000	2	2	2	1	No	Yes	Yes	No

Table (continued)

No	Company	Registration number	Revenue in rubles for 2022	Number of organizations in the group	Hierarchical levels in the group's ownership structure	Hierarchical level at which the organization is located	Number of individual owners (identified)	Organizations with sufficient individual financial statements	Organizations with sufficiently consolidated financial statements	It is advisable for organizations to prepare consolidated financial statements	It is advisable for organizations to prepare aggregated financial statements
20	AK RUSSIA LLC	5107746076488	8 570 116 000	2	3	3	-	No	No	No	Yes
21	PISHCHEVIK LLC	1107746828133	8 524 818 000	2	3	2	-	No	No	No	Yes
22	VAVILON LLC	1210400000403	8 045 437 000	1	2	2	1	Yes	No	No	No
23	ASTORIA LLC	1082301000693	8 023 425 000	1	2	2	2	Yes	No	No	No
24	PARUS LLC	1167847274781	7 726 276 000	2	3	3	-	No	No	No	Yes
25	GALEREYA-ALEKS LLC	1047796357179	7 454 171 000	9	5	4	-	No	No	No	Yes
26	PARTNERS KRASNOYARSK LLC	1112468056788	7 383 575 000	4 / 3 / 3	3 / 3 / 3	3 / 3 / 3	3	No	No	Yes / Yes / Yes	No
27	KDP JSC	1027700137541	7 263 711 000	1	2	2	-	Yes	No	No	No
28	CITY RESTAURANTS LLC	1057748191137	7 232 371 000	3	2	2	1	No	Yes	Yes	No
29	GLAVNAYA LINIYA LLC	1107746827539	6 314 824 000	2	3	3	-	No	No	No	Yes
30	GRAND KAY-S LLC	1214300010253	6 187 126 000	1	2	2	2	Yes	No	No	No
31	TEREMOK-INVEST JSC	1037789074080	6 113 069 000	1	2	2	-	Yes	No	No	No
32	ORBITAL LLC	1221800006471	5 927 770 000	2	2	2	1	No	Yes	Yes	No
33	MOSCOW CATERING LLC	1147746454350	5 775 324 000	3	2	2	1	No	Yes	Yes	No
34	RBE LLC	5147746269039	5 674 549 000	17 / 26	5 / 5	5 / 5	3	No	No	Yes / Yes	No
35	AKS	1021100897102	5 572 977 000	3	3	3	-	No	No	No	Yes
36	GSP-SERVICE LLC	1167847292580	5 570 566 000	38	5	3	-	No	No	No	Yes
37	MILTI LLC	5177746080694	5 442 143 000	5	3	2	1	No	No	Yes	No
38	NTS LLC	1117746210647	5 426 243 000	35/17/26	5 / 5 / 5	4 / 5 / 5	3	No	No	Yes / Yes / Yes	No

Table (continued)

No	Company	Registration number	Revenue in rubles for 2022	Number of organizations in the group	Hierarchical levels in the group's ownership structure	Hierarchical level at which the organization is located	Number of individual owners (identified)	Organizations with sufficient individual financial statements	Organizations with sufficiently consolidated financial statements	It is advisable for organizations to prepare consolidated financial statements	It is advisable for organizations to prepare aggregated financial statements
39	SHKOLNIK-YUZ LLC	1027700130204	5 394 216 000	4	4	4	-	No	No	No	Yes
40	PERSPEKTIVA LLC	1145321007193	5 220 550 000	2	3	3	-	No	No	No	Yes
41	YAMMI GROUP LLC	1082635003110	4 979 164 000	2	2	2	1	No	Yes	Yes	No
42	ELTEKHNORD LLC	1157847288543	4 734 902 000	2	3	3	-	No	No	No	Yes
43	JTK JSC	5077746868403	4 671 243 000	2	3	2	-	No	No	No	Yes
44	BG MANAGEMENT LLC	1162366053255	4 479 912 000	10	4	3	1	No	No	Yes	No
45	VITO-1 LLC	1027700064534	4 457 847 000	1	2	2	1	Да	No	No	No
46	ROSINTER RESTAURANTS LLC	1027739718280	4 436 863 000	31	3	2	-	No	No	No	Yes
47	AVK LLC	1107746818970	4 391 100 000	2	3	3	1	No	No	No	Yes
48	DEPARTMENT OF FOOD JSC	1171690075919	4 373 649 000	1	2	2	-	Yes	No	No	No
49	RESTORANSERVIS PLUS LLC	1037804042704	4 325 021 000	2	3	3	-	No	No	No	Yes
50	LE ROND DEVELOPMENT LLC	1122366007202	4 268 165 000	2	2	2	1	No	Yes	Yes	No
51	TEREMOK-RUSSIAN BLINY LLC	1027809178363	4 241 146 000	4 / 4	2 / 2	2 / 2	2	No	Yes	Yes / Yes	No
52	ROGSIBAL LLC	1035001601513	3 939 128 000	7	4	4	-	No	No	No	Yes
53	LOTTE RUS JSC	1027700022074	3 707 049 000	1	2	2	-	Yes	No	No	No
54	NTPO LLC	1122457001006	3 693 767 000	33	4	3	-	No	No	No	Yes
55	JIN HUAN LLC	1037739682716	3 561 007 000	2	2	2	1	No	Yes	Yes	No
56	ASP LLC	1127747146449	3 541 404 000	1	2	2	1	Yes	No	No	No
57	FASTLAND LLC	1027739292448	3 498 957 000	20	3	2	-	No	No	No	Yes

Table (continued)

No	Company	Registration number	Revenue in rubles for 2022	Number of organizations in the group	Hierarchical levels in the group's ownership structure	Hierarchical level at which the organization is located	Number of individual owners (identified)	Organizations with sufficient individual financial statements	Organizations with sufficiently consolidated financial statements	It is advisable for organizations to prepare consolidated financial statements	It is advisable for organizations to prepare aggregated financial statements
58	FAMILY HOLIDAY LLC	1159102108175	3 259 208 000	9	4	3	-	No	No	No	Yes
59	OMEGA CENTER NJSC	1062309026812	3 166 119 000	1	2	2	-	Yes	No	No	No
60	POTENTIAL LLC	1147847233270	3 124 570 000	2	3	3	-	No	No	No	Yes
61	ALTERNATIVE LLC	1185053013001	3 113 081 000	2	2	2	1	No	Yes	Yes	No
62	VARIANT LLC	1072722001109	3 112 939 000	3 / 2	2 / 2	2 / 2	2	No	Yes	Yes / Yes	No
63	OLIMPPLUS LLC	1082312008954	2 928 397 000	5	5	3	-	No	No	No	Yes
64	VYSOTKA LLC	1157746258504	2 860 589 000	4 / 18	3 / 3	2 / 2	2	No	No	Yes / Yes	No
65	LEVEL MSK LLC	1187746870497	2 856 809 000	6	3	3	-	No	No	No	Yes
66	DOMODEDOVO CATERING LLC	1155009000343	2 831 402 000	25	5	3	-	No	No	No	Yes
67	MOSTOVIK DEVELOPMENT LLC	1117746404885	2 705 239 000	4 / 5	4 / 5	4 / 5	1	No	No	No	Yes
68	PIZZA VENTURE LLC	1111101000405	2 628 224 000	8	4	3	-	No	No	No	Yes
69	SATURN-SHBS-3 LLC	1027700311847	2 574 819 000	4	5	2	-	No	No	No	Yes
70	NIKO LLC	1157847416726	2 571 500 000	1	2	2	-	Yes	No	No	No
71	FILIAS LLC	1027739493594	2 561 288 000	10 / 10	3 / 3	3 / 3	2	No	No	Yes / Yes	No
72	ORION LLC	1095035000466	2 533 467 000	2	2	2	1	No	Yes	Yes	No
73	PUBLIC CATERING LLC	1127847622979	2 509 350 000	2	3	2	-	No	No	No	Yes
74	FAST FOOD MARKET LLC	1167746682366	2 427 999 000	1 / 2	2 / 2	2 / 2	2	Yes / No	No / Yes	No / Yes	No / No
75	PROSERVIS TAIMYR LLC	1132457000719	2 422 658 000	9 / 7	4 / 4	3 / 3	-	No / No	No	No / No	Yes
76	TEREMOK-CONFECTIONERY LLC	1097847225772	2 409 268 000	4	2	2	2	No	Yes	Yes	No

Table (continued)

No	Company	Registration number	Revenue in rubles for 2022	Number of organizations in the group	Hierarchical levels in the group's ownership structure	Hierarchical level at which the organization is located	Number of individual owners (identified)	Organizations with sufficient individual financial statements	Organizations with sufficiently consolidated financial statements	It is advisable for organizations to prepare consolidated financial statements	It is advisable for organizations to prepare aggregated financial statements
77	IRKUTSK FOOD COMBINE CBM	1113850048905	2 341 623 000	1	2	2	-	Yes	No	No	No
78	GC ZHEMCHUZHINA JSC	1022302832078	2 341 186 000	2	3	3	-	No	No	No	Yes
79	VECTOR LLC	1075031003046	2 299 746 000	3	2	2	1	No	Yes	Yes	No
80	RENSERVICE LLC	1067847368797	2 286 999 000	1	2	2	1	Yes	No	No	No
81	KORPUSGRUPP URAL LLC	1076671021327	2 251 574 000	9	6 (5)	5 (4)	-	No	No	No	Yes
82	URBAN COFIX RUSSIA LLC	1167746480098	2 242 169 000	4	4	3	-	No	No	No	Yes
83	PRIMESTAR RESTAURANTS GROUP LLC	1107746986720	2 165 401 000	92 / 3 / 4	3 / 2 / 2	2 / 2 / 2	3	No / No / No	No	No / No / No	Yes
84	CAFETTERA GROUP RUS LLC	1037739512590	2 159 075 000	4	2	2	1	No	Yes	Yes	No
85	GID LLC	1144253006567	2 147 677 000	5	4	4	-	No	No	No	Yes
86	ANAPSKOE VZMORYE LLC	1102301000218	2 140 579 000	3	2	2	1	No	Yes	Yes	No
87	LUCHI SOLNTCA	1165044052788	2 087 672 000	1	2	2	1	Yes	No	No	No
88	PREMIUM HOTEL MANAGEMENT JSC	1075032015673	2 060 345 000	1	2	2	-	Yes	No	No	No
89	MENARDI LLC	1117746785925	2 026 678 000	10 / 10	3 / 3	3 / 3	2	No / No	No	Yes / Yes	No
90	PROMETEY-CITY LLC	1077758610820	2 018 508 000	1	2	2	-	Yes	No	No	No
91	BUSINESS ONLINE LLC	1157746772193	over 1 500 people	1	2	2	-	Yes	No	No	No

Source: Compiled by the author.
Note: The presence of two or more digits separated by a "slash" indicates two or more lines of ownership, two or more groups, or two or more hierarchical levels within the ownership structure.

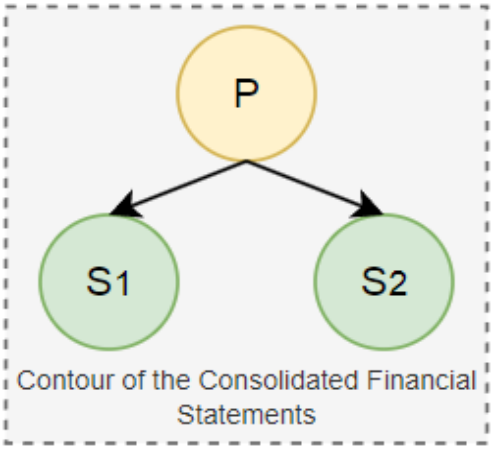

Fig. 2. **The Ownership Structure of the Group, and Consolidated Financial Statements**

Source: Compiled by the author.

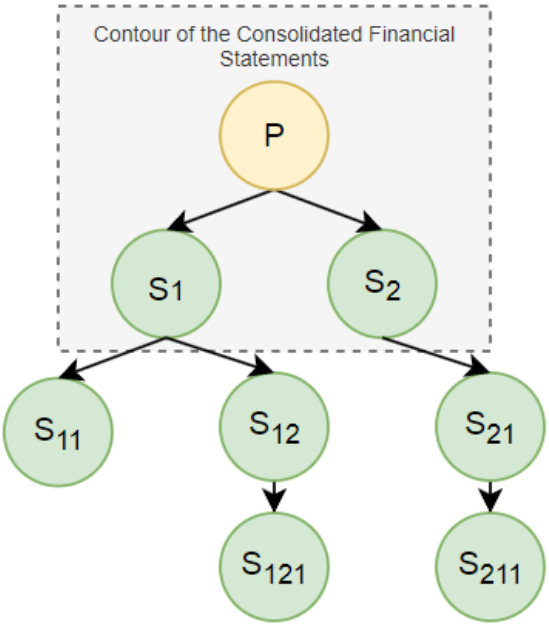

Fig. 3. **The Ownership Structure of the Group, and the Outline of the Consolidated Financial Statements, with More Than Two Levels of Hierarchy**

Source: Compiled by the author.

derivative nature. Consolidated financial statements are additional reporting to the parent company's individual financial statements. The derivative nature of consolidated financial statements is due to the fact that they are based on the individual financial statements of the parent company and its subsidiaries. In the absence of individual financial statements from the parent and subsidiary companies, consolidated financial statements cannot be prepared.

Additionally, consolidated financial statements are aimed at meeting the information needs primarily of the group's external investors. This conclusion stems from the definition of "general purpose financial statements (or simply "financial statements")" in IFRS. General purpose financial statements are understood as: "*General purpose financial statements* (referred to as 'financial statements') are those intended to meet the needs of users who are not in a position to require an entity to prepare reports tailored to their particular information needs"[10].

The main idea behind consolidated financial statements is that the cost of an investment in a subsidiary is replaced by the parent company's share of the net asset value, as well as the recognition of goodwill and non-controlling interest. At the level of consolidated financial reporting, homogeneous indicators from the individual reports of the parent and subsidiary companies are aggregated, with the mandatory elimination of intra-group transactions.

To prepare consolidated financial statements, the parent company must have an investment in subsidiaries. The ownership structure within the group and the consolidated reporting perimeter are presented in *Fig. 2*, where P — is the parent company, S_1 and S_2 — are subsidiaries.

In the ownership structure of a group with more than two hierarchical levels, consolidated financial statements have their limitations. So, organizations controlled by subsidiaries ("grandchild organizations"), like organizations at higher hierarchical levels, are not included in the consolidated financial reporting perimeter (*Fig. 3*). This limitation is related to the methodology for preparing consolidated financial statements. Since the parent organization does not directly own shares in "subsidiary organizations" and organizations at higher levels of ownership, such organizations

[10] IAS 1 Presentation of Financial Statements. IFRS Foundation. Issued 2024. URL: https://www.ifrs.org/issued-standards/list-of-standards/ias-1-presentation-of-financial-statements.html/content/dam/ifrs/publications/html-standards/english/2024/issued/ias1/(accessed on 29.08.2024).

are not included in the consolidation perimeter. They do not allow for the exclusion of the parent organization's investment and the calculation of the share of net assets attributable to the parent organization, goodwill, and the non-controlling interest.

Furthermore, the derivative nature of consolidated financial statements and their focus on the information needs of investors prevent the formation of current indicators for the group. In other words, there is currently no consolidated financial accounting as a separate type of financial accounting.

The analysis of the ownership structure of large companies in the hotel and catering business (*Table 1*) shows that only 36 out of 91 companies have an ownership structure that includes two hierarchical levels of ownership. In the remaining 55 companies, the ownership structure has more than two hierarchical levels. For example, the group that includes ROZA KHUTOR LLC (1037702012952) has 9 hierarchical levels in its ownership structure. Moreover, the organization itself, ROZA KHUTOR LLC is at the fifth hierarchical level. In 42 out of 55 cases, or 76% of the time, a large company is at level three or lower proficiency.

Thus, based on the analysis of large companies in the hotel and catering business, it can be concluded that consolidated financial statements do not accurately reflect the assets and financial performance of a group of enterprises in 55 out of 91 cases, or 60% of the time. Furthermore, the focus of consolidated financial reporting on meeting the information needs of only one group of users — investors — and the derivative nature of consolidated reporting raise the question of the need to develop a new type of accounting for a group of companies. Within the framework of the new type of financial accounting, on the one hand, the possibility of generating current indicators for the group should be provided, and on the other hand, this type of accounting should allow for the preparation of financial statements for the entire group of companies regardless of the number of hierarchical levels in the ownership structure.

COMBINED FINANCIAL STATEMENTS

When starting to examine the content of combined financial statements, it's worth noting that both the concept and the methodology for preparing combined reporting are in their initial stages of development. As of today, there is no unified understanding of combined statements as an independent type of financial statements.

The first mention of the need to disclose information about an investment entity on a "combined basis" is found in Accounting Principles Board Opinion No. 18 "Equity Method of Accounting for Investments in in Common Stock" ("APB Opinion 18"): "The significance of an investment to the investor's financial position and results of operations should be considered in evaluating the extent of disclosures of the financial position and results of operations of an investee. If the investor has more than one investment in common stock, disclosures wholly or partly on a combined basis may be appropriate"[11]. According to the Accounting Principles Board, the preparation of combined financial statements is appropriate when one investor "has more than one investment in common stock" (*Fig. 4*).

The concept of combined financial statements is contained in the International Financial Reporting Standard for Small and Medium-sized Entities: "Combined financial statements are a single set of financial statements of two or more entities controlled by a single investor"[12].

A similar definition of combined financial statements is found in the Financial Accounting Standards Board (FASB) "55 Implementation Guidance and Illustrations". According to paragraph 810–10–55–1B: "... combined financial statements would be useful if one individual owns a controlling financial interest

[11] Opinions of the Accounting Principles Board 18 "Equity method of accounting for investments in common stock", American Institute of Certified Public Accountants, Inc. 666 Fifth Avenue, New York 10019, 1971. 20 p.

[12] The International Financial Reporting Standard for Small and Medium–sized Entities (IFRS for SMEs) is issued by the International Accounting Standards Board (IASB), 30 Cannon Street, London EC4M 6XH, United Kingdom, 2009.

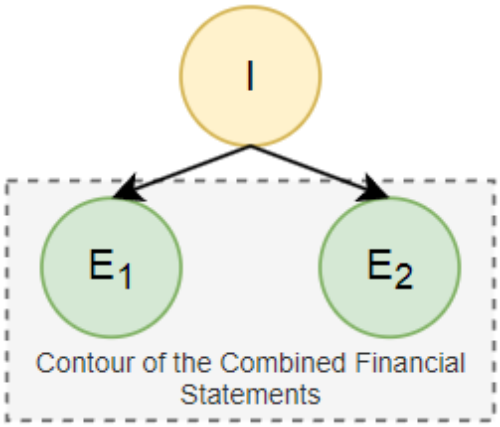

Fig. 4. **Contour of the Combined Financial Statements**

Source: Compiled by the author.

Note: To simplify, the figure shows two legal entities ("Ent 1" and "Ent 2") that are under the control of an investor ("Inv"). The outline of the consolidated financial statements is indicated by the gray rectangle.

in several entities that are related in their operations. Combined financial statements might also be used to present the financial position and results of operations of entities under common management"[13].

In the article "Criteria for Consolidation" [20], describing anomalies in consolidated reporting, John Calman Shaw gives an example where: "Mr. A and his family own the entire issued share capital of Company X Ltd and Company Y Ltd. No 'group' exists although both companies are clearly under the control of a single individual or small number of individuals acting in concert" [20, p. 72]. The author then notes: "In this type of situation there may well be significant inter-company commercial relationships and trading transactions. The effect of these may be obscured by the non-consolidation of the figures, and difficulties in interpreting the results or financial status of the companies concerned can be aggravated if different accounting dates are selected" [20, p. 72].

Another definition of combined financial statements can be found in the document by the Federation of European Accountants[14]: "Combined and Carve-out Financial Statements. Analysis of common practices"[15] and in the Discussion Paper DP/2020/2 of IFRS Standard "Business Combinations under Common Control"[16].

According to the Federation of European Accountants, combined financial statements refers to historical financial information prepared for a limited scope of economic activity. The need for combined financial statements arises when the structure of a group of companies changes or an individual company is reorganized.

According to the draft international financial reporting standard "Business Combinations under Common Control", combined financial statements are understood as financial statements that are appropriate when entities or businesses under common control are combined. In this study, **combined financial statements** refer to the financial statements of a group where the parent is a single individual or a group of individuals.

An analysis of the ownership structure of large companies in the hotel and catering business showed the feasibility of forming consolidated financial statements for twenty-nine organizations (*Table 1*).

A classic example of an ownership structure within a group that necessitates the preparation of consolidated financial statements is an ownership structure that includes the organization ORBITAL LLC (1221800006471) (*Fig. 5*).

[13] 55 Implementation Guidance and Illustrations. Financial Accounting Standards Board (FASB) Accounting Standards Codification (ASC) 810 Consolidation. URL: https://asc.fasb.org/1943274/2147481175/810–10–55–1B(accessed on 20.08.2024).

[14] The Federation of European Accountants, abbreviated as FEE (Fédération des Experts–comptables Européens), includes 45 professional accounting and auditing organizations from 33 European countries, including 27 European Union member states. The Federation of European Accountants has over 500 000 professional accountants as members.

[15] Combined and Carve–out Financial Statements. Analysis of common practices. A document primarily based on the responses received to the FEE Discussion Paper Combined Financial Statements and additional research undertaken by FEE February 2013.

[16] Discussion Paper DP/2020/2 IFRS Standards "Business Combinations under Common Control". URL: https://www.ifrs.org/content/dam/ifrs/project/business-combinations-under-common-control/discussion-paper-bcucc-november-2020.pdf(accessed on 20.08.2024).

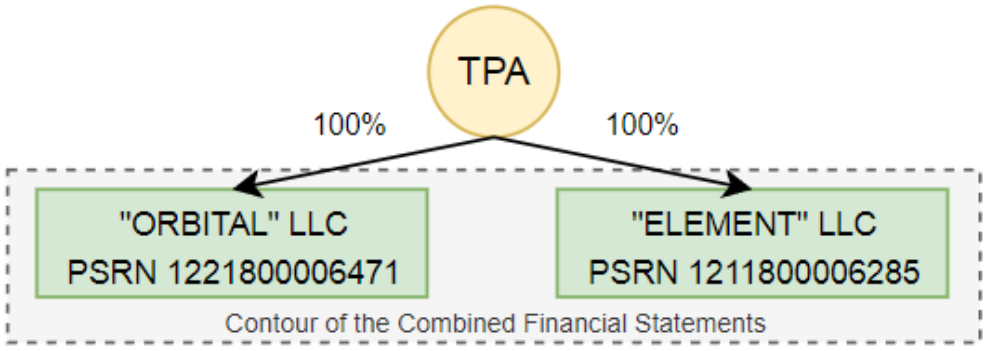

Fig. 5. **The Ownership Structure and Contour of the Combined Financial Statements for the Group with the Participation of ORBITAL LLC**

Source: Compiled by the author.

Note: Hereinafter, for the purpose of non-disclosure of personal data, the individual owner is designated by the abbreviation of the first letters of their surname, first name, and patronymic.

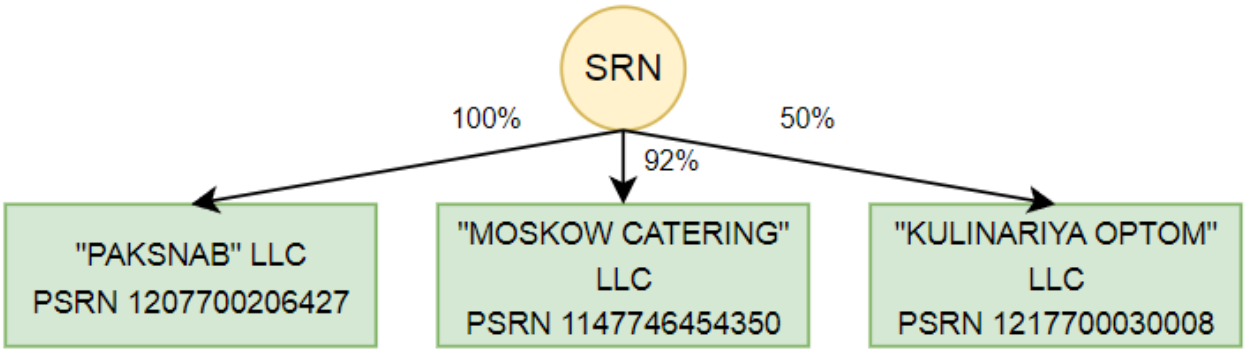

Fig. 6. **The Ownership Structure for a Group with the Participation of MOSCOW CATERING LLC**

Source: Compiled by the author.

In this case, one individual owns a 100% stake in two companies — ORBITAL LLC and ELEMENT LLC, which form a group and are included in the combined financial reporting perimeter. In other words, to determine the group's financial position and financial performance, it is necessary to prepare consolidated financial statements.

A different ownership structure of the group is also possible, in which the preparation of combined financial statements is appropriate. Let's consider the group that includes the organization MOSKOW CATERING LLC (1147746454350) (*Fig. 6*).

The group consists of three organizations with different ownership percentages — 100%, 92%, and 50%. In this case, two methodological problems arise. The first is related to defining the scope of the combined financial statements. While it can be definitively stated that the organizations Paksnab LLC and MOSKOW CATERING LLC are included in the scope of the combined financial statements, no such definitive conclusion can be drawn regarding the organization Kulinariya Optom LLC. The second problem is related to the method of preparing consolidated financial statements with varying ownership percentages. In the organization MOSKOW CATERING LLC, a private individual — the owner — holds a 92% share, while the remaining 8% belongs to other individuals. In this case, a problem arises in reflecting the 8% non-controlling interest in the consolidated financial statements. A different kind of problem arises with the organization Kulinariya Optom LLC if it is not included in the combined reporting perimeter. Under this condition, a methodological problem arises

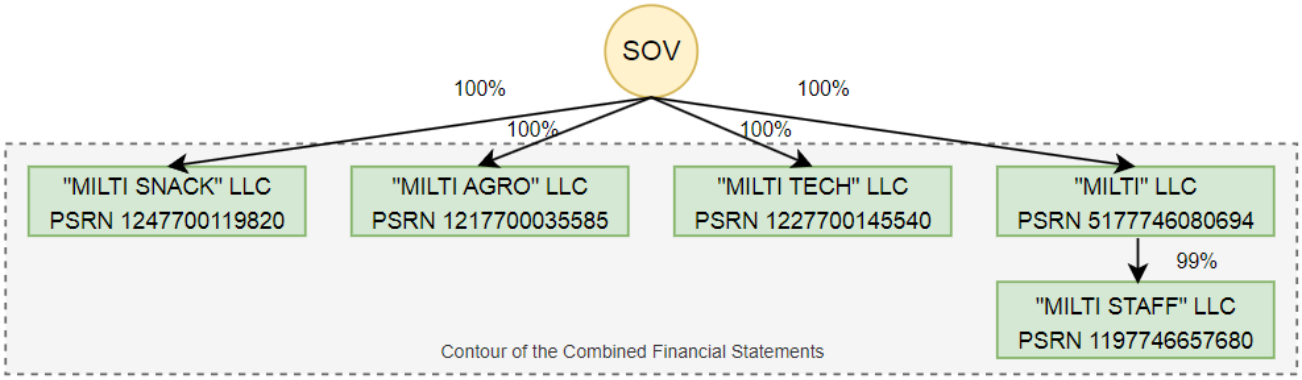

Fig. 7. **The Ownership Structure and Contour of the Combined Financial Statements for the Milti LLC group**

Source: Compiled by the author.

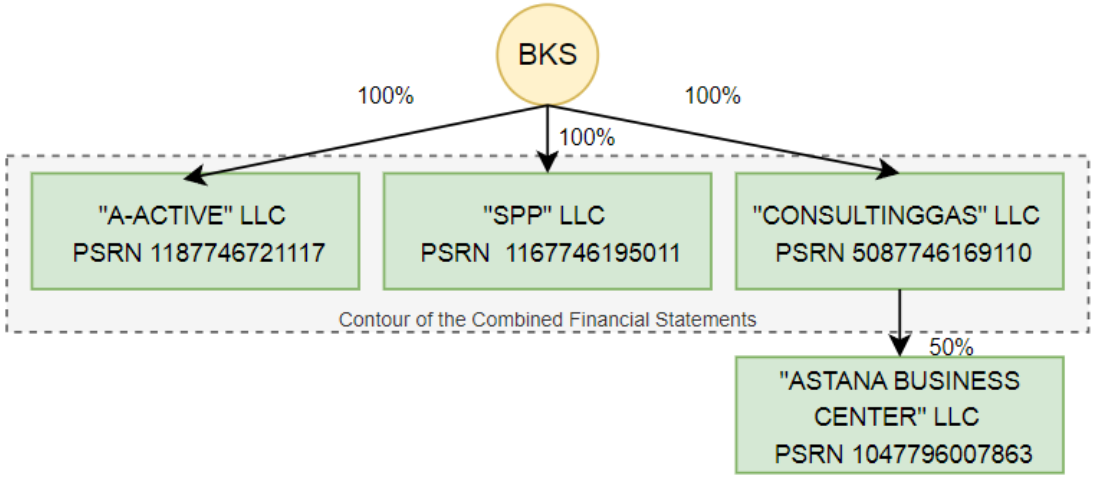

Fig. 8. **The Ownership Structure and Contour of the Combined Financial Statements for the Group with the Participation of SPP LLC**

Source: Compiled by the author.

regarding the reflection of investments in Kulinariya Optom LLC when preparing the group's consolidated financial statements.

The ownership structure of large companies in the hotel and catering business, for which it is appropriate to prepare consolidated financial statements (*Table 1*), includes various groups ranging from two organizations (YAMMI GROUP LLC (1082635003110)) to eighty-six (MAYREST LLC (1027809227050)) that make up the group. mi

Another ownership structure is represented by a group that includes MILTI LLC (5177746080694) (*Fig. 7*).

The group under consideration contains more than two hierarchical levels in its ownership structure. Milti Staff LLC is at the third level of ownership (a subsidiary of Milti LLC), which poses a methodological problem — the formation of consolidated financial statements for a group containing more than two hierarchical levels in the group's ownership structure.

In the considered area of the hotel and catering business, for which it is advisable to prepare combined financial statements (*Table 1*), the maximum number of hierarchical levels in the group's ownership structure is five (RBE LLC (5147746269039)).

A group that contains more than two hierarchical levels in its ownership structure with varying degrees of ownership deserves special attention (*Fig. 8*).

Fig. 6 shows a group for which it is appropriate to prepare consolidated financial statements

with an entity at the third hierarchical level in the group's ownership structure, located outside the scope of the consolidated financial statements. In this case, a methodological problem arises regarding the reflection in the financial statements of an investor's investment in an entity that is outside the scope of the consolidated financial statements.

The analysis of the ownership structure of large organizations in the catering and hotel industry showed that for 29 out of 91 organizations, or 31% of the organizations under consideration, it is advisable to prepare combined financial statements.

When considering combined financial statements as a new type of financial reporting, it is necessary to define the information needs of the main user groups. The users of combined financial statements primarily include: investors (both existing individual investors and potential investors), creditors, management, and the state represented by tax and statistical authorities.

For investors, combined financial statements provide consolidated financial information about the group as an investment object. This financial information includes the composition and value of assets, liabilities, and equity, the group's financial performance, cash flows, and other information. For investors, it is sufficient to prepare consolidated financial statements outside the accounting system. Maintaining financial accounting as a system, the result of which is consolidated financial statements, is not necessarily.

For creditors, consolidated financial statements allow for a more comprehensive analysis of the group's financial position for the purpose of making credit decisions.

For the state, represented by tax and statistical authorities, a new taxable entity and a new subject of statistical observation emerge — a group of companies under the single control of a natural person.

Group managers need not only summary information — consolidated financial statements — but also current financial data for the group. To obtain current consolidated financial information for the group, it is necessary to maintain full financial records for the group of organizations under the control of a single individual. This type of financial accounting can be called combined financial accounting.

CONCLUSION

The analysis of the ownership structure of large catering and hotel organizations revealed that in modern economic realities, the economic entity is not a single organization, but a group of companies with a complex ownership structure. Yes, individual financial statements are sufficient only for 19 large organizations in the industry under consideration.

The presence of more than two hierarchical levels in the ownership structure imposes significant limitations on the ability to prepare consolidated financial statements for the group. The group's consolidated financial statements allow for the disclosure of the group's financial position and financial performance in 17 out of 91 cases. At the same time, the derivative nature and orientation of consolidated financial statements toward the information needs of external users highlight the problem of consolidated accounting as an independent type of accounting.

The presence of a natural person at the zero level in the group's ownership structure makes it advisable to form a new type of reporting — combined financial statements. This type of reporting may be appropriate for groups where a group of individuals or a government body is at the zero level in the ownership hierarchy. Preparing combined financial statements is appropriate for 29 out of the 91 large organizations in the industry under consideration. To meet the information needs of both external and internal users, combined financial statements should be the result of a systematic process of combined financial statements.

An analysis of large organizations in the catering and hotel business allows us to put forward the hypothesis that a significant number of large organizations in the Russian Federation operate as part of a group of companies with a complex ownership structure.

The limitations of individual financial statements prepared for a single legal entity and consolidated financial statements for a group of companies, as well as the emergence of a new type of financial reporting — combined financial statements — allow us to conclude that there is a need to create a new type of accounting system and financial reporting to reflect the consolidated figures of the group, regardless of its composition and the number of hierarchical levels in the group's ownership structure. The new type of accounting is proposed to be called additive financial accounting, and the new type of financial reporting — additive financial statements.

The additive accounting system should be maintained on a systematic basis and allow for the preparation of both individual financial statements for a separate organization, consolidated financial statements for a group of companies, combined financial statements, and also the consolidation of indicators for all companies within the group, regardless of the ownership structure and the number of hierarchical levels of ownership. The additive accounting system should be oriented toward the information needs of both external and internal users of financial statements and allow for the formation of both current and final indicators.

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ABOUT THE AUTHOR

Sergei V. Kolchugin — Cand. Sci. (Econ.), Assoc. Prof., Department of Computer Science in Economics, Novosibirsk State Technical University, Novosibirsk, Russian Federation
https://orcid.org/0000-0001-9575-1920
s.kolchugin@rambler.ru

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ORIGINAL PAPER

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The Customs Value of Goods in the event of a Customs Warehouse Procedure

A.A. Artemyev[a], E. Yu. Sidorova[b]

[a, b] Financial University under the Government of the Russian Federation, Moscow, Russian Federation;
[b] Peoples' Friendship University of Russia named after Patrice Lumumba, Moscow, Russian Federation

ABSTRACT

The **subject** of this study is issues related to approaches to determining the customs value of goods exported from the territory of a customs warehouse. Current regulations stipulate that within the EAEU, the specifics of determining the customs value of goods upon completion of the customs procedure of a customs warehouse are established by the Eurasian Economic Commission (EEC) within the framework of a separate project (draft Specific Features). The **purpose** of the study is to offer fundamental approach for the Draft regulation "Customs value of goods in the event of the closure of Customs warehouse procedure". To achieve this goal, the following **tasks** were set and solved: to consider the systemic term for determining the customs value of goods "sale of goods for export to the customs territory of the importing country", as applied to goods for which the customs procedure of a customs warehouse is terminated; and to consider existing approaches to determining the customs value of goods for which the customs procedure of a customs warehouse is terminated; to develop standard situations that allow the author to develop a position on approaches to determining the customs value of goods exported from the territory of a customs warehouse. The **methodology** assumes that the customs warehouse is part of the Union's customs territory, while the goods being valued are not "Union's goods". **Research results and conclusions**: The authors developed a methodology for determining the customs value of goods upon their removal from a customs warehouse. They substantiated that the last transaction for their export should be taken into account when assessing the value of such goods. They prepared proposals for the EEC Expert Group on the specifics of determining the customs value of goods after the completion of the customs warehousing procedure.

Keywords: customs assessment; customs regulation; EAEU; customs procedure; "customs/bonded warehousing"; "bonded" territory

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INTRODUCTION

Against the backdrop of the increasing complexity of foreign economic activity (further — FEA), in order to improve the efficiency of foreign trade operations, Russian economic entities — participants in FEA — are paying great attention to business models that allow for maximizing the opportunities to optimize the tax and customs consequences of moving goods under various customs procedures.

A customs procedure is a special institution in the customs sphere that largely determines the regulatory regime, as well as the scope of rights and obligations of a person participating in foreign economic activity in relation to goods.

The term "customs procedure" has been detailed in the current regulations. Essentially, a customs procedure is a specific set of rules that, for the most part, provide participants in foreign economic activity with a legal opportunity to optimize their rights and obligations in the customs sphere.

Among the business models mentioned above that have become widespread recently, models that involve conducting financial and economic operations in Russia with goods that are classified as foreign in customs legal relations hold a special place.

To better understand the economic essence of such business models, it should be noted that in the customs sphere, according to current regulations, all goods are classified as "Union goods" and "foreign goods". The criteria based on which goods can be classified into one of the statuses mentioned above are established by the conceptual apparatus of the EAEU Customs Code.

An analysis of Russian legislation in force within the framework of the EAEU shows that in some cases, transactions can be concluded with goods located on the territory of Russia but having foreign status. As a rule, such transactions, which are inherently limited in business dealings due to their status, are characterized by the following circumstances:1. Goods located within the territory of the Russian Federation (the customs territory of the EAEU) retain their foreign status and are placed under one of the customs procedures permitted by the EAEU Customs Code;2. Current regulations generally stipulate requirements aimed at the "actual presence" of foreign goods within a territory that can be classified as a "special" territory or a "special zone". The most common examples of "special" territories include: special (free) economic zones, free warehouses, and customs warehouses.3. Due to their status (foreign goods) and the customs procedure (see point 1), the goods remain under customs control while they are in the "special zone" (see point 2).

Both in legislation and in scientific literature, various options for transactions are described, including the sale of foreign goods in special (free) economic zones, including "territorial types", as well as in duty-free shops, and the related tax and customs consequences of such transactions.

However, the current economic situation is characterized, among other things, by difficulties in organizing the procurement and delivery of a wide range of imported goods to our country, which is why Russian buyers of such goods are interested in purchasing large batches of goods and creating warehouse stocks that can subsequently be broken down according to economic needs.

The use of warehouses with "customs warehouse" status in customs relations can contribute to solving the noted economic task.

Currently, research into issues related to the economically justified determination of the tax and customs consequences of operations involving foreign goods placed in a customs warehouse and, accordingly, under the customs warehousing procedure, is significantly complicated by the lack of both normative and scientific development of issues related to determining the customs value of goods for which the customs warehousing procedure is terminated due to an economic decision on the feasibility of exporting the goods from the customs

warehouse to the rest of the EAEU customs territory [1, 2].

MAIN PART

Approaches to the valuation/assessment of goods exported from a customs warehouse

Existing research on customs warehousing is dedicated to the issues of organizing and functioning temporary storage facilities where it is carried out, as well as the complex of indirect taxation issues involved in its implementation [3]. However, the issue of assessing the customs value of goods leaving a customs warehouse after the warehousing procedure is completed and destined for the main part of the EAEU customs territory remains unresolved [4, 5].

Given the current objectively arisen need of Russian companies for the widespread use of customs warehouses, the lack of approaches to determining the customs value of goods exported from their territory creates significant problems for the application of business models that involve the use of "customs warehousing" and, as a result, hinders the development of modern tools for foreign trade in goods [6].

For a better understanding, let's consider the economic scheme of a customs warehouse functioning as a physical object and as a customs procedure.

The description below is largely based on published research on customs warehouses, the most comprehensive of which, in the authors' opinion, is a monograph [6] dedicated to the mechanism of indirect taxation and its economic and legal improvement.

The mechanism for using customs warehouses largely lies in the ability to import foreign goods into the country, store them in a special warehouse, and take advantage of the opportunity not to be subject to customs taxation during the "warehousing" period [7, 8].

During the "warehousing" period, goods can undergo various operations such as preparation for sale, batch splitting, etc.

When buyers purchase goods stored in a customs warehouse and "release" them for full economic circulation, there must be a change in "status" in customs relations, meaning the customs warehousing procedure is completed, as shown in *Fig. 1*.

From the described scheme, it follows that its application opens up additional possibilities for more flexible product sales.

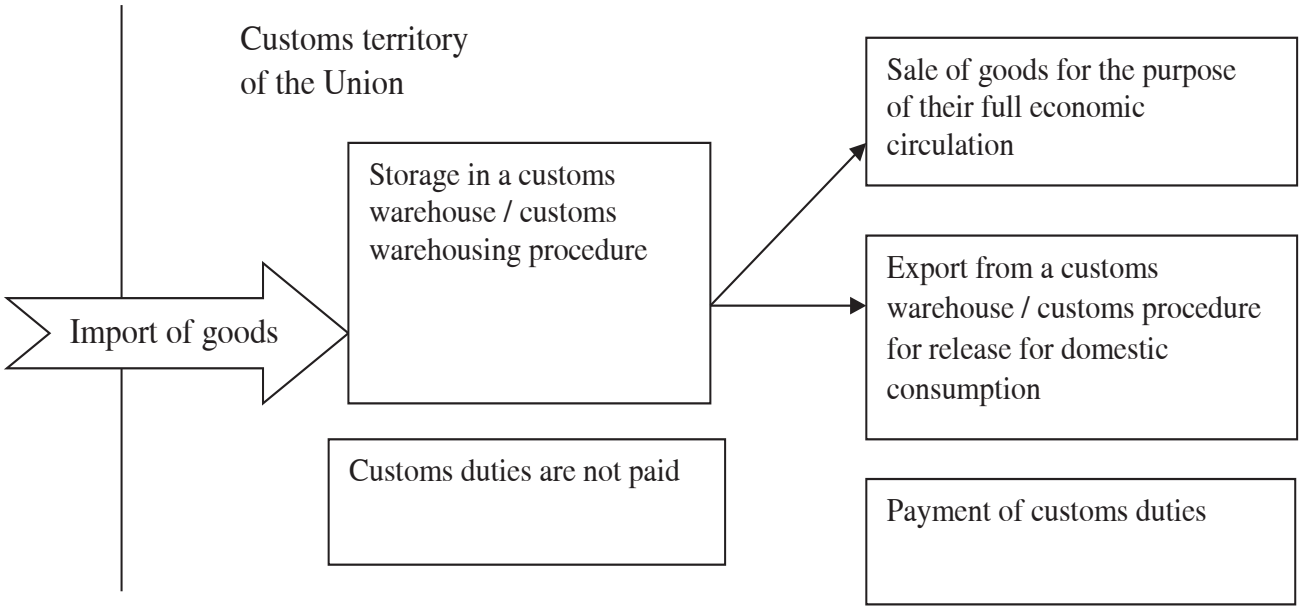

Fig. 1. **The Import of Goods Into the Customs Territory of the Union Using the Customs Procedure of a Customs Warehouse, the Subsequent Sale of Goods in Order to Involve them in a Full-Fledged Economic Turnover**

Source: Compiled by the authors.

Regarding the initially imported large consignment of goods, customs taxation is not applied due to the use of a customs warehouse. Subsequently, tax consequences for customs duties arise as goods are sold to buyers within the Eurasian Economic Union, with customs duties being paid only on the sold goods that are removed from the warehouse and placed under a new customs procedure.

However, the practical implementation of the above scheme is currently significantly hampered due to the unresolved issue of valuing goods for which the customs warehousing procedure is ending, as already mentioned above [9].

In this regard, the following points can be noted.

Current regulations in Russia stipulate that upon the import of goods into the customs territory of the EAEU, their customs value is determined [10].

The system for determining the customs value of imported goods is largely reflected in the regulatory acts related to the law of the Eurasian Economic Union and based on international principles formulated in the documents of the World Trade Organization and the World Customs Organization. The system in question includes the EAEU Customs Code, as well as decisions and recommendations of the Eurasian Economic Commission (further — EEC) adopted by the EEC in accordance with the powers delegated to it by the Union member states [11, 12].

Within the framework of the system for determining the customs value of goods, it is provided that when imported goods are placed under most customs procedures, the customs value of the goods is determined only once and, accordingly, is not redetermined when the goods are subsequently placed under a new customs procedure, including even one that involves a change in the status of the goods in customs relations.

According to the authors, a typical example of applying the general rule is the situation where imported goods are initially placed under the temporary admission (ATA Carnet) customs procedure, after which a decision can be made about the expediency of the goods remaining permanently within the territory of the EAEU (in Russia), which necessitates the completion of the temporary admission (ATA Carnet) customs procedure and the placement of the goods under the release for domestic consumption customs procedure. At the same time, placing goods under the customs procedure of release for domestic consumption is not accompanied by a re-determination of their customs value.

A customs warehouse, however, is one of the exceptions to the general rule[1] described above, which is largely explained by the fact that goods imported into a customs warehouse are not put into full economic circulation, and also by the possible absence of a transaction on the basis of which the initial import of goods is carried out (for example, if the import into a customs warehouse is carried out by a foreign person).

So, with regard to a customs warehouse, the current regulations stipulate that the customs value of goods is not determined when they are placed under the customs warehouse procedure, and that its determination should be made upon the termination of the customs warehouse procedure within the framework of a special procedure to be established by the Eurasian Economic Commission (EEC) (see above — Features)[2].

At the same time, the development of approaches to determining the customs value of goods removed from a customs warehouse to the rest of the Union's customs territory by scientists and practitioners, as described in the Abstract, is significantly complicated by the following circumstances [13, 14].

The customs value of goods is determined by the sequential application of the six methods established by the EAEU Customs Code, the main and most widely used of which is the method known as the "transaction value

[1] Point 3 of Article 38 of the EAEU Customs Code.
[2] Point 7 of Article 38 of the EAEU Customs Code.

of imported goods" (further — Method 1)[3].

Within the framework of applying Method 1, for the purposes of determining the customs value of goods, a "transaction" refers to a system of transactions based on which the assessed goods are imported into the EAEU (a purchase and sale agreement, a licensing agreement, etc.). The most important condition for the very possibility of applying Method 1 is the sale of goods for export to the customs territory of the EAEU[4].

At the same time, the approaches to understanding what should be considered "sales of goods for export to the customs territory of the EAEU" when determining the customs value of goods under Method 1, for which the customs warehouse procedure is being completed, have become the main issue, the unresolved nature of which prevents the completion of work on the draft Features and the use of the customs warehouse procedure to the required extent.

To provide a more comprehensive understanding of this issue, the authors have analyzed the following typical situations.

Typical Situation 1

A company resident in country "I" (the buyer) purchased goods (televisions) from a television manufacturer resident in country "E" (the seller) under a foreign trade contract.

Number of televisions purchased — 10 000 units;

The price per TV (unit) set by the manufacturer is 1 000 conventional units (c.u.);

Invoice for goods issued by the manufacturer — 10 000 units* 1 000 c.u. = 10 000 000 c.u.

Imported goods that were destined for the customs territory of country "I" are placed under the customs warehouse procedure. The purpose of this import is the further sale of the imported goods to customers from country "I".

Buyer "P" sold the acquired televisions to three retail store chains:

- I-network — 5 000 units at a price of 2 000 per television, resulting in a total sum of 10 000 000;
- II-network — 2 000 units at a price of 2 200 per television, resulting in a total sum of 4 400 000;
- III-network — 3 000 units at a price of 2 100 per television, resulting in a total sum of 6 300 000.

In total, organization "P" received 10 000 000 + 4 400 000 + 6 300 000 = 20 700 000[5].

Customs warehousing has been completed for all televisions sold to chain stores; the televisions have been released for free circulation in accordance with the new customs procedure, removed from the customs warehouse, and handed over to their new owners — retail chains. In other words, the televisions acquired the status of goods from country "I" and were fully involved in commercial circulation in country "I".

Regarding the cost aspects of the customs warehouse procedure, the aforementioned Typical Situation 1 clearly demonstrates the economic ambiguity of whether the category "sale of goods for export to the country of importation" should be considered for the purposes of determining the customs value of goods, in other words, which amount, 10 000 000 rubles (the price at which the televisions were purchased abroad — in country "E") or 20 700 000 units, should be the basis for determining the customs value of the televisions as the basis for calculating customs duties.

On the one hand, when purchasing televisions under a foreign trade agreement with a manufacturer from country "E", there was formally a sale of goods to the customs territory of the importing country (country "I"), the indicators of which are typically used as components in determining the customs value of the goods.

However, it should be noted that after the

[3] Articles 39 and 40 of the EAEU Customs Code.

[4] Point 1 of Article 39 of the EAEU Customs Code.

[5] In the given typical situation, the authors have made the following assumptions: the use of the same currency units in countries "I" and "E", and the absence of VAT tax consequences when selling televisions to retail store chains.

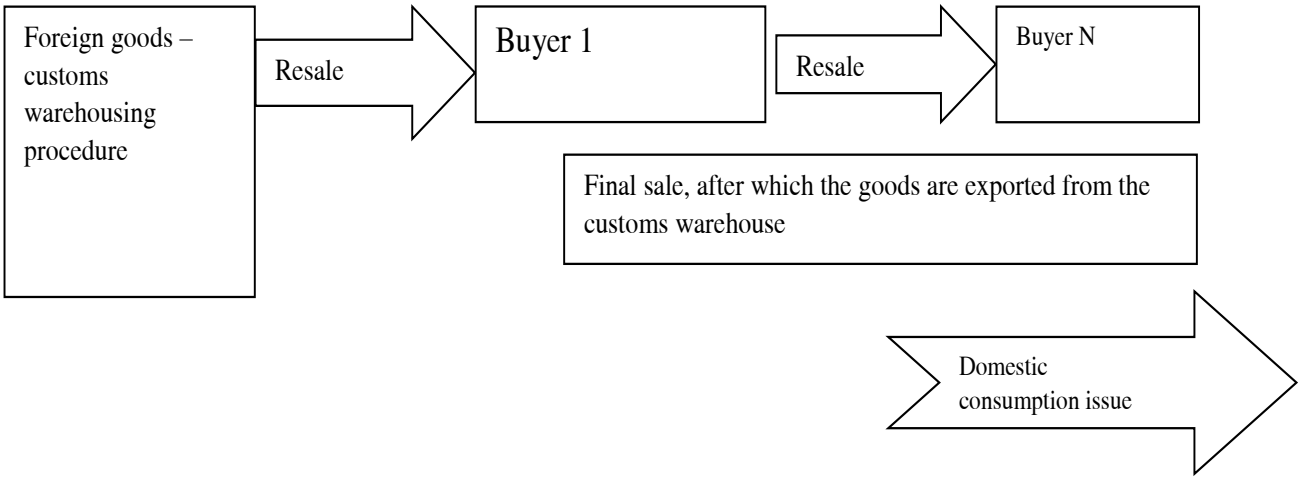

Fig. 2. **Mechanism of Importing Goods into the Customs Territory of the EAEU Using the Customs Warehouse Procedure, the "Chain" of Resales of Goods**

Source: Compiled by the authors.

described sale, the televisions are placed under the customs warehouse procedure. It is assumed that:

1. No customs duties are paid;

2. In customs relations, goods do not change their status, continuing to remain foreign;

3. Goods are only put into full economic circulation (in the Typical Situation 1 — sale to retail store chains) after the customs warehouse procedure has been completed and the goods have been placed under a new customs procedure, usually release for home consumption.

Therefore, for the purposes of determining the customs value of televisions, in our opinion, it is economically feasible to consider the sale to retail chains as a "sale for export to the customs territory of the importing country" (Country I) and, accordingly, use the value of 20 700 000 for determining the customs value of the goods.

The approach proposed by the authors is even more indicative based on the results of the analysis of the customs consequences of the "chain" resale of goods during their storage in a customs warehouse and while under the customs warehousing procedure.

The International Convention on the Simplification and Harmonization of Customs Procedures (Kyoto Convention), which is the basis for national customs regulation systems in most countries and unions of countries, including the EAEU, provides that transactions can be carried out with goods placed under the customs warehousing procedure, i.e., during the "storage" period [15, 16].

These provisions have been implemented in the EAEU Customs Code.

According to Article 158 of the EAEU Customs Code, transactions for the transfer, use, and disposal of ownership rights to all or part of the goods placed under the customs procedure of "warehousing" can be carried out.

These provisions mean that the sale and purchase of goods placed under the customs warehousing procedure is not necessarily carried out for the purpose of removing the goods from the customs warehouse, but can also have investment purposes [17]. Thus, when such transactions are carried out, the full involvement of goods in economic circulation may not be intended, and, accordingly, the completion of the customs warehousing procedure and their placement under the customs procedure of release for domestic consumption may not be planned [18, 19].

However, the "sales chain" described above ultimately ends with the sale of goods to a person interested in full rights to the acquired goods. This includes:1. Completion of "customs

warehousing" and release of goods for free circulation;2. "Leaving" of goods from the customs warehouse territory;3. Determination of the customs value of goods previously placed under the customs warehouse procedure;4. Payment of customs duties calculated based on the customs value of the goods (see point 3).

Regarding the above description, see *Fig. 2*.

The diagram illustrating the functioning of a customs warehouse in *Fig. 2* clearly shows the consequences of a chain of resales of goods without "breaking down" the initially imported batch of goods.

The diagram in *Fig. 2*, compared to *Fig. 1*, more convincingly demonstrates the circumstances discussed above, which are essential for the value aspects concerning goods imported into the country thru a customs warehouse.

Let's consider a typical situation where there is a "chain" of resales of goods during their storage in a customs warehouse.

Typical Situation 2

Organization "P", a buyer from country "I", has concluded a foreign trade contract for the purchase and sale of goods (televisions) with a television manufacturer from country "E".

Number of televisions purchased — 10 000 un.;

The price per TV (unit) set by the manufacturer is 1 000 conventional units;

The invoice for the goods issued by the manufacturer is 10 000 units. *1 000 c.u. = 10 000 000 c.u.

Goods imported into country "I" are placed under the customs warehousing procedure.

Subsequently, buyer "P" sold all the purchased televisions to buyer "P1" at a price of 1 200 c.u. per unit.

The price of the batch of televisions sold to customer "P1" was 10 000 units *1 200 c.u. = 12 000 000 c.u.

Buyer "P1" sold all the televisions purchased to buyer "P2" at a price of 1 500 c.u. per unit.

The price of the batch of televisions sold to buyer "P2" was 10 000 units *1 500 c.u. = 15 000 000 c.u.

Buyers "P1" and "P2" did not intend to remove the televisions from the customs warehouse and, accordingly, did not complete the customs procedure for the purchased televisions.

Subsequently, the televisions were resold N times, and the buyer "PN" sold the televisions to the buyer "P-Retail Network" at a price of 2 070 c.u. per unit.

The price of the batch of televisions sold to the buyer "P-Retail Network" was 10 000 units * 2 070 c.u. = 20 700 000 c.u[6].

Regarding all televisions sold to the "final" or "last" buyer by "P Retail Network", the customs warehousing procedure has been completed, the televisions have been placed under the customs procedure of release for domestic consumption, removed from the customs warehouse, and transferred to the retail store network. That is, televisions have acquired the status of goods from country "I" and are involved in full economic circulation within the territory of country "I" [20, 21].

CONCLUSION

1. Regarding the cost aspects of the customs warehousing procedure, the considered typical situations, and especially Typical Situation 2, show that it is precisely 20 700 000 c.u., not the price at which the televisions were purchased abroad in country "E" (10 000 000 rubles), that should be considered as the economic basis for the purposes of determining the customs value of goods for which the customs warehousing procedure is being completed.

Accordingly, for the purposes of determining the customs value of goods, the "last sale" after which the goods must leave the customs warehouse and be placed under the customs procedure for release for home use should be considered as a "sale for export to the customs territory of the importing country".

[6] In the given typical situation, the authors also made assumptions: the use of the same currency units (CU) in countries "I" and "E", and the absence of VAT tax consequences upon the sale – "resale" (in the terminology of the typical situation) – of televisions to customers.

2. Formally, the sale of goods imported thru a customs warehouse for export to the customs territory of the importing country (e.g., within the EAEU) is considered the "first foreign trade" sale of goods, i.e., a transaction between a foreign seller and the "first foreign trade" buyer, such as a Union person. However, from an economic perspective, it is incorrect to base the customs value of goods imported thru a customs warehouse on the cost of such a sale when they are subject to a new customs procedure that "changes" the status of the goods (from foreign goods to Union goods).

3. It is economically feasible to consider the sale of goods removed from a customs warehouse to the "rest" of the EAEU territory as a "final" sale, meaning a transaction aimed at releasing the goods into free circulation and granting them the status of Union goods. Therefore, it is proposed to use the indicators of such sales as the basis for determining the customs value of goods removed from a customs warehouse to the "Main Part" of the EAEU customs territory [22, 23].

4. An analysis of the provisions of international documents on determining the customs value of goods indicates that this issue remains unresolved at the level of recommendations from the Technical Committee on Customs Valuation of the World Customs Organization. This indicates the possibility and feasibility of addressing this issue at the level of the EAEU regulation, with subsequent proposals to be submitted for discussion at the World Customs Organization platform [24].

5. The conclusions proposed in this article can be and are used as a basis for expert proposals from the Russian Federation in the preparation of the Special Provisions, which is being carried out by the EAEU Expert Group on Customs Valuation.

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ABOUT THE AUTHORS

Alexey A. Artemyev — Cand. Sci. (Econ.), Assoc. Prof., Department of Taxes and Tax Administration, Financial University under the Government of the Russian Federation, Moscow, Russian Federation
https://orcid.org/0000-0002-4320-317X
aartemyev@fa.ru

Elena Yu. Sidorova — Dr. Sci. (Econ.), Prof., Department of Taxes and Tax Administration, Financial University under the Government of the Russian Federation, Moscow, Russian Federation; Prof., Department of Finance Accounting and Audit, Faculty of Economics, Peoples' Friendship University of Russia named after Patrice Lumumba, Moscow, Russian Federation
https://orcid.org/0000-0002-4385-7173
Corresponding author:
eyusidorova@fa.ru

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