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Social Order in the Russian Federation: A New Tool of Budgetary Policy in the Social Sphere

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ABSTRACT

In the article, the authors analyze the social results of the implementation of Federal Law No. 189 dated 07.13.2020 "On the State (Municipal) social order for the provision of state (municipal) services in the social sphere" in the pilot regions of the Russian Federation. One of the main social results is the satisfaction of citizens with the social services received within the framework of the pilot project. In this regard, the aim of the study was to assess the level of satisfaction of recipients for each tested social service in each pilot region. The index values of the satisfaction level are calculated based on the assessments of the recipients of these social services and are supported by the opinions expressed by citizens in focus group interviews. The article describes the specifics of the implementation of a social order depending on the region and the service being sold, the relationship between the level of satisfaction of service recipients and the quality of their provision, as well as the dependence of satisfaction on the justification of consumer expectations. According to the results of the conducted sociological research, the social order operating in the pilot regions showed a high social result — the satisfaction of service recipients is at a high level. The study revealed the advantages and bottlenecks of using social certificates in pilot regions. Based on the discussion of the research results with representatives of the Ministry of Finance of the Russian Federation and representatives of regional authorities, regional peculiarities and problems were identified and ways to solve them were proposed.

Keywords: social order; financial provision; budget policy; budget expenditures; social services; social sphere; social certificate; satisfaction; quality; efficiency of budget expenditures

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INTRODUCTION

Federal Law No. 189 of 13 July 2020, "On the State (municipal) social order for the provision of state (municipal) services in the social sphere" (hereinafter — Law No. 189) provides for the use of new competitive methods for determining the providers of state (municipal) services in the social sphere.[1] In accordance with the specified Law No. 189, the execution of the social order is carried out through an agreement on the financial provision for the fulfillment of the state (municipal) assignment within the framework of budgetary policy. Social services within the framework of implementing social orders are provided to individuals [1, 2]. The implementation of social order mechanisms is a pilot project, limited in time until 1 January 2025. To assess the social outcomes of implementing social orders in the pilot regions of the Russian Federation,[2] the Financial Research Institute of the Ministry of Finance of Russia developed a methodology for measuring the project's effectiveness. Based on this methodology, the Financial University conducted a comprehensive sociological study to identify and evaluate the level of satisfaction among recipients of the tested social services in 37 pilot regions of the Russian Federation.

FEATURES OF IMPLEMENTING A SOCIAL ORDER

To ensure the proper quality of budget policy, its goals and objectives must align with the strategic development goals [3]. Providing high-quality social services to the population is one of the key strategic directions of the state's social policy, and the social order is one of the tools for its implementation. The social order for the provision of state (municipal) services in the social sphere is carried out in accordance with the budget legislation of the Russian Federation: the state (municipal) assignment within the framework of the social order is executed based on the budget estimate or through the conclusion of agreements on the provision of subsidies for financial support.

Regions are independent in making decisions regarding the implementation of the mechanisms of Law No. 189 on social procurement. In this regard, the policy of service testing may vary significantly depending on the subject of the Russian Federation [4, 5]. Nevertheless, the implementation of social order mechanisms occurs in two main variations: on a competitive basis or through the provision of social certificates. Social certificates allow citizens to independently choose any service provider included in the register of providers and guarantee the selected provider payment for the provision of budgetary services in accordance with the established normative costs. The main condition is that the service provider must submit an application to be included in the list formed by the authorized body [6].

If consumers start choosing the organization themselves to receive a service, then service providers, as a result of competition for consumers, will be motivated to improve the quality of the services they provide in order to attract consumers. Thus, client-centricity is achieved, as the service provider focuses on the specific needs of individual citizens when delivering services [7].

There is a direct correlation between the level of satisfaction of public service recipients and the quality of public service provision: as quality increases, satisfaction should also rise. According to the large psychological dictionary, satisfaction is a subjective assessment of the quality of various objects, living and working conditions, life in general, relationships with people, oneself, including self-esteem. A high degree of life satisfaction

[1] Federal Law No. 189 of 13 July 2020 "On the State (municipal) social order for the provision of state (municipal) services in the social sphere". URL: http://www.consultant.ru/document/cons_doc_LAW_357066/ (accessed on 11.11.2024).

[2] Pilot region — a region where the mechanisms defined by Law No. 189 were tested.

is evidently, what is referred to as happiness; a close construct is psychological (subjective) well-being.[3] The dependence of service quality on the satisfaction of its recipients is not always confirmed; often, satisfaction depends on whether the expectations of the public service recipient were met or not.

Accordingly, the same service, even of the same quality, will be characterized by varying degrees of satisfaction of needs among different consumers. In turn, the degree of satisfaction of these needs depends not only on the quality of the service received but also on the quality of service, which is one of the factors in shaping consumer welfare, as well as on the established level of their living standards.

In combination, well-being and standard of living form the quality of life, determining its style and image. Moreover, this process is cyclical: not only does the quality of services determine the quality of life, but the quality of life, as it grows, also determines new consumer demands for service quality, shaping new needs for services [8].

The evaluation of these parameters, including the satisfaction with the quality of services received by citizens within the framework of social orders, requires the application of sociological methods, which are increasingly used in budget expenditure management. This is because the sociological data obtained (both quantitative and qualitative) perform several important functions both in the budgetary sphere and in the interaction between government bodies and society. Sociological research ensures the receipt of: (a) feedback directly from recipients of social services in regions and municipalities, i.e., they ensure accountability and responsibility for activities and their results; (b) objective assessments of citizens' satisfaction with the quality, timeliness, and accessibility of the provided social services.

[3] Big psychological dictionary. URL: https://psychological.slovaronline.com/1870-UDOVLETVORENNOST (accessed on 11.11.2024).

METHODOLOGY AND RESEARCH METHODS

From February to May 2024, the Ministry of Finance of the Russian Federation, in collaboration with the Financial University under the Government of the Russian Federation and the Scientific Research Financial Institute of the Ministry of Finance of Russia, conducted a sociological study titled "Effectiveness of the implementation of State (municipal) services in the social sphere" in 37 subjects of the Russian Federation as one of the key sources for making managerial decisions [9, 10]. To carry out the research, the following tasks were completed:

1) representative samples of service recipients have been calculated and a mass survey of respondents has been conducted (n = 43 000);

2) databases have been created to collect primary information on citizens' satisfaction with the state (municipal) services provided in the social sphere;

3) focus group discussions were conducted with recipients of the pilot services (n = 15);

4) analysis and assessment of the level of citizen satisfaction with the state (municipal) services provided in the social sphere have been conducted.

The research methodology is based on an activity-phenomenological approach to studying the behavior and perceptions of Russians regarding state (municipal) services in the social sphere, as well as on general and special methods of scientific knowledge: empirical research methods (mass questionnaire survey, focus group discussions), current and prospective analysis of practical material, statistical analysis, and conclusion.

The research methodology included desk and field stages. The desk phase was implemented using the method of analyzing statistical data on the volumes and types of social services provided in the pilot regions. The informational basis of the study was primary sociological data. The collection of primary data during the field phase for

measuring service satisfaction was carried out using the following methods:

1) quantitative online survey of consumers of tested services in pilot regions and marker regions[4];

2) conducting focus groups with consumers of trial services in pilot regions and marker regions.

The object of the study is Russians who have received state (municipal) services in the social sphere.

The subject of the study — citizen satisfaction with social services as a social outcome of the implementation of state (municipal) services by non-governmental organizations in the social sphere.

The purpose of the study is to assess citizens' satisfaction with the services provided in the social sphere as a social outcome of the implementation of state (municipal) services.

The scope of application of the research results is state policy in terms of providing social support measures to citizens of the Russian Federation, specifically within the framework of the implementation of Law No. 189.

In the quantitative online survey of consumers of the tested services in the pilot regions, more than 43 000 people (direct service recipients or their close relatives) participated, with a planned sample size of approximately 33 500 people.

The calculation of consumer satisfaction indicators and the effectiveness of the implementation of activities conducted within the framework of testing social order mechanisms was carried out based on the Methodological Recommendations of the Research Financial Institute.[5]

Participants in the focus group discussions included social service recipients from 7 subjects of the Russian Federation: Krasnoyarsk, Leningrad, Moscow, Nizhny Novgorod, Novosibirsk regions, Perm, the Republic of Bashkortostan, the Republic of Komi, and Tyumen. In each focus group, up to 8 service recipients were interviewed.

RESEARCH RESULTS

According to the results of the study, the average satisfaction rating of the population with the social services received across all areas and regions provided by non-governmental organizations is at 4.54 points,[6] which is a high indicator on a 5-point scale. Considering the fact that from 2021 to 2023,[7] social services were provided to 13 758 thous consumers with a total financial support volume of 233.5 billion rubles, one can assert the high efficiency of budget expenditures on social services [11].

The average ratings are also calculated by areas of social services (*Fig. 1*).

The highest average satisfaction ratings were received for:

- social services: 4.64 points;
- creating favorable conditions for the development of the tourism industry: 4.57 points;
- promoting employment: 4.56 points.

Conversely, a lower average satisfaction rating was received for providing palliative medical care: 4.38 points.

When measuring the satisfaction of social service recipients, several indicators were used, which were then aggregated into an overall average rating for the service in a weighted manner. The indicators include:

[4] Marker region — a region where the mechanisms defined by Law No. 189 were not tested, but similar social state (municipal) services were provided, selected for comparison with the services of pilot regions.

[5] Methodological recommendations for calculating the effectiveness indicators of the implementation of activities carried out within the framework of the pilot testing of mechanisms defined by Federal Law No. 189 of 13 July 2020, "On the State (Municipal) Social Order for the Provision of State (Municipal) Services in the Social Sphere". URL: https://www.nifi.ru/images/FILES/Docs/Методические_рекомендации_ИТОГ.pdf (accessed on 11.11.2024).

[6] The results are presented on a scale from 1 to 5, where 1 means completely dissatisfied and 5 means completely satisfied.

[7] Excluding data on the direction "Implementation of additional educational programs" (excluding additional pre-professional programs in the field of arts).

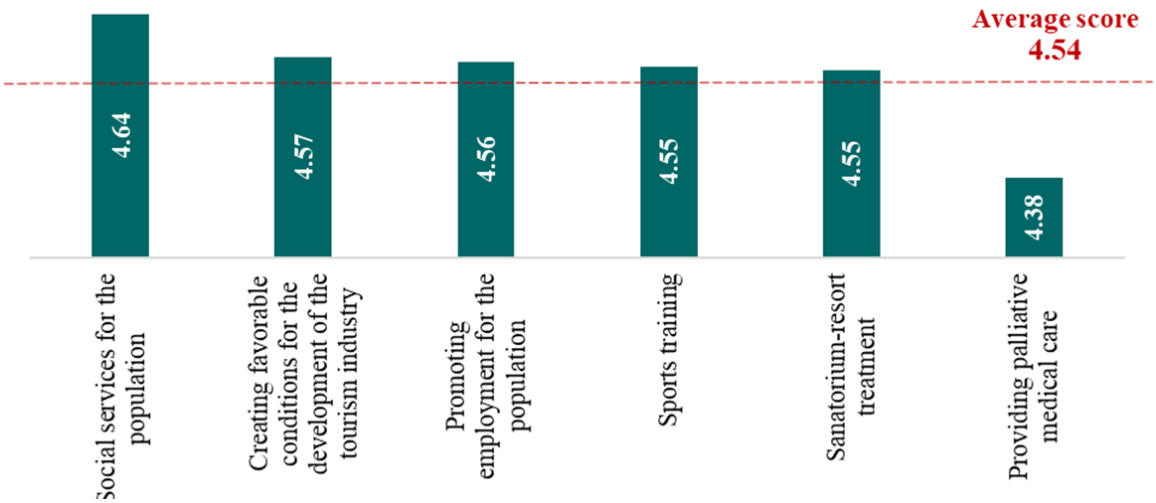

Fig. 1. **Assessment of Satisfaction for the Tested Social Services**

Source: Compiled by the authors based on the results of the study.

- satisfaction with the content of the service provided;
- satisfaction with the process of service delivery;
- satisfaction with the accessibility of the service;
- satisfaction with the results of receiving the service;
- satisfaction with the established fee for the service (in surveys for paid social services).

The average satisfaction ratings for individual indicators by areas of social services (*Table 1*) indicate that recipients are more satisfied with the results of receiving services (from 4.54 to 4.82 points depending on the service area). In second place is the satisfaction with the service delivery process (for four out of six social service areas):

- social services — 4.65 points;
- creating favorable conditions for the development of the tourism industry — 4.58 points;
- promoting employment — 4.54 points;
- sanatorium-resort treatment — 4.54 points.

In terms of sports training, in addition to satisfaction with the results, recipients are more satisfied with the accessibility of the service (4.53 points), while in palliative medical care, they are more satisfied with the content of the service (4.36 points).

The highest average ratings for the indicators were received for social services (except for satisfaction with the established fee for the service), while the lowest were for palliative medical care.

Satisfaction ratings are differentiated not only by services but also by subjects of the Russian Federation. Among the highest-rated services in the regions, the leaders, for example, were: organization of accompaniment with the assistance of employment for people with disabilities — 4.93 points (Kostroma region), social services in the form of home care (free) — 4.86 points (Moscow region), services for the development of Olympic sports (swimming) — 4.76 points (Perm region), social assistance for tuberculosis diseases — 4.75 points (Stavropol region), and many other services in various pilot regions.

Satisfaction ratings are differentiated by specific areas of services in the social sphere (*Table 2*). The highest average satisfaction rating was calculated for the profile "Tuberculosis diseases" — sanatorium-resort treatment (4.75 points), "Sports training (swimming)" — 4.73 points, "Social services for the population in the form of home care

Table 1

Average Satisfaction Ratings for Individual Indicators in the Areas of Social Services

Indicator	Social services for the population	Creation of favorable conditions for the development of the tourism industry in the constituent entities of the Russian Federation	Promotion of employment	Sports training	Sanatorium and resort treatment	Providing palliative care
Satisfaction with the content (terms/form of service provision)	4.57	4.42	4.53	4.45	4.47	4.36
Satisfaction with the accessibility of the service	4.57	4.51	4.53	4.53	4.52	4.33
Satisfaction with the results of receiving the service	4.80	4.82	4.66	4.79	4.68	4.54
Satisfaction with the service provision process	4.65	4.58	4.54	4.49	4.54	4.34
Satisfaction with the established fee for the service	4.46					

Source: Compiled by the authors based on the results of the study.

(free of charge)" — 4.70 points. And the lower (but still positive) ratings were in the area of employment assistance Vocational training and additional vocational education for individuals aged 50 and older, as well as pre-retirement age individuals.

To understand how the implementation of social ordering has affected satisfaction with services in the social sphere, a comparative study was conducted:

1) several services were selected in marker regions or marker services in pilot regions that are not provided under Law 189;

2) satisfaction with the received services was measured (1738 people were surveyed across five areas of social services).

The results are presented in *Fig. 2*. Overall, in a number of service areas, the level of satisfaction among recipients is higher for the tested services provided within the framework of social orders:

- sanatorium-resort treatment (4.55 points vs. 4.22);
- employment assistance (4.56 points vs. 4.33);
- sports training (4.55 points vs. 4.43).

Social services for the population are rated approximately at the same level, both for social orders and for state programs/tasks. Only the provision of palliative medical care is rated completely differently: satisfaction is higher with services not provided under the social order (however, the assessment is based on the opinions of an insufficient number of respondents, which makes it invalid).

In a focus group study, service recipients in pilot regions noted that they are satisfied with the introduction of the social certificate, which allows them to receive services free of charge. The social certificate expands opportunities for receiving social services and improves their quality through competition.

The noted by the study participants are:

- difficulties in obtaining the social certificate due to technical problems [2];

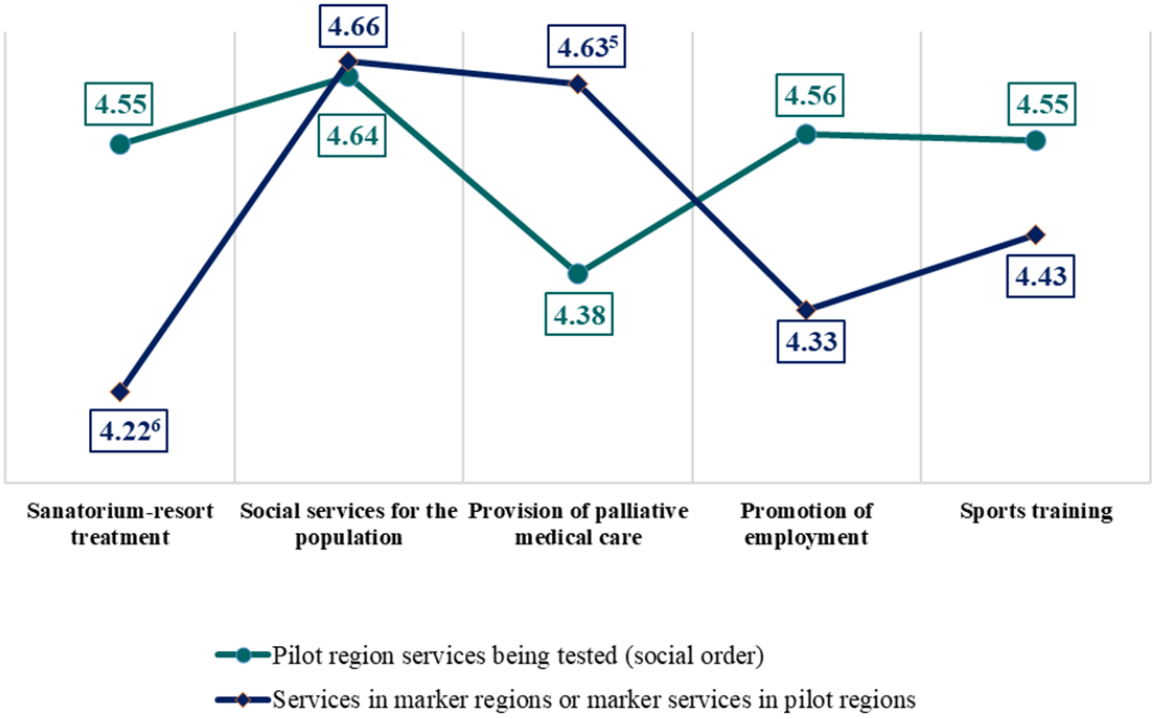

Fig. 2. **Satisfaction Assessments of Tested Social Services in Pilot and Marker Regions**

Source: Compiled by the authors on the results of the study.

- short duration of certificate use (currently six months);
- unclear regulations for its issuance;
- lack of a standard for interaction among all participants in the certificate service process [12].

As part of providing sports training services (basketball), the social certificate influences the choice of organization and increases the accessibility of training for citizens, and obtaining the certificate does not cause any difficulties.

Tourism service recipients noted a high level of organization; however, there are technical difficulties with certificate issuance and issues with technical support.

In the area of employment assistance, respondents highlighted the practical orientation of the classes, the competence of the instructors, and the high level of organization, but at the same time, not all respondents were able to easily find employment in their field of study.

As part of the provision of social services in the form of home care, recipients are satisfied with the quality and process of service delivery, while noting the insufficient level of information about changes or alternative options for obtaining non-governmental services.

The social services provided in a semi-stationary form fully meet expectations, and requests for the purchase and delivery of medicines and products are fulfilled in a timely manner and according to needs.

Focus group participants in the context of providing palliative medical care services noted that it is delivered with the necessary regularity and in full, and they are satisfied with the service provider.

Table 2

Assessment of Satisfaction with Tested Social Services in the Context of Narrow Areas of Services

No.	The direction of the service	Satisfaction, points
1	**2**	**3**
1	**Creating favorable conditions for the development of the tourism industry in the subjects of the Russian Federation**	**4.57**
2	**Sanatorium-resort treatment**	**4.55**
	Central nervous system dysfunction	4.69
	Non-tuberculous respiratory organsepa	4.49
	Somatic diseases	4.55
	Circulatory system	4.34
	Tuberculosis diseases	4.75
3	**Social services for the population**	**4.64**
	In-home (free of charge)	4.70
	In-home service (paid)	4.68
	In a semi-stationary form (free of charge)	4.56
	In a semi-stationary form (paid)	4.44
4	**Provision of palliative medical care**	**4.38**
	Outpatient	4.37
	Outpatient at home by visiting nursing teams	4.36
	Inpatient	4.43
5	**Promotion of employment**	**4.56**
	Organization of vocational training and additional professional education for unemployed citizens, including training in other locations	4.58
	Organization of vocational training and additional professional education for women on maternity leave with children under three years old	4.52
	Organization of support for the employment of people with disabilities	4.69
	Vocational training and additional professional education for individuals aged 50 and older, as well as for pre-retirement age individuals	4.25
6	**Sports training**	**4.55**
	Chess	4.59
	Equestrian sports	4.56
	Skating	4.35
	Swimming	4.73
	Martial arts (judo, taekwondo, wrestling)	4.62
	Basketball	4.26
	Tennis	4.51
	Football	4.58
	Gymnastics (artistic, rhythmic)	4.57

Source: Compiled by the authors based on the results of the study.

CONCLUSION

The comprehensive sociological study conducted allowed for the evaluation of the results of the implementation of Law No. 189 from both quantitative and qualitative perspectives. In particular:

1. A satisfaction rating of citizens with social services across all areas has been obtained, which amounted to 4.54 out of a possible 5, indicating a high level of satisfaction. The highest ratings were received for social welfare services (4.64 points), while the lowest ratings were recorded for palliative medical care (4.38 points). The average satisfaction rating of the population with the social services received varies not only by the types of services provided but also by each specific service depending on the region.

2. The attitude of Russians towards the mechanism of the social electronic certificate has been studied, which allows using the service on a free-of-charge basis, significantly expanding the possibilities for receiving social services and improving their quality due to competition among organizations. However, the following weaknesses of the social certificate were noted: a short period of use, unclear registration procedures, the absence of a standardized regulation for the interaction of all participants in the process of obtaining services through the certificate, and the emergence of difficulties in registration due to technical features or insufficient website capacity.

3. At regional dialogue platforms, the Ministry of Finance of Russia organized a discussion of the research results, which contributed to identifying the strengths and weaknesses of the new mechanism for providing public services and jointly developing solutions by representatives of regional ministries and departments, representatives of the Ministry of Finance of the Russian Federation, the Scientific Research Financial Institute of the Ministry of Finance of Russia, and researchers from the Financial University.

The data from the sociological study formed the basis for the discussion and development of the bill expanding the scope of Law No. 189 to the entire territory of the Russian Federation. 29 October 024 the State Duma of the Russian Federation has passed a bill in the first reading, which proposes the nationwide implementation of social orders starting in 2025. The document extends the scope of the social order to six social spheres without restrictions: healthcare, social services, education, employment, physical culture and sports, tourism.

The results of the research confirmed the demand for the tool among executive authorities and service providers, and most importantly, demonstrated an increase in citizen satisfaction with the volume and quality of the services they receive through budgetary funds.

The results of the comprehensive study allow us to conclude the feasibility of conducting an annual sociological monitoring of consumer satisfaction levels in the social services sector, including it in the emerging budget monitoring system in the Russian Federation [13].

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Authors' declared contribution:
A. M. Lavrov — formulation of the problem, development of the concept of the article, critical analysis of the literature.
S. P. Solyannikova — analysis of the research results, development of conclusions.
A. G. Tyurikov — conducting a sociological study, processing and analyzing the data obtained.

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Impact of Sanctions on Industry Indices

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ABSTRACT

Anti-Russian sanctions have an additional impact on Russian companies. Due to the rapid change in the situation and the development of information situations, it is becoming difficult for investors to make investment decisions. This determines the relevance of the study, the **purpose** of which is to determine the impact of information about sanctions on stock indices of lower industries. The empirical basis for the study of indicators includes 67 thousand news items from the Interfax platform for 2014–2023. The following were used as control measures: the price of Brent oil futures, the dollar-ruble exchange rate, and the RUONIA benchmark interest rate. The indices of MOEKEU (electric power industry), MOEKS (chemistry and oil chemistry), MOEKOG (oil and gas) are considered. All data were obtained for the period from 01.01.2014 to 31.12.2023. The research methodology is based on mathematical modeling using the BERTopic topic modeling algorithm. Four main topics of sanctions were identified: "Anti-sanctions policy and sanctions evasion", "Western sanctions", "Sanctions against industry-specific companies", "Financial market". The impact on industry indices was assessed using the random forest algorithm and GARCH analysis. It has been proven that sanctions have less impact on the indices of those industries that are sufficiently autonomous in Russia. Investors pay attention to entrepreneurial topic, and not to the sanctions rhetoric. Negative information can lead to their irrational behavior. The period of maximum impact of sanctions was also determined: a month from the date of release of information about the introduction of sanctions. As a result, the following **conclusions** were made: 1) when referring to industry indices, not all news about sanctions is taken into account, as are messages on the topic of manufacturers, taking into account industry specifics; 2) for the index of the chemical and petrochemical sector of the greatest initiative, which has an anti-sanction policy index; 3) the energy plumbing sector is less developed. The results of the study can be useful for determining investment directions.

Keywords: sanctions; text analysis; news feeds; econometric modeling; exchange rate

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INTRODCUTION

Domestic and foreign researchers assess the impact of sanctions on the economies of countries. It is consider that sanctions can have a demonstrative, preventive, or punitive effect and can be implemented using tools such as asset freezing, embargoes, export and import restrictions, travel bans, suspension of economic agreements, blocking, and termination of foreign aid [1]. In the study by foreign authors E. Gibbons and R. Garfield [2], it is demonstrated that sanctions negatively impact the economy of the target country, leading to a decrease in income, an increase in unemployment, higher child mortality rates, and a reduction in life expectancy [3]. Researchers A. Fuchs and N.-H. Klann [4] also share the same opinion. Having studied the sanctions against China, they identified their impact on trade flows in terms of the reduction of machinery and transport equipment exports.

A number of authors also believe that sanctions affect exchange rates and can be the cause of currency crises. D. Peksen and B. Son [5] analyzed panel data from several countries for the years 1970–2005 and proved that sanctions worsen the financial stability of the targeted countries. Sanctions affect the exchange rate and provide an additional opportunity for currency speculation by currency traders, creating additional risks. Sanctions also affect the economic growth of the targeted country. Authors K. Ohyun et al. [6], based on the analysis of 1101 sanctions from 1950 to 2019, found that they lead to a 0.39% reduction in the current level of GDP per capita. Regarding the special military operation, the introduction of sanctions against Russia has had negative consequences not only on its financial market but also on the entire global economy, as Russia plays a key role in such important sectors as metals and energy resources. The topic of the research is relevant.

The purpose of the research is to assess the impact of news about sanctions on the Russian stock market, taking into account industry specifics. Despite the popularity of this topic, the empirical assessments of the impact of sanctions presented in domestic and foreign studies differ. Our research contributes to the existing theoretical and empirical literature in the following areas:

1. Firstly, we are contributing to the literature on behavioral finance by assessing the impact of investors' expectations about sanctions on stock markets. We also test the theory of market efficiency. If news about sanctions affects the stock markets, then the market is inefficient, and this information can be used in the formation and management of investment portfolios, risk hedging, etc.

2. Extensive literature is dedicated to examining the impact of global shocks on financial markets, while few studies assess the impact of sanctions.

3. In our study, we evaluate news about sanctions based on the application of machine learning, unlike researchers where news about sanctions is selected through expert methods (see, for example, the work of V.V. Rychkov [7]). The empirical dataset includes 67 thousand news articles from the Interfax platform for the years 2014–2023.

4. In our study, unlike previous authors (see, for example, E. Fedorova et al. [8], V.V. Rychkov [9]), who form general sanction indices based on the number of publications on this topic, we form indices on individual sanction topics.

5. We apply the BERTopic thematic modeling algorithm [10], which identified 4 main themes of sanctions: anti-sanction policy and evasion of sanctions, Western sanctions, sanctions against companies, industry-specific, financial market.

6. Our research makes a significant contribution to the existing literature on asset pricing during periods of economic uncertainty. Our research makes a significant contribution to the existing literature on asset pricing during periods of economic uncertainty. We have proven that investors pay attention only to specific topics related to sanctions, rather than the general rhetoric about sanctions. This observation aligns with the assumption

that negative information about sanctions can lead to irrational behavior among investors. Thus, during times of geopolitical tension, the behavioral aspects of market participants play a key role.

LITERATURE REVIEW

As for the impact of sanctions on the financial market, all studies can be conditionally divided into several blocks: the impact on the financial activities of companies and the impact on the stock market.

Let's consider the first block related to the activities of domestic companies. The sanctions imposed against Russia were directed at specific enterprises, certain types of commercial transactions, and export-import flows. The sanctions affected both domestic and foreign companies; however, many of them did not fulfill their publicly announced commitments to exit the Russian markets. For example, according to KSE (2022)[1] as of 10 August 2023, out of 3 390 enterprises, only 265 companies have completed their exit from Russia. Many companies increased their sales in Russia after initially suspending them in early 2022 [11].

The issues of the impact of sanctions on the financial activities of companies have been raised repeatedly in domestic and foreign literature. Sanctions affect the company's supply chain, production costs, competitiveness, and profitability [12], as well as the international activities of companies by restricting market access, which can lead to companies exiting the market or reorganizing. It has also been found that the impact of sanctions depends on the size of the firm and the industry in which it operates.

Let's consider the second block related to the impact of sanctions on the stock market. The markets of developing countries, which include Russia, have high volatility and sensitivity to a multitude of various internal and external shocks, which, in turn, are largely determined by the level of institutional development, geopolitical tension, structural imbalances, low levels of diversification of the national economy, and macroeconomic policy. Western sanctions represent one of these shocks, capable of causing significant changes in the prices of financial assets due to direct restrictions imposed on specific entities, as well as the overall increase in country risk.

In most studies, sanctions are considered major exogenous shocks, and their impact on the Russian stock market is well-documented in both domestic and foreign literature. A. Ankundinov et al. [13], based on statistical analysis of the domestic stock market, proved the change in distribution regarding the heavy tails during the sanctions period. The author explains this by higher country risks due to geopolitical tensions, as well as oil price volatility. Whatever the reason, any increase in heavy tails can have serious consequences for corporate governance, economic modeling, and financial stability analysis.

Sanctions can affect not only the stock market of the target country but also global stock markets. Unlike countries such as Iran, Venezuela, and North Korea, which have previously been subjected to unilateral U.S. sanctions, Russia plays an important role in the global economy and food security, as it is one of the largest exporters of energy resources and food in the world. Sanctions against Russia have led to increased volatility in the global stock market [14] and a decrease in its efficiency [15].

Sanctions can affect the correlation of the stock market with other domestic financial markets. The impact of sanctions on the interdependence and integration of Iranian financial markets from July 2013 to May 2021 was studied using a wavelet approach [16]. The integration of the stock market with the exchange rate and the price of gold has been identified, which is strengthening

[1] News website Alarabiya news. URL: https://english.alarabiya.net/business/2022/05/31/Over-1–000-foreign-companies-left-Russia-since-Feb-24-Report (accessed on 02.08.2024).

in the long term. The greatest influence on the interdependence of financial markets in the short and medium term is related to the exchange rate and the price of gold; the integration of financial markets has increased since 2016.

The next aspect concerns the impact of news on the stock market. According to the efficient market hypothesis, it is assumed that stock prices do not depend on investor sentiment, as investors tend to be rational, and securities quickly incorporate all publicly available information into their prices [17, 18]. On the contrary, behavioral theories suggest that investors may act irrationally due to emotions when making decisions [19]. These emotional reactions can intensify when reading negative information about sanctions. There are a number of empirical studies on the impact of news about sanctions on stock markets. V.V. Rychkov [7] evaluates the impact of news about sanctions on the stock market, examining news about plans to impose sanctions, their actual implementation, and the subsequent reactions of the currency, stock, and credit markets in the Russian Federation to these events. The hypothesis that the news about sanctions and plans for their implementation have a negative impact and are a driving force in the market, regardless of their actual implementation, has been confirmed. The authors T.V. Teplova et al. [20] assess the impact of investor sentiment on social networks on the stock market characteristics of the Russian market and identify nonlinear effects. The main conclusion is that sentiment can be considered an explanatory factor in pricing and trading activity.

Based on the literature review, it was found that news about sanctions should affect the Russian stock market. We test this hypothesis in the following sections of the study.

DATA DESCRIPTION

To obtain the index dictionary and conduct the analysis, we collected news headlines from 2014 to 2023, focusing on the Interfax platform. In total, we uploaded 67thous. texts from the economics section, with their exact distribution by year presented in *Fig. 1*.

The number of publications over the past three years has sharply increased, which is related to the rise in the number of sanctions imposed against Russia.

RESEARCH METHODOLOGY

When global significant events occur, such as the imposition of sanctions, they are reflected in news publications. The more relevant the topic and the more serious the issue, the more frequently it will be mentioned. Thus, compiling an index of topic coverage based on news publications allows one to assess, for example, the index of sanction and anti-sanction activity over a specific period of time. In particular, this allows for the identification of the relevance of a topic or several related subtopics. The calculation of this index is carried out using the bag-of-words method. It has proven to be effective in this task, thanks to its transparency and efficiency. Based on it, information is extracted from textual data, transforming it into numerical data that can not only be visualized but also subjected to mathematical modeling.

To obtain the index of coverage for a specific topic, it is necessary to use a specially created dictionary for it, where each word is related to the research topic. The collection of words forms a dictionary, after which it is necessary to count how many times the words from this dictionary appear in the text. Such dictionaries exist for various fields, for example, for assessing risk levels [21].

Dictionaries are compiled to some extent using an expert method, meaning that an expert selects terms and optimizes their composition. However, various methods can be used to optimize the process of selecting terms, such as frequency analysis of words or correlations with a keyword (based on the frequency of co-occurrence). This approach is often used in scientific research, where it is necessary to analyze textual information.

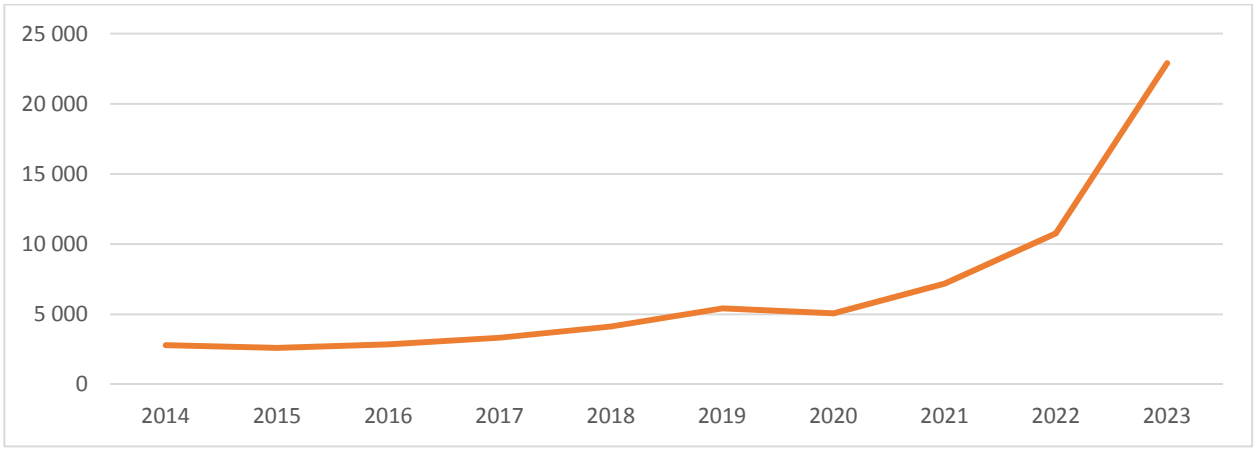

Fig. 1. **Dynamics of Texts about Sanctions in the Interfax News Portal**

Source: Author's calculations.

However, on their own, they can only help the expert identify key terms and decide whether they are needed in the dictionary. As for our research topic, in the work of E.A. Fedorova et al. [22], crisis and sanctions indices were compiled using a large corpus of texts by a linguist-expert. However, specific sanction topics were not identified there, and the topics were somewhat different, which is why this method is not suitable for the current study.

The next method involves topic modeling, usually LDA Latent Dirichlet allocation). This method allows for the identification of implicit thematic groups in a corpus of texts and the extraction of a specified number of topics. This method is not always effective on a large corpus of texts with a wide range of topics, so we use a more advanced method based on the BERT transformer network. He uses topic modeling with consideration of text semantics and is effective in topic separation. BERTopic automatically determines the number of topics in the text and highlights the frequency of words in each topic. Studies comparing various topic modeling methods show that this algorithm produces the most consistent results without topic repetitions and with a logical division of texts by topics [23]. This method automatically determines the number of topics, which reduces the need for manual tuning; we used it in our study.

The analysis of the received corpus of news related to sanctions using the BERTopic algorithm identified 219 topics. The analysis of their composition, combined with the expert method, allowed for the identification of four main themes of sanctions: anti-sanction policy and circumvention of sanctions, Western sanctions, sanctions against companies, industry-specific, financial market. Such division allows us to extract key information about sanctions, which we can obtain through dictionary analysis. Such an approach is typical when constructing index dictionaries [24]; moreover, we followed the recommendations of A.F. McKenny et al. [25] and manually analyzed the contextual usage of certain words and phrases to mitigate potential errors. The index dictionary will consist of a simple set of words or phrases for each topic, as like other similar dictionaries. The topics contain words and phrases, and our division allows us to highlight the most important subtopics in the news, which can be extracted when analyzing the bag of words, ignoring the semantic connections in the text. The results of the study are presented in *Table 1* (all words are given in their base form in lowercase).

Besides individual indices, we also calculate the overall sanction index by summing the assessment results of the four parts of the index.

The obtained news texts were preprocessed using the standard method for text analysis:

Table 1

Developed Methodology of Sanctions Indices on Individual Topics

Sanctions Indexes	Words
Anti-sanction policy and circumvention of sanctions	Anti-Russian, threat, Western, Western sanctions, imposition of sanctions, import substitution, parallel import, Chinese brand, Chinese energy resources, Chinese supply, China support, China cooperation, support Russian, support manufacturer, support project, domestic development, domestic analogue, domestic manufacturer, subsidy development, circumvent sanctions, Russia partnership, partner Russia
Western sanctions	Sanction, sanctions list, sanctions package, new sanction, European Union against, European Union discussing, leaving Russia, contract exit, leaving the market, America against
Sanctions against companies, industry specifics	Russian airplane, airline, import ban, flight ban, Russian oil, Russian gas pipeline, Russian gas, Russian energy resources, energy resources export, energy resources supply, company sanctions, sectoral sanctions, import ban, export ban

Source: Author's calculations.

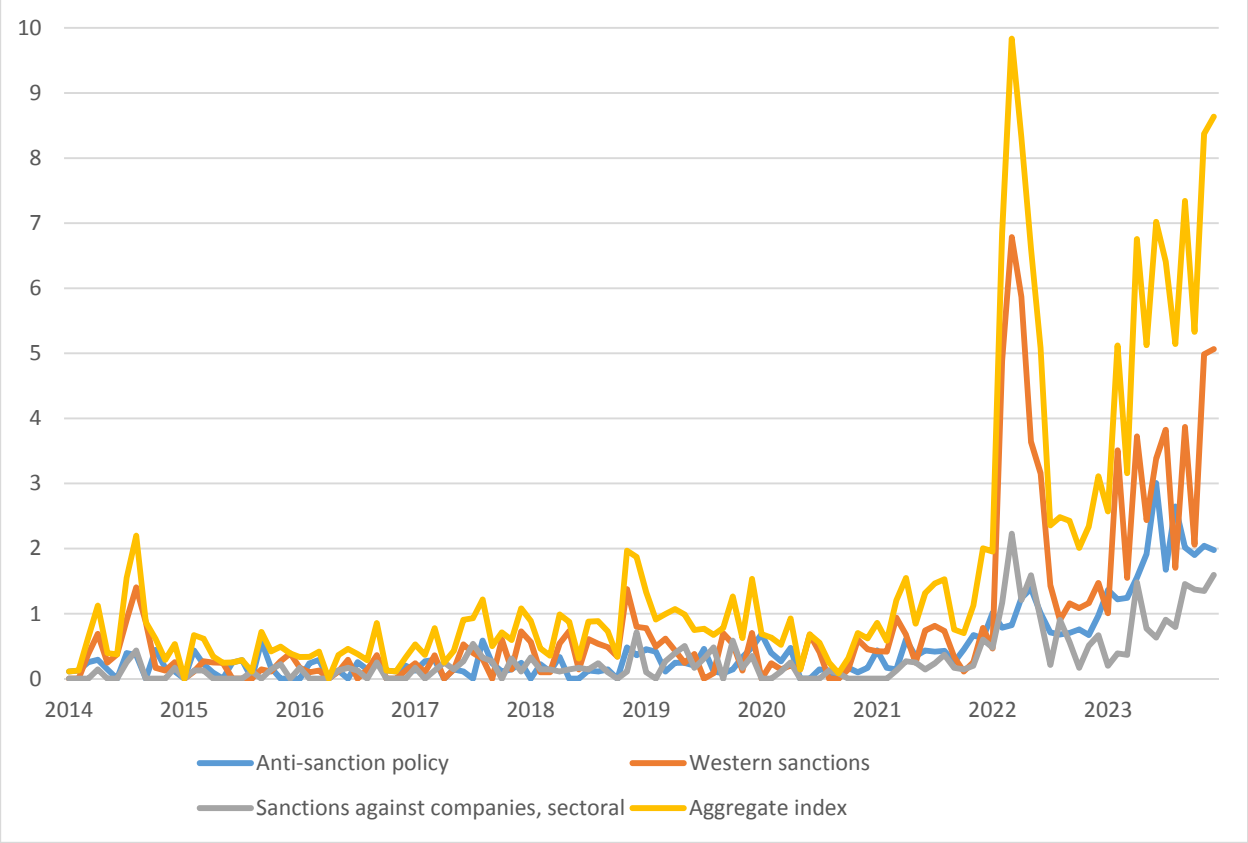

Fig. 2. **Dynamics of Sanctions Indices on the Interfax News Portal**

Source: Author's calculations.

Table 2

Descriptive Statistics

Title	mean	min	max	std	kurtosis	skewness
MOEXEU	1645.2	797.54	2292.4	452.68	−0.4962	−1.0839
MOEXCH	18709	6232.9	39483	9259.1	0.9134	−0.2747
MOEXOG	6158.1	3216.8	9558.2	1688.3	0.1241	−0.9855
Brent	67.992	18.378	122.42	21.858	0.4241	−0.3517
USD-RUB exchange rate	65.173	33.929	97.96	12.864	−0.3103	0.9795
RUONIA	8.5429	3.9961	19.36	3.0122	1.0901	1.4188
Anti-sanction policy	0.4530	0	3.0063	0.5711	2.2272	5.2375
Western sanctions	0.8514	0	6.7841	1.3094	2.5749	6.4818
Sanctions against companies and sectoral	0.2974	0	2.2265	0.4136	2.2435	5.3523
Aggregate index	1.6019	0	9.8341	2.1334	2.2061	4.0492

Source: Author's calculations.

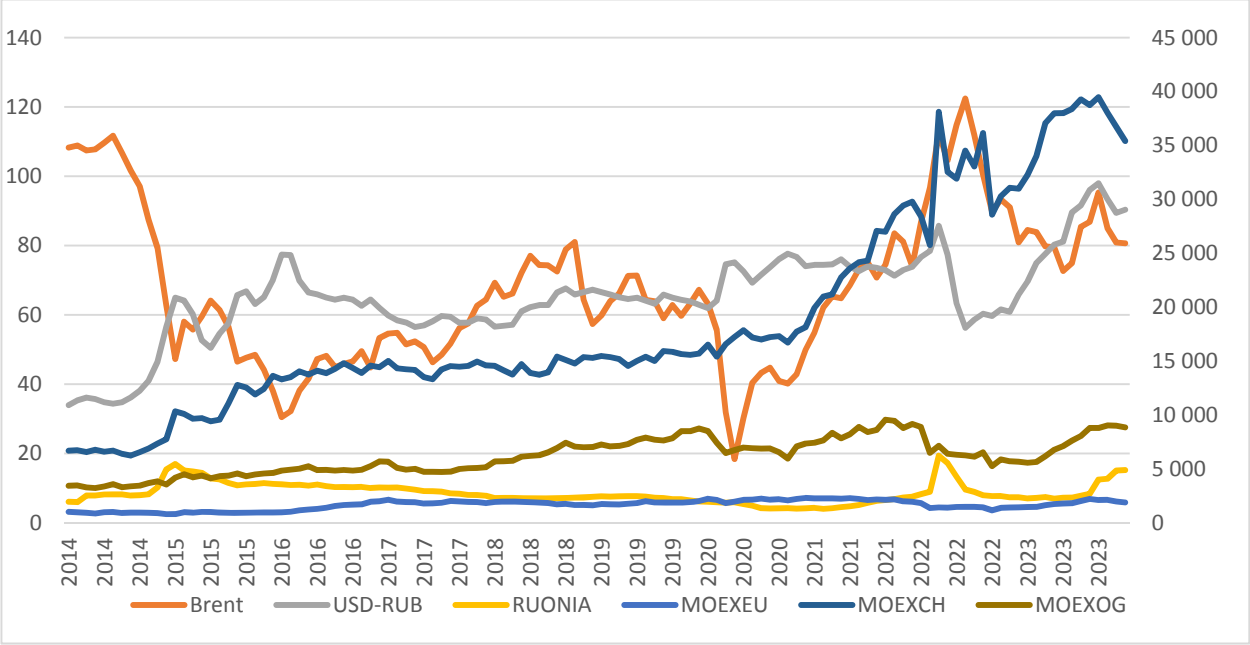

Fig. 3. **Dynamics of Fundamental Economic Indicators**

Source: Author's calculations.

Note: The price of Brent oil, the RUONIA rate, and the USD-RUB exchange rate are plotted on the main axis, while the sectoral indices of the Moscow Exchange are plotted on the auxiliary axis.

numbers and special characters were removed, and stop words (pronouns, prepositions, and other elements of the language that do not carry meaning by themselves) were removed using a dictionary. Next, the texts are broken down into arrays of individual words (tokenized) and lemmatized (returned to their original word forms).

With the help of the texts, an index dictionary was formed, based on which monthly indices were obtained by summing the indices of all individual texts for the month.

Table 3

Testing the Stationarity of Time Series

Time Series	Statistics	p-value	Lag
	Initial data in levels		
USD-RUB	–2.011	0.282	2
Brent	–2.64	0.088	1
RUONIA	–2.086	0.25	0
MOEXEU	–1.617	0.47	0
MOEXOG	–1.425	0.57	0
MOEXCH	0.1247	0.96	6
	Transformed data		
USD-RUB (log — profitability)	–7.546	0.0	1
Brent (log — profitability)	–8.353	0.0	1
RUONIA (increment)	–9,119	0.0	0
MOEXEU (increment)	–10.25	0.0	0
MOEXOG (increment)	–11.383	0.0	0
MOEXCH (increment)	–16.193	0.0	0

Source: Author's calculations.

Note: The null hypothesis of the ADF test is the presence of at least one unit root in the model with a constant and a trend.

The index itself represents the ratio of the total number of words in the dictionary to the total number of words in the text. Thus, the length of the texts does not matter; it is important only for the words from the vocabulary that reflect the theme. Daily indices fluctuate significantly, and sometimes news doesn't come out, so such information is too noisy. That is why we grouped the data by months, obtaining aggregated charts that accurately reflect the index dynamics. In *Fig. 2*, we presented the dynamics of the indices for the period 2014–2023.

The graph shown in *Fig. 2* indicates that the indices sharply increased in the first half of 2020, after which they slightly declined but then sharply increased again from 2023. Moreover, the growth of the index is not proportional to the increase in the number of publications in Interfax. Thus, the number of publications in 2022 only slightly increased, while the indices showed a record value. Peaks are also noticeable in 2014, when the first sanctions were introduced, and at the end of 2018, when another major package of sanctions from Europe and the US was imposed (the official reason was the Skripal poisoning incident). However, the main increase in indices is associated with the start of the special military operation, when many countries imposed sanctions and companies ceased doing business in Russia.

Regarding the differences in the parts of the index, it can be noted that, quite expectedly, the Western sanctions index, which covers

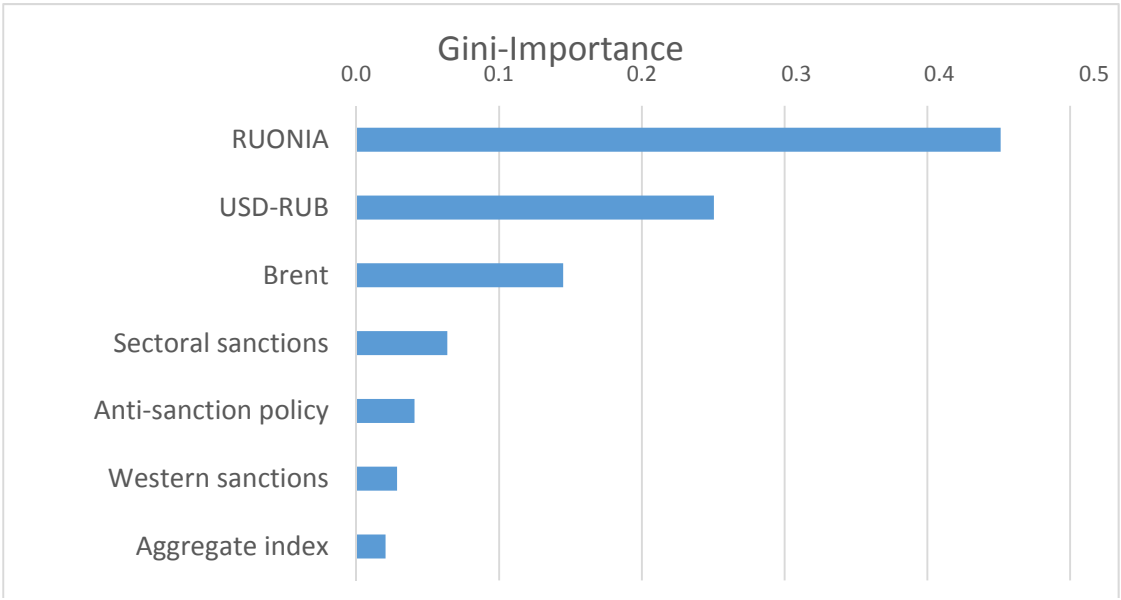

Fig. 4. **Significance of the Random Forest Model for the Dependent Variable MOEXEU (Electric Power Industry)**

Source: Author's calculations.

sanction packages and sanctions in general, predominates for most of the period. However, in some cases, it is evident that the index of anti-sanction policies and methods of circumventing sanctions exceeds it in certain months. Such cases exist both during the calm period between 2015 and early 2022, and during the new peak in 2023.

Russia has been preparing for new sanctions throughout the entire period and is looking for ways to circumvent them. Cooperation with China is being established, the development of domestic production is being subsidized, and an import substitution policy is being implemented. In some cases, it can be observed that the jump in the anti-sanction index occurs in the month following the jump in the main sanction index.

Also, a narrower and more specific index of sanctions against companies and industries, which is harder to distinguish from news headlines, sometimes exceeds the anti-sanction index. Overall, many Western sanctions are aimed at making it impossible for Russian companies to operate or cutting off their sales markets, which forces them to seek other markets.

The obtained indices are used in our further calculations.

CONTROL VARIABLES AND DESCRIPTIVE STATISTICS

To achieve the research objective, additional data were collected to form the research database. In particular, we added several important market indicators: the Brent crude oil futures price, the USD-RUB exchange rate, and the benchmark interest rate RUONIA [26]. We also used the sectoral indices of the Moscow Exchange (market capitalization-weighted composite price indices that include the most liquid indices of large Russian companies in a specific sector). We are considering the MOEXEU (electric power), MOEXCH (chemistry and petrochemistry), and MOEXOG (oil and gas) indices. We chose these indices because sanctions were imposed on these sectors.

All data was obtained for the period from 01.01.2014 to 31.12.2023 as it became available (trading on the exchange does not occur daily). To reduce data noise, we aggregated the indicators by month. *Table 2* presents the descriptive statistics of the collected empirical data and the index calculations.

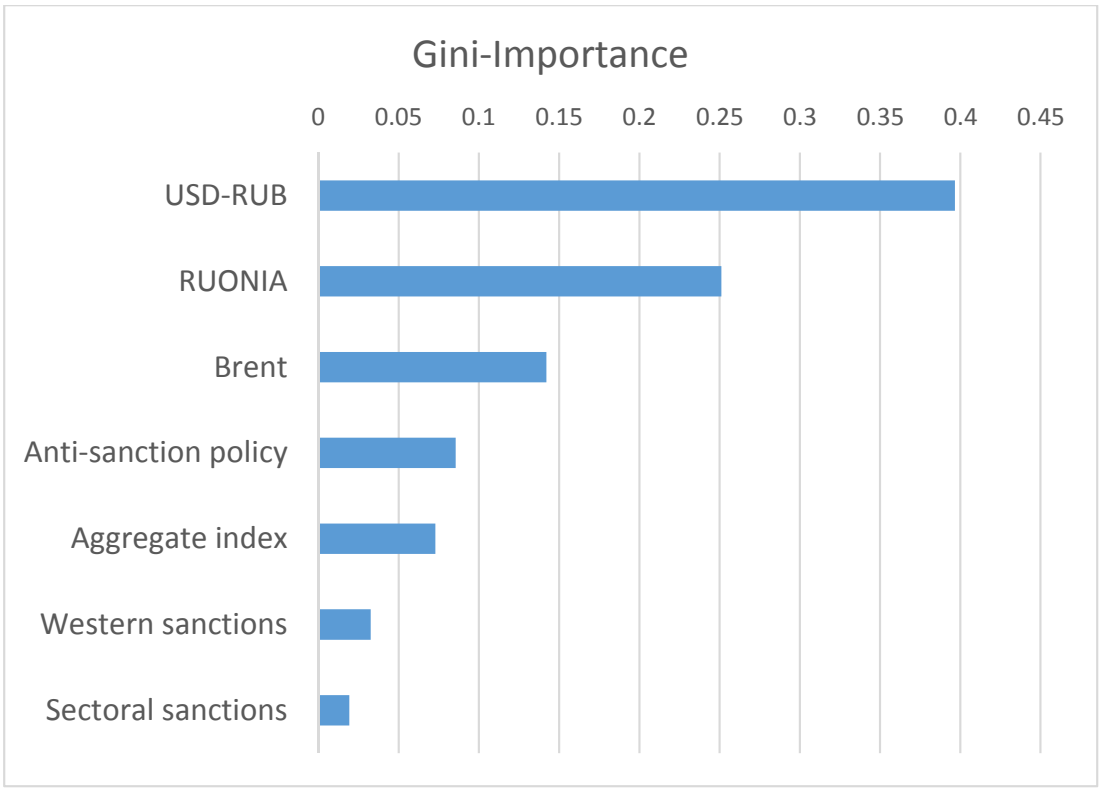

Fig. 5. **Significance of Random Forest Model for Dependent Variable MOEXOG (Oil and Gas)**

Source: Author's calculations.

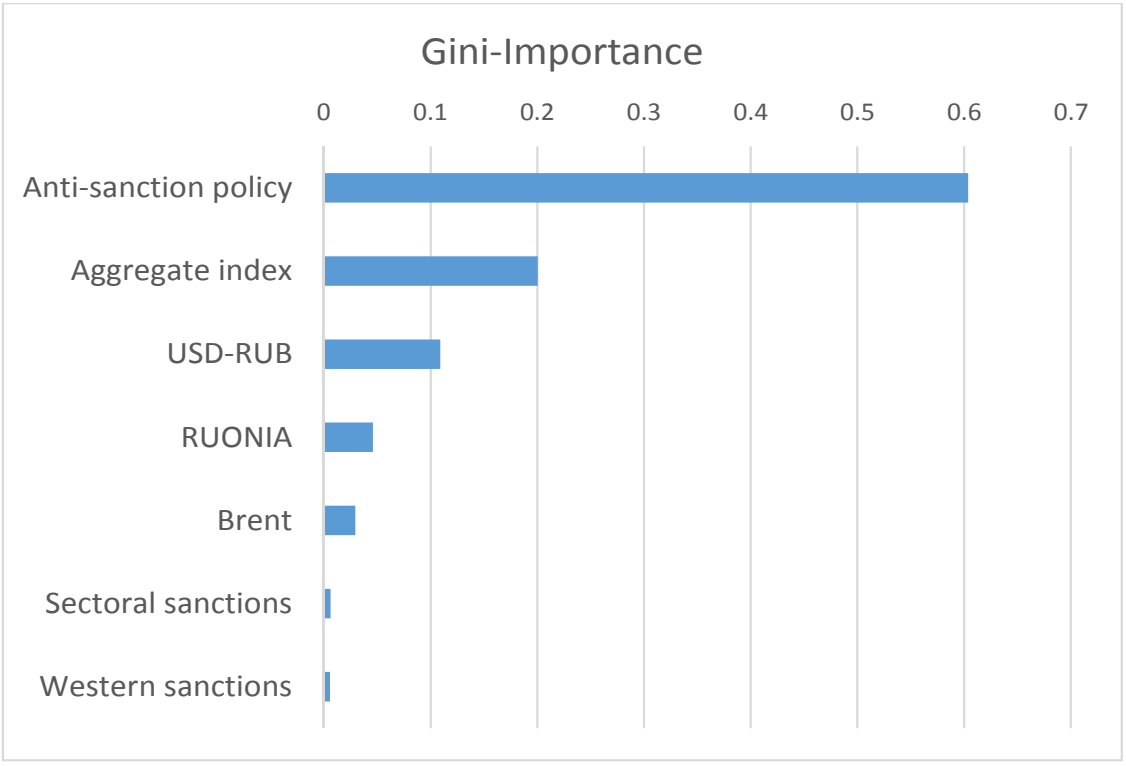

Fig. 6. **Significance of the Random Forest Model for the Dependent Variable MOEXCH (Chemistry and Petrochemistry)**

Source: Author's calculations.

Table 4

Results of Modeling the Impact of the Sanctions Index on MOEXEU (Electric Power Industry) in the Period from 01.01.2014 to 31.12.2023

Parameter	Sanctions indices			
	Anti-sanctions policy	Western sanctions	Sanctions against companies and sectorals	Aggregate index
Control economic variables				
USD-RUB (log — profitability)	901.1475*** (47.74111)	890.8900*** (38.25263)	897.0055*** (43.67303)	930.9593*** (46.46100)
Brent (log — profitability)	−111.8734** (48.58405)	−132.6377*** (44.07817)	−95.24765*** (46.14416)	−185.2012*** (50.57365)
RUONIA (increment)	−808.2726*** (58.61007)	−714.3464*** (65.30440)	−840.7698*** (39.07445)	−693.3575*** (70.43469)
Sanction indices				
Anti-sanction policy	−33.49382 (26.70509)			
Western sanctions		−25.16213* (14.29834)		
Sanctions against companies and sectorals			71.12051* (44.63939)	
Aggregate index				−13.00078 (9.601980)
GARCH-component coefficients				
C(5)	3.634336* (2.146151)	4.226743** (2.198161)	3.622536 (2.865369)	3.480297 (2.530251)
C(6)	1.508886*** (0.429179)	1.723809*** (0.523267)	1.473717*** (0.550287)	1.552271*** (0.490892)
C(7)	0.200895 (0.312448)	0.042062 (0.332808)	0.157286 (0.330347)	0.110365 (0.321029)
C(8)	0.542683*** (0.208685)	0.472001** (0.222364)	0.546734** (0.285438)	0.555758* (0.247908)
Model parameters				
LL	−821.9192	−823.2447	−821.2940	−823.5356
AIC	13.83199	13.85408	13.82157	13.85893
R-square	0.557641	0.572343	0.595469	0.562380

Source: Author's calculations.

Note: Statistical significance levels: *** — 1%, ** — 5%, * — 10%. Standard errors of the model coefficients are given in brackets. LL is the value of the logarithm of the likelihood function, AIC is the value of the Akaike information criterion.

Table 5

Results of Modeling the Impact of the Sanctions Index on MOEXOG (Oil and Gas) in the Period from 01.01.2014 to 31.12.2023

Parameter	Индексы санкций / Sanctions indices			
	Anti-sanctions policy	Western sanctions	Sanctions against companies and sectorals	Aggregate index
Control economic variables				
USD-RUB (log — profitability)	2730.395*** (127.5648)	2537.247*** (113.9950)	2688.612*** (116.1094)	2338.431*** (101.1711)
Brent (log — profitability)	−525.8164*** (123.2459)	−207.3462*** (114.8457)	−335.4771*** (102.2422)	224.1608* (102.1719)
RUONIA (increment)	−1793.879*** (127.7124)	−2084.143*** (112.7235)	−2147.060*** (119.1719)	−2438.219*** (98.93623)
Sanction indices				
Anti-sanction policy	519.3574*** (62.37387)			
Western sanctions		256.8964*** (48.47482)		
Sanctions against companies and sectorals			627.3140*** (130.0767)	
Aggregate index				264.4916*** (26.28771)
GARCH-component coefficients				
C(5)	3.003035 (2.156234)	1.961728 (2.371910)	2.443719 (2.143780)	3.239521 (2.122776)
C(6)	1.528662*** (0.430699)	1.889106*** (0.456189)	1.598831*** (0.496932)	1.583778*** (0.432544)
C(7)	0.229535 (0.267486)	0.241711 (0.272047)	0.334749 (0.252163)	0.184365 (0.249036)
C(8)	0.674840*** (0.145558)	0.722171*** (0.176446)	0.702947*** (0.150638)	0.651808*** (0.166266)
Model parameters				
LL	−974.5009	−963.7775	−964.8807	−963.8472
AIC	16.37502	16.19629	16.21468	16.19745
R-square	0.447908	0.418523	0.400153	0.579805

Source: Author's calculations.

Note: statistical significance levels: *** — 1%. Standard errors of the model coefficients are given in brackets. LL is the value of the logarithm of the likelihood function, AIC is the value of the Akaike information criterion.

Table 6

Results of Modeling the Impact of the Sanctions Index on MOEXCH (Chemicals and Petrochemicals) in the Period from 01.01.2014 to 31.12.2023

Parameter	Sanctions indices			
	Anti-sanctions policy	Western sanctions	Sanctions against companies and sectorals	Aggregate index
Control economic variables				
USD-RUB (log — profitability)	9998.333*** (289.2095)	10247.30*** (161.4734)	7806.470*** (38.59788)	7239.551*** (0.093723)
Brent (log — profitability)	−3401.454*** (189.6655)	−3487.287*** (173.5635)	−2735.645*** (212.6610)	−2456.844*** (1.386198)
RUONIA (increment)	−6279.372*** (349.5061)	−6558.308*** (231.9398)	−3930.111*** (357.3548)	−3380.176*** (38.71707)
Sanction indices				
Anti-sanction policy	1378.464*** (406.3960)			
Western sanctions		36.28521 (183.7713)		
Sanctions against companies and sectorals			10794.69*** (63.57521)	
Aggregate index				2874.283*** (38.00469)
GARCH-component coefficients				
C(5)	0.615556 (1.283508)	0.563656 (1.079852)	14.18199*** (0.035346)	13.69079*** (1.151224)
C(6)	1.694054*** (0.548072)	1.868043*** (0.371523)	1.288542*** (0.126577)	1.768181*** (0.256631)
C(7)	0.205998 (0.267432)	0.232255 (0.205322)	1.053649*** (0.197846)	0.662113*** (0.122267)
C(8)	0.868458*** (0.088845)	0.859557*** (0.073670)	0.058182*** (0.010035)	0.033924 (0.062488)
Model parameters				
LL	−1098.782	−1093.093	−1146.675	−1120.887
AIC	18.44636	18.35154	19.24458	18.81478
R-square	0.040966	0.130018	0.495219	0.700015

Source: Author's calculations.

Note: statistical significance levels: *** — 1%. Standard errors of the model coefficients are given in brackets. LL is the value of the logarithm of the likelihood function, AIC is the value of the Akaike information criterion.

During the described period, the indicators of the sectoral indices of the Moscow Exchange changed significantly, especially some of them. Thus, the oil and gas index rose from a minimum of 3 216 to 9 500, almost threefold, while the metals index fluctuated from 2 185 to 11 924, more than fivefold. The price of Brent oil also increased sevenfold, and there were significant fluctuations in the benchmark interest rate. Moreover, a more detailed analysis of the data reveals that the main peaks in its value coincided with periods when numerous sanctions were imposed and the economy was experiencing shock (late 2014 — early 2015 and the second half of 2023). After the crisis ended, the rate began to gradually decrease.

Sanction indices, in general, show strong fluctuations over the period. It can be noted that the maximum and average sanction indices are approximately twice as high as the anti-sanction index and three times higher than the industry-specific sanction index. As previously noted, the indices fluctuate significantly, and in some months, the anti-sanction index exceeded the sanction index.

For a better understanding of the dynamics of the market indicators used, we constructed a graph (*Fig. 3*).

Note: The price of Brent oil, the RUONIA rate, and the USD-RUB exchange rate are plotted on the main axis, while the sectoral indices of the Moscow Exchange are plotted on the auxiliary axis.

As seen in *Fig. 3*, many parameters fluctuated significantly. Thus, the price of oil was highest at the beginning of the period and dropped significantly when active sanctions were introduced, with a particularly sharp decline visible in the first half of 2020. However, in 2022, the price of oil reached its peak for the entire period. Overall, from 2020 to 2022, all indicators were growing (except for the ROUNA rate, which decreased, but that was also good). However, with the start of the special operation, many indices fell. Some of them, which had very low volatility, did not react to previous events; however, their values decreased in 2022 when sanctions affected absolutely all sectors of the economy. However, by the end of 2023, they had partially recovered their values. Moreover, the chemistry and petrochemistry index increased, thanks to effective anti-sanction policies.

The next stage of our research is to transform the data into a stationary form. To assess stationarity, we applied the Augmented Dickey-Fuller (ADF) test, and its results are reflected in *Table 3*. We performed the following transformations: we switched to the logarithmic returns of the dollar-to-ruble exchange rate and the price of Brent oil (first differences of the logarithms), as well as increments for the RUONIA rate and sectoral indices.

RESEARCH RESULTS

The main stages of our research include: variable selection based on random forest and evaluation of their significance based on the GARCH model for three industries.

To begin with, we will determine the significance of the indicators using the random forest algorithm. This supervised machine learning algorithm is based on decision trees combined into an ensemble. Its significant advantage is the high accuracy of predictions and classifications, surpassing many other models. In particular, this algorithm works excellently with complex market models, showing the best results. The random forest algorithm is applied to various tasks, for example, for stock market forecasting [27]. From the random forest model built by the algorithm, we obtain Gini variable importances, which reflect the degree of influence of changes in the explanatory variables on the dependent variable. For convenience, they were presented in the form of a graph in figure x, where the variables are sorted by decreasing importance.

Let's consider the significances for the three dependent variables of the industry indices, as reflected in *Fig. 4–6*.

From the first model, it is evident that the main influence, as expected, is exerted by market indicators and the bank rate. Text variables

have relatively low significance; even the linear model could not identify a strong correlation with the index of electric power companies. It can be expected that in further calculations their significance will be low, however, it is present, which indicates that the Russian electricity sector is not very sensitive to sanctions, which is quite logical. Sectoral sanctions turned out to be the most significant.

In this case, based on the analysis of *Fig. 5*, one can note the high influence of anti-sanction policies and the aggregate index, while sectoral sanctions (and sanctions against specific companies) have minimal influence. The maximum influence of the dollar exchange rate on oil and gas companies is quite expected.

For the chemical and petrochemical sector, the situation is radically different (*Fig. 6*): the most significant factors for the nonlinear random forest model turned out to be the sanction indices, with the anti-sanction policy index having the greatest influence. The fact that the aggregate index is lower is explained by its more complex structure, containing more information, and the difficulty in determining its impact on the model. It can also be noted that the impact of the sanctions themselves is minimal.

In order to determine the direction of the influence of the sanctions indices we obtained, we use the EGARCH model (1, 1). This model is used in a number of studies on the financial market, for example, in the study of stock market indices during the COVID-19 pandemic [28]. The modeling results are presented in *Tables 4–6*.

From *Table 4*, the expected results are visible: the significance of the control variables is high and unidirectional. Among the indices, the presence of the impact of general and sectoral sanctions can be noted, although it is low. We can conclude that the energy sector is less susceptible to sanctions.

The impact of sanctions on the oil and gas sector turned out to be the most significant. Although the nonlinear model is similar to that for the energy sector, here we see a strong connection between textual variables and the index. Most likely, the difference is due to the fact that the random forest evaluates individual data instances, whereas GARCH analyzes a time series, where the influence is much more noticeable.

From the analysis of *Table 6*, it can be noted that the field of chemistry and petrochemistry reacts the most to news about sanctions; it is influenced by news of anti-sanction policies, sanctions against companies, industries, and the overall index that includes all news about sanctions.

CONCLUSION

In conclusion, we can say that our research is consistent with previous studies indicating that sanctions affect the capitalization of companies from various sectors [13, 29]. The impact of sanctions on industries such as electricity, oil and gas, as well as chemistry and petrochemistry manifests in the short term — within a month after publication.

Sanctions have the least impact on the electricity sector, which is expected, as this industry in Russia has a high degree of autonomy, whereas oil and gas are extremely sensitive to all sectoral indices. In the chemical and petrochemical sector, the influence is complex and nonlinear, and although the linear model also detects high significance of the indices, in nonlinear random forest models, the significance of textual indices is particularly high.

In further research, the research base can be expanded by using more detailed information about sanctions and their nature. The number of information sources can also be expanded, and more advanced methods will be applied.

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ORIGINAL PAPER

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How to Determine Deposit Insurance Premium: A Book Value Approach

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ABSTRACT

The **purpose** of the study is to propose a new model for determining insurance premiums on deposits. As of today, there are two **models**: the first is theoretical, using market value (option theory), and the second is practical, using book value and, as a rule, a fixed rate. Market value cannot be applied as it does not reflect banking risk, while the use of book value is considered mandatory without any theoretical justification.This paper proposes a new model, namely the Asnawi Model with three advantages, namely: (1) based on book value, (2) considering the bank's risk-return (fair premium); and (3) considering incentive-compatible plans. The model formation is based on the main variables that influence banking performance, namely (1) asset-to-deposit ratio (2) lending-borrowing rate ratio, (3) and non-performing loans.The results of this research are: first, the formation of four Asnawi Groups which indicate the amount of premium that must be paid by the bank (group 4 is the one with the lowest premium); second, the Asnawi Score, as a reference value for banks to get/not get incentives; third, the results of simulations on Indonesian banking showed variations in premium groups, and in the fourth, regression of the three variables above on ROE, the results were found to be in line with predictions. This model for determining insurance premiums can be a reference/alternative for determining premiums in worldwide banks.

Keywords: deposit insurance; premium; put-option; Credit Default Swap; Non-Performing Loan; Book Value Approach; Asnawi Group; Indonesia; Deposit Insurer Corporation

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INTRODUCTION

The purpose of Deposit Insurance (DI) is to provide "cash assistance" as a preventive measure, not to compensate in the event of bankruptcy. In the DI scheme, two important factors need to be objectively determined which are the amount of coverage and premium. The coverage is standardized and determined by the institution. Meanwhile, the Deposit Insurance Corporation (DIC) determines the premium and is a concern in this study. Almost all theoretical determinations are based on adaptations of the put-option model Merton [1]. This model cannot be applied because it is based on market prices, which tend to be biased, fluctuate-subjective, and contain many expectations. For example, the rumor-shares of Jago Bank (ARTO) have increased up to 8.500% Asnawi et.al. [2]. Thus, the determination of the deposit insurance premium should use book value instead of market value.

The main activities of the bank are saving (Debt, *D*) and lending (Assets, *A*). Thus the *A/D* ratio becomes the main ratio, as has been considered in the option model (1). In further development of the option model, Deposit Insurance premium is based on the volatility of Credit Default Swap (CDS) Chen [3]. Furthermore, Chiang & Tsai [4] estimated insurance premiums through lending-borrowing and the risk of early bankruptcy. These two things are considered to affect the value of bank assets. Yoshino et al. [5] showed fair premiums are based on insurance coverage, operational costs from the operator, and the Non-Performing Loan (*NPL*) ratio. *NPL* can measure the bank risk, according to Bahri & Hamza [6], Abbas et al. [7], Hunjra et al. [8]. An alternative for *NPL* can use Z-score Zhang & Hu [9], Trinugroho et al. [10], Martinez & Baselga [11].

Research on deposit insurance in Indonesia, including Sahadewo et al. [12], Nizar & Mansur [13], Trinugroho et al. [10], Ahmad et al. [14]. Sahadewo et al. [12] examined the impact of DI using the laboratory experiment method. Nizar & Mansur [13] determine deposit insurance premiums based on risk by PCA ANOVA analysis model. The method is not practical. Trinugroho et al. [10] show the effect of risk (Z-score) and Bank stability index on deposit growth, whereas Ahmad et al. [14] showed that small bank-guarantee

depositors made them less sensitive to risk. In this case, the depositor considers the interest rate as an indicator of saving.

Various risk-based premium implementations around the world tend to group based on certain variables (DICGC),[1] IADI.[2] The USA uses two variables, capital (3 groups) and supervisory (3 groups), where the bank divides into four groups. The difference is that the risk category is based on predicting risk in the future. In Canada, premium is based on a combination of quantitative and qualitative aspects. The premium is divided into four categories. In Columbia, premium is based on the CAMEL component (score 1 to 5). A high rating will get a refund of up to 50% of the premium paid last year, while a low rating is asked to add a premium of up to 50% of the previous rating. Rewards and punishments apply. In Malaysia, premium is also based on a combination of quantitative aspects (60%) and qualitative aspects (40%), where the premium category is divided into four groups. In Taiwan, based on two variables, CAR and Composite score of the risk based premium rating system (CSRPRS), premiums are divided into five categories. From the description above, efforts to get a fair premium vary widely from simple methods (Colombia) to complex ones (USA). In Indonesia, the deposit insurance premium is a flat rate. Banks pay about 0.1% of the average monthly savings, with around IDR 2 billion coverage, equivalent to $ 136,054. There is no theoretical basis for why the premium is 0.1%.

In practice, more than 50% of Deposit Insurance premiums in the world use a flat rate, where the flat rate premium does not reflect risk. There is a premium subsidy from low-risk banks to high-risk banks. In countries that apply risk-based Deposit Insurance premiums, the determination of premiums varies widely. Conceptually, the determination of the risk premium was based on: (1) the structural model (option) initiated by Merton; (2) expected loss models based on the probability of default, exposure of default, and loss given default; (3) bucketing based on assets and examiner classification and fund size calculation, which consists of two components, namely the average premium and the difference from the average premium.

This research proposed a new model, the Asnawi model, which is a novelty in this study. Asnawi's model can be categorized as a bucketing model. Asnawi's model is based on the *A/D* ratio and considers risk-return through the lending rate-borrowing rate, as well as Non-Performing Loans (*NPL*). Each bank, based on these three variables, will get one score. The insurer can make categories (groups) and premiums. Incentive (discount) premiums are given to banks with lower risks. Thus, the premium is determined based on risk and has considered the Incentive Compatible Plan.

The advantages of this model are: first, it is completely based on the book value, which is more accurate than the market value. Second, it is easy to implement, so it can be applied in general, like the bank health measurement model (CAMEL). Third, it involves two essential components: risk-return, which is reflected through three variables (*A/D*); lending-borrowing rate; and NPLs. Fourth, this model will enrich the existing model (IADI 2020) but with a more concise variable category. Fifth, this model provides premium discounts for banks that have a low-risk category. This is in line with the concept of an incentive-compatible plan (Prescott [15], Asnawi [16]).

Several other things are ignored in the premium determination model here. First, deposit insurance premiums are affected by the Systematic Risk premium (SRP), where SRP has a positive trend toward expected default loss (Jokivuolle & Pennacchi [17]. Second, this study ignores the existence of a target fund level; for example, in Europe, it is around 8% of the average funds, according to Schoenmaker [18], Cerrone [19]. Third, the determination of the premium is related to the institutional quality of the insurer, but it is ignored in this study by Anginer & Bertay [20]. Fourth, the determination of the premium ignores the operator's operating costs, according to Yoshino et al. [5].

I proposed a new model of deposit insurance premiums based on book value. A premium based on book value has considerable potential to be implemented and will significantly impact market players. Its method will provide additional alternatives to determine the fair premium. For Deposit Insurance Corporation (DIC), a fair premium will encourage a new balance, where risk-return can be estimated more precisely. With this

[1] DICGC: Risk Based Premium-Cross Country Practices and Experience: 7–21; DICGC. URL: https://www.dicgc.org.in/pdf/Chapter2.pdf (accessed on 14.02.2023).

[2] IADI: Evaluation of Differential Premium Systems for Deposit Insurance. URL: https://www.iadi.org/uploads/DPS_Paper_final_16June2020_Final.pdf (accessed on 14.02.2023).

new method, the premium paid reflects the risk (fair premium) for banks. It will affect bank performance in the form of increased profitability and the potential to pay lower premiums (discount premiums). It can encourage the competitiveness of banks so that banks can provide better services for depositors.

This study contains the following: part two is a review of the literature concerning deposit insurance premiums, particularly concerning the selected variables. Part three, as an essential part of this research, is establishing a model for determining deposit insurance premiums. Part four is a simulation regarding the premium determination model, using limited data, namely banking in Indonesia (2019–2021). This limited use of data is due to simulation purposes. I also did a robustness test. The final section consists of suggestions, conclusions, and limitations.

LITERATUR REVIEW. HOW TO DETERMINE DEPOSIT INSURANCE PREMIUM

Deposit insurance premiums were initiated by Merton [1] using the put-option theory, where Deposit Book Value (B) is the exercise price and Asset (A) is Stock Price. The guaranteed deposit (D) amount is Bexp(–rT), where r is the risk-free rate. Also, the premium amount depends on the *A/D* ratio, which is a prerequisite for the amount determination. This *A/D* value is measurable, but when the audit is randomly conducted, the potential for finding the right number will be biased. This criticism of Merton can be seen by Ronn & Verma [21], who stated that the considered assets should be ex-ante, not ex-post. The important point to note is that the Bexp(–rT) value is discounting the deposit value to the depositor's detriment. In practice, the guarantee is not only B but also the interest income attached, hence Bexp(rT) is more appropriate.

Recent research has not shown significant changes. Change et al. [22] showed the results of mispricing premiums, especially for large banks. The option model states that all debts have the same priority (liquidation). Also, Chang et al. conveyed the idea regarding reverse convertible bonds (RCB), which would reduce risk, and premiums could be lower. The existence of RCB will reduce the potential for bankruptcy. Chiang & Tsai [4] determined the Deposit Insurance premium based on the specific official default rate (p). Chiang and Tsai considered capital requirements and good supervision as a way to reduce asset risk. This is shown through the efficient frontier between asset value and risk. Chiang & Tsai [4] criticized the use of market equity value as a risk measure. Based on the Merton model, when there is (p), then the bank is asked to reduce asset risk and/or increase equity. According to Chiang and Tsai, premiums should be lower when the bank complies with all regulatory rules. When the bank is not met, then it is subject to a penalty.

Chen [3] used the option model, predicting the Deposit Insurance premium based on several banks' volatility of Credit Default Swap (CDS). Furthermore, Chiang & Tsai [6] estimated insurance premiums through lending-borrowing and the risk of early bankruptcy. These two things are considered to affect the value of bank assets. Chiang & Tsai proved that the higher the spread, the lower the premium. Liu et al. [23] on the other hand, explained the opposite, namely the impact of Deposit Insurance on Credit Default Swap (CDS). It was found that the negative impact of Deposit Insurance is the increase in CDS spread, which indicates the moral hazard behavior of banks. Calomiris & Chen [24] confirmed that DI will increase asset risk in the banking system. This risk is measured by the loan-to-assets ratio, lending to households, and the proportion of lending to mortgages. Additionally, the presence of Deposit Insurance increases *D/A*, but not significantly.

Bank Risk-Return

Barkauskaite et al. [25] showed Deposit Insurance organizers need to consider the individual bank and the accompanying systematic risks, which are closely related to size. This systematic risk comes from various factors, such as liquidity, assets, capital, as well as business management, and the magnitude of its influence is within a certain range. The magnitude of this range is no theory or judgment. Roy [26] showed the determination of the optimal DI premium based on relative risk, which compared "j" and bank risks. The risk of each bank is based on the score from the Insurer (0–100) and adjusted to the Cycle Index. The average bank sector score becomes the average for the Insurer, and is compared with each score. When 'j' < than the average, then the bank is declared riskier. According to Roy, this approach will simultaneously show two things, namely fairness and stability. O'Keefe

Table 1

The Relation between Asset and Deposit

Time 0	Time 1
A_0	A_1 ; where $A_1 = A_0 + A = A_0 + D_0 * r_l$
D_0	D_1 ; $D_1 = D_0(1+r)\ \hat{}\ t = D_0 e^{rt} = D_0 + D_0 * r_b$

Source: Researcher model.

& Ufier [27] made a simulation regarding the target funds the insurer needs to own. The target of this fund is determined based on (1) default odds, (2) loss rate per default, and (3) the exposure to be covered. These three things depend on various conditions. Also, the probability of default is influenced by credit, liquidity, and systematic risk. The loss rate per default is determined by the Insurer's success in managing the assets of the default bank. O'Keefe & Ufier simulation explained the required funds range from 3 to 7%, which is very different from the results of FDIC.

Bahri & Hamza [6] show that the existence of deposit insurance causes banks to carry out moral hazard, taking risks if the level of competition is higher. One of the bank's risk levels is measured by Non-Performing Loans (NPL). Measurement of risk through NPL is also shown by Bahri & Hamza [6], Abbas et al. [7], Hunjra et al. [8] and alternative measurements using the Z-score Zhang & Xu [28], Trinugroho et al. [10], Martinez & Baselga [11], Hunjra et al. [8]. Altavila et al. [29] state that banks with high NPLs and low capital ratios show that the pass-through monetary policy on lending rates (real activity) is not going well. Altavila et al. [30] show that uncertainty over interbank rates can increase lending rates, reaching around 1% of peak times. The effect of this interbank rate varies depending on credit risk factors, capital ratios, and also access to the central bank.

From the above description, it can be summarized as follows: (1) premium determination model, which is based on option theory Merton [1] and its development, (2) use of market prices, with limitations in terms of data accuracy, (3) recent studies showed: (a) the importance of the CDS, (b) Non-Performing Loan as one of the criteria for determining the premium. In this study, a new deposit insurance premium design was submitted. Asnawi's Model uses risk-return based on book value variables and finds a new formula to determine the Deposit Insurance premium. Its formula can be the basis for further research with various adjustments.

DEPOSIT INSURANCE MODEL

Deposit insurance premium-Asnawi Model based on book value, taking into account 3 variables namely: A_0 / D_0, lending-borrowing rate, and NPL. The model can be stated as follows: *At* time t_0, there is an asset of A_0 and a guaranteed deposit of D_0, with an initial balance sheet value of $A_0 = D_0 + E_0$. Based on Merton [1] the premium is based on the Assets/ Deposits ratio, and the allowed situation is $A_0 / D_0 \geq 1$. A_t T_1, both assets and deposits grow. The assets grew by ΔA, which is assumed to be obtained from loan income (rate of loan, r_l) or by $L * r_l$. Meanwhile, the deposits grew by the amount of interest to be paid (rate of borrowing; r_b, or by $D_0 * r_b$. Therefore, it is assumed that the loan amount is the same as the deposit D_0, where A is equivalent to $D_0 * r_l$, which can be stated as follows (*Table 1*).

Equity value (E_1) can be expressed as the Bank-Charter Value (*V*) equal to the difference between A_1 and D_1 or $A_1 - D_1$. This *V* is referred to as the Bank Stability. The more stable the bank, the lower the chance of bankruptcy, and the lower the insurance premiums. Hence, at T_1, it can be stated that:

$$V = A_1 - D_1 = A0 + A - Do - D > 0, \quad (1)$$
$$: D_0$$

$$V = \left(\frac{Ao}{Do}\right) + (rl - rb - 1), \quad (2)$$

$$V = \left(\frac{A0}{Do} - 1\right) + (rl - rb), \quad (3)$$

where (A_0 / D_0) = Asset Deposit Ratio.

Assumptions (A_0 / D_0) :

1. I proposed 4 groups, where (i) group 1, with index 100–110 (+10 points), (ii) group 2, with an index of 111–130 (+ a maximum of 20 points), (iii) 3, with index 131–160 (+ maximum 30 points), and (*iv*) 4, with index > 160.

Table 2

Proposed Bank Groups Based on Asset to Deposit Ratio (ADR)

$(A_0 / D_0 - 1)$ (%)	Index	Group	Premium
8.7–9.57	100–110	1	Based premium
9.58–11.31	110.–130	2	Lower premium
11.32–13.92	130.–160	3	Even Lower premium
> 13.92	> 160	4	Lowest premium

Source: Researcher — proposed bank groups.

Table 3

Proposal of Deposit Insurance Premium Based on Lending-Deposit Rate Ratio (LDR)

r_l / r_b	Index	Grup	Premium
2.00–2.20	100–110	1	Based premium
2.21–2.60	110–130	2	Lower premium
2.61–3.20	130–160	3	Even Lower premium
>3.20	>160	4	Lowest premium

Source: Researcher model.

2. Group 1, lowest ranking and get the highest premium. Groups 2, 3, 4 get a premium discount.

The Asset Deposit Ratio

The Bank's Charter Value (V) is determined by two factors, namely (i) (A_0 / D_0) ratio and (ii) the difference between loan and deposit interests $(r_l - r_b)$. Banks can join the deposit insurance program when the ratio of $(A_0 / D_0 > 1)$. The minimum Capital Adequate Ratio (CAR) is 8% (prerequisite), with the assumption of all risk-weighted assets, hence the ratio $(A_0 / D_0 - 1)$ is 100/92 = 8.7%. This amount can be stated as the default index (100), and it will only change when the CAR prerequisite changes. An index above 100 indicates resilience for these banks. The proposal is presented in *Table 2*.

Lending-Deposit Rate Ratio

The second factor $(r_l - r_b)$ shows the banking-net margin (BNM) simultaneously indicates two things, namely profit and risk. Profit can be expressed as an index, dividing the net margin by the borrowing interest $(r_l - r_b) / r_b$. This is in accordance with (3), hence when $r_l < r_b$, a negative index will be obtained, and the bank will deteriorate. When the r_b is higher, the index will be lower, and the investment risk will increase. Furthermore, when the banking-operating costs and other (BOC) are considered and equalized to r_b, then there will be an additional r_b. It is assumed that the BOC is r_b, $r_l = 2r_b$, and the second factor $(r_l - r_b) / r_b$ will be 100%. This value can be used as a benchmark that the bank's lending rate is at least twice the interest on borrowings. The outcome is seen in *Table 3*.

Non-Performing Loan

Fundamental factors influence the lending rate, and loan risk is reflected in Non-Performing Loans (NPL). The fundamental factors are stochastic and they affect the quality of banking loans. Hence, the risk factor can be measured through NPL and expressed as a deduction. The government determines the *NPL* at 5%, which is a default (100), where the lower the *NPL*, the lesser the credit risk. With the four above groups, the Deposit Insurance premium proposal is as follows (*Table 4*).

The direct influence of fundamental factors cannot be traced to the financial statements, but will indirectly affect bank profits. Hence, profits are influenced by the fundamental factors, as well as the A/D and $(r_l - r_b)$. This study did not consider bank profitability.

Premium Determination Proposal

Determination of deposit insurance premiums can be done in two ways. First, each bank gets an Asnawi

Table 4

Proposed DI Premium Based On Non-Performing Loans (NPL)

NPL (%)	Index	Group	Premium
4.50–5.00	90–100	1	Based premium
3.50–4.49	70–89	2	Lower premium
2.00–3.49	40–69	3	Even Lower premium
< 2.00	⩽ 40	4	Lowest premium

Source: researcher model.

Score, and is grouped into 4 groups (Asnawi Group). Group I, is the highest premium, and group 4 is the lowest premium. Group I is the standard premium, which applies today. Groups 2, 3, 4 will get a premium discount; this research proposes this premium discount by following the Taylor series, so that the discount gets bigger but with a smaller rate. Second, the Insurer, Deposit Insurer Corporation (DIC), makes a reference value (DIC-Asnawi Score), where each bank is required to meet (exceed) the value. The value obtained by each bank will be grouped into 4 groups, and group 4 will receive the lowest premium.

Asnawi Score-Group

Based on *Tables 2–4* above, the lowest potential score is 1 (1*1*1; highest premium), and the highest is 64 (4*4*4, lowest premium). It was proposed that a bank gets Groups 1, 2, 3, and 4 based on the following scores.

The determination of the Deposit Insurance premium is de-facto and without a theory. This is proposed in Group 1 as "based premium" because all those participating in deposit insurance have met the requirements, namely $A_0 > D_0$. Therefore, groups 2, 3, and 4 pay lower premiums but with a decreasing discount rate. This pattern is solved from the Taylor series as follows:

$$P = p0,$$

$$P = Po - \left(1/1!!+\ldots..+\frac{1}{n!}\right)*discount\ rate.$$

When assumed that group 1 is the current Indonesian Deposit Insurance Corporation (IDIC) premium, which is 0.1%, the discount rate is 0.01%, and the amount of premium to be paid is:

$$Group\,1 = 0.1\%,$$

$$Group\,2 = 0.1\% - \left(\frac{1}{1!}*discount\ rate\right);(i=1) = 0.095\%,$$

$$Group\,3 = 0.1\% - \left(\frac{1}{1!}*discount\ rate + \left(\frac{1}{i!}\right)discount\ rate\right);(i=2) = 0.0933\%,$$

$$Group\,4 = 0.1\% - \left(\frac{1}{1!}*discount\ rate + \left(\frac{1}{i!}\right)discount\ rate\right);(i=3) = 0.0929\%.$$

The above method can be generalized for basic premium and scoring determinations (*Table 5*).

Insurance Deposit Corporation-Asnawi Score (IDC-AS)

The second way is for IDC to determine the Insurance Deposit Corporation-Asnawi Score (IDC-AS). The score of each bank is compared with IDC-AS, grouped as 1, 2, 3, 4 and declared the Asnawi Group (AG). Based on equation (2), the prevailing assumption is *CAR* = 8%, where the first term is at least 8.7%, and *rl* = 2*rb*. The IDC

Table 5

Bank Group-Premium Scenario

Score	Teoritical Probability	Asnawi Group	Estimate Premium (%)	Premium
1–9	29/64 = 45.3%	1	0.1000	Based premium
12–24	24/64 = 37.5%	2	0.0950	Lower premium
27–36	7/64 = 10.94%	3	0.0933	Even lower premium
48–64	4/64 = 6.25%	4	0.0929	Lowest premium

Source: Researcher model.

determines the maximum default rate of borrowing and is expressed as the Insurer-Deposit Rate (IDR). Hence, equation (3) is IDC-AS. For example, for the Indonesian Deposit Insurance Corporation (IDIC), Insurer-Deposit Rate is set at 3.5%, then IDIC-Asnawi Score is 15.7%.

$$V_{IDR} = 8,7\% + 2 * IDR\,. \qquad (4)$$

When a bank obtains a V_{bank} higher than the Asnawi Score, then it gets incentives in the form of premium discounts. Four groups were proposed, where group 1 is the basic premium because in equation (4.a), the components of measurable risk have been considered. Banks have met the requirements; hence, a healthier bank should get a lower premium. The distribution of groups and premiums is shown in *Table 6*.

Risk Adjusting Factor: Non-Performing Loan (NPL)

Banking regulations indicate a maximum NPL value of 5%. A high NPL contains a large credit risk even for the Insurer. Therefore, the amount of NPL can be used as an Incentive Compatible Plan. Banking with an *NPL* of 5% is a high risk, and the chance of being uncollected (p) is high. This will naturally reduce *V*, and banks with lower NPLs will have a lesser risk. There will be a progressive decrease in risk following the decline in the *NPL* category; hence, the adjusted-NPL (*NPL**) value arises. With the assumption of using 4 groups, the probability (p) of being uncollected is 100%, 80%, 50%, or 10%. The NPL* is as presented in *Table 7*. This *NPL* will reduce the bank value, and equation (3) can be defined as follows:

$$V_{bank} = \left(\frac{A_0}{D_0} - 1\right) + rl - NPL* \qquad (5)$$

$$V_{bank} > IDC - Asnawi\ Score\left(V_{IDR}\right). \qquad (5a)$$

SIMULATION

Data

The purpose of the study is to provide a new model to deposit insurance premiums, so that the simulation can be used as a complement to research. Thus, the use of data is only from Indonesia and limited years, namely 2018–2021. It is hoped that the results of this simulation can be considered for application in other countries, with various adjustments. All Financial Report data obtained from Indonesia Stock Exchange (IDX); www.idx.co.id.

There are 46 banks, of which 3 are Islamic. The sample was 19 banks, consisting of 5 large ones with over IDR 1000 trillion, 6 medium-scale with about IDR 100 trillion, 5 small-scale banks with around IDR 10 trillion, and 3 registered Islamic Banking. The data used include Assets, Deposits, interest receipts, interest costs, total comprehensive income (for Islamic banking, revenue from fund management as mudharib; third parties share on return of temporary syirkah funds), and the amount of own capital. All of the data are available in their financial statements. Also, Non-Performing Loans (*NPL*) were proxied by adding all allowance for impairment losses and dividing by the amount of investment that causes the losses. The lending and borrowing rates are obtained by dividing interest income or cost by the total deposit.

RESULT AND DISCUSSION

Market Statistics

The Indonesian banking data are exciting. First, there are only about 5.5% Conventional Commercial Banks that have a value of around 93%. Second, most bank ownership is domestic; only around 2.9% is foreign. Third, for four years, the number of rural banks has decreased by an average of 2.6%, indicating the number of liquidations of rural banks. Fourth, the type of deposits, around 97.5%, are savings accounts.

Table 6

Estimated Deposit Insurance Premium Based on Asnawi Score

Group	Indeks	Vbank	Premium-Taylor rate	Premium (%)
1	100–110	15,7–17,42	po	0.1000*
2	111–130	17,43–20,56	$P = Po - (1/1!) * discount\ rate$	0.0950
3	131–160	20,57–25,26	$P = Po - \left(1/1!! + \ldots.. + \frac{1}{n!}\right) * discount\ rate$	0.0933
4	>160	>25,26	$P = Po - \left(1/1!! + \ldots.. + \frac{1}{n!}\right) * discount\ rate$	0.0929

Source: Researcher model.

Note: * = basic premium.

Table 7

Estimated NPL, the chance of not being collected, and Adjusted NPL

Non Performing Loan (NPL)	Probability default	Adjusted NPL (NPL*)
4.5–5%	100	4.5–5%
3.5–4.4	80	2.8–3.52
2.1–3.4	50	1.05–1.7
⩽ 2.	10	0.2

Source: Researcher model.

In 2021, the number of accounts was 386.3 million, and the number of accounts with a value of < 2 billion was 99.9%. specifically, the number of accounts less than (<) 100 million is around 98.4%. Thus, most of the accounts are under full guarantee. Fifth, regarding value/nominal savings, around 50.7% is not guaranteed where the savings are greater than IDR 5 billion. A contradiction between the fourth and fifth. Fourth shows that most depositors save low nominal savings; fifth, some have enormous savings. The existence of IDIC has played a perfect role in protecting the bank's depositors. Sixth, IDIC has an increase in premium revenue due to the rise in nominal savings. Most of the premium revenue comes from commercial banks, but rural banks have gone bankrupt. Rural banks can apply higher interest rates on savings, so rural banks are riskier than conventional commercial banks (*Table 8*).

Table 9 shows estimates for Asset Deposit Ratio (*ADR*), Loan-deposit rate ratio (*LDR*), Non-Performing Loan (*NPL*), lending rate (r_l), borrowing rate (r_b), and adjusted *NPL* (*NPL*)* as referenced in *Table 7*. The Asnawi's score is based on *Table 5*, V_{bank} is based on equation (5), and the Score is based on *Table 6*. Some of the results that can be discussed are as follows:

Firstly, the fundamentals of each bank can be seen in columns 3, 4, 5 to get the Asnawi Group 1. The banks already have good ADR, except for BBTN, and there was a spike in ADR in ARTO and BSWD. However, this high spike did not change the group because in the previous ratio, it had entered the high group. Secondly, LDRs are very important, but there are banks with *LDR* < 1. Based on the above criteria, *LDR* = 100%, when *rl* = 2*rb*. In this case, the *LDR* shows the lending rate is less than 2 times the borrowing rate, which is not good. *LDR* < 1 is found on all scales, including large, medium, and small, including Islamic Sharia banks. Thirdly, the estimated *NPL* is that there are banks that exceed BI rules with a maximum of 5%. These banks should be penalized, but in this calculation, they are ignored. In general, the banks' fundamentals are quite good.

The fourth is the fundamentals of every bank to get

Table 8

Indonesian Banking Market Statistic

Variable	2021	2020	2019	2018
Total Banks	1739	1778	1814	1869
Conventional Commercial Bank	95	95	96	101
Sharia Commercial Bank	12	14	14	14
Rural Banks	1468	1506	1541	1587
Sharia People's Financing Bank	164	163	163	167
Nominal Amount (IDR Trillion)	7546	6737	6196	5810
Conventional Banks	7005	6267	6077	5704
Rural Banks	541	470	119	106
Bank Ownership (Persentage of IDR Deposit)				
Foreign (%)	2.9	2.9	na	na
Mixture	2.6	2.7	na	na
Regional Development Bank (RDB)	9.2	8.9	na	na
State Ownership	42.1	42.7	na	na
National Private	43.2	42.7	na	na
Covered of Guarantor				
Full Guaranteed (%)	40.80	43.6	na	na
Partially guaranteed (%)	8.50	8.9	na	na
Not Guaranteed (%)	50.70	47.5	na	na
Premium Income (IDR Trillion)	14.38	13.09	11.93	11.22
Commercial Banks	14.12	12.85	11.71	11.02
Rural Banks	0.26	0.24	0.22	0.20

Sources: Indonesian Deposit Insurance Corporation (IDIC). URL: https://lps.go.id (accessed on 14.02.2023).

Asnawi Group II. The estimated rate of lending and *NPL** are shown in columns 6 and 8. Furthermore, the Asnawi Score and Group values are shown in columns 13 and 14. The bank lending rates are good, but BTPS (Islamic-Sharia Bank) has a very high value. Some banks have high *NPL** (> 5%), which should be a concern. The value of the V-bank is quite high, but there are 2 large banks (BBNI and BBTN) with a value of < 15.7. This is because they both have high *NPL**, which can be the focus of future improvements.

Fifth, when the groups of each bank are compared (columns 12 and 14), there will be a different outcome. The groups mean were 1.86 and 3.01, which were statistically different at $\alpha = 1\%$. Therefore, the measurements of these two methods are substitutional, not complementary. In the first method, DIC created a group for the three components of *ADR, LDR*, and *NPL*, then merged and became the Asnawi Group. In the second method, DIC calculated the three components above and got a V Bank Score. The Asnawi group was created based on the DIC-AS score criteria. The second method seems more practical and has a better Asnawi Group.

Sixth, BBCA Bank is the best of the two calculation models. The BBCA, which is the third-largest bank, has assets of IDR 1228 trillion (2021), and is very popular with a good reputation in Indonesia. Meanwhile, BBTN, which is the 5th largest bank, has assets of IDR. 379 trillion (2021), and is the worst out of the 2 calculations, where it obtained a score of 1. The significant difference in this score in the same bank group shows a real difference in banking operations, which can be a concern for stakeholders. This figure will change when the assumptions used in this study also change (*Table 9*).

Robustness Test

Two robustness tests were proposed, where the first is Another *NPL** proposal. The second is whether the Asnawi Group factors influence ROE. However, only the first Asnawi Group was tested.

*Another NPL**

Adjusted *NPL* (*NPL**) can also be estimated, where the amount follows the Taylor series pattern (*Table 10*). Group 1, with an *NPL* of 4.5–5% did not get an adjustment, hence the *NPL** is the true *NPL*. When a

Table 9

Bank-Asnawi Score Estimation

Bank Tick	Year	Bank Performance (%)						Asnawi Score (AS)				Bank Value (*V*)	
		ADR	*LDR*	*NPL*	*RI*	*Rb*	*NPL**	*ADR*	*LDRR*	*NPL*	*AS*	*V*	*AS*
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Large Banks													
BBRI	2018	16.67	2.29	3.03	10.04	3.05	1.51	4	2	3	2	25.19	3
	2019	17.28	2.04	3.02	10.08	0.03	1.51	4	1	3	2	25.85	4
	2020	16.62	2.22	4.82	9.83	0.03	4.82	4	2	1	1	21.64	3
	2021	21.05	3.88	5.67	10.35	0.02	5.67	4	4	1	2	25.73	4
BMRI	2018	18.18	2.07	3.54	7.96	2.59	2.84	4	1	2	1	23.31	3
	2019	18.85	1.85	2.98	8.25	2.89	1.49	4	1	3	2	25.61	4
	2020	15.31	1.89	5.35	7.15	2.47	5.35	4	1	1	1	17.10	1
	2021	14.77	2.96	5.50	6.50	1.64	5.50	4	3	1	2	15.77	2
BBCA	2018	22.55	3.95	2.29	8.43	1.71	1.14	4	4	3	4	29.84	4
	2019	23.38	3.78	2.32	8.57	1.79	1.16	4	4	3	4	30.79	4
	2020	20.73	4.82	3.48	7.34	1.26	1.74	4	4	3	4	26.34	4
	2021	19.78	5.91	3.74	6.40	0.93	3.00	4	4	2	3	23.19	3
BBNI	2018	15.81	1.86	2.44	7.24	2.53	1.22	4	1	3	2	21.83	3
	2019	17.35	1.67	2.61	8.12	3.04	1.30	4	1	3	2	24.17	3
	2020	14.50	1.95	6.16	7.22	2.44	6.16	4	1	1	1	15.55	1
	2021	15.09	3.25	6.62	5.97	1.41	6.62	4	4	1	2	14.43	1
BBTN	2018	8.44	0.77	1.22	7.35	4.16	0.12	1	1	4	1	15.67	1
	2019	8.28	0.52	2.21	8.08	5.33	1.10	1	1	3	1	15.26	1
	2020	5.86	0.54	4.54	6.73	4.35	4.54	1	1	1	1	8.04	1
	2021	6.11	0.97	4.69	6.68	3.39	4.69	1	1	1	1	8.10	1
Medium Banks													
BBKP	2018	9.87	0.48	2.76	9.17	6.19	1.38	2	1	3	1	17.66	2
	2019	9.75	0.35	2.17	8.50	6.29	1.08	2	1	3	1	17.16	1
	2020	11.85	0.13	6.85	7.43	6.60	6.85	3	1	1	1	12.43	1
	2021	17.37	0.24	6.42	5.55	4.46	6.42	4	1	1	1	16.51	1
BJBR	2018	10.36	1.20	0.77	10.94	4.97	0.08	2	1	4	1	21.23	3
	2019	10.80	1.01	0.77	10.84	5.39	0.08	2	1	4	1	21.57	3
	2020	9.31	1.06	1.56	9.79	4.75	0.16	1	1	4	1	18.95	2
	2021	9.01	1.49	1.42	9.10	3.66	0.14	1	1	4	1	17.96	2
BNII	2018	16.46	1.21	1.56	9.70	4.39	0.16	4	1	4	2	26.01	4
	2019	18.74	1.12	1.84	10.87	5.13	0.18	4	1	4	2	29.43	4
	2020	18.65	1.30	2.34	8.79	3.81	1.17	4	1	3	2	26.26	4
	2021	20.51	1.97	2.55	7.66	2.58	1.28	4	1	3	2	26.90	4
BNLI	2018	17.21	0.95	6.54	8.49	4.36	6.54	4	1	1	1	19.16	2
	2019	17.49	0.95	3.04	8.55	4.38	1.52	4	1	3	2	24.52	3
	2020	21.56	1.22	4.79	7.33	3.31	4.79	4	1	1	1	24.10	3
	2021	18.51	1.80	4.93	6.01	2.15	4.93	4	1	1	1	19.60	2

Table 9 (continued)

Bank Tick	Year	Bank Performance (%)						Asnawi Score (AS)				Bank Value (*V*)	
		ADR	*LDR*	*NPL*	*Rl*	*Rb*	*NPL**	*ADR*	*LDRR*	*NPL*	*AS*	*V*	*AS*
1	2	3	4	5	6	7	8	9	10	11	12	13	14
MAYA	2018	14.16	0.59	2.60	10.49	6.60	1.30	4	1	3	2	23.36	3
	2019	15.22	0.49	3.27	11.03	7.42	1.63	4	1	3	2	24.62	3
	2020	16.22	0.03	3.72	6.53	6.31	2.97	4	1	2	1	19.78	2
	2021	13.30	0.07	1.51	6.03	5.64	0.15	3	1	4	2	19.17	2
MEGA	2018	19.70	1.08	0.71	9.68	4.66	0.07	4	1	4	2	29.30	4
	2019	18.23	0.93	0.42	8.74	4.54	0.04	4	1	4	2	26.93	4
	2020	19.37	0.95	0.63	8.56	4.40	0.06	4	1	4	2	27.87	4
	2021	16.83	1.48	0.55	7.13	2.87	0.06	4	1	4	2	23.91	3
Small Banks													
BBHI	2018	17.46	0.84	1.58	11.53	6.26	0.16	4	1	4	2	28.83	4
	2019	13.46	0.64	4.93	9.98	6.10	4.93	3	1	1	1	18.51	2
	2020	15.50	0.42	2.14	7.24	5.11	1.07	4	1	3	2	21.66	3
	2021	38.95	1.24	1.11	10.56	4.72	0.11	4	1	4	2	49.39	4
BSWD	2018	40.85	0.78	3.39	11.38	6.38	1.70	4	1	3	2	50.54	4
	2019	40.89	0.98	4.98	10.12	5.12	4.98	4	1	1	1	46.03	4
	2020	39.71	0.62	5.08	8.65	5.35	5.08	4	1	1	1	43.28	4
	2021	90.25	1.07	5.41	7.96	3.84	5.41	4	1	1	1	92.81	4
BGTG	2018	33.41	1.17	2.67	11.46	5.27	1.33	4	1	3	2	43.53	4
	2019	31.06	0.86	1.39	10.91	5.86	0.14	4	1	4	2	41.83	4
	2020	26.95	0.86	1.46	8.40	4.53	0.15	4	1	4	2	35.20	4
	2021	33.44	1.17	1.44	4.94	2.27	0.14	4	1	4	2	38.23	4
ARTO	2018	21.04	0.69	1.85	12.28	7.28	0.18	4	1	4	2	33.14	4
	2019	106.45	0.28	2.80	8.22	6.42	1.40	4	1	3	2	113.28	4
	2020	130.06	2.54	4.87	9.51	2.68	4.87	4	2	1	1	134.69	4
	2021	203.04	9.41	1.14	16.06	1.54	0.11	4	4	4	4	218.98	4
BABP	2018	15.17	0.68	2.48	10.19	6.08	1.24	4	1	3	2	24.12	3
	2019	17.23	0.60	2.31	11.84	7.38	1.15	4	1	3	2	27.92	4
	2020	15.36	0.61	2.24	9.60	5.95	1.12	4	1	3	2	23.84	3
	2021	20.30	0.71	1.78	8.41	4.91	0.18	4	1	4	2	28.54	4
Islamic Banks													
BRIS	2018	15.31	1.37	1.65	9.50	4.01	0.16	4	1	4	2	24.64	3
	2019	13.38	1.55	1.88	8.87	3.47	0.19	3	1	4	2	22.06	3
	2020	9.98	2.38	2.68	7.77	2.30	1.34	2	2	3	2	16.41	1
	2021	10.41	3.07	3.02	7.41	1.82	1.51	2	3	3	2	16.31	1
BTPS	2018	49.70	8.38	1.99	42.86	4.57	0.20	4	4	4	4	92.36	4
	2019	53.99	7.51	2.12	44.62	5.24	1.06	4	4	3	4	97.55	4
	2020	55.69	7.12	5.68	38.25	4.71	5.68	4	4	1	2	88.26	4
	2021	61.97	10.84	4.10	40.82	3.45	3.28	4	4	2	3	99.52	4
PNBS	2018	23.49	0.52	3.45	8.43	5.54	1.73	4	1	3	2	30.20	4
	2019	17.95	0.27	2.69	7.02	5.53	1.35	4	1	3	2	23.62	3
	2020	38.06	0.21	2.56	8.73	7.22	1.28	4	1	3	2	45.51	4
	2021	18.99	1.08	1.02	6.02	2.89	0.10	4	1	4	2	24.91	3

Source: Researcher result.

Table 10

NPL Estimation, Dan Adjusted NPL (NPL*) Taylor Series

Group	*NPL* (%)	Taylor rate	Discount (%)	*NPL** (%)
1	4.5–5	po	0	4.5–5
2	3.5–4.4	$P = Po - (1/1!) * discount\ rate$	1	2.5–3.4
3	2.1–3.4	$P = Po - \left(1/1!!+\ldots..+\frac{1}{n!}\right) * discount\ rate$	1.5	0.6–1.9
4	⩽2.	$P = Po - \left(1/1!!+\ldots..+\frac{1}{n!}\right) * discount\ rate$	1.67	< 0.33

Source: Researcher model.

1% discount rate is assumed as a benchmark, groups 2, 3, and 4 will obtain 1%, 1.5%, and 1.67% adjusters respectively. The group with lower *NPL* obtained a larger adjuster but with a decreasing pattern. When compared to *Table 6*, there is a difference in the estimated *NPL**, except for group 1, because it is calculated as 100%.

Regression Test of the Relationship Between Factors to ROE

Does the variable used to measure the score of this bank affect ROE? This becomes necessary because the variable is very important for banking. Three regression tests were carried out, namely the values of *ADR*, *LDR*, and *NPL* as presented in *Table 3* in columns 3, 4, 5. The test results showed the *LDR*, *NPL*, and Asnawi Group match the predictions and are significant as shown in *Table 11*. However, only ADR did not match the predictions. When the ADR data have outliers, it is possible that the regression results are not satisfactory. These results generally indicate that the selected variable can be used to predict earnings. *Table 11.b* shows the regression between (ADR, LDR, NPL)-group score on ROE, while *Table 11.c* is the Asnawi Group regression on ROE. *Table 11.b* gets equivalent results with *11.a*. *Table 11.c* shows a positive coefficient (as a prediction), where a high score (lowest risk) has a positive effect on firm profits.

CONCLUSIONS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This paper provides a guide on determining deposit insurance premiums using book values, which accurately reflect the bank's profile. This paper determined the premium using three important indicators, namely the *A/D* ratio, lending-borrowing rate, and Non-Performing Loans. With these three indicators, a bank will be included in the Asnawi Groups. The DIC can also create a benchmark (DIC-AS), with which the score of each bank is compared. Both the Asnawi Score and DIC-AS can be easily determined. Stock market prices fluctuate, and banking is a regulated industry; measuring bank risk would be more appropriate if using book values. The proper formulation (risk-return) means that deposit insurance premiums can be determined fairly. This research can be used as a reference to find the best fair premium.

Regarding the use of assumptions for the model, the above description states that all lending is borrowing funds, which in practice is lending<borrowing. This causes the estimate of r_l to be undervalued. When this is considered, the results will improve the score. Also, *ADR*, *LDR*, and *NPL* have the same weight, and DIC can have different perceptions. The assumption of banking operational costs is the rate of borrowing, and the use of group 1 as a based premium can be changed to group 2. In this case, group 1 will receive a penalty.

Table 11

The ROE Regression Results

a): The impact value of ADR, LDR, NPL on ROE						
Variabel	Coefficients			t-value	Sign	Model
	Predicted	Unstandardized	Standardizes			
(Constant)		0.078		2.955	.002	R^2 = .38 F = 14.75*
ADR	+	–.000	–.441	–4.171	.000*	
LDR	+	0.039	.660	6.222	.000*	
NPL	–	–0.017	–.224	–2.410	.009*	
b): The impact of Group Score of ADR, LDRR, NPL on ROE						
Variabel	Coefficients			t-value	Sign	Model
	Predicted	Unstandardized	Standardizes			
(Constant)		–.005		–.075	.457	R^2 = .17 F = 5.13*
SADR	+	–0.018	–.137	–1.263	.107	
SLDR	+	0.050	.405	3.710	.000*	
SNPL	+	0.017	.154	1.424	.077***	
c): The impact of Asnawi Score on ROE						
Variabel	Coefficients			t-value	sign	Model
	Predicted	Unstandardized	Standardizes			
(Constant)		–0.037		–1.052	.149	R^2 = 0.089 F = 7.21*
Asnawi	+	0.047	.298	2.685	.005*	

Source: Researcher result.

Notes: * = significant at α = 1%; ** = significant at α = 5%; significant at α = 10%.

Future research needs to pay attention to Yoshino et al. assertions. When the cost of DIC is considered, then DIC-AS may increase. The formulation of the DIC can be part of the research, as well as the potential for bankruptcy as part of DIC-AG's consideration. In V_{Bank}, the *NPL** has been adjusted, but the risk value has decreased. The potential for bankruptcy can be stochastic and it will impair DIC's funding capacity. In general, when this risk occurs, it is exposed to the DIC and the banking ecosystem. Therefore, how to formulate this risk is an aspect that needs to be studied. Not all deposits have the same risk, and not all risk assets are the same; hence, when it is accurately defined, a fairer premium will be obtained.

DIC can generally consider this premium design compared to the prevailing (flat premium). The determination of premiums is based on important indicators, is risk-based, and refers to the Incentive Compatible Plan. This is easy to implement and can be evaluated following economic-business developments.

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ORIGINAL PAPER

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Banking Sector Lending Activity Stimulation to Promote Economic Growth

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ABSTRACT

The subject of the study is the banking sector credit activity in Russia and the factors that determine it. **The relevance** is due to the fact that the changed external political and macroeconomic conditions, the growing role of the banking sector in economic development challenge researchers to determine ways to stimulate bank lending activity. **The purpose** of the study is to identify measures to stimulate bank lending activity. **Scientific novelty** includes the identification of the factors influencing the lending activity of banks. **The research methodology** is based on statistical modeling using a linear model on panel data. The statistical database includes indicators for 26 main banking groups, the study period is 6 years (from 2015 to 2020). We proposed a hypothesis that the banking sector lending activity depends on macroeconomic and industry factors, as well as that there is a difference in this influence in the short and long term. As a result of the empirical study, this hypothesis was not rejected. **Conclusions.** Based on modeling, we suggested some legislative and regulatory measures to stimulate the lending activity of banks.

Keywords: banks; banking regulation; economic growth; banks' lending activity; factors of lending activity; lending incentives; banking groups

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INTRODUCTION

Ensuring financial stability and seeking drivers of economic growth over the past few years have taken on a new tone due to changing political and macroeconomic conditions, the emergence of new risks, rapid digitalization, and other factors. There is no doubt about the key role of the banking sector in achieving the main goals of the country's economic development. In the modern world, credit remains the most important source of economic development [1]. At the same time, a significant problem is finding a compromise between the financial stability of the banking sector and its participation in providing credit resources to entities of the Russian economy. In these conditions, despite the relevance of the problem and the undeniable attention of the regulator, the present study has the following elements of scientific novelty. Firstly, we conducted statistical modeling and identified the factors determining the credit activity of the banking sector, providing their quantitative assessment. The merit of the work is the identification of differences in the factors of banks' credit activity in the short-term and long-term perspectives. Secondly, taking into account the results of the study, we propose appropriate measures to stimulate bank lending to the economy.

LITERATURE REVIEW AND FORMULATION OF RESEARCH HYPOTHESIS

The sources of the growth in bank credit activity are quite diverse and are actively studied in both Russian and foreign economic science. Among the key factors are both macroeconomic parameters and those directly related to the indicators of the banking sector. For example, A.V. Podrugina [2] studies the aggregate factors of bank credit activity: demand and supply of loans — and concludes that supply factors dominate in shaping credit activity. The author also asserts that the tightening of credit standards causes a statistically significant slowdown in credit activity.

M.Yu. Golovnin studies the role of macroeconomic regulation in stimulating the credit activity of banks [3].

I.V. Larionova identifies the development of relevant state programs to support the Russian economy as a significant factor stimulating bank lending [4].

A separate area of research is the study of the impact of regulatory requirements on credit activity. For example, an empirical study [5] conducted by the authors in 2014 using data from European banks shows a decline in bank lending as a result of compliance with Basel standards. Other authors [6] also argue that the implementation of the Basel Committee standards has led to a slowdown in the growth of bank lending and the replacement of loans to the private sector with risk-free and more liquid securities. Other examples can also be provided, illustrating that the new capital standards (Basel III) negatively affect banks' lending activity [7, 8]. It should be noted that there are other research results. Thus, in the paper [9], it is noted that the requirements for banks' capital adequacy stimulate the increase in banks' capitalization, and consequently, their ability to expand credit activity. On the other hand, there are studies [10] confirming the positive impact of regulatory liquidity requirements on the volume of lending, or proving that liquidity indicators have a significant positive effect on the growth of commercial lending and a negative effect on the growth of retail and other lending [11].

The analysis of economic literature, taking into account the current situation in the Russian financial market, has allowed for the formulation of the scientific hypothesis of this study: macroeconomic and sectoral factors influence the credit activity of the banking sector. The influence of factors differs in the short-term and long-term perspectives.

RESEARCH METHODOLOGY

The study was conducted by the authors in several stages, the description of which is presented in *Fig. 1*.

At the first stage of the research, Russian and foreign literature was studied, and the scientific

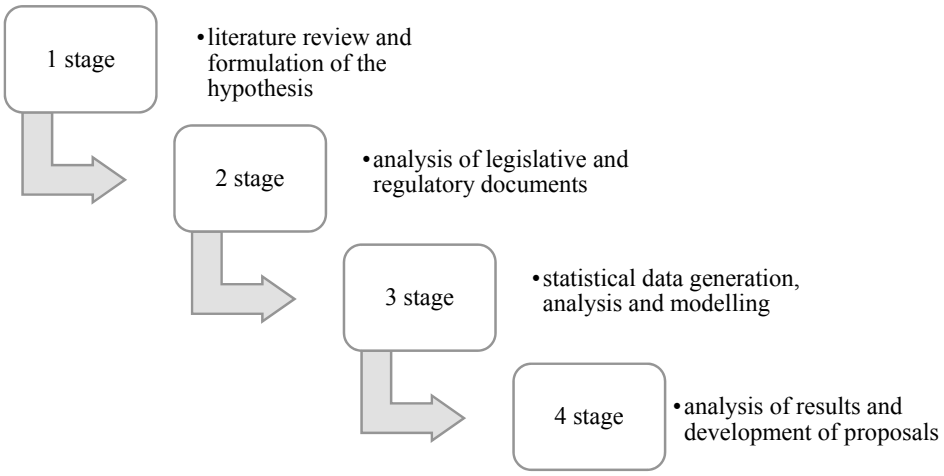

Fig. 1. **Stages of the Study**

Source: Compiled by the authors.

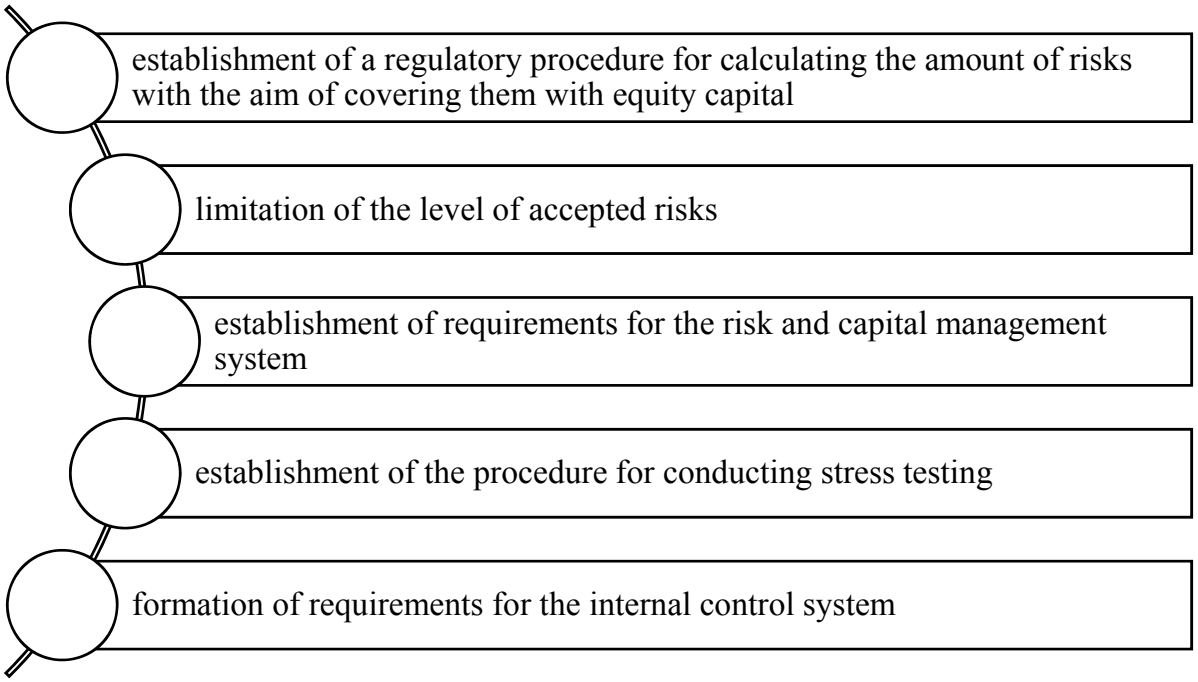

Fig. 2. **Main Directions of Regulation**

Source: Compiled by the authors.

hypothesis of the research was formulated, as presented in the previous section.

At the second stage, based on the study of the legislative regulation of banking activities and the regulatory framework of the Bank of Russia, shortcomings in modern regulation were identified, primarily in terms of stimulating the credit activity of banks.

Analysis of the regulatory practices of the Bank of Russia shows that the primary task of modern banking regulation is to ensure financial stability. Taking this into account, the mega-regulator focuses its activities on preventing the concentration of risks that could threaten financial stability at both the micro- and macro levels. Thus, over the past few years, a risk-oriented regulation policy has been implemented in the financial market. The main directions of such regulation are presented in *Fig. 2*.

Since 2018, the Bank of Russia has been demonstrating an emphasis on the application of stimulating regulation, that is, encouraging the credit activity of banks in those segments of the Russian economy that most actively contribute to economic growth.[1] As tools of stimulating regulation, one should mention the differentiation of the capital burden on banks depending on the priority of developing specific sectors, rather than solely on the risk inherent to borrowers. This approach, first applied during the economic stimulus period amid the COVID-19 pandemic, received further development with the implementation of the finalized approach to assessing the capital adequacy of credit institutions.[2] As an example, one can consider the risk assessment of project financing, mortgage lending, and lending transactions for small and medium-sized enterprises, where the capital reserve is minimized for relatively low-risk products from the provided list of loans. Another tool of stimulating regulation is the formation of reserves to cover losses on loans and other credit-related claims.[3] The Bank of Russia has changed the previously applied formalized approach to assessing the quality category of credit, based on the borrower's financial condition and debt servicing, implementing a risk assessment approach based on the level of development of investment projects applicable to project financing and lending to borrowers using escrow accounts. Moreover, the Bank of Russia is gradually developing the use of new regulatory tools. Thus, they are implementing a new tool aimed at limiting the risks of unsecured consumer lending — macroprudential limits, rather than risk coefficients that increase the capital burden. This approach will help maintain the lending potential of the economy.[4]

Thus, the stimulating regulation of the banking sector is gradually developing, but it does not have a systemic nature. It should also be noted that currently, the Bank of Russia does not incentivize credit institutions in terms of systemic lending to key state programs aimed at the economic and technological development of Russia, as evidenced by our above analysis of the regulatory norms of the Bank of Russia and the refinancing system for credit institutions. Indeed, at present, specialized refinancing mechanisms exclusively include the following areas: refinancing loans to small and medium-sized enterprises (SMEs) under guarantees from the Federal Corporation for the Development of SMEs and under the pledge of government bonds, refinancing loans to support non-commodity exports under the pledge of claims on loans secured by insurance contracts from EKSAR JSC, as well as refinancing under claims on loans for the implementation of investment projects, the fulfillment of obligations for which is secured by state guarantees of the Russian Federation. Other refinancing programs for credit organizations aimed at supporting state programs of the Russian Federation in 2023 were absent.

The third stage of the research involved the formation of statistical data, their evaluation, and modeling. The database included key financial indicators based on reporting under international standards for twenty-six of the largest Russian banking groups, with the Orbis Bank Focus analytical database used as the data source.

[1] Stimulating banking regulation. Report for public consultations. Central Bank of the Russian Federation: official website. Moscow. 2018. 16 p. URL: https://cbr.ru/content/document/file/50671/consultation_paper_180628.pdf/ (accessed on 01.05.2023).

[2] On mandatory standards and surcharges to capital adequacy standards for banks with a universal license [Instruction of the Bank of Russia dated November 29, 2019, No. 199]. Reference and legal system "Consultant Plus". URL: http://www.consultant.ru/document/cons_doc_LAW_342089/ (accessed on 15.04.2023).

[3] On the procedure for the formation of reserves by credit organizations for possible losses on loans, loan and loan-equivalent debt [Regulation of the Bank of Russia dated 28.06.2017 No. 590]. Reference and legal information system "Consultant Plus". URL: http://www.consultant.ru/document/cons_doc_LAW_342089/ (accessed on 15.04.2023).

[4] Main directions for the development of the financial market of the Russian Federation for 2023 and the period of 2024 and 2025. Central Bank of the Russian Federation: official website. Moscow. 2022. 80 p. URL: https://cbr.ru/Content/Document/File/143773/onfr_2023–2025.pdf (accessed on 15.04.2023).

To assess the credit activity of banking groups, we applied the LTA_{it} indicator, which serves as the modeled variable for the credit activity of banking group No. i = 1, 2,..., N over the period t = 2015, 2016, ..., 2020. This indicator is defined as the share of the loan portfolio in the assets of the banking group (1.1). As factors of bank credit activity, we considered macroeconomic parameters affecting the entire banking sector (GDP dynamics, exchange rates, market interest rates, oil prices) and key micro-level indicators characterizing the performance of each bank (interest margin, credit portfolio quality, efficiency indicators, asset size). Thus, as parameters explaining the magnitude (1.1), the following variables were adopted (1.2):

Z_{it} (x_{1it}) — *Z-score*, used to assess the financial stability of a bank based on the ratio of balance sheet capital to assets, return on assets, and the volatility of the latter [12–17], %;

NIM_{it} (x_{2it}) — interest margin, %;

CI_{it} (x_{3it}) — ratio of operating costs to net income, %;

LD_{it} (x_{4it}) — ratio of loans issued and deposits attracted, %;

ILL_{it} (x_{5it}) — level of impaired loans, %;

CAR_{it} (x_{6it}) — ratio of capital adequacy, %;

TA_{it} (x_{7it}) — total assets (billion USD);

y_{it} (x_{8it}) — nominal GDP growth rate, %;

MPR_{it} (x_{9it}) — Mosprime money market rate, %;

Oil_{it} (x_{10it}) — Brent price growth rate, %;

D_{it} (x_{11it}) — exchange growth rate (US dollars), %;

the values of variables (1.1) and (1.2) form a set of panel data (1.3) consisting of 156 lines:

$$\left(LTA_{it},\ Z_{it}; NIM_{it},\ CI_{it},\ LD_{it}, ILL_{it}, CAR_{it}, TA_i, y_t, MPR_t, Oil_t, D_t\right)_{i=1,\ t=2015}^{N=26,\ T=2020}. \quad (1.3)$$

Data set fragment (1.3) presented in the *Appendix*.

The modelling approaches used in this study are described in the paper [18].

The research task is to make a well-founded choice of one of the model options for determining the LTA_{it} indicator and evaluating the coefficients $(a_j)_{j=1,\ 2,\ldots m}$ — influence on the value of the LTA_{it} explanatory variables (1.2).

The fourth stage of the research is the formulation and justification of proposals for improving bank regulation to stimulate their lending activity.

RESULTS AND DISCUSSION

The special role of banks in the financial market necessitates the establishment of an effective system of regulation and supervision. This system, formed in the wake of international standards, is quite rigid and is in clear contradiction with the task of promptly countering large-scale sanctions pressure on the Russian economy. In 2022, the Bank of Russia adopted unprecedented regulatory easing measures; however, starting in 2024, a gradual rollback of many of them is planned. In recent years, as discussed above, the Bank of Russia has begun implementing the so-called stimulating banking regulation. At the same time, it is characterized by a targeted, rather than a systemic, approach. The latter can only be based on the legislative enshrinement of stimulating economic growth as one of the main tasks of the Bank of Russia. In practical terms, we are talking about a channel for stimulating the economy, such as bank lending. The empirical part of this study was dedicated to this issue. The feature of this paper is the assessment of the credit activity of banking groups in the short-term and long-term perspectives, taking into account the main hypothesis of the research proposed by us.

The model of credit activity of banking groups we built for the short term turned out to be a pooled model with the following regression equation (1.4).

$$\begin{cases} \widehat{LTA_{it}} = \underset{(5)}{27} + \underset{(0.2)}{0.2}\cdot NIM_{it} + \underset{(0.03)}{0.06}\cdot CI_{it} + \underset{(0.04)}{0.43}\cdot LD_{it} - \underset{(0.07)}{0.45}\cdot ILL_{it} - \underset{(0.15)}{0.3}\cdot CAR_{it} + \underset{(0.007)}{0.01}\cdot TA_i + \underset{(0.15)}{0.2}\cdot y_t - \underset{(0.3)}{0,8}\cdot MPR_t \\ R^2 = 0.56. \end{cases} \quad (1.4)$$

The standard errors of the coefficient estimates are indicated in parentheses.

Analyzing model (1.4), we can draw the following conclusions.

1. Not all explanatory variables from the set (1.2) turned out to be significant for explaining the values of the LTA_{it} indicator. For example, the variable Z_{it} turned out to be insignificant. Going ahead, we emphasize that in the long term, the variable

Z_{it} turns out to be significant.

2. The signs of the coefficients for the explanatory variables ILL_{it}, LD_{it}, NIM_{it}, which characterize the financial condition and operational models of banking groups, fully align with the meaning of the influence of these variables on the LTA_{it}. indicator. For example, the negative sign of the coefficient –0.45 for the variable ILL_{it} indicates that an increase in the share of bad loans reduces the inclination of banking groups to lend. Specifically, a 1% increase in ILL_{it} reduces, ceteris paribus, the value of LTA_{it} by 0.45 units.

3. As the main factor that positively influences the bank's credit activity, the LD_{it} indicator, which characterizes the ratio of loans to deposits, should be mentioned. Thus, an increase of one percent (one unit) in the value of the LD_{it} variable, with other factors unchanged, leads to an expected increase in the value of $\widetilde{LTA_{it}}$ by 0.43 units.

4. The size of total assets. The level of total assets TA_{it} also serves as a significant variable, exerting a positive influence on the lending activity of banks.

5. Regarding macroeconomic variables, y_{it} (the growth rate of nominal GDP) has a noticeable positive impact on bank lending activity. Indeed, a 1% increase in y_{it} holding other factors constant, results in an expected increase in $\widetilde{LTA_{it}}$ by 0.2 units. According to the analysis results, we also see that a one percent increase in the net interest margin (NIM_{it}) leads to an expected increase in the value of $\widetilde{LTA_{it}}$ by 0.2 units. Note that the coefficient for the variable NIM_{it} was not determined very reliably.

6. The dynamics of the Mosprime Rate have a negative impact on the credit activity of banks: an increase of one unit in the value of the variable MPR_t leads to an expected decrease in the value of $\widetilde{LTA_{it}}$ by approximately 0.8 units. An increase of one unit in the capital adequacy ratio CAR_{it} is expected to lead to a decrease in the value of $\widetilde{LTA_{it}}$ by approximately 0.3 units.

7. The coefficient of determination (R^2) shows that in model (1.4), the explanatory variables account for 56% of the variation in the credit activity of banking groups in the short term, while 44% is attributed to unaccounted factors. The correlation coefficient between the actual value of the LTA_{it} indicator and the forecasted valueя $\widetilde{LTA_{it}}$ calculated using model (1.4) is approximately equal to $\sqrt{0.56} = 0.75$.

The model for assessing the credit activity of banking groups in the long term (the variable model LTA_i), estimated using time-averaged data from $t = 2015, 2016, \ldots, 2020,$ has the following equation (1.5)

$$\begin{cases} \widehat{LTA}_i = 0.06 \cdot Z_i + 0.23 \cdot NIM_i + 0.28 \cdot CI_i + 0.41 \cdot LD_i - 0.3 \cdot ILL_i + 0.02 \cdot TA_i. \\ \quad (0.03) \quad (0.26) \quad (0.05) \quad (0.04) \quad (0.1) \quad (0.01) \\ R^2 = 0.99. \end{cases} \quad (1.5)$$

The main conclusions were as follows. In the long term, the credit activity of banking groups depends on the ratio of loans to deposits (LD_i) (positive influence), the share of impaired loans in the loan portfolio (ILL_i) (negative influence), the ratio of operating costs to income (CI_i) (positive), the net interest margin (NIM_i) (positive), and the size of the banking group's assets (TA_i) (positive). We would like to emphasize that in the long term, the variable Z_i — the financial stability of the banking group — turned out to be significant for explaining the credit activity of banks. Thus, an increase in Z_i by one unit leads to an expected growth $\widehat{LTA}_i$ by 0.06 units. The interpretation of the coefficient of determination $R^2 = 0.99$ shows that in model (1.5), the explanatory variables account for 99% of the long-term credit activity of banking groups, while 1% of the value of LTA_{it} is attributed to unaccounted factors.

Thus, the conducted modeling and analysis of the results allow us to assert that our proposed hypothesis is not refuted. An important result of the study is that when comparing the impact of factors on credit activity in the short-term and long-term perspectives, a difference was found. In the short-term, macroeconomic variables have a significant impact. In the long-term, capital adequacy does not affect the lending activity of banks; however, a factor such as the financial stability of the group emerges. In both cases, attention should be paid to the quality of the loan portfolio, the ratio of loans to deposits, the interest margin, and the level of operating costs.

The results of the conducted research allow us to conclude that the stimulation of banks' credit activity should be based on the perspective: whether a short-term task needs to be solved or long-term growth needs to be stimulated. In any case, credit activity is determined by the scale of the banking group's operations.

If we are talking about the long-term aspect of stimulating the lending activities of banks, then there is no contradiction between ensuring the financial stability of the bank and its lending activity. However, attention should be paid to parameters such as the loan-to-deposit ratio and the level of operational costs. The influence of these factors in this case is opposite.

When stimulating the credit activity of banks in the short term, it is necessary to additionally consider the opposite effect of the capital adequacy ratio: this indicator has a positive impact on financial stability and a negative impact on credit activity. A similar situation arises with regard to the factor of the money market interest rates. In the first case, the impact is also positive, in the second — negative.

Overall, it should be emphasized that the directions of banking sector regulation should be determined based on the priorities of the country's economic policy.

CONCLUSION

The conducted research allows us to draw the following conclusions.

1. The analysis of contemporary banking regulation shows that it is still primarily aimed at ensuring the financial stability of the banking sector. Stimulative regulation is carried out selectively: through special approaches to assessing capital adequacy by lowering/increasing risk coefficients when lending to specific sectors (economic entities) or forming reserves to cover losses. At the same time, given the role of the banking sector in the country's economy as the main channel for the redistribution of free resources, as well as considering the current tasks of accelerated development and economic reorientation, banking regulation should shift its focus towards stimulating the credit activity of banks. In this regard, it is advisable to expand the

objectives and powers of the Bank of Russia by making the appropriate amendments to Federal Law No. 86 of 10.07.2002 "On the Central Bank of the Russian Federation (Bank of Russia)". At present, in accordance with Article 3, the objectives of the Bank of Russia's activities are the protection and ensuring the stability of the ruble; the development and strengthening of the banking system of the Russian Federation; the ensuring of the stability and development of the national payment system; the development of the financial market of the Russian Federation and ensuring its stability. Additionally, the task of "stimulating economic development and structural restructuring of the economy" should be included.

The next direction for the development of the Bank of Russia's stimulating regulation, in our opinion, could be the reduction of capital requirements for banks on loans within the framework of targeted government programs. At the same time, the development and implementation of new refinancing tools in the practice of the Bank of Russia, aimed at supporting loans for the specified purposes, are required. For example, in September 2023, the Government approved a comprehensive state program "Energy Conservation and Increasing Energy Efficiency" (Resolution No. 1473 dated 09.09.2023). It seems appropriate to introduce a refinancing instrument such as the "mechanism for supporting energy-saving and energy efficiency projects" secured by the rights of claims under the corresponding bank loan agreements, provided that the loans are rated no lower than the second quality category in accordance with the regulatory approach of the Bank of Russia. It seems reasonable to implement similar refinancing instruments for other government programs as well.

2. The conducted modeling allowed for the identification of factors positively influencing the credit activity of banks and banking groups. In particular, a positive impact of asset size on the financial stability and credit orientation of banking policy has been identified. Based on this conclusion, lower capital requirements should be imposed on small and medium-sized banks compared to large credit institutions and banking groups in order to stimulate their lending activity. One of the options for solving the problem could be the differentiation of surcharges for maintaining the capital adequacy of banks depending on the size of their assets, which would require amendments to the Bank of Russia Instruction No. 199 from 29.11.2019.

An important fact is that the factors determining the credit activity of banks and banking groups differ in the short-term and long-term perspectives. Accordingly, the stimulation of banks' credit activity should be based on the perspective of regulation: prioritizing short-term or long-term results. This conclusion, in our opinion, should be taken into account by the Bank of Russia when improving the policy of stimulating regulation. Indeed, in the short term, it is advisable to: reduce the level of capital adequacy buffers; stimulate predictability and lower market interest rates; regulate the management of banks' non-performing loans, which will improve the quality of their loan portfolios; reduce the requirements for long-term liquidity ratios, which will stimulate the growth of the loan-to-deposit ratio.

On the contrary, if the task is to achieve long-term sustainable stimulation of banks' credit activity, then the focus, in addition to the two aforementioned positions, should be on ensuring the financial stability of banks and implementing measures aimed at increasing the efficiency of banks' credit business (growth of interest margin).

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Appendix

Fragment of the Dataset (1.3) Used for Modeling

firm	year	Z	LTA	NIM	CL	LD	ILLD	CAR	NA	y	MPR	Oil	D
1	2020	45.7	64.9	5.1	36.2	98.7	6.3	14.7	487.5	–2.1	5.3	–34.8	11.9
1	2019	114.5	68.0	5.5	37.6	100.9	7.1	14.8	487.5	5.5	7.6	–10	2.7
1	2018	115.4	62.8	6.0	41.6	101.3	7.9	12.4	487.5	13.1	7.6	31.6	7.9
1	2017	119.7	68.2	5.8	35.2	100.7	4.2	13	487.5	7.3	8.5	23.9	–12.7
1	2016	100.8	68.4	6.3	40.4	100.3	9.4	12	487.5	3	11.1	–16.5	9
1	2015	70.6	68.5	4.3	45	101.2	7.1	12.6	487.5	5.1	13.7	– 47.1	56
2	2020	38.5	62.8	3.7	54.4	95.9	8.6	11.8	245.6	– 2.1	5.3	–34.8	11.9
2	2019	84.0	65.2	3.7	46.3	99.0	8.4	11.2	245.6	5.5	7.6	–10	2.7
2	2018	64.2	69.0	3.9	41.4	105.3	9.7	11.4	245.6	13.1	7.6	31.6	7.9
2	2016	67.9	65.9	4.1	51.6	121.4	6.8	14.6	245.6	3	11.1	–16.5	9
2	2015	37.3	62.4	2.6	59.5	126.5	6.9	14.3	245.6	5.1	13.7	– 47.1	56
3	2020	48.1	66.9	2.8	80.5	90.1	4.6	12.7	101.9	–2.1	5.3	–34.8	11.9
3	2019	38.1	66.8	2.7	86.4	92.4	5.5	13.1	101.9	5.5	7.6	–10	2.7
3	2018	61.7	61.8	2.9	89.1	88.9	6.6	12.4	101.9	13.1	7.6	31.6	7.9
3	2017	58.1	64.7	3.2	82.1	96.4	8	13.1	101.9	7.3	8.5	23.9	–12.7
3	2016	74.7	66.6	3.2	85.0	105.2	24.6	13.5	101.9	3	11.1	–16.5	9
3	2015	22.0	62.5	2.3	79.2	107	20.5	14.2	101.9	5.1	13.7	– 47.1	56
4	2020	4.8	64.8	4.0	26.4	95.1	4.7	13.0	63.8	–2.1	5.3	–34.8	11.9
4	2019	9.0	62.9	4.4	57.7	93.3	5.1	12.4	63.8	5.5	7.6	–10	2.7
4	2018	14.8	61.2	4.3	30.3	91.2	3.5	12.9	63.8	13.1	7.6	31.6	7.9
4	2017	11.7	60.2	4.3	63.0	92.9	8.1	11.3	63.8	7.3	8.5	23.9	–12.7
4	2016	87.9	56.7	5.3	89.0	105.5	15.1	13.9	63.8	3	11.1	–16.5	9
4	2015	88.2	61.0	4.6	25.8	117.7	15.6	14.7	63.8	5.1	13.7	– 47.1	56

Source: Compiled by the authors on the basis of an analytical database Bank Fokus.

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ORIGINAL PAPER

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Enhancing Liquidity in the Indian Commodity Derivatives Markets: Linking Agriculture Trade to Commodity Derivative Markets

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ABSTRACT

Integrating participants in the agricultural value chain, including farmers, traders, aggregators, processors, etc., into commodity derivative markets can become a win-win option for all stakeholders in the commodity ecosystem. Participants may gain an advantage related to price setting and risk management; on the other hand, exchanges may benefit from increased liquidity. In this same context, the article presents a conceptual scheme for attracting value chain agents in agriculture to Indian commodity exchanges. Within the framework of this concept, special attention is given to raising the awareness of producers, processors, and consumers of agricultural products about the benefits of commodity derivative markets. The issue of incentivizing hedgers and participants, who should have real exposure to commodities, is also being considered to increase their participation in the operations of Indian exchanges. Moreover, it is recommended to encourage indirect participation through option traders, investment banks, or other specialized agencies. In the long term, other strategies can also be considered, including state participation in commodity derivatives markets and allowing fractional contracts on commodity derivatives to increase liquidity in Indian commodity derivatives markets.

Keywords: Commodity Derivatives; Farmers; Price risk management; Futures Markets

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INTRODUCTION

In the process of economic liberalization and deregulation in Indian commodity futures markets, commodity futures trading has been reintroduced since 2003 [1, 2]. The two major factors leading to such reforms were their ability to manage price risk and the efficient discovery of future commodity prices [3, 4]. After a healthy run, signs of corrections were observed in the Indian commodity markets in 2012. However, the NSEL Spot Exchange scam of Rs 5,600 crore in July 2013 had disastrous consequences for the volume and value of trade [4]. After the revelation of the scam, the turnover of the exchange decreased to almost 50% until February 2015. Although the erstwhile FMC adopted several measures to restore confidence among participants, Indian commodity derivative markets were not able to revive and regain the previous high-growth trajectory (*Fig. 1*).

The two primary functions for which commodity derivatives are allowed can only be achieved if the traded contracts are liquid and provide opportunities for hedgers, speculators, and investors. So far, the derivatives contracts traded on the exchanges have not been liquid when compared with similar instruments on other commodity exchanges in emerging and developed countries [5, 6]. Researchers have provided several reasons for this, including higher transaction costs, higher regulatory restrictions, and the availability of desired products. a vis. products available in overseas markets, among others, as reasons for lower liquidity in Indian commodity derivatives markets.

With the merger of FMC with SEBI (Securities Exchange Board of India), several reforms have been initiated by regulators to improve liquidity in commodity derivative markets. The reforms include allowing options on commodity futures, commodity indices, mutual funds, alternate institutional funds, foreign firms with actual exposure to agricultural commodities to participate in the Indian markets, etc. [7]. Amidst these reforms, commodity markets still underperform in terms of expected trade volumes and liquidity [8].

Given this background, this study suggests how liquidity can be increased by linking agricultural trade to Indian commodity derivative exchanges. Increased participation by farmers/food processors/traders of

agricultural commodities in commodity derivative exchanges is a much-desired objective for policymakers, as they are among the most important 'intended beneficiaries' of commodity futures markets. However, certain constraints hinder the achievement of this objective to the desired extent. This study discusses these constraints and approaches to overcome them.

Section 2 covers the theoretical basis of the need for risk management in the agricultural sector. Section 3 presents the results, Section 4 discusses the primary policy suggestions for enhancing liquidity in the Indian commodity derivatives market, and Section 5 concludes the paper.

THEORETICAL BASIS

The Indian agricultural sector broadly has to deal with two categories of risk: output risk and price risk. Risks arising from excess or deficient rainfall, temperature fluctuations, and crop diseases lead to output risks. However, price fluctuations due to market factors such as demand and supply are potential sources of price risk [9].

Various government interventions, including Pradhan Mantri Fasal Bima Yojana, Pradhan Mantri Krishi Sinchai Yojana, and soil health cards, have been initiated to counter the output risk. Further, to reduce price risk, interventions in setting minimum support prices and procurement programs are prevalent, wherein the government bears the cost of protecting farmers' interests.

However, government interventions for managing price risk have inherent limitations owing to fragmented farmer populations, weak rural infrastructure, and high transportation costs [10]. Such limitations result in not only low participation of farmers, but also wastage and spoilage of commodities during the procurement and storage process [11]. It has often been noticed that the actual benefit of such programs is availed of by aggregators and stockists rather than by actual farmers.

An alternative approach to managing price risk in agricultural commodities can be through market instruments, that is, entering into futures and options contracts traded on national commodity exchanges [12]. Although national commodity exchanges have been operating in India for more than 15 years, farmers' direct or indirect participation has been minimal [13]. As per the SEBI annual report, during 2021–2022, the share of value chain participants and hedgers to total turnover was just 0.5 percent of the total turnover. The lower participation of farmers in Indian commodity derivatives markets is due to several factors. Several of these studies have been discussed. First, there is a large vacuum in the farming community regarding the benefits of commodity futures. Most farmers consider trading in commodity markets with gambling or in a marketplace for big players to manipulate prices [14]. Awareness of the role played in risk management and price discovery has not spread among farmers and other stakeholders. Furthermore, misrepresenting facts about commodity markets, such as low physical delivery and high volumes compared to the actual quantity produced, have also taken many genuine prospective users on a back seat [15, 16].

Second, farmers often find it challenging to meet the requirements for opening a trading account such as KYC compliance, bank account, Permanent Account Number (P. A. N.), and Aadhar, which is a mandatory requirement for accessing commodity exchanges. The user has to pay an annual maintenance fee along with transaction charges, which are approximately 2–3% of the total traded value. The contract size is much higher than the average farmer produces annually. Such procedural hurdles also restrict farmers' participation in Indian commodity exchanges [17].

Third, even after opening a trading account, taking positions in future contracts requires considerable knowledge of how to trade, exposure margins, and daily mark-to-market margins [18]. The whole process of hedging price risk in terms of choosing which commodity to hedge, how much quantity, etc., would require considerable time and effort, which any ordinary farmer may find difficult to devote.

Fourth, since commodity contracts traded on the exchange are standardized in terms of quality, lot size, period, and delivery centre, many farmers do not qualify for tendering delivery in exchange for the minimum lot size. Their participation is also limited due to the requisite grade/variety/quality deliverables against the contract. The lack of adequate postharvest management, warehousing, and grading facilities also limits the available deliverable surplus. To the extent that farmers wish to use futures contracts to sell their produce, their participation becomes geographically limited around the notified delivery centres of the contract.

Fifth, the futures market has experienced several policy reversals in the past, leading to uncertainty among all stakeholders in the commodity ecosystem, including farmers [4]. Frequent instances of suspension of trading

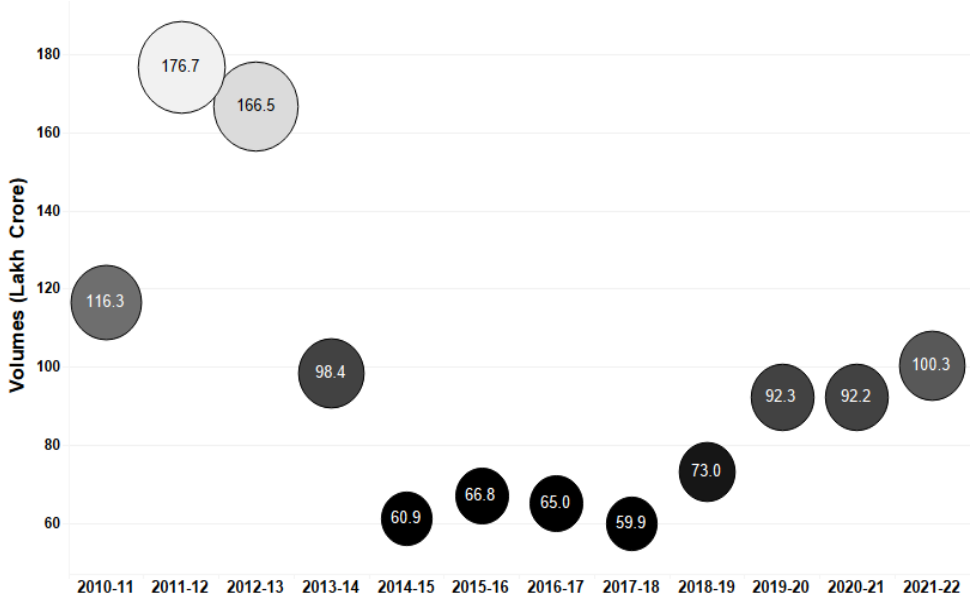

Fig. 1. **Total Volumes of Trade in Commodity Derivative Markets (In ₹ Lakh Crores)**
Source: Compiled from SEBI Annual Reports.

are linked to food price inflation and price manipulation. These interruptions not only cause immediate financial implications for active participants but also shake the confidence of current as well as prospective participants regarding the continuity of the markets [5]. Recently, seven agricultural commodity contracts were suspended by the SEBI when the prices of agricultural commodities started to rise. The ban on commodity contracts interrupted the price discovery and risk management functions of the commodity markets for which they were reintroduced in 2003. Further, it hurts market participants' sentiments and confidence, especially in dealing with price risk leading to Dabba trading or a shift in volumes to international commodity exchanges.

Finally, a developed spot market (which may not necessarily be a spot exchange) is a prerequisite for a well-functioning futures market. The major roadblock to the growth of agricultural futures markets in India is the fragmented physical/spot market [4]. Spot markets need rapid improvements in infrastructure, logistics, management, linkages with financial institutions, and efficient information systems. A spot or wholesale market of sufficient size and efficiency must be developed to establish a vibrant futures market in India [8].

RESULTS

After discussing the theoretical basis and constraints for farmers' participation in Indian commodities, the section discusses the results in the form of probable solutions for the issues mentioned above. Two types of benefits accrue to agri-value chain participants from trading on commodity exchanges: direct and indirect. Direct benefits are available when farmers use exchanges for price risk mitigation and tendering physical delivery [7]. Indirect benefits include price discovery and dissemination, wherein if a farmer is not directly trading on exchanges, he can use the disseminated prices to bargain better prices for his produce [8]. They can also use futures prices to decide which crop to sow and when to sell their produce. Additionally, indirect benefits can arise when farmers indirectly participate in the exchange through Farmer's Producer Organizations (FPOs), aggregators, etc. [14]. To ensure that farmers can take advantage of the commodity futures market by spreading awareness of commodity markets. The role of commodity markets in price discovery and risk management must be percolated among users. Alternative means of spreading awareness among stakeholders must be explored. The price dissemination project, which aims to install price tickers in rural areas, must be revamped. The installed tickers must be monitored to determine whether they are operating and installed in places where farmers can benefit from the installed instruments. Further, future price dissemination can also be undertaken through the Krishi Darshan, mKisan Portal, and Kisan

apps, which enjoy good popularity among farmers and have successfully connected with farmers across the country. Furthermore, the rising popularity of social media among farmers should be capitalized to spread information about the markets.

In the recent past, various institutions, including SEBI, Commodity Exchanges, Nabard, have initiated initiatives for spreading awareness about the utility of commodity markets to farmers. To understand the shortcomings of such programs, especially short-duration programs undertaken by SEBI, Commodity Exchanges, Nabard, etc., should be evaluated. Furthermore, a comprehensive framework for increasing awareness of measurable targets and outcomes needs to be developed. The comprehensive framework should include stakeholders from SEBI, Nabard, Small Farmers' Agri-Business Consortium **(**SFAC), Agri Skill Council, Agriculture training institutes.

Another critical issue that requires attention is incentivizing brokers to serve rural clients. Brokers often find it difficult to serve rural clients for several reasons, including the awareness of commodity markets and trading, infrastructure bottlenecks, and high trading costs due to low trading volume. All of these bottlenecks prevent farmers or rural clients from trading in commodity markets. Incentives to serve genuine rural clients exposed to commodities (farmers, Processors, Aggregators, Wholesalers, etc.) should be provided in terms of lower brokerage and account maintenance charges for small traders hedging the price risk associated with their daily operations.

Further, to improve farmers' participation in commodity markets, Plain Vanilla Options can be introduced as commodity options in Indian commodity exchanges in 2019 to provide stakeholders with a new set of financial instruments to hedge their price risks. The launch was considered one of the most significant reform measures since modern commodity derivatives trading began 14 years ago. The options can act as insurance to change prices, where the buyer's loss is limited to the amount of premium paid by him. The Options on Agriculture Contracts were initially started in guar gum at the NCDEX. However, market response has not been encouraging. The complexity of currently offered options contracts requires many participants in the back seat. Further, many genuine hedgers participate in international exchanges that offer hedge price risks using option contracts. The introduction of simple products, such as plain vanilla options, can attract agricultural value chain participants towards commodity exchanges.

Another vital measure is to improve the participation of stakeholders who can take positions in futures markets on behalf of farmers. Since farmers generally do not possess the requisite knowledge and resources to participate in commodity markets directly, the same can be taken care of by some specialized intuitions, such as banks, insurance companies, NBFC's or entities specifically instituted for farmers' risk management. Cooperatives, farmers' associations, state marketing federations, and non-government organizations can also act as aggregators by consolidating positions on behalf of a group of farmers. Furthermore, several other specialized institutions can act as intermediaries that provide risk management services to farmers for a nominal fee.

In the same context, allowing banks/ NBFC'c to hedge positions on goods kept in warehouses can improve farmers' indirect participation in the exchange. Farmers increasingly use warehousing receipts to meet their working capital and consumption needs after the harvest season. For instance, a decade ago, loans worth only around 5000 crores were made to farmers against warehouse receipts. Banking institutions have advanced around ₽40,000 crores against these receipts. While these numbers look more minor against the gross agri-credit target of ₽10,65,755 crores for the current fiscal year, there is tremendous scope for such financing in years to come back to the renewed attention of policymakers and the changing agricultural dynamics in the country. The average tenure of loans against WHR is around six months, making banks susceptible to the price risk on which loans have been granted. A drastic fall in the prices of underlying agricultural commodities may spur defaults and hurt the NWR ecosystem. If banks/NBFCs are allowed to take positions on behalf of farmers, not only will farmers be protected from price risk along with arresting the NPA of lending institutions.

Furthermore, exchange-accredited WDRA-registered warehouses can also act as procurement channels for central agencies. Food Corporation of India (FCI), the nodal central agency of the Government of India, along with other State Agencies, undertakes procurement of wheat and paddy under a price support scheme. State Government Agencies purchase coarse grains for the Central Pool based on periodic directives from the Government of India. Procurement under price support

is undertaken mainly to ensure remunerative prices to the farmers for their produce, which is an incentive for achieving better production.

To facilitate the procurement of food grains, FCI and various State Agencies, in consultation with the State Government, establish purchase canters at various mandis and critical points. In the procurement operations, around ₱900 crores were spent to support the losses from procurement operations of the previous year. The government expects the same to be around ₱2000 crore in the current year.[1] The number of centres and their locations are decided by the State Governments based on various parameters to maximize the MSP operations. Although 18 535 procurement canters were operated during the Rabi Marketing Season (RMS 2022–2023) for wheat and 65,000 procurement centres for Rice in Kharif Marketing Season (KMS 2021–2022), farmers face difficulties in reaching these procurement centres, and it has also been reported that middlemen procurement is produced from farmers at low prices from districts with fewer or fewer procurement centres and sell at a profit to direct procurement centres (DPCs) in other districts. To overcome the problem of limited procurement canters, the services of WDRA-registered exchange-accredited warehouses can be used as procurement canters, and farmers can sell their products indirectly through an exchange mechanism by depositing the same in the exchange-accredited warehouse. Warehouses may assist the farmer/FPO in procuring loans against the product, the portion of which will be used as a margin for entering into futures contracts. In the case of an order, matching occurs on the exchange at the market price, the price set by the government, or higher (procurement price), and the loan with the bank can be settled from the sale proceeds. If the buyer intends to deliver, the same can happen through the exchange mechanism; otherwise, the accredited warehouses can transfer the stocks to the procurement canters. If the prevailing market prices are lower than those offered in exchange, the government can claim a difference.

Another step in improving indirect participation can be by introducing registered agricultural trade options merchants (ATOM) in the Indian markets, which can provide marketing services of exchange-traded options contracts on farm products to producers, processors, or commercial users. Such institutions can be allowed for commodities such as soybean and coriander in pilot mode, which can then be extended to other commodities.

An important initiative for improving farmer participation can be benchmarking the best practices of farmers' producer organizations (FPOs). Currently, there are 744 FPOs set up by SFAC[2] and 5000 FPOs by Nabard.[3] Of the total, 470 FPOs started trading on commodity exchanges and realized higher prices for their produce.[4] The number of FPOs increased following the Union Budget 2018 announcement of a 5-year tax break for farmer-producer organizations. The best practices for FPOs and the critical issues of concern should be documented. Benchmarking best practices will provide a more congenial environment, thereby encouraging more FPOs to participate in commodity exchanges.

Another suggestion for improving indirect farmer participation is government participation in commodity derivatives. In all countries, governments tend to focus on the agricultural sector for various reasons. Agricultural development policies in India and across the globe aim to achieve specific policy goals. These goals may be exporting promotion, commodity sector protection, price stabilization, price support, food security and public distribution, hunger alleviation, and equitable income distribution. There are a few examples in which governments and government agencies have used markets to intervene to support their policies. The HAFED apex cooperative of Haryana effectively hedged wheat by using the NCDEX wheat futures contract. Agencies such as the FCI, NAFED, HAFED, MMTC, PEC and State Government Agencies are involved in procuring stocks. Stocks are procured during the arrival season and then gradually released during the year. In addition to the fixed cost borne by the agencies, which includes the cost of procurement and final distribution of the stock, the price volatility risk acts as an unpredictable additional cost. However,

[1] URL: https://economictimes.indiatimes.com/markets/expert-view/government-may-have-to-shell-out-rs-2000-cr-on-procurement-losses-shobhana-pattanayak-agriculture-secy/articleshow/63796341.cms (accessed on 24.102024).

[2] URL: http://sfacindia.com/UploadFile/Statistics/State%20wise%20summary%20of%20registered%20and%20the%20process%20of%20registration%20FPOs%20promoted%20by%20SFAC%20(as%20on%2031st%20May,%202018).pdf?data=53334.54 (accessed on 24.102024).

[3] URL: http://fpoexwebdata.assetview.in/ (accessed on 24.102024).

[4] URL: https://www.ncdex.com/Downloads/NCDEXImpact/PDF/NCDEX_Group_Connecting_Farmers_to_Market_April_2018.pdf (accessed on 24.102024).

suppose that the agencies choose to hedge the produce procured from farmers using derivatives traded on the Exchange. In that case, it will not only protect them from price volatility but also effectively manage price risk and lower total operational costs.

Finally, allowing fractional contracts in commodity derivatives can also help improve farmers' participation, as the minimum lot size for most agricultural contracts traded on exchanges is available for 10 MT or 10,000 kg. The large size of the contract discourages small producers, processors, stockists, aggregators, etc., from using commodity futures to hedge price risk. Smaller contracts can be introduced if participants can trade in fractions rather than in exclusive contracts. Although fractional trading in shares is still not allowed as per current regulatory provisions, enabling the same can encourage more extensive participation from participants.

INTERNATIONAL INITIATIVES FOR LINKING PARTICIPANTS TO COMMODITY DERIVATIVE MARKETS

China

The involvement of State Trading Enterprises, such as the China National Cereals, Oils and Foodstuffs Corporation (COFCO) Futures Group in China, was a significant aspect that contributed to the deepening and development of organized commodity futures in the country. The largest food maker, processor, and dealer in China, COFCO, was created in 1952, and is a state-owned holding corporation for the food processing industry. It is the only importer and exporter of agricultural goods governed directly by the Chinese state. Having full participation in all domestic futures exchanges, COFCO Futures was founded in 1996. Futures brokerage, investment counselling, and international futures trading are the few services they offer. The number of agricultural commodities exchanged by COFCO has grown throughout the years, and in the last ten years they have traded cotton, sugar, palm oil, soybean oil, and meal, among other products. The presence of state-owned businesses in the futures market, such as COFCO, instils confidence and trust among other participants.

USA

In the United States, a program allowing the buying and selling of agricultural trade options in specified commodities was launched by the Commodities Futures Trading Commission (CFTC) in June 1998.[5] The Commission modified the program in December 1999 by permitting cash settlement of contracts to simplify the registration procedure and to provide option contract designers with more freedom. When issuing or selling agricultural trade options as a component of an agricultural business, an entity may only do so through program regulations. A business must register as an agricultural trade option merchant (ATOM) before it can offer or sell agricultural trade option contracts.

Tanzania

In Tanzania, agricultural market cooperative societies (AMCOS) have been used to link farmers to organized commodity exchanges. Cooperative societies, where farmers pool their goods during harvest, are the first point where the exchange ecosystem starts. The AMCOS tracks down the farmers and their goods at collection points, temporarily stores them, and then transports the product to authorized warehouses. The Warehouse Receipt Regulatory Board (WRRB) regulates the licensed warehouses. After the depositor is recorded, the commodity is collected for quality inspection. Once acknowledged by the depositor and subject to the commodity being weighed and held in the warehouse, if it satisfies the requirements established for that specific commodity, a quality certificate will be provided. The warehouse operator provides the depositor with the warehouse receipt and uploads it to the warehouse receipt system (WRS). The WRS is connected to the exchange online trading platform once the WRRB has approved, at which point the data will be used to set up trade sessions. Trade sessions were organized with the awareness of all relevant stakeholders and market participants. After trade sessions, the exchange handles clearing and settlement activities to ensure that sellers are paid on time and that purchasers obtain ownership of the traded commodity with quality and quantity assurances. Purchasers can deliver the commodity to the appropriate warehouses.

Zimbabwe

In the case of Zimbabwe, farmers, contractors, and all other parties involved in the value chain of wheat

[5] URL: https://www.cftc.gov/IndustryOversight/ContractsProducts/AgriculturalTradeOptions/index.htm (accessed on 24.102024).

use the logistical framework set up by the Zimbabwe Mercantile Exchange (ZMX). Further, the government has chosen a structured, liberalized marketing system for strategic commodities and is now examining the instruments governing the marketing of agricultural products, where the floor producer prices for commodities such as maize, conventional grains, soy, sunflower, and wheat are regulated by the government.

These commodities must be acquired by the Grain Marketing Board (GMB) and paid by the government at these mandatory rates. Farmers that are self-financing sell to the GMB or at the best possible price. Every private contractor must repurchase contractual crops at a market rate. A transparent price discovery process is necessary for this new structure. The Zimbabwe Mercantile Exchange (ZMX) is instrumental in linking farmers with procurement agencies and the business sector.

Rwanda

EAX, the third largest exchange in Africa, was founded in 2014 to help farmers and agricultural producers obtain better prices for their goods. It also aimed to enable farmers to increase access to financial sector services by issuing quality and quantity guarantees, and collateral management services. Most of the commodities that EAX trades now are essential commodities such as paddy, rice, soy, beans, and wheat.

As a commodity exchange, EAX offers a comprehensive strategy encompassing aggregation, processing, storage, collateral management, and clearing to guarantee that the best value is realized, and extra liquidity alternatives are produced for Rwandan and regional farmers.

Further, the exchange is trying to develop a trading and supply chain network that links merchants and farmers to global commodities and financial markets in ways that guarantee increased revenue and a better quality of life. It concentrates on creating a bottom-up strategy for market development that uses farmers and storage as cornerstones. Farmers can use fully registered e-WR as collateral to obtain bank funding. Banks may offer credit to agricultural consumers at lower rates because of EAX's quality and quantity guarantees, which significantly lower the risk associated with lending.

Australia

In Australia, farmers participate indirectly in commodity derivatives markets through commodity pools. The advantages of commodity pools are their lengthy market window, which ensures that price risk is reduced by market changes. In other cases, the commodity pool consultant can sell the specific quantities needed to generate cash flow while the commodity is in the pool. Compared with on-farm storage, servicing and maintenance expenses are also lower. To help farmers prepare for the subsequent seasons, the pool manager offers advice on potential markets. The pool manager is also responsible for product marketing. It provides an effective marketing technique for producers of grains, sugar, and cotton, where pools are widespread and do not require cash flow. As long as the manager positions for price-upside participation, commodity pools provide a simple approach to profit from any prospective market upside.

France

In the case of France, futures markets play an essential role, as many farmers use the prices of the agricultural contracts traded on the exchange for signing pre-harvest contracts. In a study by Roussy et al. (2018), almost 17% of the total volume of farm sales is sold before harvest with the help of co-operatives acting as intermediaries. The price of contracts is linked to futures market contracts traded on exchanges. Final adjustments are made to the price paid upon delivery to reflect observed quality and increases or decreases in the price agreed upon at signing by the co-operative's scales (protein content, broken grains, and loss of vitreous aspect).

Farmers have access to information frequently published online and distributed by cooperative technicians, which they may use to assist them in negotiating their prices. The cooperative combines its understanding of the market and brokers' information to create price information.

The selling price is decided through forward contracts before the harvest. Farmers are given deposits during harvest as part of the average price contract, and further payments are made in equal instalments throughout the marketing season.

DISCUSSION

In the process of economic liberalization and deregulation in Indian commodity futures markets, futures trading in commodities has been reintroduced since 2003. The two major factors leading to such

reforms were their ability to manage price risk and the efficient discovery of future commodity prices. After a healthy run, signs of corrections were observed in the Indian commodity markets in 2012. However, the NSEL Spot Exchange scam of Rs 5,600 crore in July 2013 had disastrous consequences for the volume and value of trade. After the revelation of the scam, the turnover of the exchange decreased to almost 50% until February 2015. Although the FMC adopted several measures to restore confidence among participants, Indian commodity derivative markets were not able to revive and regain the previous high-growth trajectory.

Further, as per the SEBI annual report of 2021–2022, the volume of the agriculture sector in the Indian commodity derivatives markets is just 5.7% of the total volume traded in India. As India is a major producer of several agricultural commodities, the scope of price risk management and discovery is crucial. The low volumes of the agricultural sector indicate the huge potential in case stakeholders are made aware of the importance, especially in the era of high uncertainty in agricultural prices.

Therefore, the suggested measures for improving farmers' participation in Indian commodity markets can increase liquidity in commodity markets and help deepen the commodity futures market. Therefore, linking commodity value chain participants, including farmers, traders, aggregators, processors, etc., can be a win-win situation for exchange; policymakers and value chain agents as value chain participants can gain the advantage of price discovery and risk management roles. On the other hand, exchanges can gain in terms of increasing liquidity, especially in the agriculture segment (*Fig. 2*).

CONCLUSION

This study aims to recommend novel measures to improve farmers' participation in Indian commodity derivatives. This study suggests several policy initiatives to take Indian commodity derivative markets to the next level. Suggestions include spreading awareness to improve liquidity in commodity markets. It is also recommended that exchanges and policymakers focus on improving the effectiveness of current awareness programs. Further, with the introduction of index derivatives and options on futures, initiatives such as commodity trading simulation exercises and commodity price hedging simulation exercises can be taught in training rather than short-duration lectures. Furthermore, advertisements about the utility of commodity derivatives on similar lines of mutual funds can be aired on radio, newspapers, and other mass media platforms to spread awareness.

The paper also recommends incentivizing hedgers and participants to have actual exposure to commodities by subsidizing, given the higher cost of trading on Indian commodity bourses. Further, initiatives to encourage the indirect participation of value chain agents through option merchants, merchant banks, or any other specialized agency are also suggested. Similarly, price support provided to farmers by the Government of India through FCI or state procurement agencies can also be partially substituted in a phased manner through commodity exchanges through the use of put options that the government can subsidize.

It is also recommended to allow fractional trading of contracts in commodity derivatives, which will increase the reach of commodity derivative products. A smaller contract encourages small producers, processors, stockists, aggregators, etc., to use commodity futures to hedge price risk.

Finally, it must be noted that agricultural commodity derivatives contracts were introduced in India to provide a price discovery and risk management framework for its stakeholders. Despite several proactive measures, their effectiveness and utility have been questioned several times. Similarly, the success of the above-mentioned measures is debatable, especially when any issue related to farmers is considered sensitive. Stakeholders, especially farmers, are not so inclined towards market measures of price support, and they feel that in a welfare state, the government should play a vital role in direct procurement and provide direct incentives to farmers. In the same context, farm bills in India were taken back after prolonged protests by farmers and other stakeholders. Further, in the Indian context, when agriculture-related policies have to be modified, states have a significant role to play, and therefore, it becomes difficult for the central government to have a unified law for the entire nation. Despite these bottlenecks, several success stories have also emerged not only in India but across the globe, where farmers have shown keen interest in these instruments. Recently, a group of farmers appealed to SEBI to relaunch the agricultural commodity derivatives contract, which had been banned since last year. Furthermore, the use of derivative contracts has proven beneficial to small farmers in African countries. Such success stories give a ray of hope for emerging economies, especially where the agriculture

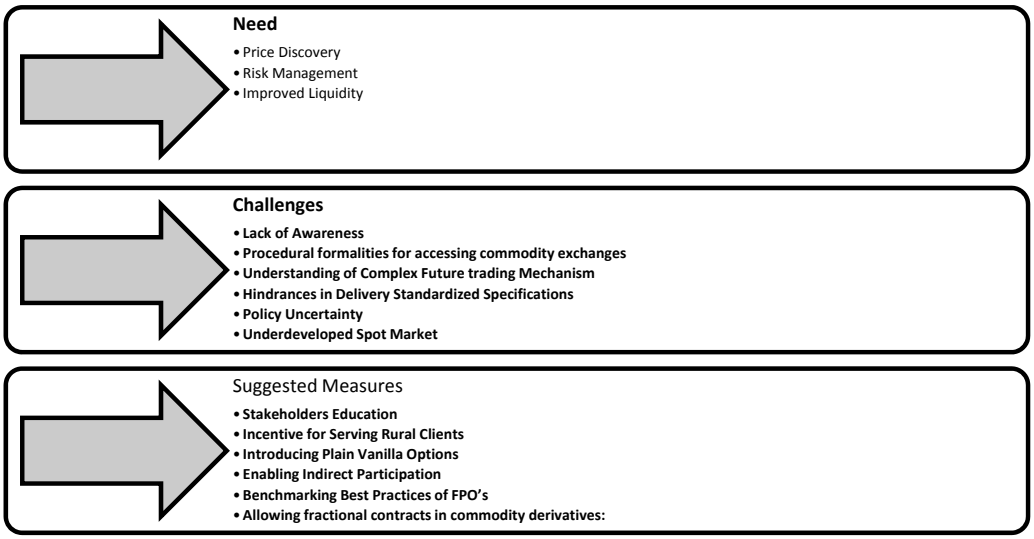

Fig. 2. **Need, Challenges and Suggested Measures for Improving Farmer's Participation**

Source: Author's own compilation.

sector has also undergone substantial transformation, and new-age farmers have shown interest and capability in using these instruments for price discovery and risk management. Furthermore, it should also be noted that the success of these measures cannot be seen overnight, and the government must formulate stable policies to onboard the farming community and other stakeholders on Indian commodity exchanges. Recent policy reversals of banning several agricultural commodity contracts created distrust among the participants, leading to a lower level of acceptability as instruments for price discovery and risk management.

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Abnormal Return of NSE Traded Gold ETFs in Crisis Settings: An Appraisal of Contrarian Versus Momentum Strategies

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ABSTRACT

This study aims to scan the efficiency of NSE gold ETFs in the context of the pandemic. The trading strategies such as the contrarian and the momentum tactics employed by the market participants towards gold ETFs in different time horizons were observed in detail. This study also attempt to check whether gold based funds is considered as a safe haven by the Indian investors in crisis settings. Daily return trend of gold ETFs and the broad market index for past four years were duly examined. The risk adjusted abnormal return method was employed for different time horizons as this technique observed to be more reliable for the topic and seems to be quite novel to the existing body of literature. The market participants were efficient in accommodating the pandemic news in their trading strategies. The analysis confirmed trading momentum attributed to gold ETFs despite the COVID-19 waves. This research points that fund managers should give more weightage for gold based ETFs in their portfolio along with common stock as the portfolios diversified with gold ETFs were able to marginalize its loss impacted by the COVID waves. From economic point of view gold ETFs enabled to divert more funds from domestic households to the corporate sector even during the crisis period.

Keywords: abnormal return; contrarian strategies; momentum strategies; COVID-19; gold ETFs

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INTRODUCTION

The exchange traded gold funds allow the investors to trade on the basis of the domestic physical gold price in dematerialized form. The traders across the world consider gold ETFs as an alternative against the gold bullion investment. In terms of physical gold consumption, India ranks in the second position in the world after China. However, gold trading is not considered a safe haven by Indian investors for long run [1]. The Gold ETF segment in the Indian stock market has attracted an investment of Rs. 48.14 million in the financial year 2020–2021 [2]. The net assets under the management of Gold ETFs increased to Rs. 204.30 million in April 2022 from Rs.192.8 million in March 2022 [3]. This flow was reported on account of the risk aversion of the investors due to the COVID-19 pandemic. This trend signals that the gold assets are being considered by the investors as a diversification tool to mitigate the crisis.

The trading strategies of the stock market participants are fashioned primarily on the basis of parameters such as risk, return safety and liquidity. The fundamental stock analysts always suggest that an investor should examine Economy, Industry and Company (EIC) wide characteristics before trading, whereas the technical analysts believe that the market movements are fashioned by historical prices. In fact, the price movements are independent and no one is capable of predicting them, and based on this notion, the theory of efficient market hypothesis (EMH) emerged. The market is efficient in collecting and processing new pieces of information, thereby the price changes are rational and independent [4].

In view of efficient market theory, it is evident that the gold ETF prices are subject to change in accordance with the new piece of information. When the information spreads, the investors are expected to respond quickly, and the gold ETF price will move in accordance with the nature of the information [4]. If the information is favorable, people will invest in gold ETFs, and otherwise they will divest. In recent days, Indian investors were attracted towards gold ETFs due to two reasons. There are increasing numbers of COVID cases across the world due to inflationary concerns in the economy.[1]

[1] Economic Times. Gold ETFs attract Rs 4,814-cr in 2021 on firming inflation, higher mkt valuations. The Economic Times, 2022. URL: https://economictimes.indiatimes.com/markets/bonds/gold-etfs-attract-rs-4814-cr-in-2021-on-firming-inflation-higher-mkt-valuations/articleshow/89379520.cms (accessed on 30.10.2024).

If the investors are rational, they will act in accordance with the market information. Conversely, if the investors are irrational, they can create short term volatility in the price movements. It is believed that investors are adopting either a contrarian strategy or a momentum strategy in response to market news [5]. If the investors are discarding the market information, it results in contrarian strategies, whereas a steady response from investors to the market information results in momentum strategies. It is believed that irrational investors attempt to make a return by behaving opposite to the market information. For example, the investor will invest in a fund with probable loss in the future or withdraw from a fund with profit potential. Such behavior of investors will result in contrarian movement of fund to the general market trend. Indeed, buying loser stocks and selling winner stocks results in a contrarian strategy [6]. A momentum strategy indicates the confidence of investors in market information and they will act rationally [5]. Here the investors will purchase winner stocks and short-loser stocks.

This study examines the trading strategies in the Indian gold ETF market by using the daily return data of gold ETFs traded through the National Stock Exchange (NSE) for the past four financial years. The data was processed by structuring the study period into 90 days, 180 days, 365 days and 730 days, respectively, prior to and post-COVID-19 information spread. The research was carried out on the basis of the risk-adjusted abnormal return method proposed by De Jong and Rhee and Aravind [6, 8].

LITERATURE REVIEW

The initial seeds for the efficient market hypothesis were originated on the basis of the argument that the capital market will be dominated by the informed agents [8–10]. Later, Fama (1970) introduced three forms of efficiencies to observe movement of the security prices. In weak form of efficiency, the security prices are subject to the historical price movements. The semi-strong form intends to test how publicly available information can adjust to the price movement of stocks, and finally the strong form of efficiency focuses on how monopolistic access to information can affect the stock prices.

The critics of EMH pointed out that under this theory, investors need to take an above average risk for generating an abnormal return [11]. They argue that the return anomalies in EMH are arising in the context of some specific models, and variation in statistical approaches may bring different conclusions. It is further explained that the security prices are highly influenced by the behavior of the investors [12]. The investors can make extraordinary profit via wishful thinking, and attention errors can cause significant losses to their asset portfolio. It is pointed out the need for conducting more studies to establish that the stock market is efficient, and if possible, new behavioral theories should be developed with new testing models [13].

Testing the efficiency of the market using ETF was found to be more effective than other passive benchmarks [14]. The ETF's encouraged the investors to have a short-lived approach to investment management, though it has enabled them to trade in huge volume [15]. The ETFs enabled the investors to manage their assets without paying any extra fee for asset management; thus, the exchange-traded fund became a favorable choice for the investors. From a market perspective, ETFs enabled to improve liquidity and bring price efficiency to the underlying assets. It helps to reduce anomalies in the form of short selling and other unfair trade practices [16].

1t is reviewed the market efficiency of gold exchange traded funds in India using the traditional run test and serial correlation test. The results report that the market efficiency is absent with the exchange traded gold funds [17]. The relative efficiency of gold ETFs in India was studied by Kaur and Singh by analyzing the role of ETFs against spot and future gold markets. It is found that the spot and future price of gold are integrated into gold ETF prices. However, some relative inefficiency is also observed with the price of gold ETFs [18].

The contrarian and momentum hypothesis argues that ETF portfolios will either sell the winners and purchase the losers or buy winners and short the losers [6]. A study conducted in the United States on ETFs reported that the contrarian strategies can provide abnormal returns to ETFs for a very short period, say a holding period from a day to one week. While testing the return trend for 4 weeks to 39 weeks demonstrates momentum strategies in asset allocation [7]. The buildup behavioral factors based on contrarian and momentum flows are relevant for asset pricing [19].

The abnormal return can be earned by using global investment strategies in long run. The world macroeconomic risk factors like industrial production and the momentum returns are highly integrated [20]. The momentum abnormal returns from ETF oriented industrial portfolios was further confirmed [21]. The price earnings

ratio, price book ratio and net foreign inflow of funds are significant factors in maintaining market momentum in the Indian stock market [22]. A weak reversal pattern was reported in the Indian capital market for a short period, and a long continuation pattern was reported for an extended period. These results strongly support the market momentum in the long run [23].

During the COVID-19 outbreaks, the ETF returns behaved indifferent to market volatility by possessing an inverse relationship with the benchmarking indices, whereas ETFs are reported to have a positive and significant relationship with gold returns [24]. Gold based ETFs can be used to short cover the systematic risk arising due to COVID-19. The price of gold remains fairly stable during the period of pandemic, showing the traders trust over this yellow metal [25]. During these periods, gold funds established themselves as a reliable diversifier by reducing the shocks on other assets in the portfolio [26]. The effectiveness of gold as a hedging instrument was confirmed during the COVID-19 period, especially in the Asian markets. The return of portfolios during the COVID subperiod was driven by gold implied volatility [27]. The COVID-19 shocks on conditional variability of the gold price, oil rates, bitcoin, and exchange rates were deep-rooted [28]. However, more clarity is required on the diversification role of gold with other crypto currencies during the process of portfolio allocation [29].

The objective of this work is to examine the efficiency of the Indian gold EFT market during the pandemic period and to observe the trading strategies employed by the investors in these difficult times. Secondly, this research work attempts to check whether gold-based funds will be considered by Indian investors as a safe haven in crisis settings.

The following hypothesis were fixed for this research:

H01: the daily return data of gold ETFs and NIFTY is not stationary.

H02: the broad market index (NIFTY) return trend has no significant impact on gold ETF returns.

H03: the trading strategies (contrarian or momentum) in crisis settings are not significant.

METHOD

Research Design

The gold ETFs actively traded through the National Stock Exchange of India (NSE) were duly incorporated in this research. Presently eleven gold funds are active in NSE trading portal; they are AXIS Gold ETF (AXISGOLD), Aditya Birla Sun Life Gold ETF (BSLGOLDETF), Nippon India ETF Gold Bees (GOLDBEES), UTI Gold Exchange Traded Fund (GOLDSHARE), HDFC Gold Exchange Traded Fund (HDFCMFGETF), ICICI Prudential Gold ETF (ICICIGOLD), IDBI Gold Exchange traded fund (IDBIGOLD), Invesco India Gold Exchange Traded Fund (IVZINGOLD), Kotak Gold Exchange Traded Fund (KOTAKGOLD), Quantum Gold Exchange Traded Fund (QGOLDHALF) and SBI ETF Gold (SETFGOLD). For observing deviation of ETFs with the stock market, broad market index of the National Stock Exchange of India (NIFTY) was fixed as the benchmark.

Data and Sample

The daily closing price of EFTs and NSE index from 1st April 2018 to 31st March 2022 was collected from the NSE web portal www.nseindia.com. It extensively covers 992 daily observations each of eleven ETFs and NSE broad market index. Thus, the data coverage includes 12*992 price observations. The simple random sampling technique was employed on the ground that in a cross-sectional time series study, it is implicit that the time element is having a random effect that only produces variance, not bias [30]. The collected data was segregated in to formation and testing periods in view of the COVID-19 crisis. The data period was further structured into 90 days, 180 days 365 days and 730 days. This sample size was fixed on the basis of the power analysis protocol for linear bivariate regression models for examining the difference between intercepts featured in G*Power software [31, 32]. The power analysis protocol has suggested a minimum sample size of 90 for one group of data. Thus 90 days fixed as the minimum time criteria in this research.

The world health organization has declared COVID-19 as a pandemic during March 2020 [33]. Two years prior to March 2020 (from 1st April 2018 to 31st Match 2020) was set as formation period and two-year post to March 2020 (from 1st April 2020–31st March 2022) was fixed as testing period. In formation period data from 1st January 2020–31st March 2020, 1st October 2019–31st March 2020, 1st April 2019–31st March 2020 and 1st April 2018 to 31st March 2020 were placed separately for observing 90 days, 180 days, 365 days and 730 days return trend. Likewise for testing the impact of COVID crisis on gold ETFs, we have fixed 1st April 2020–30th June 2020, 1st April 2020–30th September 2020, 1st April 2020–31st March 2021 and 1st

April 2020–31st March 2022 accordingly for observing the return trends of 90 days, 180 days, 365 days and 730 days.

Analytical Procedure

Using the closing prices of Gold ETFs and the broad market index the daily log return trends was computed.

$$R = Ln\,(P1 / P0). \quad (1)$$

Here $P1$ indicates new price, $P0$ denotes price of the day before and R stood for daily return. Through Ln it is assumed that the return trends are log normally distributed. The descriptive statistics of the daily return trend is duly exhibited in *Table 1*.

The Augmented Dickey Fuller Test was performed to ensure that the collected time series data is stationary [35–37].

$$\Delta Y_t = \alpha_{Yt-1} + X_t'\delta + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta Y_{t-2} + \ldots + \beta_p \Delta Y_{t-p} + \gamma_t. \quad (2)$$

In equation (2) Y_t represents time series to be tested, α is an intercept constant called drift, β the coefficient on a time trend and p is the lag order difference of the autoregressive process and γ_t is the white noise error term. The result of ADF test is presented in *Table 2*.

Thereafter the systematic risk (β) and the risk adjusted abnormal returns (α) generated by the gold ETFs for the formation and the test periods were computed by using equations (3) and (4).

$$\beta = \{(n\Sigma xy) - (\Sigma x\,\Sigma y)\} / \{n\Sigma x^2 - (\Sigma x)^2\}, \quad (3)$$

$$\alpha = \bar{y} - (\beta * \bar{x}). \quad (4)$$

In the above equation, n denotes the number of observations; x indicates NIFTY returns and y points return from Gold ETFs. β is used to designate systematic risk and α represents the abnormal return over index returns.

Those gold ETFs produced a risk adjusted abnormal return over the broad market index were classified as winner funds (W) and the funds reported with abnormal losses after risk adjustments were classified as loser funds (L). The difference between weighted average risk adjusted abnormal return of all winner funds and loser funds were further computed for the test period. If the divergence score is positive in the test period then it signals momentum effect (Forner, 2000). Refer equations (5) and (6).

$$W\,[\bar{y}_t - (\beta t * \bar{x}_t)] - L[R\,\bar{y} - (\beta t * \bar{x}_t)] > 0 \text{ signals momentum effect,} \quad (5)$$

$$W\,[\bar{y}_t - (\beta t * \bar{x}_t)] - L[R\,\bar{y} - (\beta t * \bar{x}_t)] < 0 \text{ signals contrarian effect.} \quad (6)$$

Further T — statistics was employed for validating the results.

RESULTS

From *Table 1* it is evident that the benchmarking index NIFTY has reported to have the highest mean daily return of 0.062 percent. From Gold ETFs IVZINGOLD has produced the highest average daily return of 0.061 percent during the study period. The uppermost deviation in return trend was also reported for IVZINGOLD with a standard deviation of 1.34 percent. The distribution is positively skewed for the majority of the ETFs except `AXIS GOLD, IDBIGOLD and the broad market index NIFTY as these distributions are reported to have scores of –0.587,—0.359 and –1.274 respectively. Somehow a positive symmetry was reported in the return trend of the other ETFs. The kurtosis values of the ETF's and NIFTY observed to be above 3 hints that the distribution is leptokurtic.

Table 2 indicates the result of the ADF test. This test was conducted to check whether the time series distribution is stationary. The null hypothesis set for ADF test is that the time series data is not stationary. From *Table 2* it is evident that the probability value of the test statistics is falling within the respective levels of significance of 5% (prob. < 0.05). This result strongly confirms that the collected data set is stationary (H01 is rejected). If the data set is stationary, then the statistical properties will remain relatively constant over time.

The short run formation return trend for 90 days and 180 days is explained in *Table 3*. During this period, NIFTY has produced an average daily return of –0.497 and –0.206 respectively. For the 90-day formation period, all gold ETF funds have generated a positive risk adjusted abnormal return over the broad market index. Thereby these portfolios were classified as winner (W) funds. During the 180-day formation period, only GOLDBEES has reported a negative risk adjusted abnormal return (–0.675) compared to the market index. Thus, this fund is classified as a loser fund (L). The systematic risk of individual fund returns to the market index (β) was further validated using F-stat. The probability value of the test statistics is found

Table 1

Descriptive Statistics

Fund	Mean	Median	Std. Dev.	Std. Error	Sample Var.	Largest	Smallest	Skewness	Kurtosis
AXISGOLD	0.036	0.014	1.020	0.038	1.043	7.950	−11.360	−0.587	21.810
BSLGOLDETF	0.056	0.035	1.203	0.038	1.447	12.169	9.998	0.619	17.120
GOLDBEES	0.052	0.047	0.900	0.029	0.811	4.780	−4.036	0.297	4.315
GOLDSHARE	0.051	0.030	0.853	0.027	0.728	5.922	−4.496	0.072	6.056
HDFCMFGETF	0.053	0.024	0.865	0.027	0.748	5.274	−3.496	0.535	5.000
ICICIGOLD	0.051	0.023	0.875	0.028	0.765	4.757	−4.159	0.276	4.116
IDBIGOLD	0.056	0.041	1.150	0.036	1.340	9.517	−12.560	−0.359	21.130
IVZINGOLD	0.061	0.014	1.340	0.042	1.802	6.875	−7.025	0.132	3.987
KOTAKGOLD	0.056	0.056	0.919	0.029	0.845	7.030	−3.438	0.993	7.589
QGOLDHALF	0.051	0.036	0.869	0.027	0.869	5.326	−3.718	0.413	4.699
SETFGOLD	0.053	0.125	0.916	0.029	0.839	7.613	−7.520	0.218	11.630
NIFTY	0.062	0.124	1.284	0.040	1.649	8.763	−12.980	−1.274	17.850

Source: Processed Data.

Note: N = 991, NIFTY is the benchmarking index of National Stock Exchange of India.

to be significant at 5 percent level (Prob.<0.05) confirms the rejection of H02.

Table 4 explains the long run daily return trend for 365 days and 730 days. Interestingly, the average daily return of the market index was still negative, with mean scores of –0.107 and –0.026 respectively for 365 days and 730 days. The risk adjusted abnormal return of all gold ETFs other than GOLDBEES (–0.275 and –0.131) reported to be positive and significant. The F-stat. value confirmed the rejection of H02 by signifying the impact of NIFTY movement on gold ETF's (prob. <0.05).

The above exercises were repeated in the test period, and *Table 5* spells out the short run return trend in the test period. While observing a 90-day trend, the NIFTY strongly bounced back with an average positive daily return of 0.330. This positive trend was observed for the gold ETFs also and consequently generated a positive risk adjusted abnormal return over the market index. Thus, all funds can be categorized as winners for this period. AXISGOLD is categorized to be a loser (*L*) for 180 days as the risk adjusted return score (–0.029) reported to be negative. The β scores were further validated by using F-stat and found to be significant at the 5 percent level (H02 not supported).

While observing the long run trend for the testing period (*Table 6*) the ETFs such as AXISGOLD, GOLDSHARE and SETFGOLD (–0.065,—0.345 and –0.023) found to be losers compared to the market index for 365 days. With respect to 730 days trend GOLDSHARE and SETFGOLD reported to have a negative abnormal return after adjusting risk (0.154 and –0.193). All other ETFs produced a positive risk adjusted abnormal return linked to NIFTY. The systematic risk scores (β) further signified using F-stat. The results confirmed the rejection of H02.

Table 7 is prepared to compare the trading strategy of investors for various time horizons. Either the winner funds (*W*) in the formation period turned to be losers (*L*) in the test period or the loser funds in the formation period rotated to be winners (*W*) in the test period, then the trading strategy is said to be contrarian [6]. The trading strategy is said to be momentum if the winners (*W*) and losers (*L*) maintain a constant position in the formation and testing periods [5]. While comparing the trading strategy for 90 days, the general trading strategy found to be momentum. For 180 days, the AXISGOLD and GOLDBEES reported to have varied positions, which indicates a contrarian effect of the investors trading strategies. Other ETFs have maintained a trading

Table 2

Augmented Dickey-Fuller Test

Fund	T-Stat	Prob.
AXISGOLD	–31.907	0.000*
BSLGOLDETF	–37.291	0.000*
GOLDBEES	–32.562	0.000*
GOLDSHARE	–31.044	0.000*
HDFCMFGETF	–29.770	0.000*
ICICIGOLD	–31.674	0.000*
IDBIGOLD	–37.944	0.000*
IVZINGOLD	–43.148	0.000*
KOTAKGOLD	–32.946	0.000*
QGOLDHALF	–32.028	0.000*
SETFGOLD	–20.244	0.000*
NIFTY	–10.759	0.000*

Source: Data analysis.

Note: *Significant at 5% level.

momentum. For 365 days we can observe a strategic mix in trading pattern as four GTFs viz. AXISGOLD, GOLDBEES, GOLDSHARE and SETFGOLD exhibited a reversal trend in trading, though the traders in other ETFs maintained the momentum. Still, the position of the above four ETFs can question the general asset allocation assumptions set for this research. Interestingly, only the trading pattern of two gold ETFs (GOLDBEES and SETFGOLD) twisted to be contrarian for 730 days. To get an overview of gold ETF trading strategies in crisis settings, we have further examined the statistical significance of the study results using a paired sample T-test (H03).

The weighted average of risk adjusted return of all winners and losers were duly computed for the test period and duly presented in *Table 8*. The difference (δ) of the weighted average risk adjusted returns between winners and losers are positive then the trading strategy during the crisis settings can be considered as momentum [37]. If δ score is negative then we can assume that the contrarian strategies dominated during the crisis period. The δ values obtained for 90 days, 180 days and 730 days were 0.199, 0.110 and 0.05 (refer *Table 8*). These positive δ scores strongly signals momentum effect in gold ETFs trading. However for 365 days a negative δ mark of –0.024 was obtained. This result is signaling the contrarian trading strategies preferred by the investors for the 365 days zone. The above test results were validated by using paired sample T-stat. The probability value of T-stat for 90 days, 180 days and 730 days found to be significant at 5 percent level (prob. values are 0.000,0.000 and 0.002). Here we can reject H03 by concluding that the momentum strategy is evident for gold ETF trading in the time horizons of 90 days, 180 days and 730 days. With respect to 365 days the prob. value of the test statistics not found to be significant at 5 percent level (prob. value of 0.094 > 0.05). Thereby we can conclude that the contrarian strategy is not found to be evident for 365 days (here H03 is accepted).

DISCUSSION AND POLICY IMPLICATIONS

The study results confirmed momentum trading strategies preferred for gold ETFs during the crisis period. This phenomenon can be very much connected to the efficient market theory as the market participants were efficient in responding towards the pandemic information [4]. During the period of pandemic the Indian investors considered gold as a safe heaven. Form the study results it can be observed that the gold EFTs have generated a positive risk adjusted return over the broad market index in the formation period itself. During the pandemic period a positive flow of fund was observed from other assets to gold ETFs. Thus gold ETFs outperformed over the broad market index and momentum strategies have reported in these periods. This result adds to the existing literatures of [8, 20, 21, 23] by confirming the momentum of ETFs in long run.

Interestingly the investor's overreaction the crisis news did not get reflected in the gold ETF market for the short run. This scenario is showing the investor's trust and confidence on commodity based indices. In the light of the efficient market theory we can confirm that negative market news results in the channelization of assets from common stocks to commodity based funds [4]. In India, gold is being considered as a primary commodity for asset allocation by the investors. Thereby any negative market news can result in a positive flow of fund to physical gold or towards gold ETFs.

Practical Implications

This study signals that investors and fund managers should include commodity-based funds in their asset portfolio. It is evident that the Indian investors have

Table 3

Short Run Return Trend in Formation Period

FUND	180 days						90 Days					
	Avg. Return	β	F-Stat	prob.	α	*W/L*	Avg. Return	β	F-Stat	prob.	α	*W/L*
AXISGOLD	0.134	−0.035	7.432	0.005*	0.127	*W*	0.191	−0.030	5.176	0.007*	0.177	*W*
BSLGOLDETF	0.145	−0.032	8.603	0.004*	0.138	*W*	0.195	−0.022	5.108	0.007*	0.185	*W*
GOLDBEES	−0.664	−0.051	11.51	0.000*	−0.675	*L*	0.177	0.048	6.398	0.005*	0.201	*W*
GOLDSHARE	0.119	−0.003	6.005	0.009*	0.118	*W*	0.190	0.002	5.002	0.010*	0.192	*W*
HDFCMFGETF	0.129	−0.094	13.80	0.001*	0.110	*W*	0.194	−0.088	7.820	0.002*	0.150	*W*
ICICIGOLD	0.123	0.014	6.108	0.007*	0.126	*W*	0.179	0.024	6.161	0.007*	0.191	*W*
IDBIGOLD	0.095	−0.020	7.115	0.007*	0.091	*W*	0.149	−0.030	7.187	0.007*	0.134	*W*
IVZINGOLD	0.106	0.115	12.92	0.001*	0.129	*W*	0.211	0.121	9.040	0.002*	0.271	*W*
KOTAKGOLD	0.123	0.022	7.199	0.001*	0.128	*W*	0.185	0.035	6.276	0.006*	0.203	*W*
QGOLDHALF	0.138	0.098	13.56	0.001*	0.158	*W*	0.198	0.115	12.755	0.000*	0.256	*W*
SETFGOLD	0.178	0.071	12.10	0.001*	0.193	*W*	0.286	0.082	6.592	0.002*	0.327	*W*
NIFTY	−0.206	1.000	–	–	–	–	−0.497	1.000	–	–	–	–

Source: Data analysis.

Note: * Significant at 5% level, W-Winner Fund, L–Loser Fund.

Table 4

Long Run Return Trend in Formation Period

Fund	730 Days						365 days					
	Avg. Return	β	F-Stat	prob.	α	W/L	Avg. Return	β	F-Stat	prob.	α	*W/L*
AXISGOLD	0..076	−0.083	6.594	0.010*	0.074	*W*	0.139	−0.061	6.114	0.015*	0.132	*W*
BSLGOLDETF	0.078	−0.004	6.012	0.013*	0.077	*W*	0.136	−0.022	6.216	0.006*	0.133	*W*
GOLDBEES	−0.129	−0.072	4.218	0.041*	−0.131	*L*	−0.269	−0.056	6.056	0.813*	−0.275	*L*
GOLDSHARE	0.074	−0.004	5.017	0.009*	0.073	*W*	0.129	−0.006	6.022	0.009*	0.129	*W*
HDFCMFGETF	0.073	0.070	18.93	0.000*	0.070	*W*	0.134	−0.105	7.464	0.007*	0.123	*W*
ICICIGOLD	0.069	−0.033	5.445	0.012*	0.068	*W*	0.131	−0.009	6.064	0.008*	0.130	*W*
IDBIGOLD	0.071	−0.009	6.854	0.010*	0.070	*W*	0.126	0.008	6.028	0.009*	0.127	*W*
IVZINGOLD	0.086	0.068	5.688	0.019*	0.087	*W*	0.113	0.078	6.504	0.002*	0.122	*W*
KOTAKGOLD	0.078	−0.051	5.744	0.010*	0.077	*W*	0.140	−0.030	6.490	0.005*	0.137	*W*
QGOLDHALF	0.074	0.019	7.420	0.005*	0.074	*W*	0.137	0.052	7.692	0.002*	0.143	*W*
SETFGOLD	0.085	0.046	6.666	0.010*	0.086	*W*	0.156	0.056	8.142	0.001*	0.162	*W*
NIFTY	−0.026	1.000	–	–	–	–	−0.107	1.000	–	–	–	–

Source: Data Analysis.

Note: *Significant at 5% level; *W* — Winner Fund, *L* — Loser Fund.

preferred gold-based funds during the crisis. This points out that fund managers should give more weightage to gold-based ETFs in their portfolio along with common stock. Secondly, portfolios diversified with gold ETFs were able to marginalize their losses impacted by the COVID waves. From the investors point of view of gold, ETFs can be considered as an alternative against physical gold. Compared to physical gold, the ETFs allow the investors to save expenses on account of designing, taxes and possession. Gold ETFs are found to be a suitable investment for those who are hesitated to take risk (risk-averse) and for long term investors. In India, the long term

Table 5

Short Run Return Trend in Testing Period

FUND	180 days						90 days					
	Avg. Return	β	F-Stat	prob.	α	*W/L*	Avg. Return	β	F-Stat	prob.	α	*W/L*
AXISGOLD	−0.023	0.023	5.057	0.008*	−0.029	*L*	0.179	−0.041	5.152	0.007*	0.192	*W*
BSLGOLDETF	0.135	−0.064	5.350	0.006*	0.150	*W*	0.205	−0.117	5.550	0.005*	0.243	*W*
GOLDBEES	0.123	0.018	5.073	0.008*	0.119	*W*	0.192	0.004	5.003	0.010*	0.191	*W*
GOLDSHARE	0.136	0.059	11.145	0.003*	0.122	*W*	0.228	0.042	5.516	0.005*	0.215	*W*
HDFCMFGETF	0.116	−0.098	12.030	0.002*	0.138	*W*	0.178	−0.118	11.77	0.002*	0.217	*W*
ICICIGOLD	0.114	−0.053	5.558	0.005*	0.126	*W*	0.176	−0.112	11.62	0.002*	0.213	*W*
IDBIGOLD	0.137	−0.046	5.176	0.007*	0.147	*W*	0.255	−0.041	5.071	0.008*	0.269	*W*
IVZINGOLD	0.140	0.020	5.073	0.008*	0.136	*W*	0.207	0.041	5.338	0.006*	0.194	*W*
KOTAKGOLD	0.114	−0.084	1.356	0.247*	0.133	*W*	0.178	−0.145	12.65	0.001*	0.226	*W*
QGOLDHALF	0.110	0.024	5.141	0.007*	0.104	*W*	0.162	0.003	5.002	0.010*	0.161	*W*
SETFGOLD	0.074	0.066	5.654	0.004*	0.059	*W*	0.087	0.038	0.114	0.737*	0.074	*W*
NIFTY	0.229	1.000	–	–	–	–	0.330	1.000	–	–	–	–

Source: Data analysis.

Note: *Significant at 5% level, W-Winner Fund, L–Loser Fund.

Table 6

Long Run Return Trend in Testing Period

Fund	730 Days						365 days					
	Avg. Return	β	F-Stat	prob.	α	*W/L*	Avg. Return	β	F-Stat	prob.	α	*W/L*
AXISGOLD	−0.004	−0.061	12.41	0.001*	0.006	*W*	−0.064	0.004	5.005	0.009*	−0.065	*L*
BSLGOLDETF	0.035	−0.098	4.833	0.028*	0.050	*W*	0.120	−0.064	5.864	0.004*	0.027	*W*
GOLDBEES	0.033	−0.072	4.889	0.027*	0.044	*W*	−0.005	−0.008	5.031	0.009*	0.007	*W*
GOLDSHARE	−0.170	−0.111	6.456	0.005*	−0.154	*L*	−0.382	−0.161	5.325	0.006*	−0.345	*L*
HDFCMFGETF	0.034	−0.124	14.75	0.000*	0.053	*W*	0.011	−0.086	13.35	0.001*	0.030	*W*
ICICIGOLD	0.032	−0.097	8.305	0.004*	0.047	*W*	0.006	−0.046	6.926	0.003*	0.017	*W*
IDBIGOLD	0.044	−0.117	6.324	0.012*	0.061	*W*	0.029	−0.065	6.907	0.003*	0.044	*W*
IVZINGOLD	0.037	−0.098	6.017	0.015*	0.052	*W*	0.017	−0.015	5.082	0.008*	0.021	*W*
KOTAKGOLD	0.034	−0.104	9.728	0.002*	0.049	*W*	0.071	−0.063	11.68	0.002*	0.021	*W*
QGOLDHALF	0.028	−0.057	13.21	0.001*	0.036	*W*	0.001	−0.005	5.014	0.009*	0.002	*W*
SETFGOLD	−0.176	0.111	0.449	0.503*	−0.193	*L*	−0.015	0.034	5.402	0.005*	−0.023	*L*
NIFTY	0.150	1.000	–	–	–	–	0.150	1.000	–	–	–	–

Source: Data analysis.

Note: *Significant at 5% level, W-Winner Fund, L–Loser Fund.

capital gains from ETFs are taxable at a rate of 20 percent, whereas it is practically difficult to levy tax on physical form of gold transactions. Thus, the government can accumulate more tax if the gold trading is carried out through an authorized exchange.

Social Implication

The companies act (Section 135) of India 2013; has mandated that the companies should spend at least 2 percent of their corporate profit for CSR activities. ETFs enabled to divert more funds from domestic

Table 7

GOLD ETF's Trading Strategy

Fund	90 Days			180 Days			365 Days			730 Days		
	F	*T*	Strategy	*F*	*T*	Strategy	*F*	*T*	Strategy	*F*	*T*	Strategy
AXISGOLD	*W*	*W*	Momentum	*W*	*L*	Contrarian	*W*	*L*	Contrarian	*W*	*W*	Momentum
BSLGOLDETF	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
GOLDBEES	*W*	*W*	Momentum	*L*	*W*	Contrarian	*L*	*W*	Contrarian	*L*	*W*	Contrarian
GOLDSHARE	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*L*	Contrarian	*W*	*L*	Contrarian
HDFCMFGETF	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
ICICIGOLD	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
IDBIGOLD	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
IVZINGOLD	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
KOTAKGOLD	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
QGOLDHALF	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*W*	Momentum
SETFGOLD	*W*	*W*	Momentum	*W*	*W*	Momentum	*W*	*L*	Contrarian	*W*	*L*	Contrarian

Source: Data analysis.

Note: F — Formation period, *T* — Testing period, *W* — Winner Fund, *L* — Loser Fund.

Table 8

T-Test Results

Indicator	90 Days	180 Days	365 Days	730 Days
Avg. Return on Winner Funds	0.199	0.112	0.015	0.036
Avg. Return on Loser Funds	Nil	–0.003	–0.039	–0.031
δ	0.199	0.110	–0.024	0.005
T-Value	13.095	10.028	1.848	4.095
prob.	0.000	0.000	0.094	0.002

Source: Data analysis.

Note: At *5% level of significance.

households to the corporate sector. Accordingly the corporate profit will get heightened; in turn the society will be benefitted in the form of more CSR programs.

CONCLUSION

The purpose of the study was to observe the abnormal return trend attributed to gold-based ETFs traded in India and to analyze trading strategies adopted by the market participants during the COVID crisis. The trading strategies are further classified into contrarian and momentum strategies based on the concept put forth by Jegadeesh and Titman [6]. This study confirms that the pandemic news was well received by the Indian investors and they have acted rationally. The Indian gold market has maintained momentum and gold-based ETFs have generated a positive risk adjusted return over the broad market index. By opposing the argument of [1], this research reiterates that gold is being considered a safe haven by the Indian investors for a long time horizon. The scope of this research is limited only to gold ETFs as the data pertaining to physical gold trading is not accessible in a standard form. This limitation itself opens an avenue for future researchers in exploring the trading strategies adopted by the investors on physical exchange of gold during the pandemic settings.

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Methodical Approach to Developing a Risk Management System of Risks for the Development of the Russian Stock Market

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ABSTRACT

The **object** of the study is the Russian stock market. The **subject** of the study is the management of risks that may hinder the solution of the current task of ensuring the necessary contribution of the stock market to the transformation and development of the national economy under conditions of sanctions pressure. The **relevance** of the study is due to the high importance of the development of the national stock market for solving problems of long-term funding of the national economy in modern conditions, which requires systematic and proactive risk management. The **purpose** of the study is to work out a methodological approach to risk management for the development of the national stock market in the context of economic transformation. During the study, mainly **methods** of analysis and synthesis, classification, induction and deduction were used. Based on the results of the study, the authorized government bodies were recommended to implement a unified methodological approach to risk management for all involved parties for the development of the national stock market, taking into account the different goals of different participants. The **scientific novelty** of the proposed approach lies in its combination of two levels of risk management (market level and risk owner level) and taking into account the cross-functional and cross-sectoral mutual influence of risks. **Conclusions** are drawn about the potential effectiveness of the developed approach, as well as the possibility of scaling it to the level of the financial market as a whole, provided that organizational issues related to the development of a detailed methodology, its implementation, maintenance and independent assessment of its functioning are resolved, as well as the principle of proportionality of benefits from the implementation of the system to the costs of its organization.

Keywords: stock market; investor confidence; risks; sanctions; financial stability; economy transformation

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INTRODUCTION

The domestic economy is currently going through a difficult period, associated with ongoing transformation under the pressure of sanctions. An important role in this is played by the securities market in financing businesses, whose opportunities abroad have diminished against the backdrop of sanctions.

The stock market has gained additional significance for the economy due to high lending rates under a tight monetary policy. As a result, since the end of 2022, there has been a clear trend towards an increase in the number of placements, including initial ones, in the Russian stock market (Initial Public Offering, IPO).

In the new realities of the functioning of the domestic economy, the stock market has become a subject of increased attention from the state. A striking example is the instruction from the President of Russia to the Bank of Russia and the Government of Russia to take measures to ensure that by 2030 the capitalization of the stock market reaches a level equal to 66% of the gross domestic product (GDP),[1] meaning that the indicator is to be doubled.

Taking into account the level of task setting for the development of the stock market and the potential negative impact of their non-fulfillment on the domestic economy, it is important to prevent possible events that hinder the development of the stock market, that is, to ensure effective risk management, which is impossible without a quality methodological approach.

The specificity of this issue, which inevitably affects the architecture and methodology of risk management, is the involvement of a whole range of parties in market development matters. In particular, these issues fall within the competence of the Bank of Russia, which stems from one of the goals of its activities in accordance with current legislation — ensuring financial stability and the development of the financial market of the Russian Federation.[2] The Bank of Russia pays great attention to the threat to financial stability through the so-called stock channel and its impact on the stability of the banking sector, as well as to issues of financial security, without which not only the development but also the functioning of the stock market is impossible.

Issues related to the development of the stock market also fall within the competence of the Government of Russia — in this case, with an emphasis on stimulating economic growth, implementing state programs, and ensuring the financial and economic security of the state. At the same time, different ministries, such as the Ministry of Economic Development of Russia and the Ministry of Finance of Russia, may have their own goals in the stock market, stemming from the mandates of the agencies.

Moreover, infrastructure organizations, such as Moscow Exchange and major market participants, including those with state participation (in the areas of implementing government programs, managing pension savings, etc.), are also involved in the development of the stock market, each pursuing their own goals, which often have state significance.

In this case, the goals of various departments and organizations can either complement each other or come into conflict. In such conditions, achieving the goals of developing the stock market is hardly possible without the mutual alignment of the goals of all parties. In this regard, it is evident that measures for managing risks that hinder the development of the stock market are unlikely to be effectively implemented in isolation. This issue should have unified methodological foundations, be cross-sectoral in nature, allow for the alignment of macro-level (the market as a whole) and micro-level (individual agencies and organizations) goals, and also take into account the mutual influence of risks.

[1] 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 20.05.2024).

[2] Federal Law No. 86 of 10 July 2002 "On the Central Bank of the Russian Federation (Bank of Russia)".

The design of a methodological approach to risk management for the development of the stock market must take into account, among other things, the critical importance of ensuring trust in the retail investor market, whose share in the total trading volume has increased, reaching 80% in certain periods.[3] Just like in the case of ensuring financial stability, without ensuring trust in the market, it is hardly possible to expect its development.

The purpose of the research is to develop a methodological approach to systematic risk management for the development of the national stock market in the context of economic transformation.

As part of the study, the development of a detailed methodology is not planned, including forms and procedures for maintaining risk and risk event registers, as well as a detailed procedure for applying risk management procedures (including risk self-assessments and controls, risk event registration, monitoring of key risk indicators) and their tools (for example, taxonomies of risk sources and risk events, risk appetite), which, as practice shows, makes no sense without involving risk owners who possess the full range of necessary information within their area of responsibility.

The mathematical models used in risk management, for example, for determining risk levels, are not within the scope of this study, as their application becomes possible only when databases are available, which, as a rule, are not present in the required form at the system implementation stage. Moreover, mathematical models are more applicable to financial risks and to entities with quantitative performance indicators, rather than to entities that primarily have socially significant objectives, where the risks are predominantly operational in nature and are usually measured using qualitative/descriptive criteria.

Thus, the purpose of the research is limited to the first and most critical stage of developing and implementing any risk management system, namely, the design of the system, the overall methodological approach, with proposals for its key parameters, in the development of which a detailed methodology is already being developed in practice with the direct participation of risk owners.

The hypothesis lies in the *possibility* of risk management for the development of the national stock market based on the application of a unified systemic methodological approach for all involved parties, which allows for the formation of a common comparable risk map and the alignment of goals, objectives, and risks of various market participants, thereby containing the potential to enhance the efficiency of stock market risk management as a whole.

The hypothesis is based on the author's observations during many years of work in the field of risk management concerning management objects that combine a large number of activities and divisions (organizations), as well as the exchange of experiences on this issue in well-known international professional associations.[4] These observations indicate that when applying a unified approach to risk management for all involved parties, a common understanding of risks at the level of management objects as a whole emerges, meaning what is truly significant for the object. At the same time, it becomes possible to rank all risks by their significance and prioritize their management.

Moreover, with the presence of unified approaches, including a common glossary and tools, there is an opportunity for systematic coordination of risks across various activities and divisions (organizations), usually along the chain of cause-and-effect relationships, where the root causes of risks in one area of

[3] Website of the Bank of Russia. Overview of financial market risks. April 2024. URL: https://www.cbr.ru/analytics/finstab/orfr/ (accessed on 20.05.2024).

[4] Including within the framework of the IORWG (International Operational Risk Working Group), which brings together risk management specialists from most of the world's central banks (regulators), and the PRMIA (Professional Risk Managers' International Association), which unites and certifies specialists in the field of risk management.

activity (division, organization) often include the realization of risks in another. Thus, the decomposition of significant risk sources of the management object into separate significant risks of different risk owners is effectively carried out.

Ultimately, such a systematic approach enhances the efficiency of risk management by preventing the oversight of risks that are significant for the management object as a whole, and conversely, reducing the costs associated with managing insignificant risks. It also allows for better prioritization in work, taking into account the comparability of risks in terms of significance at any management level, and managing them more effectively through the coordination of actions among entities whose risks are interconnected.

The effect of applying such an approach in practice is most evident for the main beneficiaries of its application — the management and owners of the management object, ultimately manifesting in increased effectiveness (reduction in the number and scale of risk events (risk realization cases)) and efficiency (cost-effectiveness) of risk management overall for the management object.

These observations are confirmed by both authoritative economists and government officials. For example, one of the leaders of the Bank of Russia, V.P. Goreglyad [1], expressed in his work the opinion on the effectiveness of applying a unified systemic approach to risk management for large and complex entities such as central banks (regulators). The work also notes that due to the effectiveness of the systemic approach, there has been a trend towards its implementation worldwide in recent decades.

Over the course of 20 years, from 1996 to 2015, around 50 Central banks and other financial market regulators began to implement a systematic centralized approach to risk management, as the most advanced method. The impetus for such development of risk management in relation to financial markets were the crises of the 1990s and early 2000s, which revealed obvious shortcomings in the regulation of financial markets and corporate governance. Taking into account the crises that followed after 2015, this indicator has obviously become even higher.

According to one of the studies on current trends in risk management,[5] approaches to risk management across various management entities are becoming increasingly systematic, and the industry itself is rapidly evolving. It is projected that the global market for systemic risk management services will be valued at $ 39 billion in a few years (by 2028). The main consumers of these services (over 40%) are representatives of the financial sector of the economy. At the same time, the most dynamically developing market is considered to be the Asia-Pacific region, where the average annual growth rate of the market for these services from 2023 to 2028 is estimated at 13%, which is associated with the increasing demand for a systematic approach to risk management among organizations in the region.

The implementation of a systematic approach to risk management for management objects takes an average of about one year, but specialists claim its effectiveness. Thus, in commercial organizations, the return on investment for such a system (including personnel, automated systems) is estimated to be up to 300%. In non-profit organizations, the effect is manifested in a higher quality, including with fewer losses, in achieving goals.

The work on proving the hypothesis formulated in the study was carried out by solving the following tasks:

- analysis of internationally recognized standards, guidelines, and methodological approaches to risk management for the purpose of assessing their applicability to the research object;
- cross-sectoral analysis of the approaches to risk management applied in Russia to various

[5] Isorobot. Enterprise Risk Management In 2024: A Statistical Analysis of Emerging Trends. URL: https://isorobot.io/blog/enterprise-risk-management-in-2024-a-statistical-analysis-of-emerging-trends.

entities related to the stock market, with the aim of identifying patterns;

• development (adjustment) of a methodological approach to the development of a risk management system for the development of the Russian stock market;

• approbation of the methodological approach for its effectiveness using one of the risks as an example.

The scientific novelty of the developed approach lies in the following:

• the combination of different levels of risk management (market level and risk owners' level);

• cross-sectoral coordination of risks among different risk owners.

No similar developments were found in the scientific and economic literature during the research, which determines the scientific and practical value of its results.

MATERIALS AND METHODS OF RESEARCH

The informational basis of the work was provided by the results of an independent study conducted in 2024 as part of the implementation of the state assignment from the Government of Russia to the Financial University on the topic «Stimulating the inflow of investments into the Russian securities market and its development based on the protection of investors' rights and risk reduction in the context of national financial security», works by domestic and foreign scholars, internationally recognized standards and guidelines for risk management, and other information from open sources, including websites of relevant international organizations, the Bank of Russia, Rosfinmonitoring, Moscow Exchange, Deposit Insurance Agency, Analytical Center under the Government of Russia, and others.

The study of contemporary foreign and domestic scientific thought in the field of risk management in the securities market has shown that researchers mainly focus on practical issues that have been relevant in recent years. In particular, T. Tang [2] studies the impact of the coronavirus epidemic on the functioning of the stock market and risk management within it. E. Kilic and S. Sonmezer [3] analyze the interconnections between the financial regulator's interest rate decisions (using the example of the U. S. Federal Reserve System), liquidity provision mechanisms, and risk management issues in the stock market. A. Samimi, M. Samimi, and A. Bozorgian [4] address current issues in risk management for retail investors in the stock market. Y. Zhang, J. He, M. He, and S. Li [5] investigate the impact of geopolitics on stock market stability. B. Musholombo [6] studies the interconnection of shocks in the cryptocurrency market and the stock market. P. V. Klimova [7] examines the management of market risks in the stock market under conditions of globalization. I. Yu. Vygodchikova [8] focuses on the development of a decision-making model for transactions in the stock market, allowing for the assessment of investment risks taking into account volatility.

The well-known events of recent years related to market stability and investor protection have not gone unnoticed by researchers. In particular, T. Adrian, N. Abbas, S. L. Ramirez, and G. F. Dionis [9] assess the impact of the regional bank crisis in the U.S. in March 2023 on the stock market and overall financial stability. J. Guo, L. Liu, and Y. Tang [10] investigate the dependence of the Chinese stock market on trade disputes between China and the United States. A. Aloosh, H. Choi, and S. Ouzan [11] study the impact of manipulations with so-called meme stocks on the U.S. stock market. (meme stocks). M. Kang [12] examines the issue of insider trading in the stock market.

Great attention from researchers around the world is also drawn to the issues of risks and returns of investing in the rapidly growing stock markets of developing countries. For example, N. Li, C. Wei, and L. Zhang [13] conduct a factor analysis of returns on the Indonesian stock market, which, according to indices from

Morgan Stanley Capital International (MSCI),[6] has shown growth exceeding that of the group of developing countries as a whole since 2020. S.R. Mitragotri and N. Patel [14] focus on low-risk investment rules in the stock market of another rapidly growing Asian country — India.

The expected specificity of contemporary domestic scientific literature has been a large number of publications dedicated to the issues of risks in the Russian stock market under sanctions. In particular, A.P. Garnov, E.V. Afanasyev, and N.P. Tishkina [15] examine changes in market functioning under sanctions. D.D. Nakostik [16] emphasizes the increase in cases of unfair practices. A.A. Bortnik and E.V. Travkina [17] examine specific risks that hinder the development of the Russian market. M.V. Luneva [18] examines processes and phenomena in the stock market under conditions of uncertainty. A.G. Zinovyev, I.N. Dubina, and P.I. Kuzmin [19] study the correlations of stock indices of sanctioning countries and the countries affected by them in the context of systemic risks. K.O. Ternavshchenko, E.V. Lehman, and E.A. Podieva [20] focus on identifying the main threats and determining key directions for the development of the stock market in conditions of geopolitical instability.

Regarding the issues of risk management methodology in the stock market, relevant subject studies, although available, are not numerous either in Russia or abroad. This circumstance can be explained, on the one hand, by the fact that the issues of methodology for managing classical types of risks, primarily financial ones, have long been developed. On the other hand, the development of an effective methodology concerning specific objects and circumstances requires practical experience in the relevant field.

As noted in the scientific work of V.P. Goreglyad [1], the theory of risks as an independent established scientific discipline is virtually nonexistent. The so-called riskology only covers individual issues. The well-known scientific studies on risks by such scholars as Fermat, Bernoulli, Pascal, and others were mainly dictated by practical needs and were situated within the realm of applied disciplines (physics, mathematics, cybernetics, etc.). One cannot disagree with the author that the specific risk management methodologies required in practice should not be developed in isolation from the specific circumstances to which they are intended to be applied.

The development of a methodological approach to the risk management system for the development of the Russian stock market, with a large number of stakeholders involved and the specifics of their operational context, is no exception. Therefore, in its development, alongside the use of generally accepted international standards, special attention is paid to studying practical approaches to risk management of various organizations (both foreign and domestic). The practical experience of the author was also utilized.

Various scientific methods were used in the study, including analysis and synthesis, classification, induction, and deduction.

RESULTS AND DISCUSSION

In studying foreign practices in open sources, no information was found about systematic methodological approaches that simultaneously address market stability, its development, and ensuring trust in the market, while combining both macro and micro levels of risk management. Various risk maps and matrices typically focus on specific issues at the level of the global economy/region (for example, the Global Financial Stability Risks Map[7]) or serve as indicative tools for investors (for example, the Control Risks map[8]).

[6] MSCI. Emerging Markets Indexes. URL: https://www.msci.com/our-solutions/indexes/emerging-markets (accessed on 18.05.2024).

[7] IMF. URL: https://www.imf.org/~/media/Websites/IMF/imported-flagship-issues/external/pubs/ft/GFSR/2008/02/c1/_figure11pdf.ashx (accessed on 21.05.2024).

[8] Control Risks.— URL: https://www.controlrisks.com/riskmap/maps (accessed on 1.05.2024).

Table 1

Key Internationally Recognized Risk Management Standards and Guidelines

Organization	Standards (guidelines)
International Organization for Standardization (ISO)	31000: "Risk management — Principles and Guidelines" 31010: "Risk management — Risk assessment techniques"
Committee of Sponsoring Organizations of the Treadway Commission (COSO)	"Enterprise Risk Management — Integrated Framework" "Enterprise Risk Management — Integrating with Strategy and Performance" "Risk Assessment in Practice" "Understanding and Communicating Risk Appetite"
His Majesty's (HM) Treasury	"The Orange Book Management of Risk — Principles and Concepts" "Risk Management Assessment Framework: a tool for departments"
Institute of Risk Management (IRM)	"A Risk management standard" "Risk Appetite & Tolerance Executive Summary" "A structured approach to Enterprise Risk Management (ERM) and the requirements of ISO 31000"

Source: Compiled by the authors.

The European financial markets regulator ESMA[9] conducts an investor-oriented assessment of financial market risks, taking into account their current sources. The FATF[10] group emphasizes identifying vulnerabilities in national financial systems to risks related to anti-money laundering and counter-terrorism financing (AML/CFT). IOSCO,[11] specializing in the development of standards for securities market regulation, focuses on risks to market stability.

The analysis of key standards and practical guidelines for risk management (*Table 1*) showed that, although their knowledge is undoubtedly necessary for building any risk management system due to the foundation they provide, they are predominantly focused on corporate governance tasks, which is insufficient to achieve the research objective.

The analysis of Russian risk management practices concerning entities related to the national securities market has shown that advanced standards and practices have been integrated into the daily operations of many agencies and organizations, including the Bank of Russia,[12] the Deposit Insurance Agency,[13] VEB,[14] structures of the Government of Russia,[15] trade organizers,[16] professional securities market participants,[17] the national payment system,[18] the anti-money laundering

[9] European Securities and Markets Authority.

[10] Financial Action Task Force on Money Laundering.

[11] International Organization of Securities Commissions.

[12] See the Risk Management Policy of the Bank of Russia and the annual reports of the Bank of Russia, posted on the regulator's website. URL: www.cbr.ru.

[13] See the Risk Assessment Methodology of the Deposit Insurance Agency (DIA), approved by the Agency's Board of Directors on 04.09.2017 (protocol No. 107) and the annual reports of the DIA, posted on the DIA website. URL: www.asv.org.ru.

[14] See the information on risk management in VEB posted on the VEB website. URL: www.csr2014.veb.ru.

[15] See, for example, the information on risk management issues posted on the website of the Analytical Center under the Government of Russia. URL: www.ac.gov.ru.

[16] See, for example, the Rules for Managing Risks Associated with the Activities of a Trading Organizer and a Digital Financial Asset Exchange Operator, and the annual reports of the Moscow Exchange, published on the Moscow Exchange website. URL: www.moex.com.

[17] See the information on risk management posted on the websites of Professional Participants in the Securities Market.

[18] See, for example, the Bank of Russia Regulation dated 27.10.2020 No. 738 "On the Procedure for Ensuring the Continuous Operation of the Bank of Russia Payment System".

and counter-terrorism financing system[19] and others.

The relevant systems are focused on risk management at the corporate level or in relation to systems performing individual functions related to the operation of the stock market, which does not fully cover the purpose of the research.

At the same time, the results of the analysis allowed for important conclusions relevant to the research objectives. Firstly, all the examined systems have the same classical elements that comply with international standards, including a cyclical process algorithm, similar terminology, classification, and a set of applied procedures, tools, and methods.

Secondly, the configuration of risk management system elements in each specific case directly depends on the objectives of the object's functioning, its profile, and the scale of its activities.

Thus, the attention of commercial organizations is focused on risks to financial results and the feasibility of conducting activities in principle. Therefore, the risks that are primarily recognized as significant are those associated with substantial financial losses and non-compliance with regulatory requirements (compliance risks). This circumstance also necessitates the application of procedures, tools, and risk management methods appropriate for this type of risk, where various databases and mathematical models play a significant role.

In the case of entities that primarily have socially significant objectives, where profit extraction is either not the goal of the activity at all or is secondary to state tasks, which also applies to the object of this study, the main focus in risk management is on the quality and timeliness of the processes aimed at achieving these objectives. This determines the operational nature of significant risks and the focus on expert procedures, tools, and methods for managing them. Examples of such risk management entities include the Bank of Russia, the structures of the Government of Russia, the Deposit Insurance Agency, VEB, the National Payment System, the anti-money laundering and counter-terrorism financing system, and others.

In entities whose functioning is associated with market stability issues, risks in the area of business continuity (BC) and the corresponding methodologies and tools (including scenario analysis, BC plans) become of great importance, which is relevant for systemically important credit organizations and professional participants in the securities market,[20] trading organizers, part of the functions of the Bank of Russia, and others.

In the event that the operation of the facility is related to risk management for the execution of important projects, the project risk management methodology is applied, and risk management itself is integrated into the project management system, which is the case at the Analytical Center under the Government of Russia and partially in a number of large agencies and organizations, including the Bank of Russia.

Taking into account the above, it becomes evident that the risk management system for the development of the Russian stock market, considering the stated socially significant goal (market development), will tend towards more operational and expert systems aimed at proactive management of risks associated with improper process execution. Issues of HSE and project management in this system will also be relevant given the importance of

[19] See the Public Reports on the National Risk Assessment of the legalization (laundering) of proceeds of crime and the financing of terrorism, as well as the Sectoral Risk Assessment Reports, posted on the Rosfinmonitoring website. URL: www.fedsfm.ru.

[20] See, for example, the Bank of Russia Guidelines dated 21.08.2017 No. 4501 "On the requirements for the organization of professional participants in the securities market for risk management systems related to professional activities in the securities market and operations with their own assets, depending on the type of activity and the nature of the transactions" and dated 15.04.2015 No. 3624 "On the requirements for the risk and capital management system of a credit institution and a banking group".

ensuring financial stability and implementing comprehensive projects.

At the same time, adjustments to the basic parameters of the risk management system, dictated by the specifics of the research object, will take place during the execution of almost every classic process in the risk management cycle, which will be discussed further.

THE FIRST PROCESS IS RISK IDENTIFICATION

At this stage, out of the multitude of risks for the development of the Russian stock market, it is necessary to identify the significant ones — those that actually warrant the expenditure of resources for their management. In accordance with international risk management practices, significant risks are those that simultaneously meet two criteria:

1) the realization of risks is associated with noticeable negative consequences for achieving the objectives of the entity;

2) the risks can indeed materialize, taking into account the existing sources of risks and vulnerabilities in the activities, meaning they are not abstract but rather quite real events in the current conditions, albeit possibly with a low probability of occurrence.

If the second criterion can generally be considered universal for various objects (it makes sense to manage only what is real), then the first is adjusted to the object's goals by determining a list of high-level consequences when realizing risks that negatively affect the achievement of goals. All possible events that could lead to the occurrence of the specified negative consequences are included in the system's perimeter as significant risks.

At the same time, the identification of significant risks for the development of the Russian stock market should, in accordance with international practice, begin with the first criterion — first, the range of possible events (risks) that truly pose a danger to the object as a whole (associated with the identified negative consequences) and on which it makes sense to spend resources is determined, and then the reality of these events is assessed taking into account the existing sources of risks and vulnerabilities. A detailed analysis of risk sources will be important at the risk assessment stage (probability level) and critical at the stage of developing response measures, as the measures are directed at specific sources (as well as at consequences).

The correct identification of the list of relevant consequences is critical, as the effectiveness of the entire system depends on it, including the cost-benefit ratio of its functioning. In practice, one to four relatively independent consequences are usually identified, which allows, on the one hand, not to overlook important consequences, and on the other hand, not to complicate risk identification.

In commercial organizations, the corresponding negative consequences primarily include financial losses (with the possible establishment of a significance threshold). All relevant events are included in the management perimeter, and their occurrence is recorded in databases with loss documentation. Significant importance is also given to damage to business reputation, but again through its impact on financial results.

In organizations and systems with socially significant (governmental) objectives, as previously noted, the focus is shifted towards operational activities — ensuring the proper execution of functions. Damage to business reputation and financial losses are also often highlighted as separate negative consequences, but they have a lower priority (significance).

As part of the methodological approach to developing a risk management system that hinders the development of the national stock market, for the purpose of identifying significant risks, it is proposed to define the following high-level negative consequences:

1) failure to ensure the expected contribution of the stock market to the transformation and development of the economy (non-fulfillment of assignments, guidelines, roadmaps, directions,

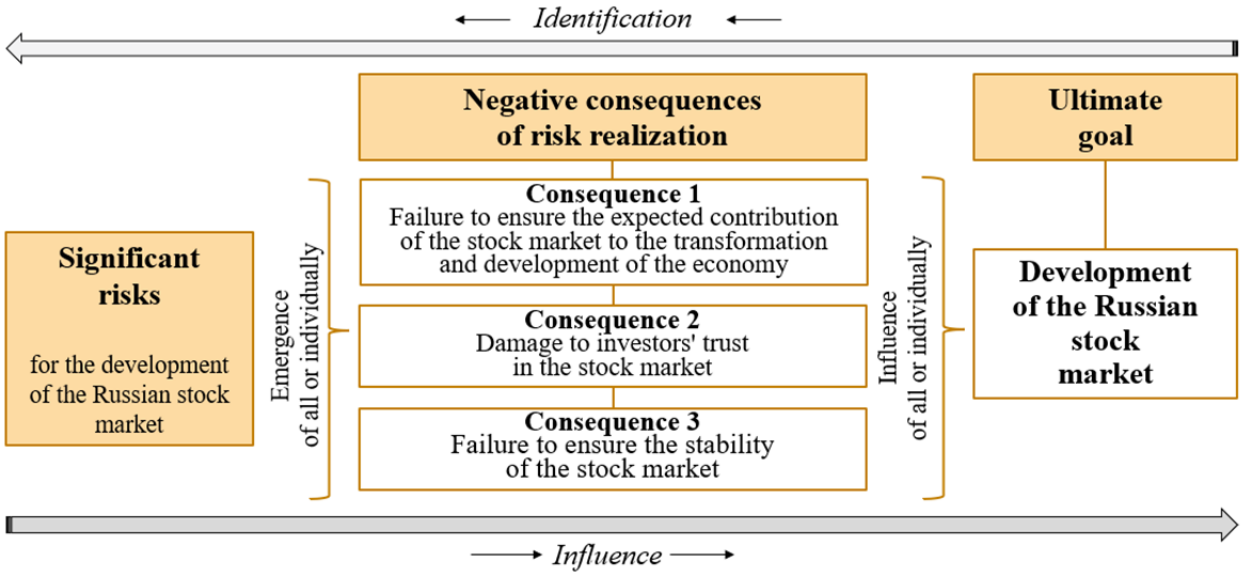

Fig. 1. **Proposals for a List of Top-Level Negative Consequences to Identify Risks for the Development of the Russian Stock Market**

Source: Compiled by the authors.

programs/projects aimed at the stock market by higher authorities for this purpose[21]);

2) damage to investors' trust in the stock market, without which market development is unlikely, is similar to damage to business reputation in the case of commercial organizations;

3) failure to ensure the stability of the stock market, without which not only development but also the functioning of the market is impossible.

The above proposals are schematically presented in *Fig. 1*.

Additionally, the scope of identifying significant risks for the development of the stock market may include potential financial losses/inefficient expenditures. But they are unlikely to be decisive given the priority of ensuring market development. It is a well-known fact that when it is necessary to ensure market stability (without which its development is impossible), the regulator can, for example, reduce collateral requirements within the framework of refinancing and even issue unsecured loans. The presence of negative capital among regulators in international practice is not unusual. Moreover, the subsequent assessment of the effectiveness/ineffectiveness of expenditures on achieving set objectives or ensuring market stability is highly subjective.

If any financial losses, regardless of the type of risk, are capable of leading to the aforementioned negative consequences, hindering the achievement of the ultimate goal (market development), the corresponding risks will fall within the scope of the methodological approach due to the presence of the specified consequences.

Financial risks are risks of financial losses that may arise from owning financial assets and conducting transactions with financial instruments (credit and market risks, liquidity risks).[22] Like any other type of risks, they can also directly fall within the system's perimeter when it is built based on the proposed approach, regardless of the type of risk owner (government, private investors, or others). In the event that, for example, state structures make errors in

[21] Taking into account the Strategy for the Development of the Financial Market of the Russian Federation until 2030 (URL: https://insurancebroker.ru/f/strategiya_2030_utverzhdennaya_29122022.pdf) and the Main Directions for the Development of the Financial Market of the Russian Federation for 2024 and the Period of 2025 and 2026 (URL: https://www.cbr.ru/about_br/publ/onfinmarket).

[22] Classification of the Bank of Russia: Risk Management Policy of the Bank of Russia. URL: https://cbr.ru/Content/Document/File/36486/policy.pdf.

managing their financial risks while conducting operations with financial assets (instruments) on the stock market, which due to the resulting effects undermine investor confidence in the market as a whole or disrupt market stability, such risks must be identified within the framework of the system.

In the event that financial risks consciously accepted by investors (including private ones) are limited to damage to themselves, they should not be identified as significant in relation to the market, but such risks will be within the system's perimeter in the context of analyzing and managing the associated risks for market development. For example, the risk of failing to protect investors' rights, which directly leads to difficulties in achieving the market development goal through the consequence of damaging investors' trust, may be associated with investors taking on increased financial risks due to financial intermediaries imposing their services on them, the insufficient effectiveness of the qualified investor institution, and other reasons. Relevant aspects should be taken into account when managing regulatory risk (response measures should be directed at them).

Thus, the type of risks is not important for the purposes of identifying significant risks for market development; the determining factor will be the possibility of the specified consequences when realizing the risks. At the same time, despite the expected predominance of operational risks, other types of risks can also lead to the specified consequences. Differences in types of risks will be important at the stage of responding to them due to differences in risk management methods, as well as for analytical purposes.

As an example of a significant risk negatively affecting the development of the stock market due to its insufficient contribution to the transformation and development of the economy (the first type of consequences), one can cite the risk of failing to fulfill the instruction of the President of Russia to achieve a stock market capitalization level equal to 66% of GDP by 2030. It is also advisable to establish key risk indicators (KRI) for this risk, which, depending on the progress of activities aimed at fulfilling the specified directive, will characterize the vulnerabilities to its realization and, accordingly, the likelihood of its realization and the level of possible consequences under current conditions.

An example of a significant risk hindering the development of the stock market due to damage to investor trust could be the risk of

Table 2

The Proposed Scale for Assessing the Likelihood of Risks for the Development of the Russian Stock Market

Grade	Description
1	"Extremely unlikely" / Very low level
2	"Unlikely" / Low lev
3	"Quite likely" / Medium level
4	"Very likely" / High level
5	"Almost certain" / Very high level

Source: Compiled by the authors.

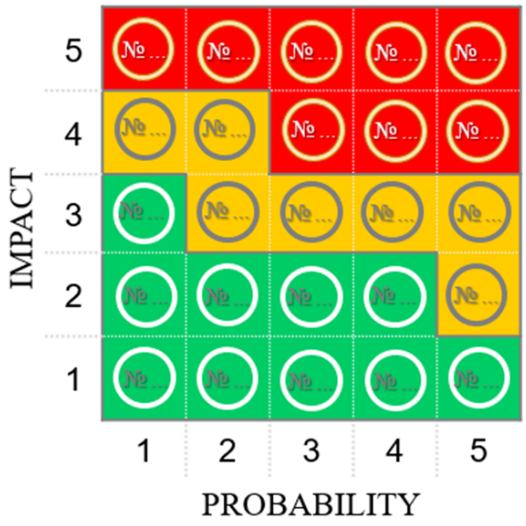

Fig. 2. **Proposed Map for Risks for the Development of the Russian Stock Market**

Source: Compiled by the authors.

Table 3

The Proposed Scale for Assessing the Impact of Risks for the Development of the Russian Stock Market

Impact grade	Failure to deliver expected contribution to the transformation and development of the economy	Damage to investor confidence			Failure to ensure stock market stability
		Impact duration	Trust in the source and the severity of judgment	Scale of event coverage	
5 — very strong	Failure (improper) to perform all or part of the tasks	More than 10 years, the canonization of the event	A series of negative trust-inspiring statements, comments are needed	A multitude of well-known media, a large number of complaints and appeals	Unforeseen suspension/ disruption of market functions for more than a few days
4 — strong	Delays in completing key tasks, significant decline in quality of execution	From 5 to 10 years	Individual negative trust-inspiring statements, comments are necessary	Certain well-known media, a large number of complaints and appeals	Unforeseen suspension/ disruption of market functions for a period of one to several days
3 — medium	Significant difficulties in performing key tasks	From 1 year to 5 years	A series of credible negative statements	Regional/ thematic media, a number of complaints and appeals	Periodic and significant disruptions in work
2 — low	Significant difficulties in completing tasks that can negatively impact other important actions within their execution	From 6 months to 1 year	Separate credible negative statements	Regional/ specialized media, individual complaints and appeals	Individual noticeable disruptions in work, of a temporary nature
1 —insignificant	Difficulties in performing individual actions	Less than 6 months	Separate untrustworthy negative statements	Lesser-known media	Short-term individual interruptions in work

Source: Compiled by the authors.

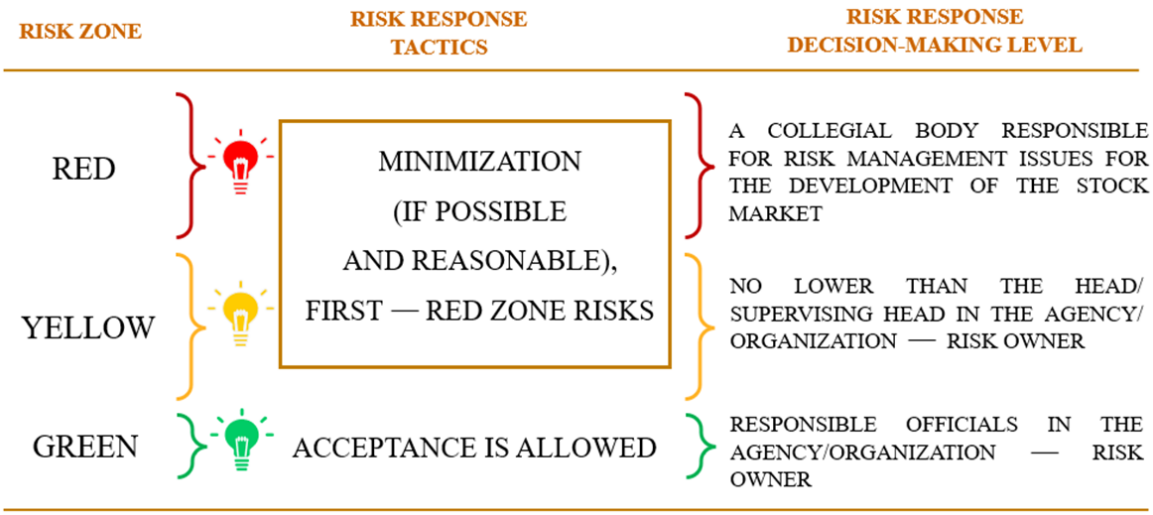

Fig. 3. **Proposals for Adjusting Risk Appetite to Address Risks for the Development of the Russian Stock Market**

Source: Compiled by the authors.

investor losses resulting from the use of insider information in the market. It is also advisable to manage this risk proactively by establishing Key Risk Indicators (KRIs) that characterize the scale of the relevant phenomena and the vulnerability to risk.

Risks that can negatively impact the development of the stock market due to the lack of market stability include, for example, prolonged unforeseen trading halts or disruptions in the uninterrupted functioning of the payment infrastructure. These risks, considering the high severity of the potential consequences from their realization, are obviously already being managed (at least by the Bank of Russia and Moscow Exchange) using various risk management measures.

The task of identifying macro-level risks should be addressed within a collegial body that includes representatives from key parties (at a minimum, the Bank of Russia, the Government of Russia, and Moscow Exchange).

THE SECOND PROCESS IS RISK ASSESSMENT

After compiling a list of significant risks for the development of the stock market at the macro level (market level), it is necessary, considering the limited resources of specialized agencies and organizations for managing them, to rank the risks by significance. For this, it is no longer enough to simply assess whether the risk is real and whether its consequences can be considered significant in principle; it is necessary to evaluate the level (degree) of probability of the risk materializing and the possible consequences (respectively).

The methodology for risk assessment is directly related to the key negative consequences for the respective object and the profile of its activities. In organizations where financial losses are of primary importance, databases on losses, scenario analysis, various tests, and mathematical models are used to assess both the probability and impact of risk, with gradations in the form of financial thresholds, etc.

In objects where the key negative consequence is improper performance of functionality, which is the case for the object of study, risk assessment is generally carried out using predominantly expert methods, including various scales describing different levels of probability and impact. The application of mathematical models is possible with the accumulation of the necessary statistics, but they are quite simple, mainly taking into account the number and frequency of risk events.

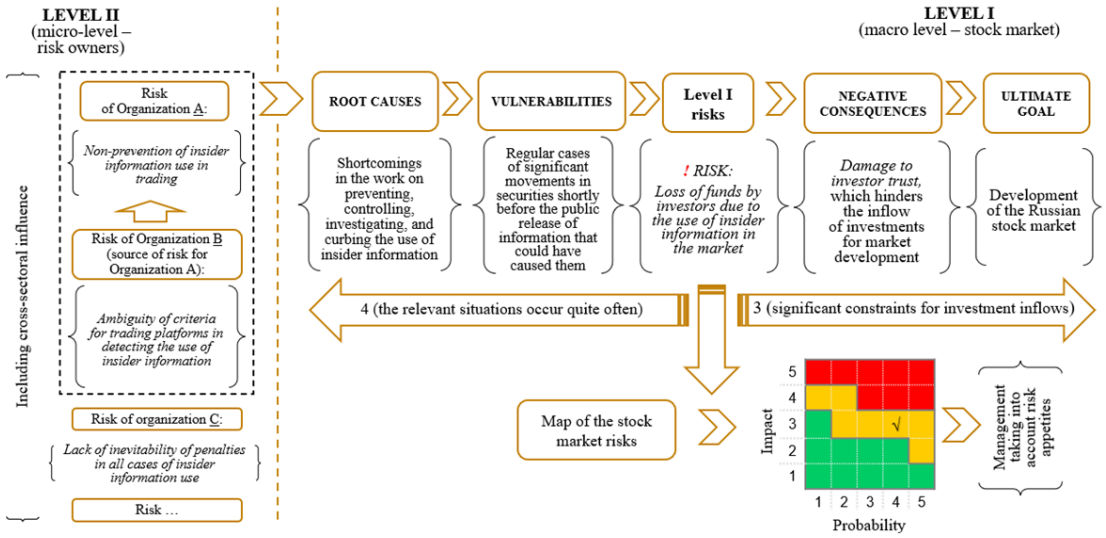

Fig. 4. **Methodical Approach to Developing a Risk Management System of Risks for the Development of the Russian Stock Market with a Practical Example**

Source: Compiled by the authors.

The most commonly used scales in international practice for assessing both probability and impact are 5-point scales. The uniformity in both criteria allows for the subsequent formation of a risk map. For the object of the present study, it is proposed to use a generally universal scale, as presented in *Table 2*.

Unlike the risk probability assessment scale, the risk impact assessment scale requires the adjustment of impact level (degree) descriptions for each negative consequence relevant to the risk management object. Proposals regarding the object of study are presented in *Table 3*.

The overall impact assessment, considering that the risk can receive different evaluations for different types of consequences, is proposed to be assigned according to the most common conservative scenario (based on the highest value). The final assessment of each significant risk will represent a combination of "Probability × Impact" (for example, 2 × 5, 1 × 4, etc.).

As a result of the assessment conducted according to unified rules, all significant risks can be placed on a common risk map for all involved parties, which will serve as a managerial guideline for prioritizing subsequent risk responses. For this purpose, heat maps are generally used, divided into risk zones depending on their level. When assessing risks on a 5-point scale, the risk map for market development will look as shown in *Fig. 2*.

The specific procedure for risk assessment for the development of the Russian stock market will also be characterized by the fact that adequately assessing the level of risks at the macro level, as well as subsequently managing them effectively, is impossible without their decomposition to the level of departments and organizations in cases where deficiencies in their area of responsibility are actually the root causes of macro-level risks. In particular, it is impossible to accurately assess the likelihood of the realization of macro-level residual risk[23] without knowing the vulnerabilities and control environment in the processes of the relevant departments and organizations. This statement will also be valid regarding impact assessment, as different root causes can lead to different consequences both in composition and level.

To carry out the work on assessing micro-level risks and aligning them with macro-level risks, it will be necessary to identify an authority that would coordinate this work — among the bodies most closely related to this issue due to their functional responsibilities and existing

[23] Residual risk is the risk taking into account the action of the control environment (response measures), for which further management measures are already being applied in practice.

competencies regarding the securities market. тенций в отношении фондового рынка.

THE THIRD PROCESS IS RISK RESPONSE

In international risk management practice, risk appetite (risk tolerance) is used when making decisions on risk response, which allows resources to be concentrated on the most significant risks. If for commercial organizations this indicator is usually expressed in financial terms, then in management objects with non-commercial goals, this issue is often resolved by establishing tactics and decision-making levels for risks in various zones on the risk map. The adjustment of risk appetite applicable to the object of study is presented in *Fig. 3*.

Regarding the direct management of risks, taking into account their frequent mutual influence (the risks of one agency/organization often cause risks for others) and, accordingly, the possible jurisdiction of the risks themselves and the issues of responding to them by different agencies/organizations, the developed methodological approach proposes cross-sectoral coordination of risks with each other. For example, the organizer of the trading platform is unlikely to be able to effectively combat the risk of investor losses due to the use of insider information in the trades (the realization of which at the macro level can lead to damage to investor trust) if the necessary criteria for this are not clearly defined outside the organizer's area of responsibility.[24]

The response measures themselves, taking into account the operational/qualitative nature of the main risks for the development of the Russian stock market, will also primarily be of an operational/qualitative nature, corresponding to this type of risk (implementation of activities, regulation of procedures, measures in the area of personnel management, etc.).

At the same time, within the scope of the proposed system, there will also be special response measures aimed at specific risks — such as measures in the field of occupational health and safety regarding risks whose consequence is market instability. The methodology for managing project risks will be relevant for activities carried out in a project format. In the case of identifying financial risks (credit, market, liquidity), it is evident that classic measures for managing these risks can be applied.

THE FOURTH PROCESS IS MONITORING AND REPORT PREPARATION

No specific settings in this process regarding classical tools and their application order are observed by the authors. Specific settings will be determined by the needs of the system participants and outlined in the detailed methodology.

An important aspect of this process will be the inclusion of a periodic independent audit of the system's effectiveness in the monitoring perimeter for the functioning of the risk management system. At the same time, commercial entities should not be involved in the execution of this procedure, considering the possible sensitivity of information about risks and risk events in the current conditions.

The general scheme of the methodological approach to developing a risk management system for the development of the Russian stock market, recommended for implementation by relevant state bodies (primarily the Bank of Russia and the Government of Russia), is presented in *Fig. 4*. As a trial demonstrating the applicability of the approach, the figure presents an example of identifying and assessing one of the macro-level risks.[25]

In particular, when identifying significant macro-level risks, the list should include, alongside other risks, the risk of investors losing funds due to the use of insider information in

[24] Example — conditional, may not align with the opinions of the direct risk owners. Provided solely for the demonstration of the methodology.

[25] The risk data is provided solely to demonstrate the functionality of the approach and may differ from the positions of the direct risk owners. Moreover, in practice, the formulation of the risk is adjusted by the risk owners in such a way that it is unequivocally clear which event is being referred to, including for the purposes of recording risk events, meaning it can also be specified.

the market, as its realization may lead to one of the identified consequences that hinder market development — damage to investor trust. Regarding this risk, it will be extremely difficult to document its realization, including due to legal peculiarities, but identifying the risk is necessary for proactive management.

When assessing macro risk using the proposed scales, the level of consequences and the level of probability of risk realization are determined through expert evaluation (using available statistics). At the same time, the main sources and vulnerabilities of the risk are identified for the probability assessment. The likelihood of risk realization can be indicated by vulnerabilities, such as the scale of relevant market phenomena, which can be monitored, including quantitatively using KPI. As sources of risks, possible deficiencies (unresolved issues) in the activities of system entities, for which they are responsible, will be considered. For these entities, the corresponding aspects will act as risks that need to be managed. The external nature of the macro-risk source relative to the system will not be a reason for not decomposing it to the level of risk owners, as appropriate events also need to be prepared for.

The sources of the considered macro risk at the micro level can theoretically be: the failure of trading organizers to prevent cases of insider information use in trading, the ambiguity of the criteria for the use of insider information established by the relevant authority (which specific actions should be considered as insider information use), and the lack of inevitability of penalties for such facts. At the same time, the first reason may be due to the second, falling under the jurisdiction of another agency (organization).

As a result of discussing all key root causes of risk and vulnerabilities to them, taking into account the presence and effectiveness of the existing control environment, conducted with the participation of stakeholders (during the RCSA[26]procedure), an assessment of the probability of the macro risk will be given, which in combination with the assessment of consequences will allow obtaining the final risk assessment and placing it on the overall risk map for the development of the stock market, in our example — with an assessment of 3×4.

Next, taking into account the accepted risk appetite at the appropriate managerial level, the method of responding to the risk is determined; in our example, it is minimization (if feasible and appropriate).

Risk response will be carried out at the micro level by departments and organizations that are responsible for the root causes of macro-level risks. For them, these causes are separate risks subject to classical risk management processes, including response and monitoring. For the first two macro-risk causes, which are interrelated micro-level risks, it will be necessary to coordinate measures with the risk owners.

Only by decomposing the considered macro-level risk into its causes, which will be treated as separate micro-level risks with their cross-functional alignment and the application of management measures, will it be possible to achieve high manageability of the macro risk.

CONCLUSION

Based on the research results, an author's methodological approach to the development of a risk management system for the development of the Russian stock market has been proposed, taking into account the specifics of both the risk management object itself and the set goal (market development) in its basic settings. Within the framework of the methodological approach, the integration of two levels of risk management has been implemented (risks of the market as a whole and the risks that condition them at the level of direct risk owners — specialized agencies and organizations) and cross-sectoral risk coordination (considering that the risks of one agency/organization can be the cause of risks in others).

The conducted testing of the methodological approach on one of the risks indicates the possibility of its application. Considering the similarity in many aspects of goals, infrastructure, and participants between the

[26] Risk and Control Self-Assessment.

stock market and the financial market as a whole, the proposed approach can be scaled up to the level of the financial market if necessary.

The expected benefit of implementing a methodological approach is ultimately the increase in the stock market's contribution to the development of the national economy through the development and implementation of a systematic approach to risk management for the development of the stock market.

To implement the methodological approach, it will be necessary to determine the agency responsible for coordinating the work, as well as to create (define) an interdepartmental collegial body for discussing current issues and making decisions, which should include key system participants, including the Bank of Russia, the structures of the Government of Russia, and Moscow Exchange.

The main challenges for implementing the approach will be the difficulty of reconciling the interests of a range of involved parties and the need to ensure a balance between the costs and benefits of applying the approach.

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The Impacts of Credit Risks on the Financial Stability of Jordanian Commercial Banks between 2010 and 2020

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ABSTRACT

Banks are unique establishments that are exposed to both returns and risks across various dimensions. Among the risks they face, credit risk stands out as one of the most critical, stemming from banking transactions with customers and institutions. Risk is an inherent aspect of the banking business, particularly due to factors such as increased competitiveness, technological advancements, larger banking transactions, and the presence of large banks. Today, banks encounter a range of banking risks, varying in their levels of severity across different institutions. To ensure their continued existence in the banking market with reasonable returns and minimal risks, banks must conduct thorough evaluations and analyses while effectively managing all potential risks. These measures contribute to their success. This study specifically examines the influence of credit risk on the financial stability of Jordanian commercial banks during the period of 2010–2020. The study incorporates key drivers of financial stability, including the capital adequacy index, liquidity ratio, return on assets, and costs, which were derived from previous research. The study's findings indicate that the leverage ratio (expressed as a percentage) of credit risks had no impact on the financial stability of Jordanian commercial banks between 2010 and 2020. However, there was an impact observed in relation to credit risks represented by the ratio of nonperforming loans to total loans (expressed as a percentage), affecting the financial stability of these banks. Based on the final results and discussions of the study, it is recommended to prioritize transparency, as it plays a crucial role in achieving financial stability even in the face of financial, political, and epidemic crises. Additionally, adherence to institutional governance principles in financial markets and establishing a link between economic indicators and banking safety are essential. Overall, this study underscores the significance of effectively managing credit risks and implementing measures to ensure financial stability in the banking sector.

Keywords: assets; banking sector; capital; costs; COVID-19; financial stability; instability; liquidity

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INTRODUCTION

The global history of financial and economic systems has been marked by various crises that have disrupted domestic and global markets. These crises are considered successive shocks to these systems, highlighting the need to reevaluate the factors contributing to stability in both the financial and economic domains [1–4]. Risk is acknowledged as an inherent aspect of the banking business, as emphasized by Murinde et al. [5] and Zhao et al. [6]. Factors such as increased competitiveness, technological advancements, larger banking transactions, and the presence of large banks have further amplified the significance of risk in the banking sector. Consequently, banks face a range of banking risks, which vary in their severity across different institutions. To ensure their continued existence and success in the banking market while maintaining reasonable returns and low risks, banks must conduct thorough evaluations, analysis, and effective risk management [7–9].

The financial and banking sector, like other industries, has experienced the impact of various financial distresses that have occurred globally. This sector has confronted crises that can have long-term influences [10–12]. Schnabl and Sonnenberg [13] also highlight that risk is an inherent aspect

of the banking sector, particularly due to increased rivalry, technological progress, a higher volume of financial transactions, and the demand for large banks. Consequently, banks face a diverse array of banking risks, which differ in their magnitude across different banks.

Credit risk emerges as one of the most critical risks that banks face in their banking transactions with customers and institutions. These risks can be categorized into different types, and advanced indicators can be employed to accurately identify and forecast them [14]. This enables banks to control or reduce credit risk, even if complete elimination is challenging. Contemporary studies have focused on managing and controlling bank credit risks, employing robust control and managerial systems and methods to enhance risk identification. Effective classification and decision-making regarding credit risks contribute to better achievement of financial goals [15–17].

In line with the aforementioned arguments, the present study examines the impact of credit risks on the financial stability of Jordanian commercial banks between 2010 and 2020. The study investigates four main areas of interest: the capital adequacy index, liquidity ratio, rate of return on assets, and costs [18]. By analyzing these factors, the study aims to shed light on the relationship between credit risks and financial stability in the Jordanian banking sector during the specified period.

LITERATURE REVIEW

Financial Stability

The concept of financial stability is widely recognized among economists as the ability to achieve a balanced state in all elements of the financial sector, including the stability of these elements [19]. Financial stability is built upon three main anchors: financial organizations such as banks, financial markets, and the financial infrastructure [20]. These anchors work together to create a stable financial environment that can effectively manage financial risks [21]. Financial stability can be understood as the absence of factors that may lead to financial instability within these anchors, such as banks, insurance companies, and financial markets [22]. It entails the ability of the financial environment to withstand internal and external risks, resolve them, and mitigate any negative impact they may have [23].

Financial stability is characterized by the financial sector's ability to handle risks in a prudent and robust manner, as well as predict and effectively manage crises [24]. It is not solely about responding to risks as they arise but also about preparing the financial sector to absorb and mitigate risks, reduce their occurrence, and prevent their adverse effects from spreading to the main financial anchors, which can have a detrimental impact on the overall economy [25]. Financial stability is also based on the principle of directing financial resources toward investment opportunities regardless of the prevailing circumstances, allowing the banking sector to operate efficiently in terms of payments, credit, and liquidity, even in the presence of credit risks [26].

The link between financial stability and credit risk is considered crucial for predicting and mitigating risks, ensuring that the growth of financial assets aligns proportionally with the growth of the economy [27]. A balanced fiscal environment is important because the performance of the financial sector significantly affects the economy's ability to achieve financial stability [28]. Central banks, as key financial institutions, play a vital role in directly addressing financial risks as they arise. It is essential for banks to be prepared for expected shocks and prevent their transmission to other components of the financial environment and the broader economy. Key principles such as transparency, corporate governance, and the alignment of macroeconomic indicators with banking soundness are crucial for achieving systematic performance in financial markets and enhancing the ability to make internal and external financial settlements [29].

Financial stability and economic stability are interconnected, and the discipline of one contributes to the other through sound monetary and financial policies and transparent allocation of financial resources [30]. In many developing countries, the discipline of the macroeconomic environment is essential for achieving financial stability and the sound performance of financial institutions [31]. Improving liquidity and profitability through domestic savings helps mitigate the risks associated with exchange rate and interest rate fluctuations, ensuring stability in external payments for financial institutions, particularly banks. Developing economic stability

policies to address short-term economic issues like inflation, cash reserves, and fund transfers is also a priority for these countries [32].

Short-term problems can hinder the achievement of long-term comprehensive policies for financial stability in some developing countries. Economic downturns can lead to companies failing to fulfill their obligations to banks or make it difficult to launch new projects due to reduced purchasing power. Consequently, unemployment rates rise, family savings decline, and obtaining bank loans becomes challenging, resulting in an increase in non-performing loans. This situation can create market price bubbles, where the value of collateral provided to banks for loans does not reflect the true value of the assets [33].

Financial stability is closely tied to the concept of trust. A trustworthy financial environment is one that is built on solid foundations and robust infrastructure, enabling the prediction and effective resolution of risks [34]. Trust is a fundamental element in achieving financial stability and ensuring the optimal functioning of the financial system.

Requirements of Financial Stability

To achieve financial stability, it is crucial to have well-developed and balanced financial systems that can effectively allocate investments, create robust investment opportunities, generate employment, and increase production levels. Corbet et al. [35] argue that financial stability is a fundamental element in attaining economic stability, as it enables better management and mitigation of credit-related risks through a sound financial state. Baicu et al. [36] support this perspective, stating that financial stability helps prevent the concentration and accumulation of credit risks, leading to more effective management of their consequences.

The relationship between monetary policy and financial stability is highlighted by Goodell [37], who emphasizes the impact of monetary policy tools, such as interest rates, on the ability of organizations within the economic framework to fulfill their debt obligations to banks. Monetary policy measures, including interest rate adjustments and exchange rate policies that limit unwarranted fluctuations and prevent currency speculation, support efforts to achieve economic stability and enhance international competitiveness. Flögel and Gärtner [38] further assert that financial stability cannot be achieved in isolation from economic stability, emphasizing the complementary roles played by the financial sector and monetary policy.

A stable banking sector is also a requirement for financial stability, as it can effectively mobilize savings to finance multiple investment opportunities, create job opportunities, and enhance productivity. Financial stability in the banking sector is considered a pathway to economic stability [39]. Yildirim [40] highlights the importance of monetary stability as a prerequisite for financial stability, with the monetary sector maintaining price stability at targeted levels (typically around 2% in developed countries and higher in developing countries). Al-Shboul et al. [41] suggest that establishing a clear interest rate structure that aligns with economic and international developments, while organizing credit and its terms to support economic growth and mitigate credit risks, particularly in sectors vulnerable to volatility, is essential for financial stability in the banking sector.

Credit Risks

Sharma and Lakhotia [42] emphasize that economists focus on understanding and managing the risks associated with banks. Risk is generally defined as a deviation from the expected positive outcome due to certain incidents or events that result in damage or loss. When discussing risks in the context of banks, it refers to the potential exposure of banks to unforeseen fluctuations or uncertainties that can impact their activities, including investment returns, debts, credits, and other financial operations [43].

There are two main types of risks that banks typically face, as highlighted by Sharma and Lakhotia [42]. The first type is the risk of the bank's inability to repay its debts on time, which can lead to financial losses. The second type of risk is credit risk, which arises from the possibility that borrowers may fail to fulfill their obligations and meet the terms agreed upon with the bank after receiving a loan.

Credit risk specifically refers to the potential losses that may arise when clients or borrowers are unable to repay the principal amount and interest within the agreed timeframe [25]. This risk is associated with loans and bonds

provided by the bank to individuals or organizations based on mutual agreements to cover expenses and repay the loan in installments within a specified period [44].

In summary, credit risk represents the potential losses that banks may face when borrowers are unable to fulfill their repayment obligations as agreed, and it encompasses the risks associated with loans and bonds granted by the bank to individuals or organizations.

Types of Credit Risks

Long et al. [45] provides a classification of risks associated with loans, distinguishing between systematic risks and non-systematic risks:

1. Non-Systematic Risks (Special Risks): Non-systematic risks are internal risks that arise within the bank's own environment and are related to its activities and financial situation. These risks are specific to the bank and not directly influenced by external factors. Examples of non-systematic risks include weak management practices, corruption, managerial errors, and problems with clients or borrowers [46]. These risks are unique to the bank and can be managed through proper risk management practices and controls.
2. Systematic Risks (General Risks): Systematic risks are external risks that the bank faces from the broader environment. These risks are not specific to a particular bank but affect the entire market or economy. They can arise from factors such as economic and political instability, non-compliance of borrowers with loan conditions, or external events like natural disasters (e.g., earthquakes, floods) and pandemics (e.g., COVID-19) [23]. Systematic risks are beyond the direct control of individual banks and can have a widespread impact on the banking industry as a whole.

It is important to note that while non-systematic risks can be managed and reduced through internal measures and diversification strategies, systematic risks are more challenging to control or predict. Diversification may help mitigate non-systematic risks, but it cannot eliminate or avoid systematic risks [47]. The total risks faced by banks typically comprise a larger proportion of systematic risks compared to non-systematic risks [48].

In summary, loans are exposed to both non-systematic (special) risks, which originate internally within the bank, and systematic (general) risks, which arise from external factors affecting the broader market or economy. Non-systematic risks can be managed through internal controls, while systematic risks are more difficult to control and are influenced by external events and conditions.

Hypotheses Development

The COVID-19 pandemic had a significant impact on the financial stability of banks, particularly in terms of their income and profitability. The low-income risk caused major issues in cash liquidity, making it challenging for banks to meet their financial obligations such as debts, interest payments, and operating expenses like rents and staff costs [39]. This was especially problematic for banks that were already weak or facing performance difficulties, as their debts and monetary problems escalated, further complicating their situation.

Flögel and Gärtner [38] highlighted the substantial impact of the pandemic on banks' profits, particularly in the first quarter of 2020. Closures, curfews, and the redirection of support towards the health sector placed additional pressure on banks, resulting in a significant contraction in revenues, activities, and liquidity. The return on assets experienced a significant decline, reaching levels lower than the cost of borrowing, which had not been observed since 2014.

In response to the pandemic, many banks implemented cost-cutting measures, including complete closures, reducing employee capacity to less than 50%, utilizing liquid assets to cover financial obligations, and relying on unpaid financial statements [49]. Some banks also resorted to borrowing, issuing debts, or withdrawing investments and contributions from members to address the financial challenges posed by the pandemic [50].

While the impact of the COVID-19 pandemic on the financial system and banking sector exceeded that of the 2008 financial crisis, Angurer et al. [51] noted that major banks with greater flexibility were able to absorb shocks rather than exacerbate the crisis. This flexibility likely played a role in mitigating some of the adverse effects on financial stability.

METHODS

The study aimed to achieve its goals and objectives by employing a quantitative research approach. The population of the study comprised Jordanian commercial banks operating from 2010 to 2020. The researchers identified drivers of financial stability, including the capital adequacy index, liquidity ratio, return on assets, and costs, based on existing literature. To analyze the collected primary data, the researchers utilized EViews software version 9. Linear regression was employed as the statistical technique to present the study's findings (*Table 1*).

ANALYSIS AND DISCUSSION

Results of Hypothesis Testing

Ho1: There Is an Impact of Credit Risks (Nonperforming Loans/Total Loans (%)) on Financial Stability (of Jordanian Commercial Banks (2010–2020)

Linear regression was used to test the above hypothesis. The F-statistic = 8.4206 and was statistically significant at 0.05, indicating that the above hypothesis was accepted and that credit risks (nonperforming loans/total loans (%)) have an impact on Jordanian commercial banks' financial stability between 2010 and 2020.Also, R-squared = 0.48 reflected that the independent variable explained 48.3% of the variance in the dependent variable (*Table 2*).

The equation is: Financial Stability = 16.22607 + + 0.386960 (Credit Risks).

Ho2: There is an impact of credit risks (leverage ratio) on the financial stability of Jordanian commercial banks between 2010 and 2020.

Linear regression was used to test the above hypothesis. The results showed that the F-statistic of 2.215748 was not significant at the 0.05 level, indicating that the hypothesis was accepted, and there is no impact of credit risks (leverage ratio (%)) on the financial stability of Jordanian commercial banks between 2010 and 2020. Furthermore, the R-squared value of 0.197 indicated that the independent variable explained only 19.7% of the variance in the dependent variable.

The equation derived from the regression analysis was Credit Risks = 2.39 + 1.26 * Financial Stability.

The current study aimed to investigate the impact of credit risk on the financial stability of Jordanian commercial banks between 2010 and 2020. The study utilized drivers of financial stability, including the capital adequacy index, liquidity ratio, rate of return on assets, and costs, which were derived from previous studies. A quantitative approach was employed, and primary data were collected through a questionnaire distributed to financial managers within Jordanian commercial banks. The study used SPSS for data analysis.

The results of the study indicated that credit risks (nonperforming loans/total loans (%)) had a significant impact on the financial stability of Jordanian commercial banks during the specified period.

The study revealed that the Jordanian banking sector demonstrated a robust infrastructure and strong foundations, enabling it to recover well from the global financial crisis and its repercussions during the years 2010–2020. The sector exhibited high levels of resilience and was able to withstand the challenges of financial instability and various insurance risks that emerged during that period. This contributed to the attractiveness of the sector for investment and its significant role in maintaining the financial stability of the Jordanian state.

The decrease in liquidity within banks has exacerbated the effects of the crisis, particularly in financing small and medium-sized businesses, due to the uncertainty caused by the COVID-19 pandemic. Effectively managing credit risks and ensuring financial stability require transparency and governance, particularly institutional governance, to provide a clear understanding of financial conditions and the ability to predict potential credit risks by linking macroeconomic indicators with relevant factors. Credit risk has demonstrated its ability to promote discipline in financial markets and enhance the efficiency of the banking sector in performing its functions.

The study also emphasized the importance of developing a stable and robust banking sector capable of channeling savings into productive investments to achieve financial stability. A competent banking system is a prerequisite for achieving complete economic stability in the face of various credit risks. It serves as a crucial step toward overall economic stability for the country.

Table 1

Results of Least Squares Regression for the Impact of Non-Performing Loans on Capital Adequacy Ratio

Dependent Variable: CAPITAL_ADEQUACY_RATIO				
Method: Least Squares				
Date: 05/04/24 Time: 02:59				
Sample: 1 11				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
NONPERFORMING_LOANS_TOTA	0.386960	0.133350	2.901833	0.0175
C	16.22607	0.821485	19.75212	0.0000
R-squared	0.483371	Mean dependent var		18.53727
Adjusted R-squared	0.425968	S.D. dependent var		0.880762
S.E. of regression	0.667308	Akaike info criterion		2.191837
Sum squared resid	4.007705	Schwarz criterion		2.264182
Log-likelihood	–10.05510	Hannan-Quinn criter.		2.146234
F-statistic	8.420632	Durbin-Watson stat		1.574650
Prob (F-statistic)	0.017543			

Source: Amman Stock Exchange (ASE).

Table 2

Results of Least Squares Regression for the Impact of Leverage Ratio on Capital Adequacy Ratio

Dependent Variable: CAPITAL_ADEQUACY_RATIO				
Method: Least Squares				
Date: 05/04/21 Time: 03:14				
Sample: 1 11				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LEVERAGE_RATIO	1.257035	0.844476	1.488539	0.1708
R-squared	0.197557	Mean dependent var S.D. dependent var Akaike info criterion Schwarz criterion Hannan-Quinn criter. Durbin-Watson stat		18.53727
Adjusted R-squared	0.108396			0.880762
S.E. of regression	0.831657			2.632173
Sum squared resid	6.224887			2.704518
Log likelihood	–12.47695			2.586570
F-statistic	2.215748			1.050703
Prob (F-statistic)	0.170788			

Source: Amman Stock Exchange (ASE).

CONCLUSIONS AND RECOMMENDATIONS

The concept of financial stability encompasses more than just managing financial crises when they arise. It also involves strengthening the financial sector to enhance its capacity to withstand and mitigate the impact of such crises. This can be achieved through effective prediction of crises and minimizing their adverse effects on banks, thereby preventing the contagion of negative consequences to other economic sectors interconnected with the banking industry. The study emphasizes the importance of transparency as a key factor in achieving financial stability during financial, political, and even epidemic crises. It recommends implementing institutional governance in financial markets, establishing links between economic indicators and banking security, and ensuring the efficiency and reliability of payment, settlement, and clearing systems during times of crisis to support their crucial functions. By adopting these measures, financial stability can be fostered, enabling the banking sector to effectively navigate through challenging circumstances while minimizing the impact on the broader economy.

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The Effect of Institutional Pressure on the Level of BPK Auditor Reliance: A Study of Government Audit Institutions in Indonesia

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ABSTRACT

Supreme Audit Agency (BPK) and Government Internal Supervisory Apparatus (APIP), as government audit institutions, have an essential role in realizing the accountability of state financial management. Both are expected to establish good coordination because it can benefit both the audit institution and the government organization being audited. This study examines the effect of institutional pressure, namely coercive pressure, normative pressure and mimetic pressure, on the level of BPK auditor reliability. In addition, this study also aims to examine the impact of BPK auditor reliability on audit quality. The research was conducted at government audit institutions considering that reliability is a form of coordination in conducting government financial report audits. The survey method was carried out to collect data from 264 audit team leaders tasked with examining the government's 2020 financial reports. SEM PLS analysis was used with the help of the WarpPLS Version 8 software. Unlike previous studies, this study found that mimetic pressure does not affect the level of auditor reliability. BPK is the only external government audit institution so no other audit institutions can be used as a benchmark in auditing government financial reports. The study also concluded that BPK auditors' reliance on APIP could improve audit quality. This research provides input for the government regarding strategies to improve coordination and cooperation between BPK as the government's external auditor and APIP as the government's internal auditor.

Keywords: institutional pressure; coercive pressure; normative pressure; mimetic pressure; auditor reliability; audit quality; government financial reports; coordination and cooperation

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INTRODUCTION

Government audit institutions in Indonesia consist of the Supreme Audit Agency (BPK) as the government's external auditor and the Government Internal Supervisory Apparatus (APIP) as the government's internal auditor. The BPK is tasked with examining the management and accountability of state finances carried out by government institutions. Meanwhile, APIP is tasked with fostering and supervising the running of government. The two audit institutions have strategic roles in realizing accountability in managing state finances and presenting credible financial information [1]. Due to the essential roles of these two institutions, BPK and APIP are expected to establish intense coordination in carrying out their functions because coordination between the two can provide several benefits for both institutions [2] and the institution being audited [3]. Ho & Hutchinson [4] stated that coordination between external and internal auditors could increase efficiency and impact audit quality.

One form of coordination that can be carried out between BPK and APIP is the utilization of certain aspects of each other's work [5]. BPK can take advantage of APIP's work to reduce its audit workload, and conversely, APIP can gain insight from the extensive experience and knowledge possessed by BPK auditors. However, BPK is currently experiencing limited auditor resources [6]. With limited auditor resources, BPK auditors must apply an audit efficiency strategy to overcome these limitations by utilizing the results of APIP's work in conducting audits of government financial reports.

The importance of using the results of the internal auditor's work by external auditors in auditing financial statements has attracted the interest of researchers to examine various aspects that can affect the level of utilization. Previous researchers have tested various variables that affect the level of utilization of the work of internal auditors by external auditors, for example, the quality of governance [7, 8], internal auditor resources

[9], allocation budget [10], audit risk [11], audit fees [12], and internal auditor quality attributes [13].

Of the various aspects that have been studied, no research has examined the institutional pressure variable as a variable that can affect the external auditor's level of reliance on internal auditors. However, this study views that in the context of public sector audits in Indonesia, institutional pressure can play a role as a variable affecting the level of reliability of BPK auditors. Therefore, this study aims to examine the influence of institutional pressure factors from the point of view of institutional theory because this theory is seen as able to provide an understanding of the interaction of different elements of governance [14].

In addition to examining the institutional pressure factor as a variable that affects the level of BPK auditor reliability, this study also aims to test whether the level of BPK auditor reliability affects audit quality. It was done with the consideration that the findings of previous researchers showed contradictory results. For example, the internal audit function contributes to improving the quality of financial statement audits [15], while different results are shown, who conclude that the reliability of the internal audit function can lead to reduced findings that affect quality audits [16]. In addition, Morril also discovered that because it could have a detrimental effect on audit quality, external auditors can only use the work of internal auditors in part [17].

LITERATURE REVIEW

Agency Theory

This study uses agency theory to explain the behavior of external auditors as parties involved in the relationship between principal and agent. In agency relationships, problems arise because of differences in interests between principals and agents and information asymmetry [18]. As a result, management tends to prioritize their interests in the operational activities of the entity, which leads to the use of assets for personal gain, neglect of their duties as agents, or may appear diligent but misdirected, resulting in agency costs [19].

Agency relationships do not only occur in business entities but also in public sector organizations. The pioneers of agency theory, namely Jensen & Meckling, explained that agency problems occur in all types of organizations, all forms of cooperative efforts, and at every management level, including in public sector organizations [20]. In public organizations, agency relationships do not only occur personally between principals and agents [21]. These relationships are more complex because they occur at several levels of relationships.

In the context of auditor reliance behavior, external auditors can take advantage of the work of internal auditors with a motive to maximize their utility, namely to minimize the effort that must be made to make their work easier, not for the principal's interest. Argento et al. are concerned about the risk that agents (external auditors who decide whether or not to rely on the work of internal auditors) do not always act in the best interests of principals, thereby creating a risk to audit quality [22].

Institutional Theory

The institutional theory states that social actors face external pressure to conform through shared conceptions of desirable and appropriate behavior to secure resources and gain social support by observing organizational legitimacy [23, 24]. Social actors consider efficiency, productivity, and rationality of social behavior and social legitimacy [23, 25]. This theory also examines the influence of institutions on human behavior through rules and norms built by institutions [26].

The use of the results of APIP's work by BPK auditors can be studied using the perspective of institutional theory because this theory provides insight into the influence of the institutional environment, in the form of rules, norms, and culture on organizational actions [24]. Organizations consider various institutional pressures in interpreting what actions are legitimate for them in making decisions [27]. Organizations conform to social expectations and norms to maintain their legitimacy. Institutional legitimacy is a shared conception of desirable and appropriate action that is carried out under accepted regulatory pressures, professional norms, and beliefs [23]. Scott [28] describes these pressures as the three pillars of institutions, namely the pillars of regulative, normative, and cognitive-cultural, while DiMaggio & Powell [23] identify this institutional mechanism as institutionalized isomorphism.

DiMaggio and Powell explain that three types of power shape institutional behavior: first, pressure to comply with rules and regulations issued by individuals

or organizations, which is called coercive pressure [23]. Second, the pressure of uncertainty creates the need for self-adjustment to goals by imitating procedures used by other organizations, which is called mimetic pressure. Third, the pressure to conform to the rules and norms issued by professional bodies, namely normative pressure.

In the context of coercive pressure, although various regulations and laws and regulations are clearly presented, then monitored and enforced [29], these regulations and regulations are still subject to various interpretations and levels of implementation which give rise to various variations [30]. These variations in interpretation and implementation lead to uncertainties, contradictions, and pressures for actors. Inconsistency in law enforcement or implementation can cause uncertainty and create pressure for the auditor. For example, there is an opportunity for litigation risk that can become pressure for the auditor.

Normative pressure arises from the existence of moral and social obligations and binding expectations regarding "what is the right thing to do" [31]. For example, in the context of an audit, the public expects that the auditor can detect all material misstatements, including fraud therefore the auditor must maximize efforts to ensure this audit objective is achieved and obtain the expected level of audit quality. Maximizing audit efforts by auditors can increase costs which are often not covered by audit fees. Thus the existence of public expectations regarding audit objectives and quality can ultimately create pressure for auditors.

Mimetic pressure arises from the incompatibility of actions, shared understandings and social constructions [31]. This pressure arises from the difference between routine behavior, automatic behavior, and behavior that is resistant to change in conditions where "no one can imagine an alternative". This pressure can stem from incompatibilities related to "how things are done."

Hypothesis Development

This study aims to examine institutional pressure consisting of coercive pressure, normative pressure, and mimetic pressure on the level of reliability of BPK auditors against APIP in carrying out audits of government institution financial statements. In addition, this study also aims to test whether the level of dependence of BPK auditors on APIP affects audit quality (*Fig. 1*).

In the context of carrying out financial statement audits, BPK auditors experience coercive pressure to comply with applicable laws and regulations. After all, BPK is a government institution that is very strongly influenced by regulations. For example, regarding the utilization of APIP's work by BPK, there are regulations that stipulate that BPK auditors can utilize APIP's work to avoid duplication of work. This regulation is a signal of the existence of coercive pressure that regulates the behavior of BPK auditors.

Several researchers have found the effect of mimetic pressure on auditory behavior. Chiang confirmed that auditors respond to isomorphic pressures that affect them through agreement or compromise strategies [32]. Other researchers, Chiang & Northcott also found that coercive pressure in the form of negative publicity from the media, and the "fear factor" of government intervention played a role as a driver of change in auditing practices [33]. Utami found that internal audit practices are influenced by coercive pressure in both formal and informal forms [34]. Pressure in its proper form comes from regulations issued by the OJK, the Ministry of BUMN, BPK, BPKP and IDX. Meanwhile, pressure in an informal form comes from the Internal Audit Association (IIA), COSO, and the community. Based on this, this study assumes that pressure originating from government regulations and applicable auditing standards can affect the level of utilization of APIP work results by BPK examiners on APIP work results:

H1. Coercive pressure positively affects the level of utilization of APIP work results by BPK examiners.

Normative pressure is a form of pressure that comes from the profession to be "the same". For example, professional organizations define their profession cognitively and provide legitimacy and autonomy for their profession [26] Normative pressures limit behavior through value systems, expectations, and roles. For example, with normative isomorphism, auditors will conform to the norms to maintain their legitimacy by convincing their constituents [35].

In its position as a government audit institution, BPK has played an active role in various audit communities such as the International Organization of Supreme Audit Institutions (INTOSAI), Asian Organization of Supreme Audit Institutions (ASOSAI)

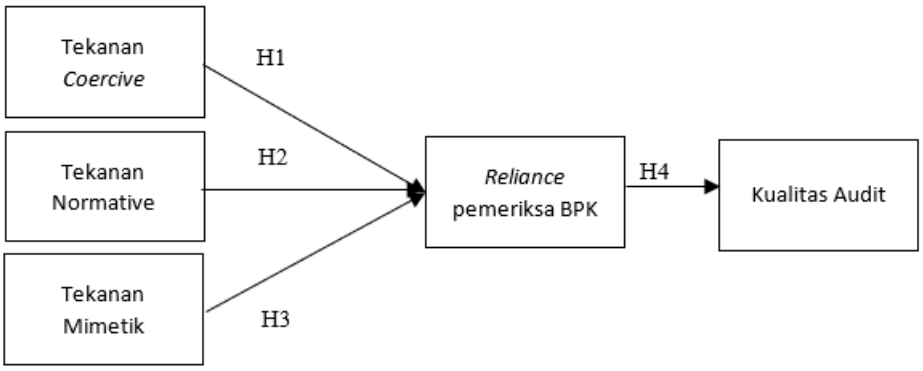

Fig. 1. **Research Model**

Source: Compiled by the authors.

and ASEAN Supreme Audit Institutions (ASEANSAI). BPK's active participation in these various bodies is expected to encourage the exchange of knowledge and experience in order to increase the professionalism and independence of BPK auditors. In addition, auditor associations at various levels mentioned above can act as institutions that influence the behavior of their members, including in the practice of cooperation and reliance between the two government audit functions. King et al. concluded that participation in government-supported bodies, standards bodies, and professional associations might provide events so that the involvement of government auditors in audit associations can affect the level of utilization of APIP work results by BPK examiners [36].

Previous research has shown that normative pressure influences audit practice by emphasizing professionalism and training education systems for auditors and increasing competency through continuing professional education [34]. In addition, Chiang found that auditors also feel normative pressure influencing their attitudes and practices and directing them towards compliance with professional standards. Therefore, we put forward hypothesis 2 as follows:

H2. Normative pressure positively affects the reliability of BPK examiners on the results of APIP work in conducting audits of government institutions.

Mimetic pressure is a mechanism of isomorphism that occurs when an organization imitates the actions of other organizations that are structurally equivalent and occupy the same position in the same industry [23]. Adherents of the institutional theory argue that to deal with uncertainty, organizations imitate the structures and processes of other organizations, especially those with the same characteristics as themselves [37].

Interactions that exist between fellow auditors within the same professional organization, for example, the International Organization of Supreme Audit Institutions (INTOSAI) or the Indonesian Association of Accountants (IAI), provide preference for BPK auditors to imitate successful practices implemented by other fellow auditors in the association. The auditors who join the same association have almost the same features, for example, in terms of vision and mission, goals, the organization being audited, and sources of funding. Therefore, the behavior and practices of members who are considered to be of high qualit and victorious will become appropriate references for fellow members when faced with conditions of uncertainty regarding appropriate practices.

From the point of view of agency theory, the behavior and actions of external auditors as agents cannot be observed and evaluated directly by the principal. Principals need more information about the behavior and actions of auditors, so principals use the practices of other groups of auditors who are considered successful as benchmarks and references for assessing and evaluating the practices of their agency auditors. For this reason, principals will positively evaluate auditors who carry out practices similar to other groups of auditors who are considered successful and negatively assess auditors who are deemed not to implement these norms [38]. Thus the external auditor will imitate the audit quality of colleagues in the association to meet preferences and increase their credibility in the eyes of the principal.

Several previous studies have found that mimetic isomorphism affects auditing practices, both internal and external auditors. Freitas & Guimaraes found

Table 1

Data from the 2021 Government Financial Report Examination Team

No.	Work unit	Examination Scope	Number of Examination Teams
1	Auditor	Ministries and Institutions (K/L)	87
2	Representative office	Provincial government	34
3	Representative office	City Government	93
4	Representative office	District government	415
Total Number of Examination Teams			629

Source: Compiled by the authors.

that a mimetic isomorphism mechanism influences auditing practice [39]. Chiang and Northcott found that mimetic, coercive and normative pressures are essential in developing financial statement auditing practices [33]. The results of Utami's research concluded that mimetic isomorphism puts pressure on auditors through various comparative studies conducted [34]. Based on this, this study proposes a third hypothesis as follows:

H3. Mimetic pressure positively affects the level of utilization of APIP work by BPK auditors.

Coordination between BPK and APIP auditors is expected to reduce duplication of audit work, resulting in inefficiencies in audit implementation. The results of Oussii & Boulila's research concluded that the reliability of external auditors affects audit delay, which is an indicator of audit quality [40]. Argento et al. also concluded that the use of the work results of the internal audit function by external auditors has a significant effect on improving audit quality [22]. Research by Pizzini et al. found that audit delay decreased along with the quality of the internal audit function [15]. Audit delay is also four days shorter when the internal audit function contributes to the external audit. Abbott et al. also proved that the involvement of internal audit staff hurts audit delay, which has implications for increasing audit quality [41]. Based on the results of previous studies, this study proposes the following hypothesis:

H4. The use of the results of APIP's work by the BPK Examination Team has a positive effect on the efficiency of conducting audits of government entity financial statements.

METHOD

Sample Selection

The population of this study is the BPK audit team that conducts audits of the government's financial reports. From each inspection team, a team member was selected who has the role of team leader or technical controller with the consideration that both of them have authority in making decisions related to the level of utilization of APIP work results. *Table 1* presents data related to the total population of 629 audit teams that have examined the financial statements of government entities for 2021.

Data collection by distributing questionnaires was carried out in the form of an online questionnaire supplemented with a cover letter explaining survey details, contact information, and instructions for completing the survey. Respondents were also informed that all information provided would be kept confidential. Of the total target population of 629, the respondents who participated in this study were 264 people or as much as 41.98%, which are detailed in *Table 2*.

Variable Measurement

This study uses exogenous and endogenous variables. Exogenous variables are coercive pressure, normative pressure, and mimetic pressure, while endogenous variables are auditor reliability and audit quality. The coercive pressure variable was adapted from an instrument developed by Kim & Stanton using three indicators: rules, laws and sanctions [42]. The normative pressure variable is measured using three indicators: education, professional standards, and

Table 2

Respondent Demographic Profiles

Variable	Category	Frequency	Percentage, %
Gender	Man	167	63
	Woman	97	37
Age	25 to 35 Years	15	6
	35 to 45 Years	153	58
	45 to 50 Years	82	31
	Over 50 Years	14	5
Educational Background	S 1/DIV	209	79
	S 2	55	21
Years of service	5 to 10 Years	5	1.8
	10 to 15 Years	66	25
	Over 15 Years	193	73.2
Role in the Team	Team Leader	209	81
	Technical Controller	55	19

Source: Compiled by the authors.

networks between organizations [42]. The instrument for measuring mimetic pressure was adapted from the instrument developed by Teo et al. [43]. The instrument for measuring the level of reliability was adapted from research by Usman et al. by dividing the level of utilization of the results of APIP's work into four levels, namely no reliability, little reliability, moderate reliability, and high reliability [13]. Finally, audit quality is measured using one indicator: audit delay, referring to Pizzini, Lin, & Ziegenfuss [15].

Data Analysis

Data analysis uses Partial Least Square-Structural Equation Modeling with the help of WarpPLS 8.0 Software. This study uses WarPLS software version 8.0 to test the hypothesis because it has several advantages, namely: 1) can test complex relationships simultaneously; 2) can handle all types of measurement scales; 3) is designed to solve problems such as small sample sizes, incomplete data normally distributed in a multivariate manner, there are missing values and multicollinearity problems between exogenous variables [44].

Evaluation of Measurements and Structural Models

Measurements were evaluated using composite reliability parameters, Cronbach alpha and AVE values. The recommended composite reliability and Cronbach alpha values are >0.7, while the AVE values are >0.5. For validity assessed based on convergent validity and discriminant validity. Convergent validity is related to the principle where the construct has a high correlation or has a relationship with the manifest variable [45].

RESULTS AND DISCUSSION

The results of the construct reliability test and convergent validity are presented in *Table 3*.

Based on the data in *Table 3*, composite reliability and Cronbach alpha have met the reliability criteria, namely > 0.7 and AVE > 0.5 [46]. Convergent validity also meets the criteria, namely the loading range of indicators for the construct > 0.5 which indicates that all indicators are valid in measuring the construct. Furthermore, the discriminant validity test is carried out to ensure that each concept of each latent variable is different from

Table 3

Convergent Reliability and Validity Test Results

Variable	Number of Items	Composite Reliability	Cronbach Alpha	AVE	Loading Range
Coercive pressure	4	0.957	0.941	0.921	0.902–0.943
Normative Pressure	5	0.943	0.924	0.877	0.841–0.923
Mimetic pressure	5	0.929	0.903	0.852	0.693–0.910
Reliance Auditors	1	1.000	1.000	1.000	1.000
Efficiency Audit Quality	1	1.000	1.000	1.000	1.000

Source: Compiled by the authors.

Table 4

Construct Discriminant Validity

Variable	Coercive pressure	Normative Pressure	Mimetic pressure	Reliance Auditors	Quality audits
Coercive pressure	(0.921)	0.137	0.177	0.396	0.112
Normative Pressure	0.137	(0.877)	0.662	0.395	0.057
Mimetic pressure	0.177	0.662	(0.852)	0.379	0.028
Reliance Auditors	0.396	0.395	0.379	(1.000)	0.336
Quality audits	0.112	0.057	0.028	0.336	(1.000)

Source: Compiled by the authors.

other variables. The Fornell-Lacker criterion approach compares average variance extracted (AVE) roots with correlations between latent/construct variables [44]. Based on the Fornell-Lacker criteria approach, the model has good discriminant validity if the AVE root value of each exogenous construct exceeds the correlation between that construct and other constructs. *Table 4* shows that the AVE roots of all constructs (diagonal values) consistently exceed the correlation between constructs, which means that all indicators in the reflective construct have met the required discriminant validity criteria.

After evaluating the measurements, the next stage of the SEM-PLS analysis is evaluating the structural model by looking at the goodness of fit value. The goodness of fit value is presented in *Table 5*, which shows that all criteria consist of average path coefficient (APC), average R-Square (ARS), Average adjusted R-Square (AARS), average block VIF (AVIF), Average full collinearity VIF (AFVIF) and Tenenhaus GoF have met the criteria [47]. So that the analysis of the causal relationship can be continued.

Hypothesis Testing Results

The results of model testing using WarpPLS version 8.0 software are presented in *Fig. 2*, which shows the standardized path coefficient, p-value and R-Squared coefficient of determination.

The results of testing the research model show that of the four hypotheses proposed, one hypothesis is not supported statistically, namely the third hypothesis. A summary of the results of hypothesis testing is presented in *Table 6*.

Table 6 shows that of the three forms of institutional pressure tested in this study, namely coercive pressure and normative pressure, they have a positive and significant effect on the level of auditor reliability. Coercive pressure is positively related to the level of BPK

Table 5

Model fit and Quality Indices

Model fit and Quality Indices	Value	Sign	Rule of Thumb	Conclusion
Average path coefficient (APC)	0.281	P < 0.001	P-value < 0.05	Fulfill
Average R-squared (ARS)	0.236	P < 0.001	P-value < 0.05	Fulfill
Average adjusted R-Squred (AARS)	0.231	P < 0.001	P-value < 0.05	Fulfill
Average block VIF (AVIF)	1.700		<=5	Fulfill
Average full colinearity VIF (AFVIF)	1.527		<=5	Fulfil
Tenenhaus GoF	0.453		small >0.1 medium >=0.25 large >=0.36	Fulfill

Source: Compiled by the authors.

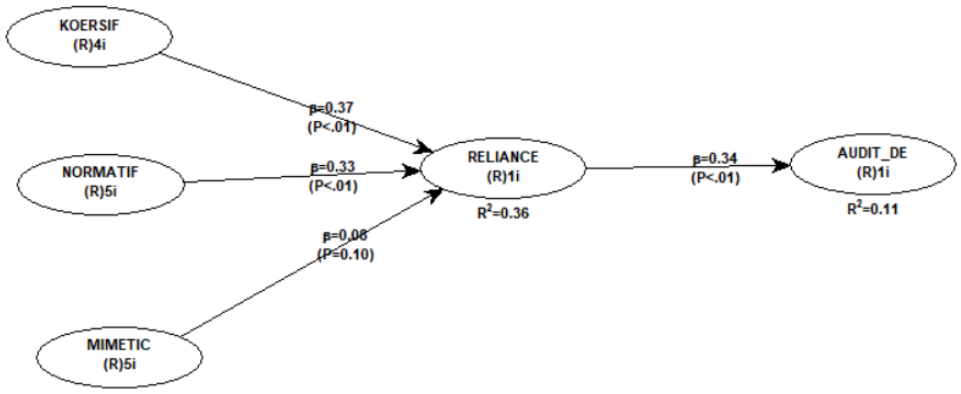

Fig. 2. **PLS Model Test Results**

Source: Compiled by the authors.

auditor reliability, where at every one standard deviation an increase in coercive pressure causes an increase in the level of BPK auditor reliability by 0.374 (p < 0.001). This finding is in line with the results of research by Chiang and Chiang & Northcott who found that coercive pressure influences the actions and practices of external auditors [32, 33]. This finding also aligns with other studies which conclude that coercive pressure in formal and informal forms influences the implementation of audit decisions [34].

Second, normative pressure also affects the level of BPK auditor reliability, where one standard deviation increases normative pressure causing a 0.332 increase in the level of BPK auditor reliability (p < 0.001). The results of this study are in line with King et al. conclusion that participation in the agency supported by the government, standards bodies, and professional associations may provide events, so that the involvement of BPK auditors in audit associations can affect the level of reliability of BPK auditors [36].

Third, mimetic pressure was found to not affect the BPK examiners' reliability level, with a significance value of p = 0.095 greater than 0.05. The findings of this study are different from the results of studies which found that there is a mimetic isomorphism mechanism that influences audit practice [32, 33, 39].

Furthermore, this study also found a positive effect on the level of reliability of BPK auditors on audit quality. *Table 6* shows that in every one standard deviation the BPK auditor's reliability causes an increase of 0.337

Table 6

Summary of Hypothesis Testing Results

Hypothesis	Parameter (β)	P-value	Conclusion
Coercive pressure → Auditor Reliance	0.374	<0.001	Supported
Normative pressure → Auditor Reliance	0.332	<0.001	Supported
Mimetic pressure → Auditor Reliance	0.080	0.095	Not supported
Auditor Reliance → Audit Quality	0.337	<0.001	Supported

Source: Compiled by the authors.

audit quality ($p < 0.001$). These results indicate that the higher the level of reliability of the BPK examiners, the better the quality of the audit. This finding is in line with Argento et al. [22] and Pizzini et al. [15], but differs from the findings of Abbott et al. [41].

CONCLUSIONS

This study found that coercive pressure has an effect on the level of BPK auditor reliability. These findings prove the occurrence of coercive isomorphism in the implementation of government audits in Indonesia, namely when the BPK as a government audit institution is very dependent on resources and support from the government in carrying out its functions [23]. The institutional theory divides coercive pressure into two types: elevated and informal. Elevated pressure comes from regulations, such as laws, government regulations, standard operating procedures, and legitimized rules and structures. This finding confirms that government sector audits place great emphasis on aspects of compliance with regulations [48]. Informal pressure comes from outside organizations where these institutions are administratively dependent and culturally expected in society. Fowler et al. state that coercive pressure arises from two sources: the first arises from internal authority, and the second is rooted in coercive power, which is spread by formal and informal institutional mechanisms [49].

The results of the study also found that normative pressure affected the level of BPK auditor reliability. This indicates that BPK's involvement in various professional associations can have an impact on the implementation of audits of government financial reports. BPK's involvement in various government auditor associations at various levels, for example, the International Organization of Supreme Audit Institutions (INTOSAI), Asian Organization of Supreme Audit Institutions (ASOSAI) and ASEAN Supreme Audit Institutions (ASEANSAI) has been proven to influence the behavior of BPK auditors, including in matters of cooperation and reliance between BPK and APIP. Institutions can provide normative pressures such as professional bodies, communities, local networks, affiliates, and certification bodies that support public values [50]. Normative ideas and practices are generally shaped through formal training, education, certification, accreditation and shared networks [49].

Unlike the findings of Freitas & Guimaraes [39]; Chiang [32], Chiang & Northcott [33]; and Utami [34], this study found that mimetic pressure did not affect the level of CPC reliability. This result is also inconsistent with institutional theory, explaining that mimetic pressure occurs "when an organization imitates the actions of other organizations that are structurally equivalent, occupying the same economic network position in the same industry" [23]. To deal with uncertainty, organizations imitate other organizations' structures and processes, especially those with the same characteristics as themselves [37]. In contrast to business sector audits, where many external auditors (Public Accounting Firms) operate and are structurally equivalent, in the context of government audits, BPK is the only external audit institution that carries out the function of auditing government institution financial reports. Because of its existence as a single audit institution, BPK does not have other structurally equivalent organizations that can be used as a reference for benchmarking audit practices. Therefore, mimetic pressure does not affect the level of BPK auditor reliability.

The effect of institutional pressure on the reliability level of BPK auditors then has a positive impact on

audit quality. This is in line with relational coordination theory, which explains the importance of coordination and cooperation in organizations to improve the quality of work results. In an audit work situation with a degree of dependence on other parties, time constraints, and environmental uncertainty, coordination between BPK and APIP will improve the quality of work results through intense communication [51]. Thus, the utilization of the results of APIP's work by BPK auditors in examining financial reports, both physically and in documents, will have an impact on improving the quality of BPK's work.

RESEARCH IMPLICATIONS AND LIMITATIONS

The study results show that institutional pressure will increase the utilization of APIP work by BPK and the quality of government financial report audits. This will positively impact coordination between the two because the use of APIP work by BPK auditors is a form of coordination between the two government audit functions. Thus, the findings of this study are expected to provide input for the government to formulate a strategy to improve coordination and cooperation between BPK and APIP, because, with good coordination, it is hoped that the government audit function can play a role in creating good government and clean governance.

This study has limitations; the sample selected is only one element, namely the element of the BPK team leader. Therefore, further research can use a broader sample, for example, by involving all members of the BPK audit team to see if there are differences in perceptions between members of the audit team and their team leaders, because sometimes audit staff is more directly involved in fieldwork and interact directly with APIPS.

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R. Masdar — Conducted the literature review, provided significant support in data interpretation, and contributed to revisions and final editing of the manuscript.
Masruddin — Supervised the overall research process, contributed to developing the theoretical framework, and provided critical input and feedback for the manuscript refinement.

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Beyond Bitcoin: A Taxonomy of Cryptocurrencies in a Historical Perspective

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ABSTRACT

The field of cryptocurrencies is in existence and dynamically evolving for over 14 years. Each year introduces new cryptocurrencies, with their total number exceeding 8,500. However, to date, there is no exhaustive categorization of cryptocurrencies that could possibly fully describe the landscape of the cryptocurrency market, which underscores the **relevance** of this research. **The objective** of this study is to construct a hierarchical categorization (taxonomy) of cryptocurrencies based on their main characteristics and functions. The principal research method is a retrospective analysis of the development of the cryptocurrency field from the creation of Bitcoin to the present day. As the industry evolved, new projects emerged, which significantly differed in their properties from what existed before, thus forming entirely new categories and niches in the cryptocurrency space. Moreover, the emergence of certain types of cryptocurrencies could lead to changes in the existing classification. **The outcome** of this research is a taxonomy of interchangeable cryptocurrencies/tokens. The proposed taxonomy is accompanied by a detailed examination of the cryptocurrencies associated with each category, as well as a consideration of the largest cryptocurrencies in terms of capitalization through its prism. The **scientific novelty** of this research lies in the absence of similar studies that look at the issue of categorizing cryptocurrencies through a historical lens.

Keywords: cryptocurrencies; bitcoin; blockchain; smart contracts; ethereum; decentralized finance (DeFi); taxonomy; categorization

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INTRODUCTION

The cryptocurrency market has existed for over a decade and continues to evolve, despite the ongoing skepticism from some investors and researchers, as well as regulators (see, for example, [1–5]). With each passing year, the number of cryptocurrencies is increasing (*Fig. 1*), and new services, protocols, and applications are emerging in the market.

On average, the market capitalization of cryptocurrencies has not significantly dropped below $ 1 trillion for almost 2.5 years, which is comparable to the markets of other assets. For comparison, the capitalization of the global stock market at the beginning of 2023 was $ 107 trillion, of which 41.1% ($ 44 trillion) accounted for the American stock market; the capitalization of the gold market is estimated at $ 12.34 trillion, and the Russian stock market at $ 0.55 trillion.

This paper presents a retrospective analysis of the development of the cryptocurrency market from the emergence of Bitcoin in 2009 to 2023. This analysis allows, on the one hand, to assess the progress that cryptocurrencies have made in technical terms over 14 years, and on the other hand, to track the emergence of new technologies and features that are the sources of differences between cryptocurrencies.

An important task of this retrospective analysis is also an attempt to classify or, more precisely, to taxonomize cryptocurrencies based on their functional purpose and economic meaning, as this issue appears relevant both from the perspective of attempting to systematize the understanding of the field and from an investment standpoint, since the price dynamics of cryptocurrencies belonging to different classes and categories can be influenced by various factors.

It should be noted in advance that the task of establishing a strict and comprehensive

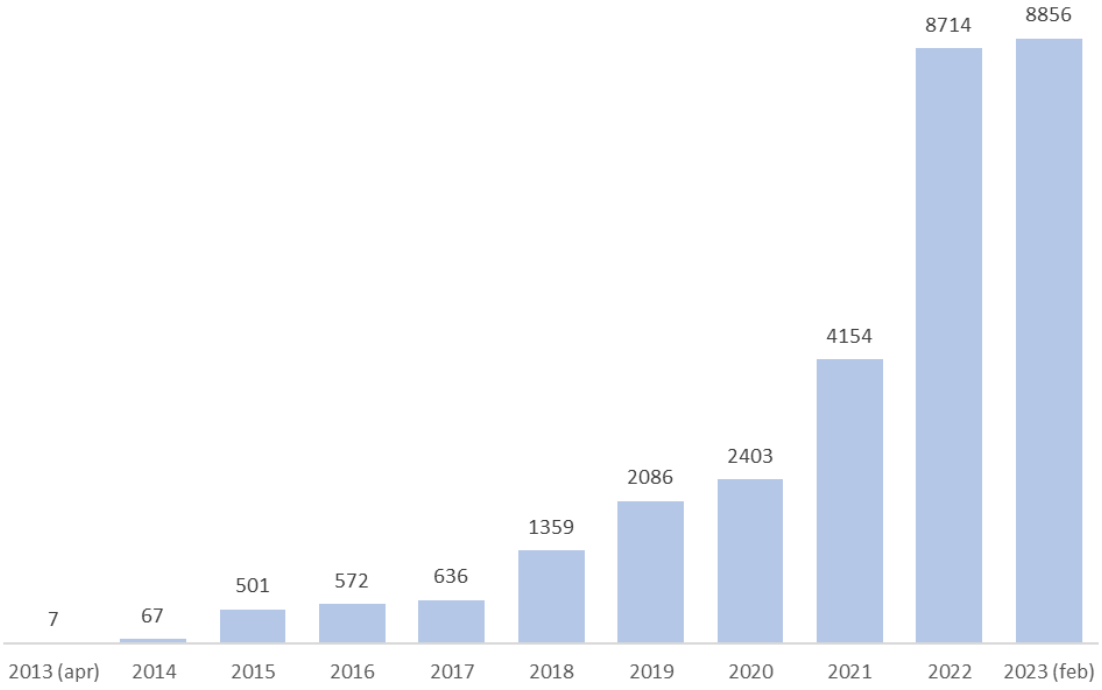

Fig. 1. **The Number of "Active" Cryptocurrencies**

Source: Author's calculations based on [6].

Note: "active" cryptocurrencies are those with a non-zero price and that have quotations on at least one cryptocurrency exchange.

classification of cryptocurrencies is quite difficult, as many cryptocurrencies can combine several properties and functions at once. The classification we propose is based, first and foremost, on the key properties, positioning, and actual application of the mentioned cryptocurrencies. Over time, the number of cryptocurrencies grew, and existing digital coins were technically updated, acquiring new qualities and functions. This, in turn, led to a constant rethinking of the cryptocurrency landscape. Thus, the taxonomy proposed in this work does not claim to be the ultimate truth, but it does comprehensively describe the stages of development in the cryptocurrency sphere and how it looks today.

It is also important to note that almost all of the mentioned cryptocurrencies and tokens[1] share one common function — they are a means of investment and speculation. Despite the fact that individual cryptocurrencies may be positioned as something else and the fact that blockchain projects try to avoid equating their tokens with securities,[2] this does not exclude the fact that a significant portion of the owners of these assets buy them with the aim of selling them at a higher price in the future. That is precisely why economists classify cryptocurrencies as a separate class of financial assets [7].

BITCOIN AND THE FIRST CRYPTOCURRENCIES

Practically any discussion about digital assets features Bitcoin. Many people primarily associate the term cryptocurrency with Bitcoin, the emergence of which in 2009 gave impetus to the formation of the corresponding

[1] Possible only with the exception of stablecoins and some derivative tokens.

[2] By mid-2023, at least 55 cryptocurrencies were known to have been classified as securities by the U.S. Securities and Exchange Commission, including XRP, BNB, TON, BUSD, ADA, and others. URL: https://cryptorank.io/watchlist/747c0b6bd3ef (accessed on 02.05.2023).

sector. The Bitcoin blockchain was conceived as a decentralized payment system, and after some time, the cryptocurrency units themselves began to be perceived as a kind of money/currency, even despite the fact that Bitcoin does not possess all the necessary properties of money [8]. Nevertheless, here and thereafter, we will assume by default (unless stated otherwise) that any cryptocurrency is positioned as a potential medium of exchange and, in some sense, as money.

Since the source code of Bitcoin is open, other cryptocurrencies began to appear over time. Often, all cryptocurrencies other than Bitcoin are referred to as alternative cryptocurrencies or altcoins. Some of the first altcoins were Litecoin and Namecoin, which appeared in 2011. In Litecoin, a slightly modified version of Bitcoin's code is used, while Namecoin is a fork or branch of the main Bitcoin blockchain and is technically almost entirely identical to its predecessor.

These cryptocurrencies still exist, but they have different fates — as of mid-May 2023, Litecoin remains one of the highly capitalized cryptocurrencies, ranking 11th in terms of market capitalization ($ 6.7 billion), while Namecoin ranks 582nd with a market capitalization of only $ 21.8 million. Thus, the first and quite straightforward way to categorize cryptocurrencies is to divide them into Bitcoin and all the others (altcoins).

In 2012, the cryptocurrency Peercoin emerged, using the proof-of-stake consensus mechanism alongside proof-of-work. This mechanism determines the probability of a miner creating a block based on the amount of funds in their cryptocurrency wallet, rather than on computational power. Alternatives to Proof-of-Work, on average, speed up transactions, make the network scalable and environmentally friendly (see, for example, [9]), but reduce the level of resilience of the distributed network to a number of threats, including those related to the safety of funds. Nevertheless, the consensus mechanism itself is not crucial as a defining feature when categorizing cryptocurrencies by their functions.

In the same year, 2012, the Ripple project (now known as XRP) was launched, unique in its focus on working with major international banks. It was assumed that the cryptocurrency XRP would be used as an intermediary asset in interbank settlements. The unique consensus mechanism of the Ripple blockchain ensures fast transaction processing; however, the network itself remains relatively more centralized (compared to Bitcoin) since the validators are organizations approved by the developers (banks, universities, hedge funds). Nevertheless, there is no specific information available to the public as of today regarding whether financial institutions are using any solutions based on the cryptocurrency XRP (11 years after the project's launch).

Thus, from the perspective of categorization, the cryptocurrency XRP can be classified into a narrow group of cryptocurrencies that are positioned as bridge cryptocurrencies. On the other hand, since such cryptocurrencies are used in a specific way exclusively within the framework of the created platform/protocol/product, they are also referred to as utility cryptocurrencies/tokens. Utility tokens, according to their creators' design, are not investment assets and do not serve as a means of payment outside the project, similar to in-game currency purchased with fiat money. XRP became one of the first cryptocurrencies not striving to be a universal, decentralized means of payment.

In 2013, Dogecoin was created based on the source code of Litecoin. Exploiting a well-known Internet meme in its name, Dogecoin was created *as a joke*, as a satire mocking other meaningless cryptocurrencies, and became the first *meme coin*. In May 2023, Dogecoin's market capitalization was around $ 10 billion, ranking 8 in terms of market capitalization. Some online stores and services accept payment in Dogecoin, but this is not a common practice. There is an opinion that meme coins are Ponzi

schemes, which is mentioned, among other things, by one of the creators of Dogecoin (see [10]), discussing other meme coins.

Despite the *seriousness* of meme coins, some of them surpass real projects in terms of capitalization. Thus, in April 2023, the cryptocurrency Pepe quickly reached a market capitalization of $ 1 billion, and then dropped to a level of $ 600 million.

In the same year, 2013, an event occurred that significantly influenced the further development of cryptocurrencies — the emergence of the MasterCoin project (now known as Omni) with the same-name cryptocurrency. This project became the first example of a cryptocurrency appearing on top of an existing cryptocurrency. In Bitcoin blockchain transactions, in addition to information directly related to the transaction of transferring units of the cryptocurrency Bitcoin (who, to whom, how much, etc.), there is a field where any information can be stored. The creator of Mastercoin proposed using this field to create an entire protocol (set of rules), which can be used to build a new user layer on top of the Bitcoin blockchain.[3] The first example of using this layer was the cryptocurrency Mastercoin itself.

Cryptocurrencies created on the basis of other blockchains have come to be called tokens, the first of which was Mastercoin (MSC). Thus, within this framework, a digital coin is considered a cryptocurrency if it is native (i.e., the first and primary) to the blockchain. If a digital coin is created within another blockchain (using smart contracts or a third-party protocol like Mastercoin), then it is a token. Nevertheless, we will not distinguish tokens as a separate type of cryptocurrency, as this fact is also technical and does not reflect the immediate purpose of a particular digital asset.

In March 2015, Mastercoin was renamed to Omni Layer, and the MSC token was renamed to OMNI, which still exists today (with a market capitalization of only $ 1 million). The OMNI token can formally be classified as a utility cryptocurrency/token; however, in practice, no practical application for this token has been found.

Despite the questionable applicability of the OMNI token, the Omni Layer protocol itself has had a significant impact on the entire cryptocurrency sphere. In particular, the most popular feature of Omni Layer became the ability to create other tokens based on the Bitcoin blockchain, which led to the emergence of the first stablecoin[4] from Tether in 2014. The stability of the USDT token's exchange rate is achieved through investors' trust in the promises of Tether Limited Inc. to exchange all USDT tokens for US dollars at any time. Despite the constant criticism of Tether for insufficient transparency (see, for example, [11, 12]), as of May 2023, the Tether USDT dollar stablecoin was the largest stablecoin with a market capitalization of over $ 80 billion. Thus, stablecoins are a separate important category of cryptocurrencies, allowing investors to have a kind of digital dollar within the cryptocurrency market without the need to interact with the traditional banking system each time they sell other cryptocurrencies.

For a long time, Bitcoin and cryptocurrencies were considered completely anonymous, which facilitated their use for trading illegal goods. However, since 2013, it has become clear to most of the crypto community that cryptocurrencies are only anonymous until the wallet owner is identified (i.e., they are pseudo-anonymous), and studies (see, for example, [13–15]) have shown that an identification of owners is possible. This led to the emergence of cryptocurrencies whose goal is to maximize user anonymity. One of them was Dash, launched in 2014. Later, others appeared, including quite well-known ones: Monero (in the same 2014) and Zcash (in 2016). Thus,

[3] As an analogy, the HTTP protocol built on top of TCP/IP and not functioning without the latter is often cited.

[4] Stablecoins are cryptocurrencies/tokens whose exchange rate is pegged in a one-to-one ratio to a certain fiat currency (such as the US dollar, euro, yen, etc.) or to the prices of some other financial assets (for example, gold).

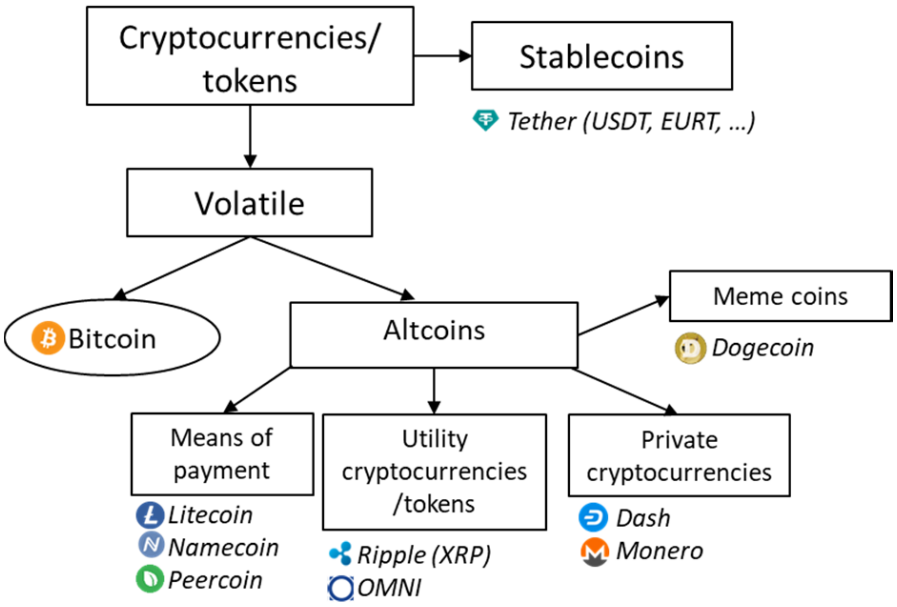

Fig. 2. **Cryptocurrency Categories as of the Beginning of 2015**

Source: Compiled by the authors.

another category of cryptocurrencies can be distinguished — private ones.

Fig. 2 presents a scheme for categorizing cryptocurrencies taking into account the aforementioned categories as of early 2015.

ETHEREUM AND SMART CONTRACTS

The next significant milestone in the development of cryptocurrencies was the emergence of the Ethereum blockchain in 2015. The main advantage of Ethereum was the ability to create smart contracts — small computer programs executed not on a separate dedicated server, but distributedly, using the computing power of network participants (miners). The native cryptocurrency of the Ethereum blockchain is Ether,[5] which is used to pay transaction fees on the network, including for the execution of smart contracts.

The emergence of smart contracts, in turn, opened up the possibility of creating decentralized applications (dApps) — a collection of interconnected smart contracts that represent a certain service/software product. Moreover, smart contracts can also be used to create various tokens. The relatively fast Ethereum blockchain turned out to be a more attractive platform for creating a large number of diverse utility tokens for various projects (including Ponzi schemes and outright fraudulent schemes) than Omni Layer and other similar protocols built on top of the Bitcoin blockchain (Counterparty, ColoredCoins, etc.). An advantage was also the unified rules for creating ERC-20 tokens (Ethereum Request for Comments No. 20) released by Ethereum developers in November 2015, which significantly simplified the issuance of digital assets on the Ethereum blockchain. Tokens issued in accordance with these standards are also called ERC-20 tokens.

With the emergence of Ethereum, non-fungible tokens (NFTs) gradually began to gain popularity as well. These differ from standard fungible ERC-20 tokens or cryptocurrencies (such as Bitcoin, Ether, etc.) in that each unit of these tokens is unique due to the specific information contained within them. Since the value and characteristics of almost every NFT are unique, it is quite difficult to categorize them all into a single or even several categories

[5] Quite often, even in scientific literature dedicated to cryptocurrencies, there is confusion when it is said that Ethereum is a cryptocurrency. In fact, Ethereum is the name of a distributed network (blockchain) on which the cryptocurrency Ether circulates.

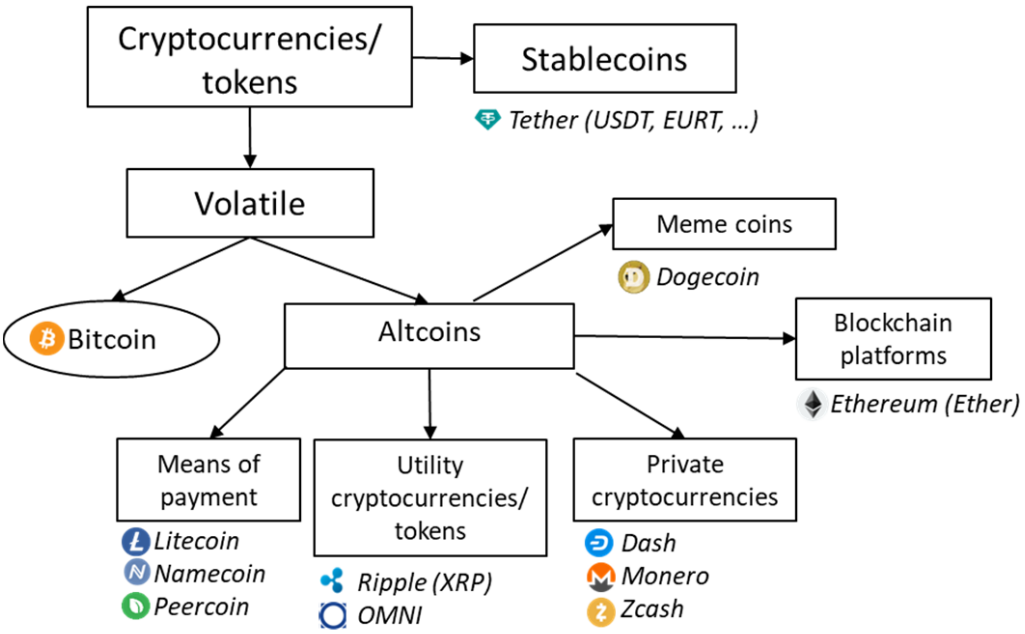

Fig. 3. **Cryptocurrency Categories Including Blockchain Platforms**

Source: Compiled by the authors.

within the cryptocurrency space. In this regard, we will focus only on the categorization of standard fungible tokens.[6]

The Ethereum blockchain became the first, but far from the last, blockchain with the capability to create smart contracts. Native cryptocurrencies circulating on such blockchains can be classified into the category of cryptocurrencies/tokens of blockchain platforms. Formally, such cryptocurrencies can be classified as utility tokens, as they primarily serve as a means of paying fees for the operation of smart contracts and conducting transactions. However, we will place them in a separate category due to the distinct characteristics of the blockchain on which they operate. *Fig. 3* presents the categories of cryptocurrencies taking into account the emergence of blockchain platforms.

With the development of the field, the number of blockchain platforms has increased. Moreover, some utility tokens over time could acquire their own blockchain platforms. A striking example is Binance Coin (BNB), launched in 2017 as an ERC-20 token, and in 2019 migrated to its own blockchain with smart contract support, making BNB similar to Ether. Another example is the Stellar project, positioned as a competitor to Ripple, which is currently introducing a smart contract creation feature.[7]

GOVERNANCE TOKENS AND DECENTRALIZED AUTONOMOUS ORGANIZATIONS

Besides the ability to create tokens and various dApps, smart contracts have opened up the possibility of organizing so-called decentralized autonomous organizations (decentralized autonomous organization, DAO). A DAO is usually understood as a distributed ledger-based system in which member interactions and management decisions are made in a decentralized manner through the mediation of smart contracts [17]. In some sense, a DAO can be compared to a joint-stock company. To participate in a DAO, it is necessary to acquire tokens that grant the right to vote on further development or even

[6] Detailed information in the paper [16].

[7] Note that XRP is also currently preparing to introduce the function of creating smart contracts.

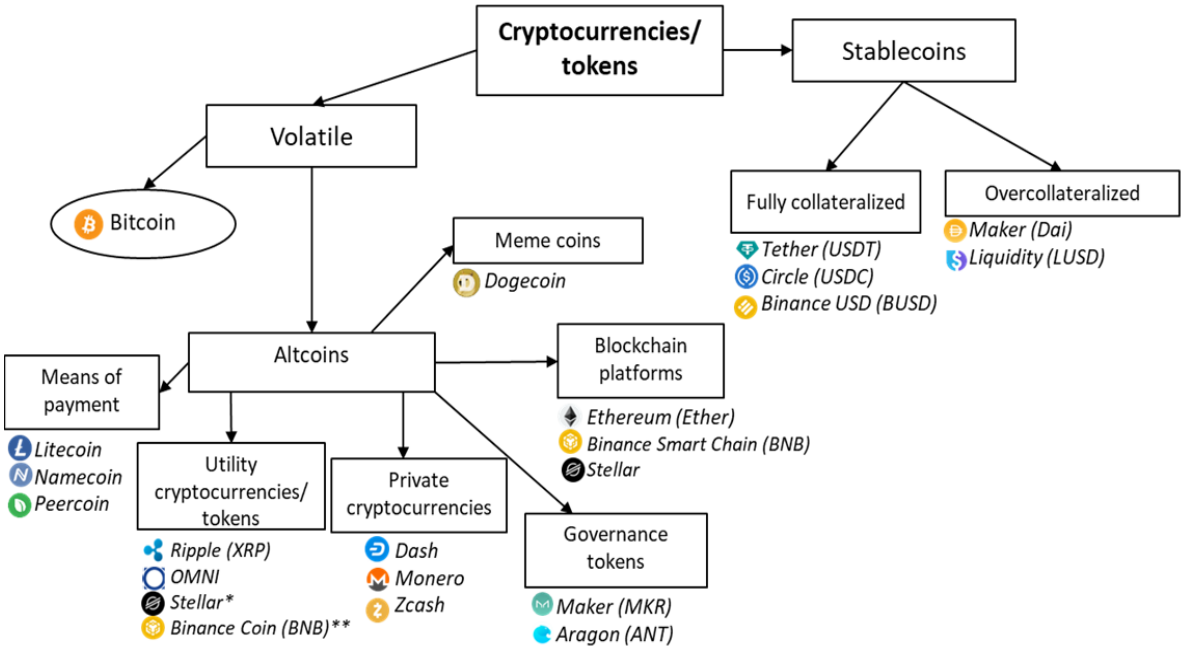

Fig. 4. **Cryptocurrency Categories**

Source: Compiled by the authors.

Notes: * Stellar before the introduction of full-fledged smart contracts in 2023; ** before the launch of its own blockchain Binance Smart Chain in April 2019.

specific actions of the community, including issues related to the distribution of the DAO's profits. Just like with an initial public offering (IPO), the initial distribution of tokens goes through a similar procedure — an initial coin offering (ICO), as a result of which the collected funds (a kind of equity) are accumulated in DAO wallets, and the management of the funds is carried out through voting by token holders.[8]

One of the first DAOs was the project TheDAO, launched in April 2016 on the Ethereum blockchain. TheDAO was conceived as a kind of hedge fund, where the funds raised during the ICO[9] would be managed through voting by token holders. Investors who participated in the ICO received DAO tokens in exchange for their investments.[10] However, as early as June 2016, a malicious actor discovered a vulnerability in the code of TheDAO's smart contracts, which led to the theft of one-third of their funds ($ 50 million).

Another extremely important event for the development of the entire cryptocurrency industry was the emergence in December 2017 of another DAO on the Ethereum blockchain — MakerDAO. This DAO manages the decentralized application (protocol) Maker, whose function is the issuance of an over-collateralized stablecoin Dai. Unlike fully collateralized stablecoins like USDT, Dai is backed by other cryptocurrencies (primarily Ether and other ERC-20 tokens). Due to the high volatility of cryptocurrencies, Maker uses special collateralization ratios exceeding one. Accordingly, when depositing collateral into the protocol, for example, Ether worth $ 100, the user can receive a maximum of $ 58.8 in Dai (at a ratio of 170%). For the issuance of Dai, the user is charged an equivalent interest rate (stability fee), which is paid upon returning Dai to the protocol, after which the user regains access to their pledged assets.

[8] The paper [18] is dedicated to a detailed analysis of the principles of DAO functioning.

[9] During the ICO of the TheDAO project, approximately $ 150 million was raised.

[10] The phrase "DAO token" specifically refers to a token that certifies the owner's right to participate in the TheDAO project. Unfortunately, the creators of TheDAO decided not to be very creative with names, which often leads to confusion in discussions specifically about the case of TheDAO.

MKR tokens allow participation in the governance of the MakerDAO protocol, including voting on issues such as changing collateralization ratios, interest rates, profit distribution, and more. These tokens, like TheDAO tokens, can be classified as governance tokens, allowing participation in the management of decentralized organizations. MKR tokens are often also classified as DeFi tokens due to the Maker protocol's affiliation with this sphere. Nevertheless, MKR tokens are governance tokens and are not much different from other tokens in this category (for example, from the ANT token of the Aragon project, a platform for creating other DAOs).

Fig. 4 demonstrates the updated scheme of cryptocurrency categories, taking into account governance tokens as well as over-collateralized stablecoins.[11]

DEVELOPMENT OF THE DEFI SECTOR AND CRYPTOCURRENCY DERIVATIVES

One of the areas of cryptocurrency that gained popularity after the market crash in 2017 was decentralized finance. (DeFi). In this field, there are currently a large number of various services, among which one can highlight lending protocols (Maker, Compound, Aave, etc.), decentralized spot exchanges (Uniswap, Balancer, PancakeSwap, etc.), decentralized exchanges with margin trading support (dYdX) and options trading (Opyn), tokenized ready-made investment strategies (TokenSet). Prediction markets (Augur) allow to bet on the occurrence of any event in the world, which opens up opportunities for hedging open positions, while insurance services (Nexus) enable to take out an insurance smart contract against undesirable events in the world of cryptocurrencies (for example, excessive deviation of a certain dollar stablecoin from the price of 1 dollar).

The development of the DeFi sector has also led to the emergence of a large number of new types of tokens, which are derivatives not only of certain real assets (such as stocks or even real estate) but also of other cryptocurrencies and even entire portfolios consisting of them. Formally, the first class of derivative tokens can be considered stablecoins, in which the underlying asset is fiat currency or a basket of other cryptocurrencies (in the case of cryptocurrency-backed stablecoins).

An important infrastructural category of derivative tokens is wrapped tokens, the most popular of which is the wrapped Bitcoin (WBTC) that appeared in 2019 — an ERC-20 token on Ethereum. Many blockchains are incompatible in the sense that they do not allow the transfer of cryptocurrencies between blockchains. To solve this problem, the Wrapped BTC project was organized, which brings together a number of specialized agents (merchants) who accept the cryptocurrency Bitcoin on the Bitcoin blockchain and issue an equivalent number of WBTC tokens on Ethereum, allowing Bitcoin to be used in DeFi services on the Ethereum blockchain. In May 2023, the capitalization of WBTC was around $ 4.3 billion, meaning that about 1% of all bitcoins are circulating on Ethereum in the form of WBTC tokens.

Another type of derivative tokens serves as a kind of receipt and is a digital confirmation of the fact that the user's funds have been transferred to DeFi services for the purpose of earning income on the deposited funds. In turn, such receipt tokens can be divided into two major groups: liquidity provider tokens (LP-tokens) and interest-bearing tokens (or yield tokens). The former are used within various decentralized exchanges and swap platforms.

Any exchange requires a market maker to ensure liquidity and depth of the order book for each instrument. On decentralized exchanges (for example, Uniswap or Balancer), liquidity pools replace market makers. Users contribute funds to the pools, receiving a portion of the

[11] The attempt to create algorithmic stablecoins, such as TerraUSD (UST) of the Terra blockchain, which collapsed in 2022, has not yet been successful, so their classification as a separate category does not seem justified.

transaction fees for a specific trading pair in return. When creating a pool (for example, BTC/USDT), users deposit both assets in a specific ratio, receiving an LP token in return that confirms their share in the pool and their right to a portion of the transaction fees.[12] Such LP tokens are automatically issued when funds are deposited and destroyed when withdrawn.

In lending protocols such as Compound (launched in September 2018), users can receive so-called interest-bearing tokens or yield tokens for depositing funds into them. In Compound, they are designated as cTokens. For example, if a user deposits 100 USDC, they receive an equivalent amount of cUSDC. At first, these cUSDC correspond to the deposit amount, but over time they increase in value, reflecting the accumulated interest. If the user decides to redeem cUSDC, they will receive back more than their initial deposit, including interest. The recalculation of the cUSD price occurs every 13–15 seconds with each Ethereum block.

The Compound protocol earns by issuing secured loans at an interest rate higher than the deposit rate. Unlike Maker, it allows borrowing different cryptocurrencies, not just stablecoins.[13] Thus, the cTokens of the Compound project (like the aTokens of the AAVE protocol and the yTokens of the yearnFinance protocol) act as a kind of deposit certificates and are definitely a separate class of derivative tokens. Moreover, these interest-bearing tokens can be traded on the secondary market or even used as collateral in other DeFi protocols. Repeatedly re-staking such tokens and profiting from the interest rate differences across various protocols is called yield farming.

Another interesting category of derivative tokens is structured tokens (analogous to structured products in traditional finance), the dynamics of which reflect a chosen investment strategy. These can be simple followings of the return index of a cryptocurrency portfolio, similar to exchange-traded funds (ETFs), as well as more complex strategies reflecting inverse (analogous to inverse ETFs) or leveraged (analogous to leveraged ETFs) asset dynamics. Examples of such tokens include the tokens of the Index Coop project — DeFi Pulse Index (DPI), which reflects the dynamics of a market-weighted portfolio of governance tokens from various DeFi protocols; Metaverse Index (MVI), which reflects the dynamics of a portfolio of tokens related to the concept of metaverses; as well as margin tokens ETH-2x Flexible Leverage Index and BTC-2x Flexible Leverage Index, which reflect the doubled dynamics of Ether and Bitcoin, respectively. Among the more sophisticated structured tokens, the tokens of the decentralized options platform Opyn stand out. One of them, Squeeth (Squared Ether), is an ERC-20 token and functions similarly to perpetual futures contracts; however, in the case of Opyn, all clearing and variation margin calculation functions, which are usually performed by an exchange, are carried out using smart contracts.

The Opyn options protocol (Opyn V2) also offers a separate module (Gamma Protocol) that allows the creation of full-fledged options contracts in the form of ERC-20 tokens. Although the Opyn project has shifted its focus to creating structured tokens, the Gamma Protocol continues to operate and is used, for example, by another DeFi service for issuing structured tokens, Ribbon Finance, which hedges its positions using options created on the Gamma Protocol. Thus, these option tokens are quite specialized and are usually not available on any exchanges. Nevertheless, it seems important to note the very existence of such concepts in this field.[14]

[12] More details on the operation of decentralized exchanges can be found in the paper [19].

[13] The Compound protocol includes various risk management mechanisms, including automatic liquidation of positions if the collateral value falls below a certain threshold.

[14] Let's note that on another options DeFi protocol, Hegic, options are issued in the form of NFTs.

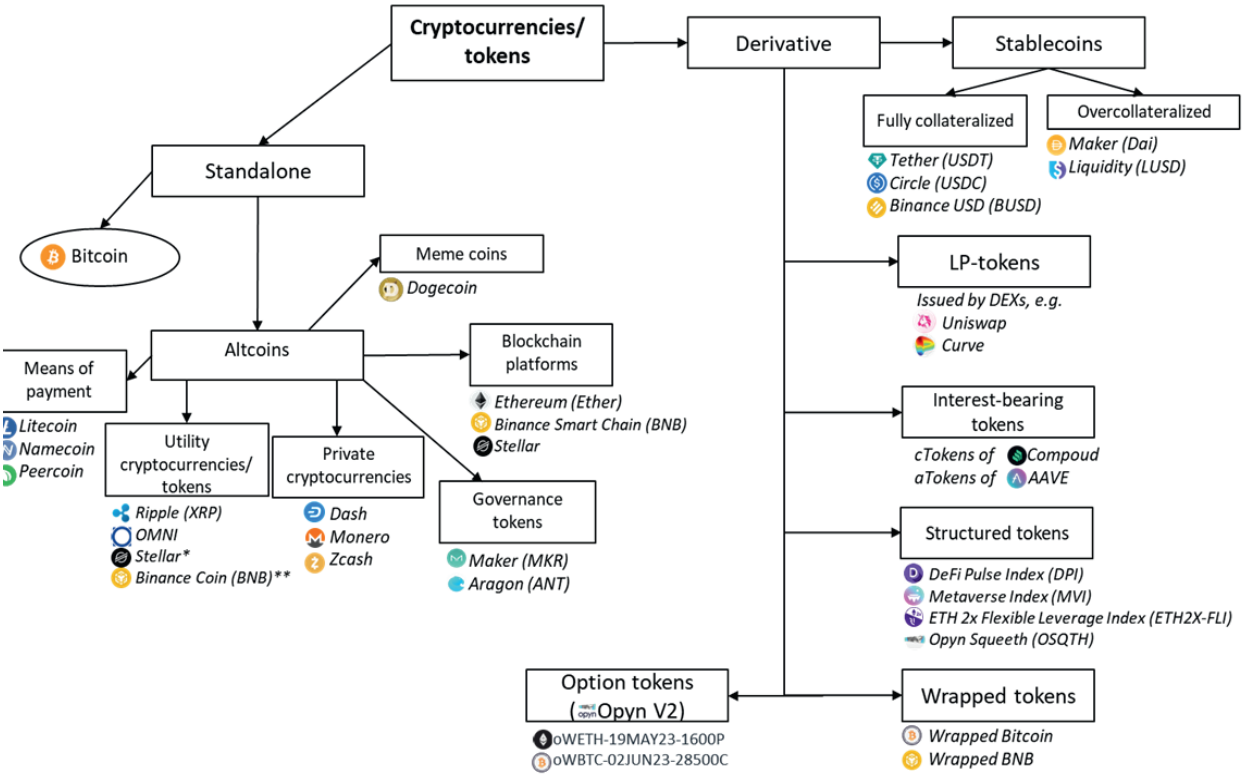

Fig. 5. **Final Taxonomy of Cryptocurrencies**

Source: Compiled by the authors.

Note: see the note to *fig. 4.*

Table

The Top 10 Cryptocurrencies by Market Capitalization as of May 14, 2023

No.	Name (ticker)	Category	Creation date	Market capitalization	% from market
1	Bitcoin (BTC)	Means of payment	09.01.2009	521 billion	46.5%
2	Ethereum (ETH)	Blockchain platform	30.07.2015	222 billion	19.8%
3	Tether (USDT)	Stablecoin	26.02.2015	83 billion	7.4%
4	BNB	Blockchain platform	26.07.2017	49 billion	4.3%
5	USD Coin (USDC)	Stablecoin	05.10.2018	30 billion	2.7%
6	XRP	Utility token	05.08.2013	22 billion	2.0%
7	Cardano (ADA)	Blockchain platform	02.10.2017	13 billion	1.1%
8	Dogecoin (DOGE)	Mem-coins	06.09.2013	10 billion	0.9%
9	Solana (SOL)	Blockchain platform	11.04.2020	8,3 billion	0.7%
10	Polygon (MATIC)	Blockchain platform	29.04.2019	7,9 billion	0.7%
Total cryptocurrency market capitalization				1121 billion	86.2%

Source: Compiled by the authors based on coinmarketcap.com data.

CONCLUSION

Fig. 5 presents the final version of the cryptocurrency categorization proposed by us. Today, cryptocurrencies represent a rather extensive space of diverse digital assets, especially compared to how the market looked even in 2015. In this work, we have only considered fungible tokens, leaving NFTs aside, just as we have not examined the many possible categories of services and products existing in the cryptocurrency space. Nevertheless, we have made an attempt to highlight the main essential characteristics inherent to individual groups of cryptocurrencies, doing so, on the one hand, through the lens of market development, and on the other hand, without overly complicating the proposed taxonomy with technical aspects. It is quite difficult to analyze the entire market, which is also constantly evolving. Nevertheless, the obtained taxonomy, in our opinion, largely covers most of the cryptocurrency space to date.

We have identified categories of tokens that closely resemble various financial instruments from the realm of traditional finance. For example, there are governance tokens, which function similarly to simple voting shares and can even distribute profits. Another interesting category is the designated class of cryptocurrency derivatives, which reflect the dynamics of certain other assets or certify the users' right to receive income from the managed funds. Moreover, with the help of smart contracts and on a decentralized basis, entire analogs of exchange-traded funds (ETFs) and more complex structured products, and even options contracts, have begun to emerge. All of this indicates the establishment of some alternative decentralized financial system in the realm of cryptocurrencies. It is unlikely that we will see rapid growth in this sector in the near future due to the significant increase in pressure from financial regulators, especially in light of the collapse of several major projects in this area (TerraUSD, the FTX cryptocurrency exchange) and the bankruptcy of several American commercial banks (Silvergate, Silicon Valley Bank, Signature Bank) that were actively involved in this sector, as well as the close attention of the U.S. Securities and Exchange Commission to cryptocurrencies in 2023.

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Financial Inclusion of Banking Services for Consumers in the Context of Digitalization

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ABSTRACT

The object of the study is the inclusion of banking services for making payments in the context of consumers using the Internet, mobile subscriber devices. **The subject** of the study is the factors and approaches to assessing digital financial inclusion for consumers of payment services provided by the banking sector. **The relevance** of the study is due to the need to increase financial inclusion in the context of ensuring financial stability, economic growth, prosperity and equal opportunities for all members of society, which is determined by domestic strategic priorities, as well as a global sustainable agenda, in the context of the development of digital technologies. **The purpose** of the study is to identify factors associated with increasing the inclusion of financial services for Russian consumers in the context of the development of digital technologies, using the example of payment services provided by the banking sector. **Methods** of generalization, grouping, statistical and comparative analyzes were used in the study. **As a result**, factors associated with the digital inclusion of payment services provided by the banking sector to consumers were identified, including the share of the population that are active Internet users in the total population; the number of divisions of operating credit institutions per 1 million adults, and population density. **It is concluded** that the development of digital literacy of consumers will contribute to the increase in digital financial inclusion, for which it is advisable for the state, the regulator and the financial market participant to form a need among consumers and provide the opportunity to develop digital skills to receive and ensure security when receiving financial services. **Further research** can be focused on individual components of digital financial inclusion, various groups of counterparties, certain financial services, certain types of financial institutions, including operators of financial and investment platforms, as well as on the effects and risks of the micro and macro levels.

Keywords: digital financial inclusion; digital finance; welfare; digital payments; digital literacy; information and communication technologies; online shopping; Sustainable Development Goals; digital economy; Russia

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INTRODUCTION

Issues of financial accessibility attract the attention of the government and researchers in the context of ensuring financial stability and economic growth. Reducing inequality and positive outcomes in the fight against poverty as a result of increased financial accessibility contribute to the achievement of sustainable development goals (SDGs) [1]. Financial inclusion (FI) is understood as the availability of access for individuals and legal entities to useful and affordable financial products and services that meet their needs, provided in a responsible and sustainable manner.[1] FI is a factor in increasing welfare, implying both the possibility of receiving the service itself, which is determined by the presence of financial service infrastructure, and the ability of the service to meet the corresponding need, which is determined by the usefulness, quality, and clarity of the financial service.[2]

The provision of FI banking services in the pre-digital period was ensured by the presence of a developed network of physical offices of credit organizations and was associated with high costs for the development of banking structures. Besides physical access, FI was determined by the presence of legal rights of banking counterparties to enter into a service contract and the availability of the financial service at a price [2].

In the digital economy, FI takes on the character of digital financial inclusion (DFI), the development of which is carried out in accordance with the G20 Principles.[3] DFI is considered as FI, enhanced by fintech, and retaining all the established positive effects of FI [3]. The exchange of best practices on financial digitalization issues is carried out on the platform of the Global Partnership for Financial Inclusion (GPFI).

Issues of accessibility to financial services are coming into the spotlight of financial regulators due to the need to improve the quality of life and increase welfare by leveraging the advantages provided by digital technologies to ensure stable economic growth and reduce transaction costs.

The reduction of costs in payment transactions is facilitated by the development of remote access channels for consumers to their bank accounts, which stimulates banks to use qualitatively new technologies in their operations [4, 5], aimed at creating positive macroeconomic effects [2] and implementing a sustainable agenda in the financial sector [1, 6, 7].

The relatively short period during which attention has been paid to DFI issues in Russia and around the world has determined the initial development of research on this topic. The high intensity of digitalization processes in the banking and insurance sectors of the domestic financial market [8] underscores the relevance of DFI research.

The purpose of the research is to identify factors related to the increased accessibility of financial services for Russian consumers in the context of the development of digital technologies, using the example of payment services provided by the banking sector. Research objectives: based on the systematization and critical analysis of scientific literature, identify the composition of factors related to DFI banking services for consumers; form a database of statistical indicators that allow for the evaluation of these factors, and conduct an economic-

[1] Financial Inclusion. The World Bank. URL: https://www.worldbank.org/en/topic/financialinclusion/overview (accessed on 10.04.2023).

[2] Website of the Central Bank of the Russian Federation. URL: https://www.cbr.ru/Content/Document/File/44188/onrfr_2016–18.pdf; https://www.cbr.ru/content/document/file/143773/onfr_2023–2025.pdf (accessed on 10.04.2023).

[3] G20 High-Level Principles for Digital Financial Inclusion. URL: https://www.gpfi.org/sites/gpfi/files/G20%20High%20Level%20Principles%20for%20Digital%20Financial%20Inclusion.pdf (accessed on 10.04.2023).

statistical analysis using the formed database; based on the factors identified from the analysis results, formulate directions for improving the digital accessibility of financial services.

LITERATURE REVIEW

The scientific literature addresses issues related to DFI. Studies that take into account the use of digital technologies in the economy and finance [9, 10] further develop the previously established scientific agenda of expanding access to finance.

DFI positively impacts welfare [11, 12], reduces inequality [3, 13], contributes to lowering transaction costs [14], the development of the financial market [15] and financial stability, expands consumer opportunities [16], positively affects savings formation, and stimulates innovative growth [17].

The increase in consumer welfare as a result of DFI development occurs not only due to cost reduction and the release of time resources but also through risk reduction [18] and the expansion of asset diversification when consumers invest their funds [15].

A unified methodology for assessing the accessibility of financial services is lacking [19]. When selecting a target variable that reflects DFI, researchers use two approaches. In the first approach, the study of DFI is conducted on separate aspects of finance: payments, lending, and portfolio decisions, each of which is represented by a target variable [6, 18].

The second approach involves studying DFI using indices as the dependent variable. In this case, either the published values of the DFI index [15] are used, or the index is calculated by the researchers themselves, with justification for its construction [12].

As factors related to DFI, digital payments, fintech lending, robo-advisory [11], the use of mobile phones for bill payments, mobile phone penetration, and fixed broadband penetration [6, 20, 21], the volume and number of payments, and population density are analyzed [22].

The literature on DFI develops the theme of consumer financial behavior [23, 24]. The use of mobile communication for making payments is positively influenced by the reduction of costs and the convenience of obtaining the service, while the cost and perceived risk do not have an impact [25]. The use of mobile communication means by consumers to access bank accounts is positively associated with the volume of payments in the economy [22], the growth of per capita expenditures, and the level of education [21]. The positive influence on DFI is exerted by the digital and financial literacy[4] of consumers [26]. Consumers take a passive position in the collection, analysis, and processing of information about digital access to financial services, which necessitates the enhancement of consumer rights protection and the development of measures to improve digital literacy [27]. The practical interest of consumers in improving financial literacy is determined by the increase in disposable free funds and the necessity to manage them [28].

One direction for increasing DFI in the context of financial market development in accordance with the SDGs is ensuring access to financial services for the population in remote areas. In this regard, foreign authors pay special attention to rural areas, which is particularly characteristic of studies in African countries, India, and China [12–15, 29]. Remote areas of the country are considered difficult to access and unattractive for the banking sector to establish physical presence offices, and, as a consequence, the development and use of information and communication technologies by consumers are aimed at increasing the accessibility of financial services for the population of such areas. Summarizing the obtained results, it

[4] Interconnections between Financial Accessibility and Financial Literacy: A Review of Publications. Bank of Russia. URL: https://www.cbr.ru/content/document/file/44101/publ_15022018(2).pdf (accessed on 10.04.2023).

can be noted that the studies have established a positive impact of the expansion of DFI on improving welfare and reducing the poverty level of the population in remote areas.

Thus, when selecting the target variable as the DFI indicator and related factors, researchers specify the financial service (payments, loans, savings, and investments) and the service recipient (consumers, businesses, small and medium-sized enterprises), as well as additional characteristics of the recipient, including the area of activity, place of residence, or place of business. The specification of the financial service and the characteristics of the recipient form the basis for justifying the selection of factors and indicators used to identify the relationship between the chosen factors and DFI.

DATA AND METHODS

The author's approach is based on the regulatory grouping of DFI,[5] components, which includes price, physical, assortment, and mental availability. Assortment availability is specified by the payment service provided by the banking sector to the population. As the target variable, the statistical indicator "the share of accounts opened for individuals, for which operations on the withdrawal of funds have been conducted since the beginning of the reporting year, with access provided remotely, in the total number of accounts opened for individuals that can be used for making payments" was used. The indicator allows for the assessment of the DFI service, the presence of a formed consumer demand for financial services, and the physical possibility of obtaining them.

The explanatory variables are grouped as follows. To assess the consumer's technical ability to obtain banking services without visiting a physical bank branch (the physical component of DFI), the indicators "number of fixed broadband Internet subscribers per 100 people" and "number of mobile broadband Internet subscribers per 100 people" were used. The physical possibility of obtaining a financial service is also determined by digital financial literacy in terms of the literacy of obtaining the service. To assess the digital literacy of consumers of banking services related to making payments, the indicators "share of the population that are active Internet users in the total population" and "share of the population that used the Internet to order goods and/or services in the total population" were used. The indicator of the financial services provision infrastructure "number of branches of active credit organizations per 1 million adult population" allows assessing the existence of a connection between the reduction of physical presence offices and the development of banking payment services for consumers in the digital environment [2, 22].

An important direction for increasing DFI is ensuring access to financial services for the population of remote areas. Since remote areas are characterized by low population density, the population density indicator is used to verify the existence of a relationship between the consumer's distance from the physical offices of banking sector structures and the development of remote access channels to banking payment services using information and communication technologies, including digital ones.

To assess the demand for financial services among consumers, which characterize the mental component of DFI, the following indicators were selected: "the number of payments for goods (works, services) made using payment (settlement and credit) cards issued by Russian credit organizations on the territory of Russia, per adult population, units / per adult population," "the volume of cashless payments made by individuals, per adult population, thousand rubles / per adult population," and the quality indicator of financial services, which allows

[5] Website of the Central Bank of the Russian Federation. URL: https://www.cbr.ru/content/document/file/44188/onrfr_2016–18.pdf (accessed on 10.04.2023).

Table 1

Results of the Model Validation Against the Data

R	R-square	Adjusted R-square	Standard error	Durbin Watson
0.938	0.880	0.855	1.590135	1.850

Source: Compiled by the author.

Table 2

Results of the Overall Significance Testing of the Regression Model

Model Specifications	Sum of squares	D.f.	Middle squares	F	Significance
Regression	967.030	11	87.912	34.68	0.000
Residual	131.484	52	2.529		
Total	1098.513	63			

Source: Compiled by the author.

for the assessment of trust formation in the financial market by consumers, the number of consumer complaints related to the activities of credit organization. The mental component of financial accessibility is also determined by the digital literacy of the consumer in ensuring security when obtaining financial services, for which the indicator "share of the population using information protection means in the total population using the Internet, %" has been chosen for evaluation.

To assess the price component of the DFI, the indicator "total volume of monetary expenditures of the population on the purchase of goods and payment for services, excluding payments for goods (works, services) produced abroad using bank cards" was used. Indicators characterizing the number of complaints and the total volume of monetary expenditures by the population have been recalculated taking into account the adult population of the respective area.

To achieve the research objective, a database was created, including published data obtained from surveys conducted by Rosstat on behalf of the Bank of Russia, as well as official statistical data from the Bank of Russia, Rosstat, the Ministry of Digital Development, Communications and Mass Media, and the Federal Service for State Registration, Cadastre and Cartography for the entire Russian Federation and federal districts for the period from 2014 to 2022.

RESULTS AND DISCUSSION

Econometric modeling was conducted using the SPSS software. A multiple linear regression model was chosen, which allows for testing the presence or absence of a relationship between the dependent variable (target) and several independent variables (factors).

The results of the model fit to the data and the overall significance test of the regression model are presented in *Table 1* and *Table 2*.

Table 3 presents the regression model.

In the model reflecting the relationship between the target variable and factors, all variables were included, of which three are statistically significant: the share of the population that are active Internet users in the total population; the number of branches of active credit organizations per 1 million adult population; and population density.

Table 3

Regression Model

Variable*	Coefficient	Standard error	Standardized coefficient	t-statistic	Significance
constant	13.204	12.276	-	1.076	0.287
x1	–0.214	0.138	–0.266	–1.551	0.127
x2	0.026	0.048	0.104	0.538	0.593
x3	0.102	0.095	0.248	1.078	0.286
x4	0.040	0.076	0.072	0.523	0.603
x5	**0.273**	**0.121**	**0.459**	**2.259**	**0.028**
x6	**–0.027**	**0.008**	**–0.425**	**–3.491**	**0.001**
x7	**–58.460**	**19.929**	**–0.251**	**–2.933**	**0.005**
x8	0.013	0.008	0.411	1.711	0.093
x9	–0.003	0.003	–0.306	–1.327	0.190
x10)	–0.690	0.410	–0.109	–1.683	0.098
x11	–9.852	8.472	–0.175	–1.163	0.250

Source: Compiled by the author.

Note: * x1 — the number of fixed broadband Internet subscribers per 100 people, units/100 people; x2 — the number of mobile broadband Internet subscribers per 100 people, units/100 people; x3 — the share of the population that used the Internet to order goods and/or services in the total population, %; x4 — the share of the population using information protection means in the total number of the population using the Internet, %; x5 — the share of the population that are active Internet users in the total population, %; x6 — the number of branches of active credit organizations per 1 million adult population, units/1 million people; x7 — population density, thousand people/sq. km; x8 — the number of payments for goods (works, services) made using payment (settlement and credit) cards issued by Russian credit organizations on the territory of Russia, per 1 adult population, units / 1 adult population; x9 — the volume of cashless payments made by individuals, per 1 adult population, thousand rubles / 1 adult population; x10 — the number of consumer complaints about financial services related to the activities of credit organizations, units/1,000 people; x11 — the total volume of monetary expenditures of the population on the purchase of goods and payment for services, excluding payments for goods (works, services) produced abroad using bank cards, billion rubles / 1,000 people.

The activity of the population in using the Internet is the main factor determining the target variable (DFI of the banking service for making payments for consumers). The demand for the banking service of making payments using a remote access channel to the account is present among consumers who possess the digital literacy to obtain such a service.

The absence of a significant relationship between the target variable and the number of Internet access subscribers, despite a high proportion of the population having access,[6] indicates that the overwhelming majority of the population lacks digital financial literacy, which would allow them to take advantage of digital access to finance.

The limiting factors for the development of DFI in a territorial context are the high population density and the presence of a developed network of physical offices of credit

[6] In 2022, 85% of the population had broadband access to the Internet. Rosstat website. URL: https://rosstat.gov.ru/statistics/infocommunity (accesed on 10.04.2023).

organizations, which is explained by the demand for offline services among the population in high-density areas, and confirms the importance of the mental component of DFI, including consumers' negative perception of security issues [30]. The proportion of the population using the Internet to order goods and services is statistically unrelated to the choice of bank account for making remote payments. To pay for goods and services ordered online, consumers use various methods without preferring the bank's remote payment service. Concerns about using digital channels to access banking services lead to the choice of offline services and are not related to digital literacy in ensuring security when receiving the service, nor to the proportion of the population using information protection measures on the Internet.

The development of consumers' digital literacy is facilitated by the ability to make transactions with financial organizations using financial platforms. In 2022, 142.8 thousand clients joined Russian marketplaces, and 82 127 transactions[7] were concluded, with 98.1% of the total transaction amount consisting of bank deposits. The main clients of financial platforms are consumers whose income allows them to place part of it in bank deposits.

Thus, the greatest influence on the development of DFI banking services for making payments is exerted by their physical component, which determines the need to develop digital skills among consumers and confirms the necessity of enhancing their digital literacy both in terms of receiving financial services and ensuring the security of their receipt. Improving digital literacy will contribute to the development of the mental component of DFI, creating a conscious need for consumers to use the advantages of digital technologies to access banking services. A factor increasing the need for digital access to finance will be the rise in consumer incomes. The operation of financial platforms will ensure the expansion of DFI, as well as positive effects for the competitive environment and the development of the financial market.

[7] Overview of platform services in Russia. Central Bank of the Russian Federation. URL: https://cbr.ru/Content/Document/File/146720/platform_services_20230515.pdf (accesed on01.06.2023).

CONCLUSION

In the literature, digital financial inclusion is considered as augmented fintech FI, or the ability to access finances, the development of which determines positive effects for the economy, the financial sector, and consumers of financial services.

The selection of factors and indicators used by DFI researchers is justified for a specific financial service, certain characteristics of its recipient, and the type of financial organization providing the service.

The main directions for the development of DFI for consumers are increasing digital financial literacy, raising consumer incomes, building trust in the financial market, including through the development of responsible financial service practices and the protection of consumer rights.

Further DFI research is possible taking into account the factors that determine the choice of financial services consumers, including income; it will focus on various financial services provided, including those using financial and investment platforms, as well as on certain categories of counterparties of financial organizations. DFI research will develop in the context of economic growth, digitalization, financial stability, sustainable agendas, as well as the risks generated by DFI and approaches to their management.

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The Impact of Decentralized Finance on the Activities of Traditional Financial Intermediaries

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ABSTRACT

Over the past decade, digitalization, which has become a key driver of innovation in the financial industry, has led to the development of new products and financial services. The services and opportunities provided in the field of decentralized finance have similar characteristics to traditional financial services. The lack of sufficient experience in the functioning of the decentralized finance sphere determines the relevance of the study of the content and problems of the development of this format of financial organization. The object of study is the relations arising in the process of providing financial services in traditional and decentralized finance. The subject of the study is the impact of decentralized finance on the activities of traditional financial intermediaries. The purpose of the study is to determine the aspects of the impact of decentralized finance on the activities of traditional financial intermediaries. The objectives are to study the theory of trust in relation to decentralized finance, identify problems of their development, assess the challenges and prospects for the impact of decentralized finance on the activities of traditional financial intermediaries. The authors use general scientific and special methods, including system, comparative analysis, generalization, scientific abstraction. The scientific novelty of the study lies in a comprehensive assessment of the impact of decentralized finance on the activities of traditional financial intermediaries through the prism of the capabilities of the decentralized finance system at the current stage of financial market development. The authors conducted a study of the theory of trust in relation to decentralized finance, and also proposed forms of ensuring trust in financial services provided in the traditional (TradFi) and decentralized financial systems (DeFi). To assess the challenges and prospects of decentralized finance and their impact on the activities of traditional financial intermediaries, a PEST analysis was conducted, identifying groups of political, economic, technological and socio-cultural factors of influence. It is concluded that the influence of the decentralized finance sphere on the activities of traditional financial intermediaries will expand due to the increase in the market capitalization of DeFi and the spread of systemic risks characteristic of TradFi. Focus on minimizing risks should facilitate the use of DeFi services by traditional financial intermediaries in the context of creating and developing innovative projects. The conducted research can be useful both for users of traditional and decentralized finance services and for regulatory and supervisory authorities.

Keywords: traditional finance (TradFi); decentralized finance (DeFi); central banks digital currencies (CBDC); digital financial assets; financial service; PEST-analysis

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INTRODUCTION

Decentralized finance (DeFi) from the perspective of the Bank of Russia is a model of financial relations without intermediaries and without establishing a specific type of digital asset [digital financial assets, central bank digital currencies (CBDCs), stablecoins, cryptocurrencies, tokenized cashless currencies]. Despite the small market share that DeFi occupies in the global market, the decentralized financial environment has already managed to create its own unique infrastructure. However, with the significant expansion of the DeFi market, systemic risks inherent to the traditional financial market may also arise. Therefore, it is necessary to study the features of innovative systems, analyze the impact of DeFi on the activities of traditional financial intermediaries in order to improve the regulation of the Russian financial market.

As noted, the Bank of Russia emphasizes the financial technology in the terminology of DeFi, on the basis of which transactions are conducted without intermediaries: Decentralized finance (DeFi) is a model of financial organization in which there is no intermediary, transactions are carried out automatically using smart contracts that execute on the basis of distributed ledger technology (DLT), and users have direct control over their assets.[1]

However, many specialists consider DeFi as a collection or system of *financial services* (decentralized financial services and applications) based on public blockchains. At the same time, transactions are carried out automatically using smart contracts. Let's examine the presented definition in more detail. In accordance with Article 4 of Federal Law No. 135[2] financial service is understood as a banking service, an insurance service, a service on the securities market, a leasing service, as well as a service provided by a financial organization related to the attraction and/or placement of funds of legal entities and individuals. The definition is revealed from the perspective of the object-subject approach, while the law further stipulates that this service can only be provided by financial organizations that have the appropriate licenses for providing a particular financial service. However, in DeFi, participants can be various legal entities, which may or may not fall under the category of financial organizations as well as individuals.

It should be noted that, on the other hand, in the field of decentralized finance, financial services are provided that have their own specifics — based on distributed ledger technology (peer-to-peer lending, savings, spot trading, derivatives, etc.), while in many countries, regulation is virtually absent and, accordingly, there is no central administrator. But in practice, such an administrator is a group of private individuals who develop and approve rules within their platforms and exchanges, which are perceived as certain regulatory provisions. If they are not followed, the necessary financial service will not be provided.

In a study conducted by the analytical agency Statista,[3] t is stated that DeFi resembles crowdsourcing, which literally translates to the use of crowd resources. In his research, W. Mensi [1] defines DeFi as a collection of cryptocurrencies used on automated decentralized platforms that operate using smart contracts. The authors of the study S. Gunay [2, 3] adhere to a similar ideology. A different position is held by the group of researchers F. Şoiman, J.-G. Dumas, S. Jimenez-Garces, and others [4–11]: DeFi is considered a system in which financial assets and products are offered using smart contracts in a decentralized blockchain network.

[1] Decentralized finance. Report of the Bank of Russia. URL: https://cbr.ru/Content/Document/File/141992/report_07112022.pdf (accesed on 04.10.2023).

[2] Federal Law No. 135 from 26 July 2006 «On Protection of Competition».

[3] Decentralized Finance (DeFi) — statistics & facts. URL: https://www.statista.com/topics/8444/decentralized-finance-defi/#topicOverview (accessed on 04.02.2024).

Despite the wide range of research on the topic of DeFi, a number of scientific problems still remain outside the purview of researchers: from the conceptual foundations of functioning to the directions of development and regulation of decentralized financial environments. The practical significance of solving these problems has predetermined the necessity of researching the DeFi sphere. It should be noted that within the framework of this study, the authors adhere to the conceptual framework presented by the Bank of Russia.

FORMS OF TRUST ENSURANCE IN TRADFI AND DEFI

DeFi offers peer-to-peer interactions without the need for centralized management, thereby eliminating financial intermediaries. Among the factors determining interest in decentralized finance compared to traditional finance, the following can be highlighted: anonymity (conditional, most likely pseudonymity according to the Bank of Russia); high inclusivity; the possibility of using it as a tool for long-term investment; the potential for quick profits; distrust of TradFi; fear of missing out on opportunities; and the presence of direct control over assets for users. It should be noted that there is both a low base effect and an increase in the role of digital services in the financial sector.

At the same time, it is worth noting that the capitalization of the global DeFi market is incomparably small compared to the capitalization of the cryptocurrency, gold, stock, real estate, and derivatives markets. As of 16 February 2024, the total market capitalization of cryptocurrencies exceeded $ 2 trillion, while DeFi reached $ 80 billion (*Fig. 1*).

The concept of "distributed ledger technology" (DLT) encompasses a range of technologies such as blockchain, hashgraph, holochain, and others, which differ from each other in terms of the structure of the ledger data, methods of consensus, and data synchronization. Thus, a specific case of DLT is blockchain technology, and the main feature of distributed ledger technology is the *distribution of the system*.

In simple terms: a centralized system is one where there is a central administrator; in a decentralized system, there is no single administrator, but there are several central administrators; a distributed system allows users to share ownership of data. However, a system can be both decentralized and distributed, just as it can be centralized and distributed. Accordingly, the question arises about users' trust in the system or in the providers of decentralized financial services. Proponents of DeFi describe it as follows: code is law,[4] but does this property work in practice? Is it possible for a financial system to exist and develop without the need to establish trust between individual entities? Based on the scalability trilemma, which includes the interrelated properties of distributed ledger technology — security, scalability, decentralization — any DLT can have no more than two of the presented properties. It is worth emphasizing that such a property of DLT as security, which directly affects trust, may take a back seat.

The theory of trust among participants in economic relations was considered as early as the 19th century by K. Knies [12]: trust as a prerequisite for the emergence of economic relations. Trust can be defined as the subjective probability that people attribute to the possibility of being deceived.

The traditional financial system largely depends on trust [13]: from trust between financial counterparties to trust in the legal environment that ensures the enforcement of transactions. In contrast, the rapidly growing DeFi system is built on a paradigm where the financial obligations of individuals are defined in computer code stored on the blockchain, and participants must trust the computer

[4] What Is Decentralized Finance (DeFi)? URL: https://coinmarketcap.com/academy/glossary/defi (accessed on 10.10.2023).

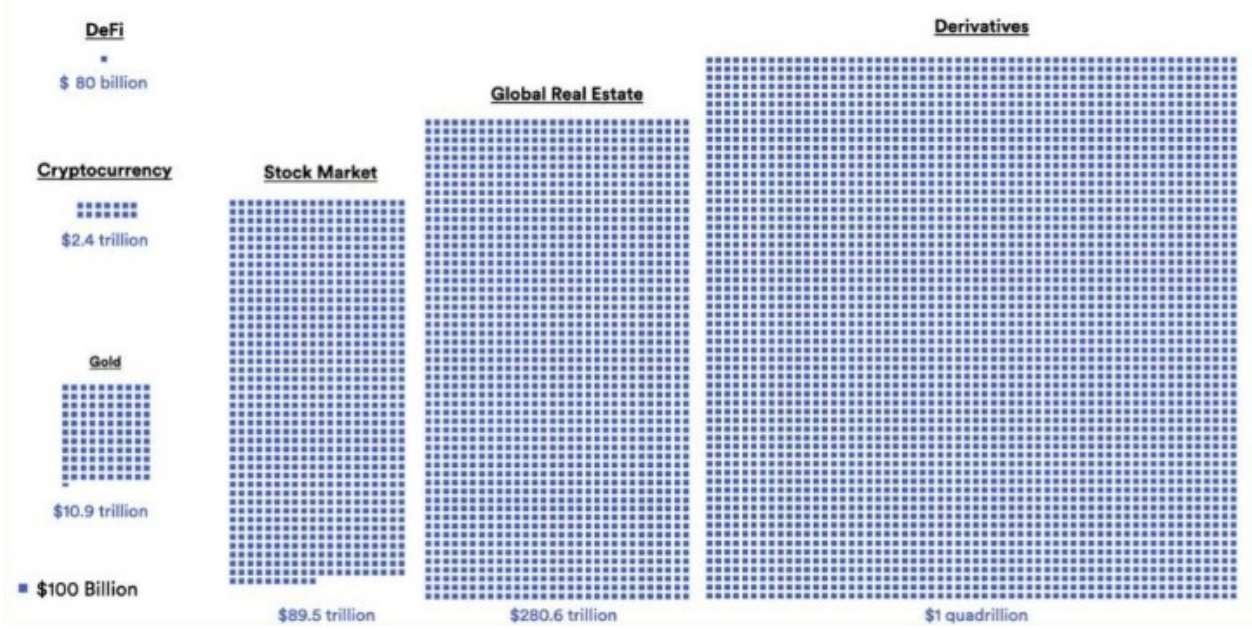

Fig. 1. **Capitalization of Global Financial Markets (1 Square is Equal to $ 100 Billion)**

Source: URL: https://cointelegraph.com (accessed on 03.11.2024).

code — automatically ensuring compliance with the terms in the smart contract. Thus, it can be said that the need for trust between individual participants in the system is lost, and DeFi platforms differ from the traditional model based on trust in the financial system, relying on lawful and efficient interaction between financial intermediaries and participants in the centralized system.

Let's consider the forms of trust assurance from end consumers for financial services provided by TradFi and the services provided by DeFi (*Table 1*). As the object of analysis in TradFi, a basic set of financial services[5] has been chosen: insurance, lending, savings formation (including ISAs), and payment services. As the object of analysis in DeFi, the following types of assets have been selected: tokenized cash currencies, central bank digital currencies (CBDCs), cryptocurrencies, stablecoins, digital financial assets.

The theory of trust is developing not only in scientific research. It should be noted that in the documents of the Bank of Russia, one of the main directions for the development of the financial market is identified as strengthening citizens' trust in the financial market and increasing the accessibility of financial services — ...preservation and enhancement of citizens' trust in the financial market, including the creation of incentives and conditions for their interest in long-term and conscious participation in the capital market.[6]

Trust is a prerequisite for the emergence of economic relationships: it is present in both TradFi and DeFi. In DeFi, it appears at the moment of registration on the respective platforms, when the user accepts certain rules. However, this trust is ensured (sometimes not) at the micro level, i.e., the financial well-being of participants ultimately depends on the reliability of individual providers. Due to years of experience and traditional forms of relationships in TradFi, trust and legal support are ensured at the state level.

[5] Website of the Bank of Russia. URL: https://cbr.ru/develop/development_affor/ (accessed on 16.11.2023).

[6] Main directions for the development of the financial market of the Russian Federation for 2023 and the period of 2024 and 2025. Report of the Bank of Russia. URL: https://cbr.ru/Content/Document/File/143773/onfr_2023–2025.pdf (accessed on 10.10.2023).

Table 1

Forms of Trust Assurance in Financial Services Provided by TradFi and DeFi

Characteristic	TradFi	DeFi
Insurance system	Insurance: since 2013, the protection of the lawful interests (including) of policyholders and insured persons has been legally established as one of the functions of the mega-regulator, and strategic goals and objectives for the further development of this area have been defined[a] Savings: in accordance with Law No. 177[b], insurance compensation for deposits in a bank where an insured event has occurred is paid to the depositor in the amount of 100% of the deposit amount in the bank, but not exceeding 1 400 000 rubles. *Payment services:* the requirement to ensure information protection when transferring funds[c] *Lending:* the creation of appropriate reserves by banks	Insurance is implemented only through smart contracts.
Regulation and supervision	TradFi anticipates regulation and oversight at all stages of providing financial services	The principle of decentralization. However, any type of DLT has regulation in the form of consensus, where, in turn, a group of private individuals acts as central administrators.
Provision	Full asset and capital backing; the presence of special structures for conducting bankruptcy procedures; trust in the existing national currency.	Depending on the type of asset: – stablecoins (Tether, USD Coin, Terra) — full or partial backing by a set of assets or the use of an algorithm to maintain stability; – unsecured cryptocurrencies (Bitcoin, Ethereum) — absent; – tokenized assets (Tesla tokenized stock FTX, Amazon tokenized stock FTX) — backed by assets (securities, commodities, real estate, and other real or financial assets, the right to receive a specific good or service)
Protection of consumer rights in the financial market	Implementation by the Bank of Russia of reactive and preventive measures to protect consumer rights in the financial market	The status of cryptocurrency in the Russian Federation is still not fully regulated, which leads to risks in its circulation. Industries with predominant public regulation (bankruptcy, enforcement proceedings, etc.) directly recognize cryptocurrency as property, and civil and criminal law also adhere to this trend, which imposes restrictions on any transactions and operations involving it. When registering on cryptocurrency exchanges, users need to carefully and thoroughly familiarize themselves with the rules of the specific investment project/cryptocurrency exchange, as well as the terms of the contracts. In many cases, plaintiffs are unable to have their claims satisfied in court due to the presence of disclaimers in the documents and the risky nature of cryptocurrency transactions.

Table 1 (continued)

Characteristic	TradFi	DeFi
Inclusivity	Since April 2020, ensuring the accessibility of financial services in the Russian Federation has been legislatively established as one of the functions of the mega-regulator, and strategic goals and objectives for the further development of this area have been defined[d]	The level of inclusion is higher compared to TradFi, partly because the infrastructural functions (issuance organization, storage, accounting, and settlements) are carried out without the use of centralized infrastructure (there is no responsible legal entity).
Identification/ possibility of conducting KYC procedures	When concluding a contract for the provision of the financial services in question, a mandatory condition is the identification of the client and the possibility of conducting KYC procedures, except for the selected electronic payment method when making transfers of electronic money (however, the limit is restricted).	Anonymity is possible, depending on the design and requirements of the intermediaries.

Source: Compiled by the authors.

Note: [a] Federal Law No. 86 of 10 July 2002, "On the Central Bank of the Russian Federation (Bank of Russia)." [b] Federal Law No. 177 of 23 December 2003 "On Insurance of Deposits in Banks of the Russian Federation". [c] Regulation of the Bank of Russia dated 04.06.2020 No. 719 "On the requirements for ensuring information security during the transfer of funds and on the procedure for the Bank of Russia to monitor compliance with the requirements for ensuring information security during the transfer of funds." [d] Federal Law No. 86 of 10 July 2002, "On the Central Bank of the Russian Federation (Bank of Russia)."

By their nature, the financial services provided in DeFi are derivatives of traditional financial services and products. Therefore, there is a likelihood of not only the development of risks specific to DeFi environments but also the emergence of systemic risks. As of today, there is no unified position in either the global or the Russian scientific community regarding which approaches and regulatory scenarios are optimal for ensuring a balance between the development and regulation of DeFi. However, there is no doubt that with the increase in market volumes, appropriate legislative regulation will be necessary, aimed both at protecting the rights of financial services consumers (the financial well-being of citizens) and at ensuring the financial stability of the DeFi platforms themselves.

ASSESSMENT OF THE IMPACT OF DECENTRALIZED FINANCE ON THE ACTIVITIES OF TRADITIONAL FINANCIAL INTERMEDIARIES

To assess the impact of decentralized finance on the activities of traditional financial intermediaries, the PEST analysis methodology can be applied. As an analytical tool, it is most often used for analyzing the macroenvironment of an enterprise, but, in our opinion, it is also appropriate to use it to obtain an objective understanding of the state of the financial market and, in particular, to assess the prospects for the development of decentralized finance in light of the most important influencing factors (*Fig. 2*).

PEST analysis is advisable to use for assessing the challenges and prospects of decentralized finance and their impact on the activities of traditional financial intermediaries, as this method allows:

- identify general market risks and individual opportunities for market participants;
- show possible vectors of change;
- develop a list of external market influences;
- optimize planning, organizational and infrastructural processes, product development, and project management development.

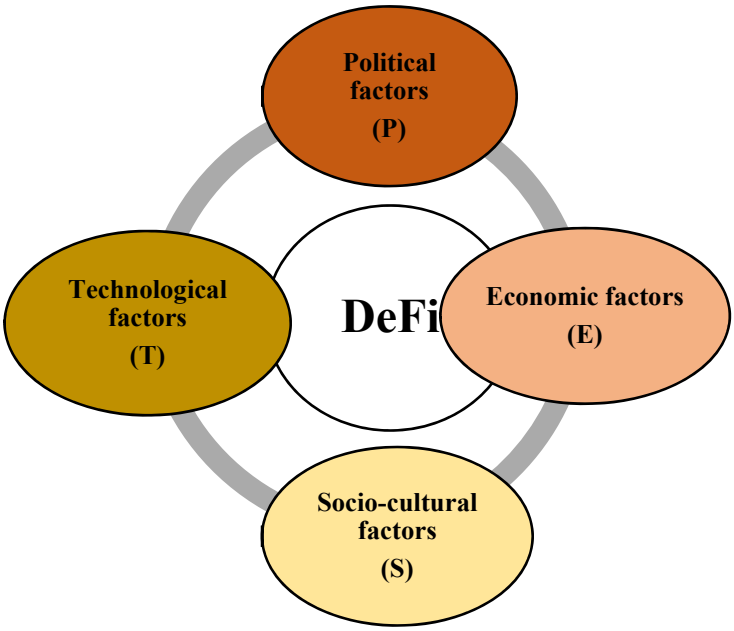

Fig. 2. **Factors of PEST Analysis DeFi**

Source: Compiled by the authors.

Within the framework of the PEST analysis, we will create a matrix (*Table 2*) of political and legal (P), economic (E), sociocultural (S), and technological (T) factors. Next, we will describe the identified factors in detail, determine the opportunities and threats, as well as the ways to neutralize their impact.

Political factors

At the moment, there is a rapid increase in interest in DeFi worldwide, while in Russia, there is no regulatory framework that fully governs this area. This creates risks of uncertainty and potential legal issues. Market participants should monitor DeFi trends and prospects to minimize their risks. Due to the rapid development of DeFi, the state, in addition to developing and implementing regulatory frameworks, will regulate the activities of financial intermediaries in terms of providing services and conducting familiar operations using new technologies, combating the legalization (laundering) of proceeds obtained through criminal activities, and financing terrorism, which, in turn, may generally affect the speed of technology adoption in the financial sector.

Economic factors

The pace of economic growth in the country is not insignificant in the context of its impact on the implementation of decentralized finance, especially when we talk about the largest financial institutions. Funding for the implementation of developments in the DeFi sector directly depends on economic growth, as potential negative changes in the economy are highly likely to affect the activities of financial institutions and cut budgets for DeFi projects. Changes in interest rates in the economy (the key rate of the Bank of Russia, rates in the interbank lending market) affect the capital and profitability of traditional financial intermediaries, which naturally leads to questions about the potential competition between decentralized financial platforms and traditional financial institutions.

Socio-cultural factors

As consumers of financial services gradually learn about some significant advantages of DeFi, their financial behavior and preferences may change, for example, the choice of new services in the DeFi format. Therefore, financial intermediaries will need to adapt

Table 2

The PEST Analysis Matrix

P (POLITICAL)	E (ECONOMIC)
• Political stability • Protection of financial services consumers' rights • Regulatory framework • State regulation and compliance control	• Economic growth rates • Fiscal factors (inflation, interest rates, etc.) • Currency regulation and restrictions • Investment climate
S (SOCIO-CULTURAL)	**T (TECHNOLOGICAL)**
• Demographic trends (population size, growth rate, age) • Generational change (B + X + Y ⩾ Z)* • Customer preferences and financial literacy of the population	• Key technological changes in the financial industry • The degree of penetration and use of digital financial technologies, particularly artificial intelligence • Cybersecurity

Source: Compiled by the authors.

Note: * According to the generational theory of W. Strauss and N. Howe, Generation B consists of people born between 1940 and 1959, Generation X between 1960 and 1979, Generation Y between 1980 and 1994, and Generation Z between 1995 and 2010.

their products and services to the changing preferences of users.

With the increase in the overall level of financial literacy among the population, there will likely be a demand for the implementation and development of more DeFi services. It should also be noted that a generational shift is occurring, i.e., Zoomers (Generation Z) are more technologically savvy than Generation X, and to some extent Generation Y. Thus, the new generation can more quickly master modern technologies, actively use them, and, importantly, recognize their advantages.

As the main threat, one can highlight the demographic situation, which is capable of restraining the potential for economic growth and increasing the burden on the country's pension system. It is also worth noting the significant share of conservative financial service consumers in Russia [15].

Technological factors

DeFi is significantly based on blockchain technology. Traditional financial organizations need to keep an eye on developments in this area to be able to integrate new technological solutions into their operations. As financial and/or banking services transition to a digital format, the risks of cyber threats become increasingly evident. Therefore, financial intermediaries should invest funds in the creation and/or acquisition of technologies that ensure cybersecurity and cyber resilience, protecting customer data during financial transactions.

In the context of the factors considered, we will perform calculations using the expert evaluation method (*Table 3* and *4*).

The results of the conducted PEST analysis can be used for the development of effective strategic planning at the state level, the development of regulatory aspects of the activities of financial intermediaries, as well as for identifying current problems and/or potential future changes in financial markets under the influence of the spread of DeFi services. As a result of evaluating the factors in all the considered categories, it can be concluded that political and technological factors of the external environment are the most significant in the context of DeFi development. Focusing on minimizing the

Table 3

PEST Analysis of the Impact Assessment of DeFi (With Factor Estimates)*

Description of the factor	The influence of the factor (1–3 points)	Expert assessment					Average rating	Weight-adjusted assessment
		1	2	3	4	5		
Political								
1. Regulatory framework	3	5	5	4	5	5	4.8	0.6
2. State regulation and compliance control	2	4	4	5	4	5	4.4	0.4
Economic								
1. Economic growth rates	2	4	4	2	3	2	3	0.4
2. Fiscal factors	1	1	1	2	2	1	1.4	0.2
3. The state of the banking sector	2	3	4	4	4	3	3.6	0.4
Socio-cultural								
1. Customer preferences	1	2	2	3	2	1	2	0.2
2. Financial literacy	2	3	4	3	4	4	3.6	0.4
3. Generational change ($B + X + Y \geq Z$)	2	3	3	3	4	3	3.2	0.4
Technological								
1. Development of DeFi technologies	3	5	5	5	5	5	5	0.6
2. Cybersecurity	3	3	5	4	4	5	4.2	0.6

Source: Compiled by the authors.

Note: * Scores: 0 — no effect, 1 — neutral effect, 2 — moderately positive effect, 3 — positive effect. As experts, representatives of the financial industry, who fully possess the necessary knowledge about the specifics of DeFi and sufficient experience in this professional field.

Table 4

The Results of the PEST Analysis of the Assessment of the Impact of DeFi

Political		Technological	
The factor	**Weight**	**The factor**	**Weight**
1. Regulatory framework	0.6	1. Development of DeFi technologies	0.6
2. State regulation and compliance control	0.4	2. Cybersecurity	0.6
Socio-cultural		**Economic**	
The factor	**Weight**	**The factor**	**Weight**
1. Customer preferences	0.2	1. Economic growth rates	0.4
2. Financial literacy	0.4	2. Fiscal factors	0.2
3. Generational change ($B + X + Y \geq Z$)	0.4	3. The state of the banking sector	0.4

Source: Compiled by the authors.

risks associated with them, as the authors suggest, will help traditional financial intermediaries more organically develop the application of DeFi within their current activities and in the development of new projects.

CONCLUSION

The examined features of decentralized finance, as well as their impact on the activities of traditional financial intermediaries in the context of the digital transformation of the Russian economy, synthesize and expand traditional notions of TradFi and DeFi. The authors have determined that the goal of regulation and supervision in the financial market is trust as a prerequisite for the emergence of economic relationships, which is present in both TradFi and DeFi. In the field of decentralized finance, trust is manifested at the moment of registration on the respective platforms, when the user accepts the rules; however, this trust is ensured (sometimes not) at the micro level. That is, the financial well-being of participants ultimately depends on the reliability of individual providers. Due to years of experience and traditional forms of relationships in TradFi, trust is ensured at the state level along with regulatory support.The authors note that by their nature, the financial services provided in DeFi are derivatives of traditional financial services and products. As transaction volumes expand and DeFi market capitalization increases, both specific risks and systemic risks characteristic of TradFi may arise.

To identify key trends and assess the impact of decentralized finance on the activities of traditional financial intermediaries, the PEST analysis method was applied. As a result of the analysis of factors from various categories, it was concluded that political and technological factors of the external environment are the most significant in the context of DeFi development. Focusing on minimizing the risks associated with them will solve most of the emerging problems in this area, which will help traditional financial intermediaries consider the possibility of applying DeFi services and opportunities within their activities and the development of technological projects.

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Financial Aspects of the Solid Waste Management

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ABSTRACT

The article dwells on financial aspects of the municipal solid waste management. The *aim* of the article is to consider common factors of solid waste financing in developed and developing countries, to determine the structure of total costs of municipal solid waste services, to consider complications that appear in relation to capital costs and operation and management costs, to compare costs of municipal solid waste technologies, to find out how do cities obtain investment funding for solid waste management projects, how local governments obtain operational and maintenance funding, as well as to make comparison of waste management user fees by income level and by region. The following important costs consideration has been made. Capital costs and operation costs are normally financed differently. Capital costs are rather not difficult to benchmark. Quite often some important operation costs are not duly calculated or even overlooked. It is difficult to determine total cost of a service, especially in low-income countries. It is challenging task for a city in a developing country to get investment funds for municipal solid waste management projects for several reasons: municipal financing is highly limited in the context of growing volumes of waste; struggling cities can't just apply for loans because they are not considered creditworthy by international stock markets; accessibility of donor financing for municipal solid waste management is extremely low if to compare to other sectors; donor financing is often restricted to emerging economies; economic downturns limit private funding available for solid waste management.

Keywords: waste; capital costs; operation and maintenance cost; total cost; policy drivers; funding; cost of technologies; user fees

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INTRODUCTION

The actuality of the research is determined by the fact that waste management financing is a serious concern for cities. Providing municipal solid waste management services is a large part of expenses for municipalities. The quality of waste management services is largely dependent on the amount and sources of funding necessary for different stages of waste management system: sorting, collection, transportation, treatment and disposal, landfilling.

Investment costs (capital expenditures, CapEx) and operation and maintenance costs (O&M costs; operational expenses, OpEx) are normally financed differently. Cost recovery is important in order to avoid dependence on subsidization from private, national or external sources. Thus, a reliable cost-recovery system must be designed. The cost for the full range of waste services (from collection to final disposal) can't be completely recovered only from user fees. To keep the whole system floating government subsidies or external budgetary support are required.

Thus, the *purpose* of the study is to consider solid waste management financing as a whole system. In particular, the article aims to solve the following *tasks:* to consider common factors of solid waste financing in developed and developing countries; to determine the structure of total cost of municipal solid waste services; to consider complications that appear in relation to capital costs and operation and management costs; to make service-wise comparisons of various costs involved; to find out how cities obtain investment funding for solid waste management projects; and to determine how local governments obtain operational and maintenance funding.

There is a large body of *literature* on waste management issues. However, studies of waste management financing are still rather uncommon and not systematized. The information is scattered across articles and mostly country reports. Driving factors, charging methods and options of financing of solid waste management are considered in the following studies [1–5], in publications of the Asian

Development Bank [6, 7],[1] ISWA publications [8],[2] International Finance Corporation of the World Bank group [9, 10],[3] World Bank publications [11].[4] The in-depth literature review of economic and ecological efficiency of different waste treatment policies is carried out in the following studies [12, 13], systematic literature review and recommendations for different countries are given in the following studies [14–16].

Methodology. The research incorporates the assessment of the current situation in determining cost of solid waste management services. The author provides a comparative analysis between CapEx and OpEx, investigates methods of collection data on these types of costs and sources of its financing. Research findings might be useful for researchers and decision-makers.

PRINCIPLES OF THE MUNICIPAL SOLID WASTE MANAGEMENT

Are people willing to pay for both waste collection as well as waste disposal services? There are some basic *principles* that are true for solid waste financing in developed and developing countries:

- People are more willing to pay for waste collection than waste disposal because collection is more visible than disposal. Therefore, disposal is driven by environmental legislation and policies rather than demand for services.
- Recycling and treatment are also driven by the market value of materials. Higher-value materials like metal and paper tend to have better recycling rates in most places. Policy drivers are required for achieving higher waste diversion rates.
- The cost of inaction is greater than the cost of doing nothing.

What are the common *factors* of solid waste financing in developed and developing countries? How are the market and policy related to solid waste management? Here is a look at the market and policy drivers along the solid waste management chain (*Fig. 1*).

Collection is driven by demand for services and by policy. Policy, here, is driven by the need to protect or improve public health.

Treatment and recovery are driven by the market as well as by policy. There is value in recovering materials as well as in recovering energy from waste, factors that drive the market to participate in materials and energy recovery. Treatment is also driven by policy in terms of valuing and protecting the environment.

Disposal differs from both collection and treatment in that it is almost solely policy driven so as to protect the environment. Noticeably, users are less striving to pay for disposal than they are for collection and recovery.

DETERMINING COST OF SOLID WASTE MANAGEMENT SERVICES

How do local governments determine costs involved for introducing solid waste services? Financial revenues and financial costs are registered (or have to be registered) by accountants. Total costs are generally divided into investment costs and operation and maintenance costs (*Fig. 2*).

It is important in waste management to make a difference between operation costs and direct investment costs. It is difficult to determine the total cost of a service, especially in low-income countries, for several reasons. First, there may be no separate budget for municipal solid waste management. Second, money comes from various sources such as grants, loans, taxes, and fees. Third, costs are borne by multiple parties, making it difficult to keep track of the expenditure. For instance, the total estimated global capital expenditures and operational expenses for waste management is US $ 375 billion from 2010 to 2025.

Investment Costs (CapEx)

Numerous programs and projects focus on upgrading waste management infrastructure, which usually leads to a better understanding of investment costs. CapEx are costs related to evolving and building a project, including:

- preparation of a project, in particular planning, site selection, technical justification, permission, consultation, public involvement;

[1] Web-site of the Asian Development Bank. URL: https://www.adb.org/search0?keywords=waste%20financing (accessed on 30.05.2023).

[2] Web-site of the International Solid Waste Association. URL: https://www.iswa.org/wmw/?v=925ab312a51a (accessed on 30.05.2023).

[3] Web-site of International Finance Corporation. World Bank Group. URL: https://www.ifc.org/wps/wcm/connect/ifc_ext_design/ifc+search/search/ifc+search?q=waste+&tab=1&count=1896& (accessed on 30.05.2023).

[4] Web-site of the World Bank group. URL: https://elibrary.worldbank.org/wb-working-papers (accessed on 04.06.2023).

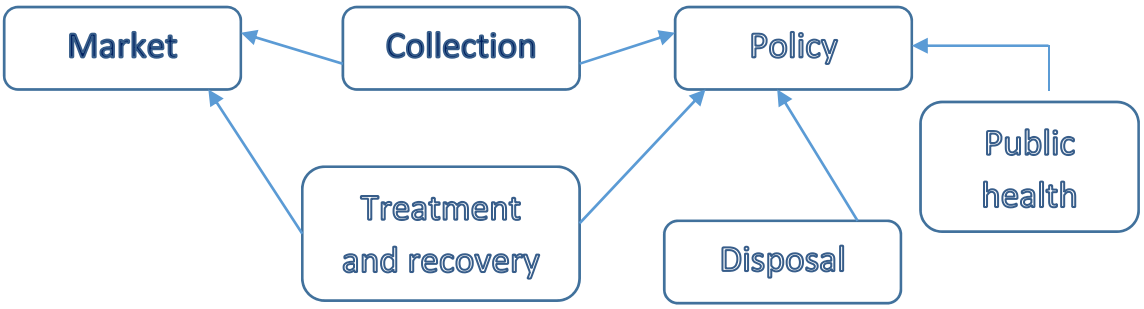

Fig. 1. **Policy Drivers Along the Municipal Solid Waste Management Chain**
Source: Author's development.

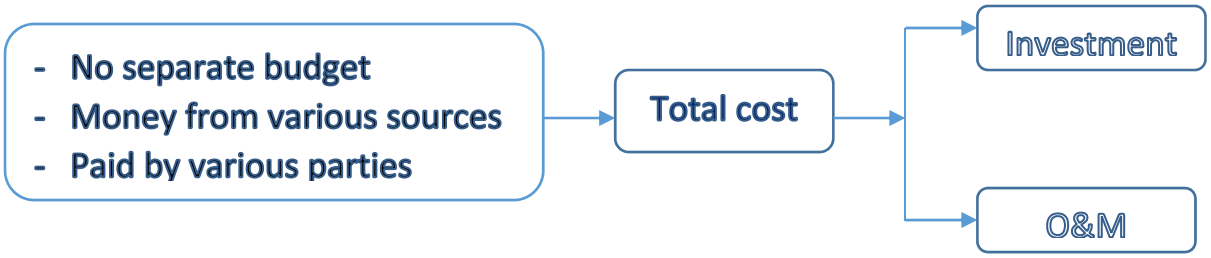

Fig. 2. **Total Cost of Municipal Solid Waste Services**
Source: Author's development.

- detailed projection;
- cost of land, particularly in the case of landfill sites;
- rigging, installations and construction.

In fact, CapEx is rather not difficult to benchmark, because facilities and technology suppliers are aware of the price of products they deliver. The costs of containers, garbage trucks, sorting lines, or landfill lines are evaluated on the base of price offers from facilities and technology suppliers, under the technical requirements. Mandatory foundation and building works are evaluated by respective professionals (engineers) on the base of cost standards for a specific country, in which investments are adopted.

Nevertheless, in practice, numerous difficulties may appear:

- it is not easy to obtain accurate and trustworthy data on CapEx for alternative types of disposal facilities and treatment plants;
- additionally, commercial confidentiality restrains the availability of data for public;
- waste is not homogeneous, so implementation of especially adapted technologies is inevitable;
- locally produced component costs differ between sites and countries;
- environmental standards are different;
- some new technologies, being rather appropriate, lack experience at large-scale work under diverse local conditions.

To sum up, it is very difficult for a city in a developing country to get investment funds for municipal solid waste management projects. Investments in solid waste management infrastructure in developing countries are 0.1% of total investments. Why are the investments in solid waste management infrastructure quite low in developing countries? We found out some *reasons*. First, municipal financing has become highly limited in the context of growing volumes of waste. Second, struggling cities can't just apply for loans. In fact, the World Bank reports that in developing countries, only 4% out of the top 500 cities are creditable in international stock markets, and therefore eligible for financing. Third, accessibility of donor financing for municipal solid waste management is extremely low if compared to other sectors. Forth, donor financing is often restricted to emerging economies. Finally, economic downturns limit private funding available for solid waste management.

Operations and Maintenance Costs (OpEx)

The key components of operation and maintenance costs are expenditures for energy, fuel, labor, maintenance and repair, monitoring, control of emissions, collection of fees, administration and management, and public communication. However, some important OpEx are *not duly calculated or even overlooked*. For example, payment for services of environmental auditors, customer care costs, awareness-raising campaign costs, investment in capacity building and worker training, and, in case of participation of private sector service providers, the customer's costs with regard to tenders, negotiation of contracts, insurance, control, and inspection. Additionally, operators are usually subject to the value added tax (VAT), even though tax exemptions may apply in some cases. Dividend taxes and income taxes are usually relevant for private commercial service providers but are not relevant for public ones. It may be that some waste management costs appear because of legislative requirements.

Completely *new costs* may appear. Among them the cost of implementing "user pays" systems; costs connected with new policy preferences (for example, implementing pollution prevention and re-use principles in the waste management agenda); and the after-care costs of landfills that don't receive waste any longer.

OpEx are registered in the accounting of municipalities and are employed to evaluate annual budgets. However, there is often a lack of data on OpEx of solid waste management services. It still persists a riddle why comparative analysis, for example, for landfilling costs or collection costs, is so complicated even in municipalities with similar circumstances. This is partially because of differences in the accounting. Municipalities usually assign only a portion of the OpEx to the waste management activities. For instance, in a municipal department, waste management services may be combined with other public services. Thus, cost allocation for a particular service, such as solid waste management services, is uncommon practice. Quite common for developing countries is that the sanitary department used to monitor waste management, but garbage collection vehicles used to be under control of the mechanics' department or by the staff of different "zones" within a municipality, while the costs are registered by each department "zone" separately. Different methods used to aggregate the costs complicate the things.

Among other restrictions are rather common lack of information and unwillingness to share data on costs and revenues. When it comes to sharing information on organizational data, technical data, or even investments costs of inventories, equipment and facilities, the staff of municipalities are usually very helpful. However, when it concerns operation costs, this type of cost is usually treated as "confidential" and is not available. Hence, tracing the information across municipalities is very uneasy, both in terms of obtaining and comparing the available data.[5]

To sum up, OpEx can be direct or hidden. *Direct costs* are those that can be directly traced to a project or product. These costs include salaries, fuel, utilities, maintenance and repair, replacement, feedstock, disposal of rejects, additives. *Hidden costs* can't be directly accountable to a project. These costs include overhead, marketing, taxes, insurance, monitoring and reporting, environmental auditing, emergency preparedness, training and capacity building, customer care, administration, revenue collection.

In some cases, where the municipality contracts out waste management services, the *municipality acts as a "client"* of the operator of the service. In this case, the hidden costs may be borne by the operator of the service and not the local government (*Fig. 3*).

Municipality as "client" costs include tendering, contract negotiation, monitoring service performance, insurance, administration fines, controlling and managing, revenue collection.

WASTE MANAGEMENT FUNDING

Waste management financing is a serious concern for cities. Cost recovery is important in order to avoid dependence on subsidization from private, national or external sources. CapEx and OpEx are normally financed differently [11].

Obtaining Operation and Maintenance Funding

We have studied different sources of information [19, 20] and found out that it is virtually

[5] There have been attempts to collect primary data based on templates that would facilitate collection of comparable data, including applied research work [17]. The information on cost has been consolidated in the waste report, which aims to collate various data on waste from around the world [18].

Fig. 3. **Operations and Maintenance Costs**

Source: Author's development.

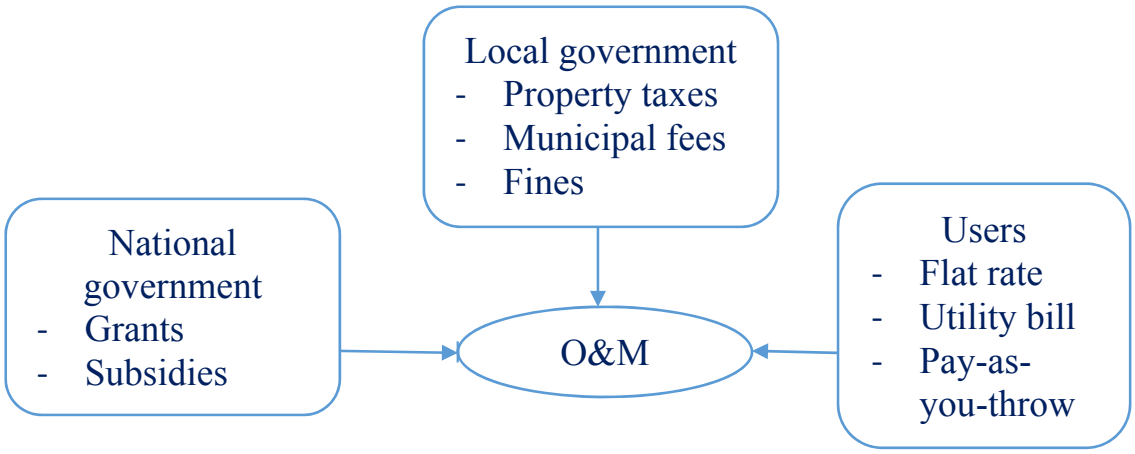

Fig. 4. **Obtaining O&M Funding**

Source: Author's development.

impossible to find donors to meet operational and maintenance costs. How crucial is OpEx funding for a solid waste management projects? Operating costs can often make up to 60–70% of total costs on waste management. This is very crucial for the success of a solid waste management project. It is important to plan the source of OpEx at the start of a solid waste management project to ensure its sustainability.

Funding for operation and maintenance can be obtained from national governments, local governments, and users of the service (*Fig. 4*).

In order to achieve long-term sustainability operational costs usually require a reliable *cost-recovery system*. A standard user fee (charges for service delivery) is a starting point for municipalities. In order to provide price availability for low-income users and to stimulate reduced waste generation user fees can be variable or fixed. To make them effective, affordability and willingness to pay must match user fees rates. Additional elements of a cost-recovery system that may be implemented in cities are waste-to-energy generation, selling compost and recycled materials, deposit-refund system for water bottles and aluminum cans, license taxes for transfer stations operators and operators of final disposal sites, consumer taxes on batteries, plastic bags and disposables.

There are averages across regions in the *Table 1*.

Table 1 shows that user fees vary greatly across regions of the world. We may see that in the Europe, Central Asia, Latin America and Caribbean user fees are the highest while in Sub-Saharan Africa and South Asia are the lowest.

If to compare user fees by income level of residents, we may see that it also varies greatly. In higher-income countries residents pay significantly greater fees for waste management services in comparison with lower-income countries. *Table 2* compares user fees for waste management services by income level.

Table 2 shows that in high income countries annual commercial fees are the highest and constitute US $ 314. In some middle- and high- income countries for each business commercial fees are flat. It makes them easier to collect and administer. In low-income countries commercial fees tend to be charged less often. However, data is very scarce and might be unreliable.

Essential remark is that for many countries the cost for the full range of waste services (from collection to final disposal) can't be completely recovered only from

Table 1

Waste Management User Fees by Region

Region	Average user fee in selected cities (US $/year, as reported in data)
Europe and Central Asia	83
East Asia and Pacific	46
South Asia	34
Middle East and North Africa	55
Sub-Saharan Africa	10–40*
Latin America and Caribbean	80

Source: Author's development.

Note: * Based on World Bank estimates.

Table 2

Waste Management User Fees by Income Level

Income group	Average fees, US $ per year	
	Household	Commercial
Low income	37	155
Lower-middle income	47	173
Upper-middle income	52	235
High income	168	314

Source: Author's development.

user fees. To keep the whole system afloat government subsidies or external budgetary support are required. Available sources provide the following actual data: annual transfers/subsidies, typically received by local governments, vary from US $ 4 to US $ 10 per capita [18]. The average annual value of a transfer/subsidy received from central government is US $ 8 per capita. National or regional governments may be donors of these funds.

Obtaining Investment Funding

Most cities, even in high-income countries, don't necessarily have the funds to invest in large projects. Then, how do cities get investment costs for solid waste management projects?

Since equipment and infrastructure investment are associated with high costs, national governments, partnership with private sector, or international donor, can typically do investment-funding organizations. Admittedly, local governments globally make at least 50% of investment in waste services, while 10–25% are made by private sector (dependent on the waste service provided), and 20% are national government subsidies [11].

Cities can raise capital for the solid waste management projects through a combination of sources (*Fig. 5*).

Funding can be in the form of grants, which do not have to be paid back, or loans, which have to be paid back with the interest.

Local government. Municipalities can also raise funds locally through revenues, taxes, or fees. Funding can also be raised through the issuance of bonds. Green bonds are a financial tool used to attract investors for climate-resilient and low-carbon infrastructure. A multilateral development bank, a financial institution, or a city can issue a green bond.

National government. National governments are usually an important source of funding for capital expenditures through grants.

Cities across the globe, especially in developing countries, usually have difficulties financing the waste management sector. Therefore, any grant or public financing are always desirable. Financing by local government assumes that a single city must increase the funds from local income sources. These sources usually consist of local fees (like parking fees), fines and taxes (like property taxes). Some cities are wealthier than others, so they may manage their funds more effectively, and can earn revenues by public-private partnership schemes or by renting out their assets.

Donors. Donor financing comes without interest payments, but often municipalities have to meet certain requirements to access these funds. The risks of donor financing are that consideration is not always given to local waste characteristics or local conditions. As a result, operations costs tend to increase significantly, resulting in the failure of the project.

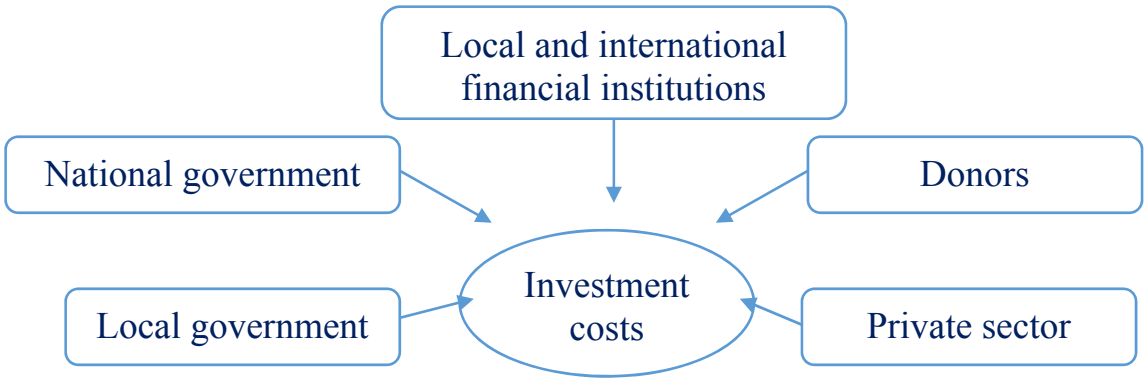

Fig. 5. **Obtaining Investment Funding**
Source: Author's development.

Private sector. Private sector entities invest only when it is possible to make a profit and recover their investment costs.

Public-private partnership in waste management systems is usually considered a means to achieve financial investment, technical expertise and efficiency [21]. Private businesses are able to participate in all stages of a waste management value chain: waste collection from households and commercial institutions, street cleaning, construction of transfer stations and disposal sites, its operation, education of people on the importance of waste reduction and separation at a source. Cost-recovery of private operators is made through the provision of their services. So municipalities with advanced waste management system guarantee that private operators are stably provided with the possibility to ern their incomes from user and tipping fees, the sale of recyclables, or are paid directly from the locality [22]. Conductive environments for private sector are characterized by rather easy and transparent procurement procedures, low political and other types of risk, a stable and robust legal system to stimulate paying and increase user compliance with regulations (like waste separation at a source, littering, etc.).

Local and international financial institutions. Often municipalities, particularly in developing economies, have competing priorities and lack the financial resources necessary for solid waste. In this case, they can obtain loans from international financial organizations (like very active in the waste management field the Inter-American Development Bank, the Asian Development Bank, the World Bank), or local banks. Generally, international lending institutions offer loans at lower interest rates than commercial banks.

A recent study for the ISWA has recorded the contribution of international financial organizations to the financing of solid waste management programs in developing countries. Namely, the greatest amounts (70%) of the donor support have been provided as lending from development banks. The total amount of this financial aid between 2013 and 2022 compiles US $ 2.8 billion. For some middle-income countries, access to capital has been provided in order to develop their municipal solid waste management infrastructure, especially engineering landfills and waste collection. Interestingly, the allocation of loans for solid waste management has been highly uneven. The top-10 recipients of finances for the development of the solid waste management sector are middle-income countries. These countries accepted fat about 2/3 of the grants and loans over US $ 4 million.[6] In general, low-income countries accepted essentially less financial aid: just 10 countries of Sub-Saharan Africa got transfers in the form of loans and grants that compiled more than US $ 4 million (or less than 5% of the total financial aid). The uneven allocation of financial funds is, perhaps, because middle-income countries have better opportunities for accessing and absorbing financial aid for waste management sector development. Nonetheless, this issue has to be investigated more profoundly so as to guarantee that development funds are targeted properly.

DISCUSSION AND CONCLUSION

On balance, studying the issue of costs, we have found the following facts:

[6] In descending order, these are the PRC, India, Morocco, Turkey, Azerbaijan, Vietnam, Venezuela, Ukraine, Tunisia and Argentina.

• Waste management policy is driven by the need to protect or improve public health.

• People are more willing to pay for waste collection than waste disposal because collection is more visible than disposal. Thus, collection is driven by the demand for services and by policy. Recycling and treatment are driven by the market value of materials and by policy. Disposal is solely driven by environmental legislation and policies.

• Total costs are divided into investment costs (CapEx) and operation and maintenance costs (OpEx). In general, CapEx includes project preparation, detailed design, land costs, equipment, construction costs. OpEx includes costs for energy, fuel, labor, maintenance and repair, monitoring, control of emissions, collection of fees, administration and management, and public communication. OpEx accounts for 60–70% of the total costs in well-developed waste management systems.

• CapEx are rather not difficult to benchmark. The lack of data on OpEx is very common. Quite often some important OpEx are not duly calculated or even overlooked. Differences in accountancy between municipalities, different methods used to aggregate data on OpEx and unwillingness to share data complicate the things. It is important to understand OpEx because it influences investments in cost-efficient technologies and improvements in the system as a whole.

• To compare OpEx, we may apply the standardized methodology of collection activity-based cost data. This methodology assumes collection only of the costs exclusively related to a particular waste management activity. To increase data collection, it is recommended to develop the interactive web-based interface.

• It is difficult to determine the total cost of a service, especially in low-income countries, because (a) there may be no separate budget for municipal solid waste management; (b) money comes from various sources (grants, loans, taxes, and fees); (c) costs are borne by multiple parties, making it difficult to keep track of the expenditure.

• It is very difficult for a city in a developing country to get investment funds for municipal solid waste management projects for several reasons: (a) municipal financing is highly limited in the context of growing volumes of waste; (b) struggling cities can't just apply for loans because they are not considered creditworthy by international stock markets; (c) accessibility of donor financing for municipal solid waste management is extremely low if compared to other sectors; (d) donor financing is often restricted to emerging economies; (e) economic downturns limit private funding available for solid waste management.

• CapEx and OpEx are normally financed differently. It is virtually impossible to find donors to meet OpEx. Funding for OpEx can be obtained from national governments, local governments, and users of the service. To ensure sustainability of a solid waste management project (a) OpEx must be planned at the start, (b) a reliable cost-recovery system must be designed.

• Funding CapEx can typically be done by national governments (20%), local governments (at least 50%), partnership with private sector (10–25%), or international donor organizations. Funding CapEx can be in the form of subsidies, grants, loans, taxes, fines, fees, revenues from different activities, and public-private partnership schemes.

• The greatest amount (70%) of the donor support is been provided as lending from development banks. The allocation of loans for solid waste management has been highly uneven across countries. The top-10 recipients of finances for the development of the solid waste management sector are middle-income countries.

• On balance, local government revenues and national government grants can be used as a source of both CapEx and OpEx. Users of the service are a source of OpEx whereas loans from development banks and bilateral donor agencies are sources of CapEx.

Here are some important considerations to keep in mind regarding municipal solid waste management costs. Often, there are many opportunities to reduce costs if operations are optimized. The largest cost efficiencies often come from: (a) staff productivity (reducing overstaffing); (b) cost accounting (recording actual solid waste

management expenditures instead of items such as snow removal, beautification, etc.); (c) fuel efficiency (driving trucks that are full). High cost-efficiency potentials are found in collection and transportation, whereas disposal is typically underfunded. Optimization is extremely important, as many cities are reaching or exceeding affordability benchmarks while at the same time having little or no room to increase tariffs.

Thus, why should we pay for solid waste management services? The economic costs of improper municipal solid waste management to society are essentially higher than the financial costs for waste management programs.

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ORIGINAL PAPER

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The US Dollar as a Prerequisite for the Crisis Potential of the Global Monetary and Financial System

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ABSTRACT

The crisis of the global monetary and financial system based on the US dollar has been the focus of attention of the international academic community for a long time. At the same time, modern research does not sufficiently present a comprehensive approach to studying the causes and consequences of the dysfunctionality of the current international monetary standard. The **purpose** of the paper is to systematize the cause-and-effect relationships of the crisis potential of the global monetary and financial system based on the US dollar as the key reserve currency. Methods of scientific abstraction, system analysis and logical generalization were used. Factors characterizing the crisis potential of the global monetary and financial system are identified: reproduction of global imbalances, chronic capital outflow from countries of the global periphery, growth of global debt and inflation, rupture of global chains and neoprotectionism, destabilization of markets for fuel, raw materials and food products. According to the author, the conservatism of the current international currency standard is due to the lack of real alternatives to the US dollar as international liquidity due to the US control of key institutions and mechanisms of the global financial market. The restrained attitude of the United States towards the need to introduce advanced digital technologies in the sphere of monetary circulation and reluctance to participate in the transformation of the global monetary and financial system reduces the chances of its qualitative reform. It is **concluded** that the main impulses for the de-dollarization of the global monetary and financial system should be the coordinated demands of the IMF member countries to restore the system of multilateral settlements using a wide range of national currencies; large-scale diversification of their investment portfolios by including emerging market assets; coordinated actions of the BRICS+ countries to create innovative mechanisms for international payments based on modern digital technologies.

Keywords: crisis of the global monetary and financial system; U.S. dollar; dedollarization; sovereign default; international investment position; diversification of investment portfolios; payments in national currencies; BRICS+; digital currencies

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INTRODUCTION

The American currency remains the central element of the global monetary and financial system (GMFS) for more than 50 years after the cancellation of its convertibility into gold. At the current stage, the use of the US dollar as a financial-economic weapon and the intensification of geopolitical tensions associated with the formation of new centers of global influence predetermine the irreversibility of the process of transforming the GMFS in the direction of diversifying international reserves and creating alternative international reserve, settlement, and payment mechanisms [1]. Meanwhile, the US' desire to maintain financial power at any cost in the emerging multipolar world is hindering systemic reforms.

In this regard, the greatest risks of GMFS imbalance stem from the growing U.S. national debt, the total amount of which exceeded $ 36.0 trillion in the fourth quarter of 2024.[1] Sanction restrictions are reducing trust in American debt obligations as a primary reserve asset. Meanwhile, high interest rates from the Federal Reserve System (FRS) increase the cost of servicing debt obligations and, consequently, the risks of sovereign default. From March 2022 to July 2023, the Federal Reserve conducted 11 interest rate hikes, increasing the rate from 0.25% to 5.50% during this period. In 2023, the U.S. government spent a total of $ 875 billion on interest payments on the national debt, which is $ 150 billion more than in 2022. About 78% of debt servicing payments are distributed in favor of private investors not affiliated with government federal institutions. Their reaction to the reduction in interest payments due to the easing of monetary policy by the FRS, which began in September 2024, is unpredictable (*Fig. 1*).

Another threat to the destabilization of GMFS comes from the preservation of the key positions of the US in the management of global financial flows. The dominance of the US in key international financial organizations (IFOs) promotes the advancement of the dollar as the currency for international loans and investments. At the same time, due to the limited financial resources available and as a result of adhering to the principles of the Washington Consensus in conducting stabilization policy, the activities of international financial organizations do not provide countries with reliable protection against unilateral manipulations by the US using such levers of the global financial and commodity markets as the Federal Reserve interest rate, credit ratings of the "Big Three" American specialized agencies (S&P, Moody's, Fitch), or pricing on international exchanges, which directly affects the cost of financial and raw materials resources and their availability for all other entities in international economic relations.

Under the current international monetary standard, it is becoming increasingly difficult for sovereign and corporate borrowers to overcome their dependence on American-centric structures of the global financial market. At the same time, the use of the US dollar as a global currency creates a chain of cause-and-effect relationships that characterize the persistent crisis-proneness of the global monetary and financial system, which objectively necessitates the replacement of the US dollar as its central element (*Fig. 2*).

To form a clearer understanding of the causes of the dysfunctionality of the current international monetary standard, let us examine the aforementioned cause-and-effect relationships in more detail.

CRISIS-SENSITIVITY OF THE GLOBAL CURRENCY-FINANCIAL SYSTEM

Permanent Reproduction of Global Imbalances

Within the framework of the modern GMFS, 190 IMF member states interact. However, only the US, as the issuer of the benchmark currency in which the exchange

[1] Debt to the Penny. An official website of the U.S. government. URL: https://fiscaldata.treasury.gov/datasets/debt-to-the-penny/debt-to-the-penny (accessed on 09.11.2024).

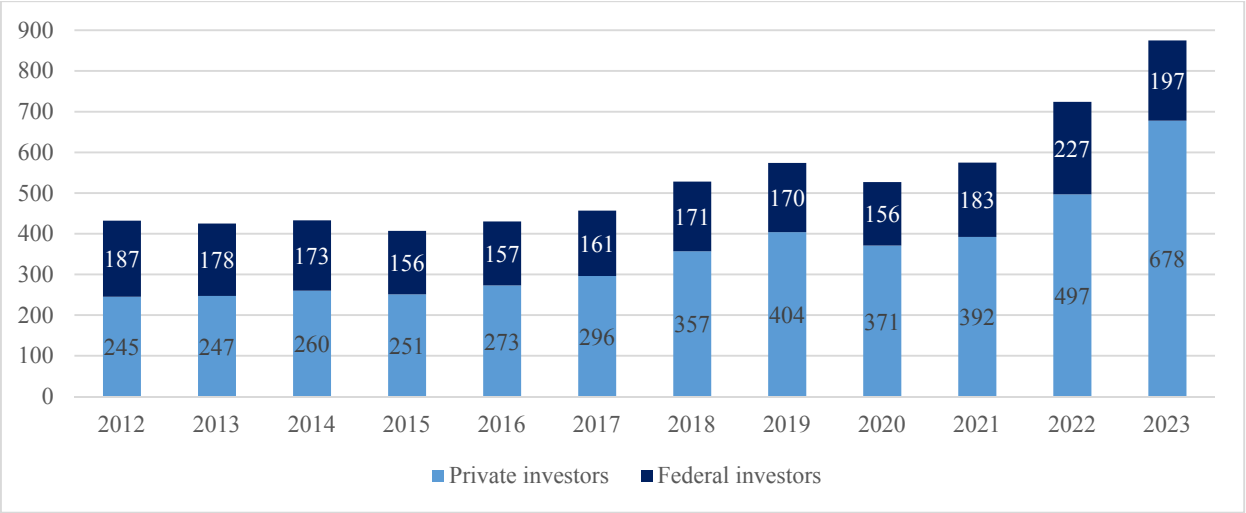

Fig. 1. **Aggregate Interest Expense of the U.S. on Debt Held from 2012 to 2023 (in Billion Dollars)**

Source: Statista. URL: https://www.statista.com/statistics/246439/interest-expense-on-us-public-debt/ (accessed on 10.02.2024).

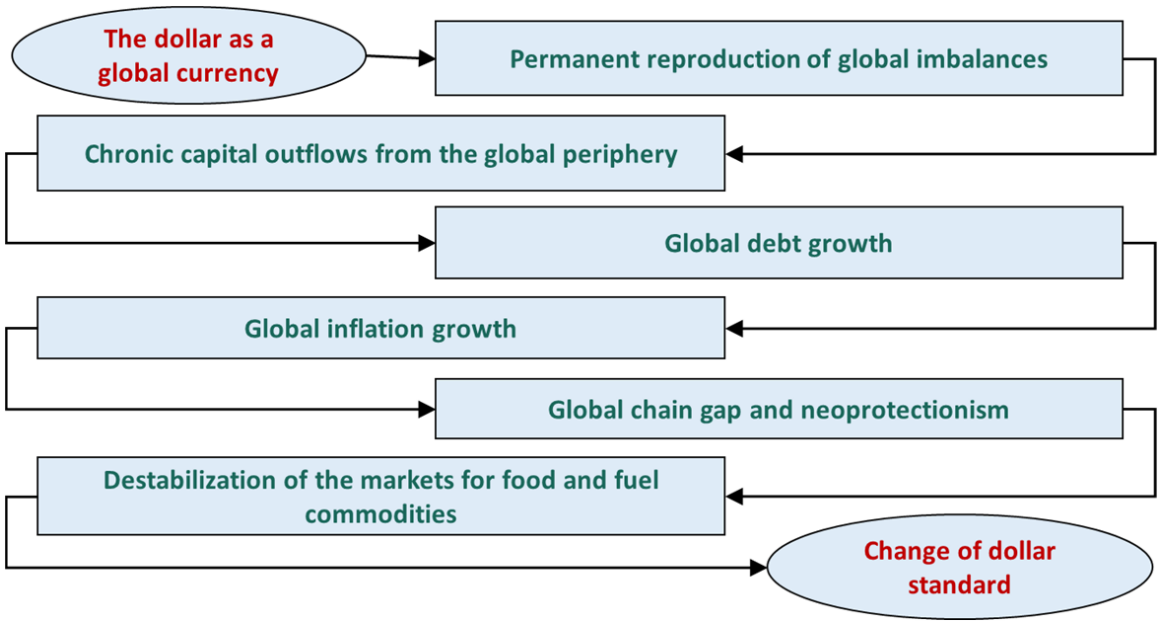

Fig. 2. **Cause-and-effect relationships of the crisis potential of the modern global monetary and financial system based on the U.S. dollar as the key reserve currency**

Source: Compiled by the author.

prices of strategic goods are expressed, international financial assets and official reserves are denominated, and settlements in international trade and payments for servicing external debt are carried out, possess the right to unconditional access to international liquidity. Other countries need to produce competitive products for the international market beyond the needs of their national economies to gain access to dollar liquidity. Especially hard, export dependence affects the economies of developing countries, which, in order to accumulate international reserves, practically transfer part of their national product to the global market without compensation, impoverishing national

consumers by this amount. At the same time, developing countries often cannot utilize available international assets for currency interventions aimed at stabilizing the exchange rate of national currencies due to the disproportion between the size of their economies and the volumes of cross-border flows of global financial capital [2, p. 24–25].

By placing international reserves in highly liquid but *low-yield* financial assets of developed countries (primarily in US dollars), developing countries simultaneously attract borrowed resources on the international capital market through the issuance of *high-yield* debt securities (also predominantly denominated in US dollars). The difference in interest rates that arises between low-yield reserve assets and high-yield debt obligations serves as an additional tool for redistributing part of the national product of countries on the global productive periphery in favor of the financial core of the world economy [3, p. 193–194].

The priority development of the export sector in developing countries and emerging markets at the expense of the stability of the national currency and the development of other strategically important national industries results in a chronic gap in global levels of welfare. Thus, according to the results of 2022, per capita incomes in 41 developed countries were on average 4.4 times higher than per capita incomes in 155 countries with developing and emerging market economies (*Fig. 3*).

Thus, the policy of official international reserve currency under the auspices of the IMF, with the US dollar as the key reserve asset, contributes to the implementation of a model of unequal exchange between the productive periphery and the financial center of the global economy, leading to its gradual destabilization [4].

Increase in the External Financing Imbalance

Currently, the volume of monetary and financial obligations denominated in US dollars exceeds all permissible limits. Analysts tend to downplay the risks of an oversupply of US dollars due to their impeccable performance as credit money and the unwavering attractiveness of American Treasury bonds as a means of placing excess dollar liquidity [5, p. 43]. However, this is precisely where the problem lies. The thing is that against the backdrop of the relative reduction in the savings and consumption imbalance, which has been emerging since the global financial crisis, there is an exacerbation of another global imbalance — external financing. This is well illustrated by the global international investment position (GIIP) in terms of the expansion of global external liabilities, which in 2021 exceeded the size of external assets by 7% — mainly due to the increase in the external debt position of the US, which reached a record 19.47% of the size of the world's GDP (compared to 6.07% in 2012).

If ten years ago the size of the external debt obligations of the US accounted for 36.6% of their global value and was balanced by the external debt obligations of Eurozone countries and other creditors, then in 2021 the share of the US in the global volume of external debt obligations, measured by GIIP, increased to 89.9%. According to IMF forecasts, this ratio will remain in place for at least until 2028 (*Fig. 4*).

This situation means that in 9 out of 10 cases, investors choose the US dollar as the currency for denominating their foreign assets, which increases the risks of destabilizing the global economy. The difference between today's risks and the situation in 2008 lies in the significant reduction in the relative size of international reserves denominated in US dollars compared to the size of global dollar debt. It should be noted that from the third quarter of 2021 to the third quarter of 2022, there was the largest decline in dollar reserves in absolute terms in history, with their size decreasing by 650 billion. From January 2022 to January 2023, the largest decline in the

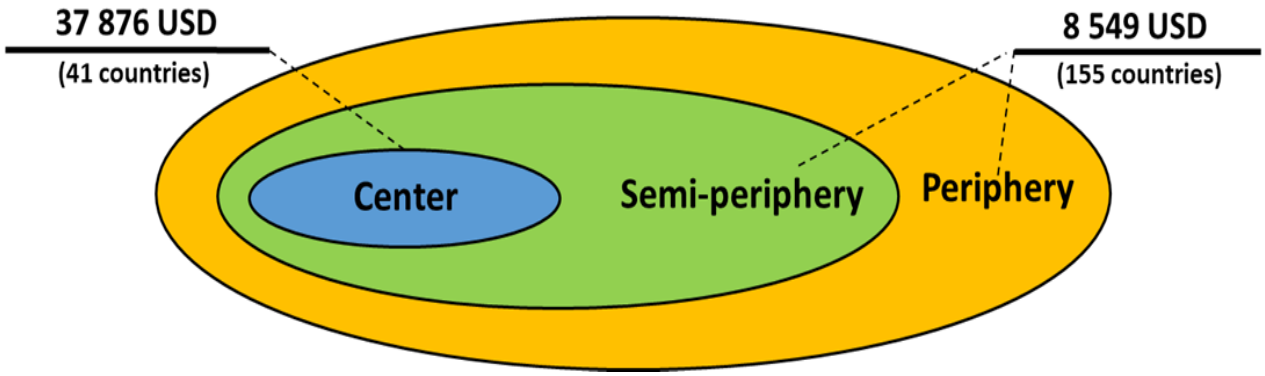

Fig. 3. **Gap in Per Capita Income Between Countries in the Center and Periphery of the World Economy, 2022**

Source: Calculated by the author on the data: IMF. World Economic Outlook Database. URL: https://www.imf.org/en/Publications/WEO/weo-database/2023/October / (accessed on 12.04.2024).

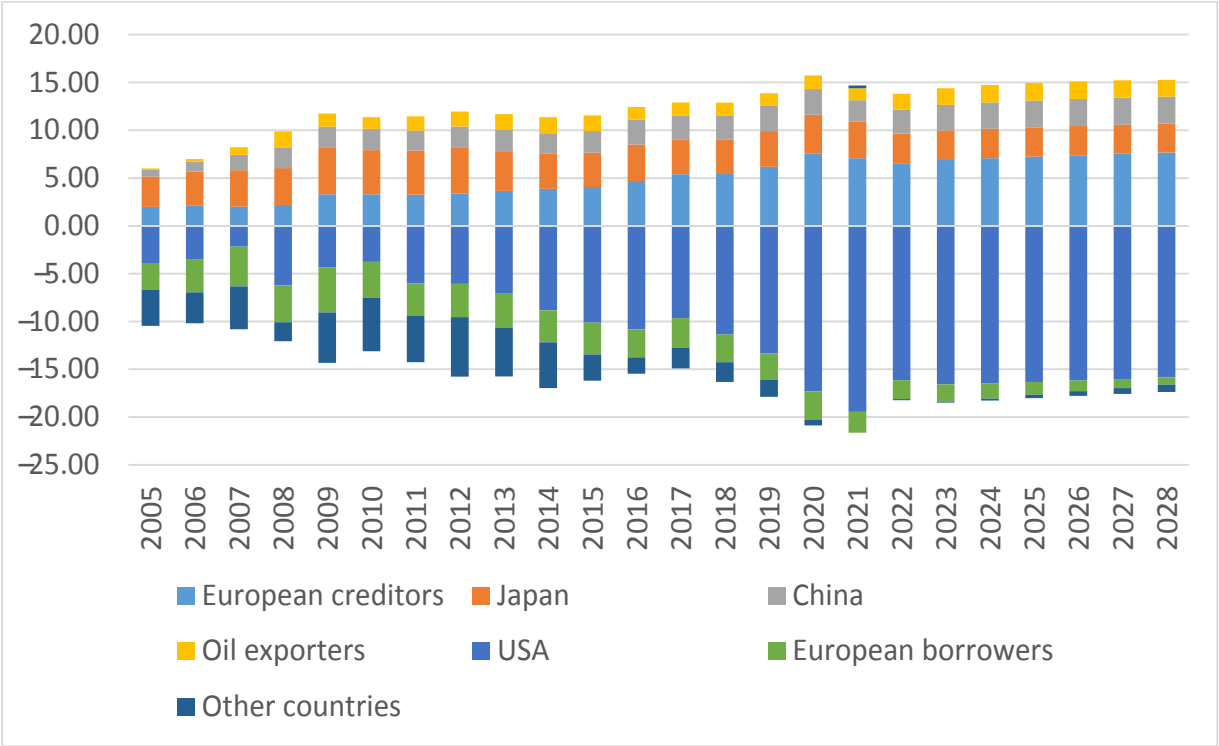

Fig. 4. **International Investment Position (Percent of Global GDP)**

Source: IMF. World Economic Outlook Report October 2023. URL: https://www.imf.org/en/Publications/WEO/Issues/2023/10/10/world-economic-outlook-october-2023 (accessed on 10.02.2024).

portfolio of U.S. Treasury bonds was observed among the following official holders: Japan (–195.5 billion), China (–174.4 billion), Ireland (–55.2 billion), France (–49 billion).[2]

[2] Department of the Treasury. Estimated foreign holdings of U.S. Treasury bills. URL: https://ticdata.treasury.gov/Publish/mfh.txt (accessed on 13.02.2024).

Overall, from March 2020 (the beginning of the COVID-19 pandemic) to December 2022, the share of foreign holders of U.S. Treasury securities in the total portfolio of private investors in U.S. government debt decreased from 48% to 38%, indicating a gradual loss of international investment attractiveness of U.S. government bonds.

Chronic Capital Outflow from Global Peripheral Countries

The predominant placement of international reserve and investment assets in US dollars leads to a permanent revaluation of its exchange rate against the currencies of the US trading partners, which increases global inflation. Given the underdevelopment of national currency markets and the insufficient volume of foreign exchange reserves in most developing countries, the risks of a sharp capital outflow, the sale of assets in the national currency, and the subsequent deterioration of the macroeconomic situation increase during crises.

Studies by the Federal Reserve on the impact of the COVID crisis on the economies of emerging market countries have demonstrated a direct link between capital outflows from these countries and the depreciation of their national currencies against the US dollar [6]. Thus, during the four-week period of the COVID shock, the US dollar exchange rate rose by almost 7% against the currencies of emerging markets. At the peak of the crisis in mid-March 2020, the size of the global portfolio of assets managed by investment funds was falling by approximately 1.5% per week, while the size of assets in the form of debt obligations was decreasing by more than 4.5% per week, which exceeded the rate of portfolio contraction during the global financial crisis in October 2008 [7].

Thus, every time the global economy is subjected to a crisis impact, emerging markets experience macroeconomic shocks accompanied by capital outflows, which further destabilize global economic processes due to the almost insurmountable dependence of developing countries on the import of strategic goods and refinancing in international financial markets.

Growth of Global Debt

The extraordinary volatility of the US dollar as a global currency leads to increased costs for other countries in the form of imported inflation, the conclusion of expensive risk hedging contracts, and rising expenses for servicing external debt. This problem is particularly acute for the developing countries of Latin America and the Caribbean (LAC), which, since the debt crisis of the 1980s, have been forced to continuously increase their external debt burden to counteract the aforementioned issues, without the possibility of stabilizing the state of their national economies in the long-term [8].

The financing of chronic budget deficits primarily through new government borrowings amid unstable economic growth rates in 2020 resulted in the declaration of defaults on government bonds in Ecuador, Argentina, Belize, and three times in Suriname. The economies of Venezuela, Brazil, El Salvador, and Mexico[3] are also exposed to insolvency risks, as evidenced by the restructuring of debt obligations amounting to over $ 80 billion within a year after the onset of the pandemic.[4]

To cover increasing budget deficits and finance current expenditures against the backdrop of low global interest rates and borrowing costs, in 2021, sovereign and corporate borrowers from LAC countries issued bonds on the international debt market for a historically record amount of $ 149 billion. In the currency structure of external debt obligations of LAC countries, the US dollar traditionally predominates, with its share in 2021 issuances amounting to 81.1%, and reaching 92.0% in January-April 2022.[5] The subsequent increase in

[3] White & Case. Sovereign debt restructurings in Latin America: a new chapter. 25.10.2021. URL: https://www.whitecase.com/publications/insight/latin-america-focus/sovereign-debt (accessed on 13.02.2024).

[4] Six sovereign defaults in 13 months roil Latin American ma rkets. Bloomberg. 12.05.2021. URL: https://www.bloomberg.com/news/articles/2021–05–12/six-defaults-in-13-months-upend-latin-america-s-bond-market (accessed on 12.02.2024).

[5] Economic Commission for Latin America and the Caribbean. Capital flows to Latin America and the Caribbean 2021 year-in-review and first four months of 2022. P. 29. URL: https://www.cepal.org/sites/default/files/news/files/22–00485_was_-_capital_flows_2021_year_in_review_web.pdf (accessed on 12.02.2024).

the cost of financing international loans, driven by a strong dollar and the tightening of monetary policy by the FRS, is further exacerbated by investors' distrust of the debt obligations of Latin American borrowers due to insufficiently high economic growth rates in the region.

Thus, considering the strategic importance of Latin American countries as suppliers of key raw materials to the global market, the uncontrolled growth of their debt obligations denominated in US dollars increases the risks of a repeat global debt crisis [9].

Global Inflation Growth

The devaluation of national currencies in emerging markets and developing countries leads to an increase in imported inflation on fuel, raw materials, and food products, the global prices of which are denominated in US dollars. According to the IMF, "in 2022, inflation in advanced economies reached its highest level since 1982, ... and in emerging market and developing economies since 1999".[6] The acceleration of inflation followed the massive liquidity injection by the central banks of developed countries to overcome the imbalance between supply and demand caused by disruptions in global supply chains in the second half of 2020 [10].

As a result of the sharp tightening of monetary policy by leading central banks, by the end of 2023, a steady decline in inflation was observed (down to 3.4% in the US and EU and 4% in the UK). The IMF predicts that global inflation will steadily decline: from 8.7% in 2022 and 6.8% in 2023 to 5.8% in 2024 and 4.3% in 2025. However, the inflation in leading developed countries exceeding the 2% target indicates serious failures in the monetary policy of central banks — the issuers of key reserve liquidity.

Disruption of Global Supply Chains and Neoprotectionism

After the global financial crisis (GFC), the United States embarked on a path of neo-protectionism. According to the Chairman of the U.S. Federal Reserve, B. Bernanke, the GFC was caused by the excessive pumping of the U.S. economy with surplus savings from the rest of the world (global saving glut), primarily originating from China. As early as 2007, the Foreign Investment and National Security Act was passed, which restricted the inflow of foreign investments into strategic sectors of the American economy. However, the U.S.-China trade wars truly ignited after D. Trump took office, having called China a "currency manipulator" in his campaign speech. During his second presidential campaign, D. Trump expressed his intention to increase the import duty on Chinese goods from 25% to 60%. Although under the administration of D. Biden, the trade deficit in goods between the US and China had already decreased to its lowest level since 2010 in 2023.[7]

The positions of the China as an emerging superpower have been fundamentally shaken by the COVID crisis, which has led to a significant slowdown in the growth rate of the Chinese economy. The COVID-19 pandemic accelerated the trend of decreasing interdependence between the economies of the United States and China.[8] The decision by the United States to exclude Chinese companies from its 5G networks, the ban on exporting American semiconductor technologies to China (imposed by the White House administration on all leading global chip manufacturers), and the reduction of dependence on Chinese imports of pharmaceuticals and medical supplies have strengthened the resolve of Chinese

[6] IMF. World Economic Outlook. Confronting the cost of living crisis. October 2022. P. 4. URL: https://www.imf.org/ru/Publications/WEO/Issues/2022/10/11/world-economic-outlook-october-2022 (accessed on 12.02.2024).

[7] Trump's favorite metric has Biden winning the US-China trade war. Bloomberg. 06.02.2024. URL: https://www.bloomberg.com/news/articles/2024–02–06/trump-s-favorite-metric-has-biden-winning-the-us-china-trade-war (accessed on 12.02.2024).

[8] Lowy Institute. US-China Competition. URL: https://interactives.lowyinstitute.org/features/covid19/issues/us-china/ (accessed on 12.02.2024).

politicians to achieve greater independence in advanced technology sectors. The rise of xenophobia in China and anti-Chinese prejudices in the United States may further limit their economic interaction and China's participation in global supply chains.

Destabilization of Fuel, Raw Materials, and Food Markets

Hypervolatility of fuel, raw materials, and food prices is yet another risk of destabilizing the economies of developing countries, which are respectively dependent on the import or export of strategic resources. Despite this, the coalition of Western countries led by the US exacerbated this risk by imposing unprecedented sanctions against Russia, one of the largest exporters of raw materials. Initially, the sanctions triggered a sharp rise in commodity prices, followed by an equally sharp decline, caused both by the imposition of an embargo and the establishment of a price cap on the import of Russian energy resources by the EU and G7 — a reaction to Russia's special military operation in Ukraine. During the years 2020–2023, on global commodity exchanges, the prices of benchmark oil brands — American WTI and European Brent — fluctuated in the range of $ 21 to $ 125 per barrel, and the price of a bushel of wheat ranged from $ 473 to $ 1175.

Meanwhile, Western sanctions against Russia have had a destabilizing effect not so much on Russia itself, but on other countries around the world, causing disruptions in supply chains, rising food prices, increased costs for production resources, a slowdown in the manufacturing sector, and a deceleration of economic growth, which has particularly severely impacted low-income countries.

However, as noted above, under the current currency standard, crises on the periphery of the global economy increase the demand for international liquidity expressed in US dollars, which allows the US to significantly shift the financing of its foreign policy costs onto the rest of the world.

TRANSFORMATIONS OF THE CURRENCY STANDARD

The current international monetary standard has plunged the global economy into a peculiar state of "Stockholm syndrome", where the "hostage" countries find themselves unable to abandon the dollar as the world currency, despite the increasing costs of unequal exchange. However, despite the American currency performing universal functions to meet the growing demands of the global consumer society, the current status quo is vulnerable to the influence of the following circumstances.

Firstly, the freezing of Russia's international reserves, which are the seventh largest in the world, raises the question of a qualitative change in the strategy of accumulating reserve assets [11] and returns the world to the original logic of creating the IMF as an institution designed to facilitate multilateral transactions between countries in their own currencies [12]. After all, despite the expansion of the IMF's credit program lineup, about 70% of the Fund's available borrowing resources remain unutilized in servicing global financial flows [13, p. 111]. The unpredictability of U.S. foreign economic policy is strengthening the trend of diversifying currency reserves through assets from developing countries, primarily Chinese ones. This is also facilitated by the expansion of strategic Russian-Chinese economic cooperation, outlined following the state visit of the Chairman of China, Xi Jinping, to the Russian Federation in March 2023,[9] as well as the increase in the use of the yuan and the ruble in foreign economic transactions.[10]

Secondly, the development of the crypto-assets market, which ensures financial

[9] Joint Statement by the President of the Russian Federation and the Chairman of the People's Republic of China on the Plan for the Development of Key Areas of Russian-Chinese Economic Cooperation until 2030. 20.03.2023. URL: http://kremlin.ru/supplement/5919 (accessed on 27.03.2023).

[10] The yuan and the ruble have for the first time accounted for half of Russia's export transactions. RBC Finance. 09.03.2023. URL: https://www.rbc.ru/finances/09/03/2023/6409deb29a7947280bbc1758 (accessed on 26.03.2023).

inclusivity for the broadest segments of the population even without the need to improve their financial literacy, is gaining increasing popularity in the global economy [14, p. 227]. On the one hand, crypto assets may be subjected to strict regulation to avoid causing extreme speculative impacts on the functioning of financial markets. On the other hand, they encourage central banks to adopt a more proactive policy in implementing modern digital technologies in the field of monetary circulation. In the US itself, regulators are thwarting significant attempts to undermine the authority of official monetary authorities through initiatives from the private high-tech sector and are skeptical about the idea of introducing digital currency. Meanwhile, European and Asian central banks are gradually joining forces to develop projects for the use of central bank digital currencies to service cross-border trade and currency operations [15, 16].

Thirdly, taking into account the expansion of the official BRICS group composition from January 2024 and the prospects of new member countries joining, one should expect an intensification of efforts by BRICS+ participants to develop innovative approaches to mutual settlements and payments in national (collectively created) currencies, as well as to accelerate work on creating new mechanisms for international settlements based on modern digital technologies [17, p. 41]. A peculiar indicator of the potential reduction in the dollar dependency of BRICS+ countries in foreign economic activities could be the progress in China's use of its own digital currency for international settlements and payments [18].

CONCLUSION

The sustainability of the dollar-centric model of the GMFS is due to the lack of real alternatives to the US dollar as a global currency, the demand for which increases during financial crises occurring both in the US itself and on the global periphery. The prolonged dominance of the US dollar as the monetary axis of the modern GMFS system is due to a multitude of factors, among which a special role is assigned to American institutions that mediate the movement of global financial flows.

In the context of implementing ambitious global foreign policy goals, the dollar is increasingly being used as a financial-economic weapon aimed at weakening major competitor countries, which exacerbates the crisis potential of the current international monetary standard and preserves numerous risks of destabilizing the global economy. The negative consequences of using the US dollar as the key global currency include: the reproduction of trade and financial imbalances, chronic capital outflows from global peripheral countries due to the revaluation of the US dollar exchange rate against the currencies of major trading partners, the growth of global debt and prices, currency wars and the disruption of global value chains, as well as neoprotectionism and the destabilization of fuel, raw materials, and food markets.

The need to protect the global economy from the risks of excessive use of the US dollar and the emergence of alternative international settlement technologies related to the development of the digital economy leads to the emergence of numerous initiatives aimed at the gradual de-dollarization of foreign economic activities. However, the successful transformation of the dollar-centric GMFS standard largely depends on the coordinated demands of IMF member countries to restore the status of GMFS as a system of multilateral settlements using a wide range of national currencies; the implementation of large-scale diversification of their investment portfolios by including assets from emerging markets; and the coordinated actions of BRICS+ countries in creating a new mechanism for international settlements using modern digital technologies.

Undoubtedly, the issue of replacing the US dollar cannot be viewed simplistically. Most likely, the American national currency will continue to be used as global money in the familiar technological format for a long time. In fact, the demonetization of gold was not instantaneous; it took place over more than six decades (1914–1978). However, to outline the contours of the new global monetary order, it is first necessary to have a clear understanding of the main driving forces behind the transformation of GMFS.

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Bond Parameters and Economic Instability

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ABSTRACT

During periods of economic crises, investment activity decreases. The growth of yields on the securities market, typical for such periods, is unprofitable for issuers. Fluctuations in interest rates and general instability in the economy favor mainly short-term investments of investors. Issuers construct bond parameters that help attract investors and reduce risks. **The purpose** of this work is to consider the behavior of some controlled parameters of the bond during periods of instability, to obtain mathematical evidence of the dependence of the duration and price of the bond on the frequency of coupon payments and to justify the possibility of considering the frequency of coupon payments as a parameter that reduces the risks of the investor and the issuer. **Methods** of differential calculus are used to obtain evidence. **The novelty** of the work consists in the fact that the proofs obtained in the work are not available in the literature. The **results** are obtained for bonds that do not have credit risk. It has been established that with an increase in the number of coupon payments per year at fixed values of the main parameters, the duration of the bond decreases, and the price increases. The proven statements about the behavior of the duration and the price of the bond are consistent with market observations. A decrease in the duration of the bond with an increase in the number of coupon payments per year means a decrease in the "real term" and a decrease in the interest rate risk of the bond, which may be of interest to the investor. The price increase indicates an increase in demand for bonds with an increase in the number of coupon payments per year and the possibility of increasing the issuer's income. The **relevance** of the work lies in the fact that the conditions for economic instability in Russia and in the world remain and the results of the work may be of interest to participants in the bond market. Conclusions: the paper shows that an increase in the number of coupon payments per year contributes to an increase in the attractiveness of bond issuance for both investors and issuers. **Conclusions**: the paper shows that an increase in the number of coupon payments per year contributes to the growth of the attractiveness of a bond issue for both investors and issuers. **Practical significance** of the work: the results of the work can be useful for investors and issuers, financial engineering specialists in the design of bond parameters, as well as in theoretical studies of the investment properties of bonds.

Keywords: mathematical methods; coupon bond; frequency of coupon payments; bond duration; bond price

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INTRODUCTION

Periods of economic difficulties and crises are characterized by instability, rising interest rates, and inflation. In conditions of stable economic development, the bond market is an important component of the country's economy, where all market participants earn income. However, during periods of instability, the bond market is perceived as risky by both investors and issuers. Activity in the primary bond market is slowing down [1]. After the key rate was raised by the Bank of Russia in 2014 and 2021, previously purchased fixed-income securities significantly lost value, and many investors left the market. First-tier issuers have reduced their presence in the market.[1]

Nevertheless, in conditions of instability, bonds are considered the most reliable instrument for preserving funds and financing the development of the country's economy [2–4]. Indeed, the fixed stream of payments from bonds reduces the level of uncertainty and risk for investors. According to studies [5, 6], bonds can pose good competition to deposits. According to the internet resource,[2] during periods of instability, the growth of interest rates on bank deposits always lags behind the growth of interest rates on bonds, which helps attract a certain segment of investors to the bond market. On the other hand, issuers also show interest in issuing bonds as a more advantageous way to attract borrowed funds compared to loans during such periods [1, 2]. The issuance of government bonds, such as government loan bonds (OFZ —abbreviation for Russian), during periods of instability helps the government address budget deficit coverage issues by attracting the savings of the Russian population, which are generally significant [3]. According to the Ministry of Finance of the Russian Federation, in 2023–2025, domestic borrowings will be the main source of financing the budget deficit.[3] As we can see, during periods of economic instability, bonds remain a sought-after financial instrument.

As already noted, during periods of instability, the bond market is perceived by market participants as risky. For issuers, the problem of attracting investors becomes more complicated. Financial engineering is working on constructing bond parameters that ensure increased issuance attractiveness and reduced risks for both the issuer and the investor. According to [7], the goal of financial engineering in the bond market is to construct bond parameters such that the generated cash flows most closely align with the primary interests of the issuer, while maximizing the investment attractiveness of the product. This goal is achieved through the reasoned selection and careful construction of each individual bond parameter.

As indicated by the works on financial engineering [7, 8], the maturity period of a bond and the coupon rate are the main controllable parameters of a bond. The payment frequency parameter, which is secondary, is also manageable. Let's consider the principles of financial engineering in relation to these parameters.

According to [7], the maturity period (urgency parameter) is a managed parameter that must ensure the interests of both the issuer and the investor are met. The main requirement for this parameter is that the maturity period must align with market conditions. The term of a bond can be either fixed or variable, where investors or the issuer have the right to demand early redemption of the bond (bonds with embedded call or put options). The more stable the situation, the more widespread fixed-term bonds become.

[1] The bond market in 2021: overcoming instability. URL: https://www.raexpert.ru/docbank/804/304/9a1/b6c6cf48add84b022b4906e.pdf (accessed on 27.08.2024).

[2] The bond market in 2021: overcoming instability. URL: https://www.raexpert.ru/docbank/804/304/9a1/b6c6cf48add84b022b4906e.pdf (accessed on 27.08.2024).

[3] Bond market: high volatility amid significant uncertainty. Overview of the ruble bond market for 2022: RF Ministry of Finance policy on the primary OFZ market. P. 33. URL: https://rusbonds.ru/rb-docs/analytics/240123_2022.pdf?ysclid=lkmovldjp0985661739 (accessed on 27.08.2024).

The coupon rate is the interest rate paid by the issuer to the investor periodically until the bond matures as a reward for the debt. This is a managed parameter that allows for the management of risks for both the investor and the issuer [7, 8]. The main requirement for this parameter is compliance with the current market situation, i.e., the size of the coupon income must correspond to the current yield of similar obligations. The coupon rate can be either fixed or variable, with the rate being adjusted according to changing market conditions. The issuance of fixed-rate bonds is advisable in the case of short- or medium-term issues [7]. The size of the coupon is determined by a number of factors: general market conditions for debt obligations of this term, the creditworthiness of the issuer, the tax status of the issuance, and the cost of collateral to support the issuance [8].

According to [7, 8], the parameter of payment frequency, i.e., the number of coupon payments per year, affects the investment attractiveness of a bond, as it essentially determines the frequency with which investors receive interim payments on the bond. The main principle regarding this parameter is the alignment of the coupon income payment frequency and its period with those accepted in the market. According to [9], as a rule, interest on bonds is paid every six months. In some cases, the interest payment interval is reduced to one month, and very rarely, the payment is made once a year. In bond loans of Russian issuers, the duration of the coupon period most often applied is 3 and 6 months. The author of work [7] notes the importance of this parameter specifically in the Russian bond market: in developed markets, where a significant number of instruments are traded, this factor is not as significant, however, in Russian conditions, with relatively low volumes of bonds in circulation, it can be of great importance [7, p. 57].

BOND PARAMETERS AND RISKS

For an investor, two main types of risks associated with bond investments are identified: credit risk (the risk of the issuer's insolvency) and interest rate risk (the risk of rising interest rates leading to a decrease in bond prices) [10]. According to market research on the risk factors of bond investments [11–14], parameters such as the maturity period and coupon rate of bonds are risk factors for investors. Let's consider what types of risks these parameters are associated with for the investor.

The maturity period is a key characteristic of a bond [15]. This is the period after which the borrower is obliged to fully repay the borrowed amount. According to the results of studies [11–14], the potential for greater risks generally arises with long-term investments. This greater potential risk is due to the exposure of bonds to interest rate risk, i.e., the risk of changes in interest rates and, consequently, the risk of changes in prices. Moreover, the changes in prices are greater the longer the maturity period. In the paper [16], a mathematical proof of the dependence of bond interest rate risk on the maturity period is presented. It has been shown that the interest rate risk of short-term bonds is lower compared to long-term bonds, which is consistent with market observations. According to [11–14], the shorter the maturity period of bonds, the more attractive they will be to investors, as they are considered to have lower risk. Long-term investments are associated with the risk of uncertainty, especially during periods of instability, which exposes the investor not only to interest rate risk but also to default risk, liquidity risk, and reinvestment rate risk [17, 18].

According to [8, 11, 12], the coupon rate serves to determine the level of attractiveness of bonds from the investors' perspective. It is considered that the higher the coupon rate, the more attractive the bond will be for investors. However, as noted in [12], it is often overlooked that a high coupon also indicates

relatively low bond quality, which must be compensated by high coupon rates. According to observations [11, 12], bonds that promise higher coupons generally prompt investors to demand a higher yield to maturity, that is, an increase in the risk premium. Thus, a high coupon rate may indicate the presence of default risk. The main adverse factors that a high coupon rate may indicate are a low credit rating of the issuer, a high tax on bond income, the presence of a call option in the bond structure, and reinvestment rate risk [8, 17].

Let's consider how market participants manage bond parameters to mitigate risks during periods of instability. As already noted, periods of economic instability are characterized by inflation, an increase in the key interest rate, and bond market yields, which means that bonds are exposed to interest rate risk. The rise in rates in the bond market increases the default risks for some companies, which leads to an increase in credit risk in the bond market. For an investor, both types of risk, credit and interest rate, become real during periods of instability, which is why investors prefer short-term investments. According to [17], bonds with an embedded put option may be of interest to investors in a rising interest rate environment.

From the issuers' side, strategies in this situation are formulated approximately as follows:[4] regularly make small-volume issues for a term of 1.5–3 years, now, when rates have increased, we are making shorter issues. As we can see, the strategies of issuers during periods of instability correspond to the principle of financial engineering in forming the maturity parameter — aligning the bond's maturity with market conditions. According to [7, p. 43], in the context of general instability, long-term instruments will either not be redeemed at all or will be acquired at a deep discount.

As we can see, in periods of instability, market participants prefer short-term borrowings and investments. According to the study,[5] in 2021, during the period of rising key interest rates by the Bank of Russia and yields in the bond market, issuers sharply reduced their activity in the long-term bond market. Long-term placements are postponed in case of an unstable market situation [1, p. 104]. A similar conclusion was made in the work [18] based on the results of studies of the U. S. Treasury bond market during two major crises — the global financial crisis of 2007–2009 and the onset of the COVID-19 pandemic in early 2020: in times of crisis, the demand for short-term U. S. Treasury bonds increases, and there is a sharp rise in short-term portfolio debt.

Let's consider how the issuer manages the coupon size to attract investors. According to [8], any factor that increases financial losses and the level of investor uncertainty raises the coupon size. Conversely, the more secure the position of bondholders, the lower the coupon rate can be for the issuance to be successful. The presence of collateral and the convertibility of the bond can attract investors, which reduces the coupon rate required to sell the instrument. The callability of a bond is unattractive to investors, and therefore, to sell the instrument, the issuer increases the coupon yield.

As already noted, when constructing a bond, the coupon size is set according to the principle of adequacy of coupon income to market conditions for comparable debt securities. Therefore, the size of the coupon rate characterizes not only the issuer but also the market. Bonds issued during periods of instability may have an increased coupon rate in line with market yields during such periods, which is advisable for short-term issues to attract investors. In the case of long-term bond placements with a higher coupon rate, the issuer bears the risk of paying larger amounts relative to market rates [7]. Moreover, a high coupon rate

[4] The bond market in 2021: overcoming instability. URL: https://www.raexpert.ru/docbank/804/304/9a1/b6c6cf48add84b022b4906e.pdf (accessed on 27.08.2024).

[5] See ibid.

reduces the interest rate risk of the bond, which can also attract investors during periods of instability.

As we can see, the bond's maturity period and coupon rate are managed parameters that the bond issuer uses to attract investors and reduce risks.

It can be assumed that during periods of instability, the frequency of coupon payments becomes another risk factor for bonds with unreliable credit ratings, alongside the maturity period and coupon rate. The authors [7, 8, 19, 20] note the importance of this parameter in constructing issues that are attractive to investors, including in conditions of economic instability [4]. According to [4, 7], to attract investors in conditions of instability, it is more justified to issue bonds with a coupon period of 3 months, which is the shortest period accepted in the Russian market.

This article examines the issues related to the impact of the frequency of coupon payments, i.e., the number of coupon payments per year, on the values of duration and the price of a risk-free bond. These are OFZ bonds on the Russian bond market or Treasury bonds on the US market. The price and duration of a bond are the most important indicators of its investment properties, which are of primary interest to the investor alongside the yield to maturity [21–23]. Differential calculus methods are used to solve the problems. The yield to maturity of a bond is considered in the form of an effective interest rate, as it is more accurate in these studies [24]. Based on the obtained results, the frequency of coupon payments is proposed to be considered as a parameter that allows reducing the risks for both the investor and the issuer.

MATERIALS AND METHODS

The tasks concerning the impact of coupon payment frequency on the values of duration and bond price are being considered. The bond has no embedded options, is fairly valued, and has no credit risk.

Let D_m and P_m — be the duration and quoted price of a bond, with coupon payments made m times a year, $m = 1, 2,\ldots$. The bond is considered at the moment immediately after the coupon payment, when there are T years and n coupon payments ($n = Tm$), remaining until maturity, with $T > 1$ (otherwise if $m = 1$ the bond is not a coupon bond). We will consider the duration D_m and price of the bond P_m as functions of the number of coupon payments per year m, for a given term to maturity T, the coupon rate f and the yield to maturity r. The influence of the parameter m on the magnitude of the duration D_m and the bond price P_m we will study by differentiating the functions D_m and P_m with respect to the variable m. Differentiation with respect to an integer variable is applied in the study of the investment properties of bonds. For example, in the papers [16, 25, 26].

Let's consider the expressions for the functions D_m and P_m. By definition:

$$D_m = \frac{\sum_{i=1}^{Tm} \frac{i}{m} \cdot \frac{\frac{1}{m} fA}{(1+r)^{\frac{i}{m}}} + T \cdot \frac{A}{(1+r)^T}}{\sum_{i=1}^{Tm} \frac{\frac{1}{m} fA}{(1+r)^{\frac{i}{m}}} + \frac{A}{(1+r)^T}},$$

where A — bond face value. This expression transforms into the form:

$$D_m = \frac{\frac{f}{m^2}(1+r)^{\frac{1}{m}}\left((1+r)^T-1\right)-T\left((1+r)^{\frac{1}{m}}-1\right)\left(\frac{f}{m}-\left((1+r)^{\frac{1}{m}}-1\right)\right)}{\left((1+r)^{\frac{1}{m}}-1\right)\left(\frac{f}{m}\left((1+r)^T-1\right)+(1+r)^{\frac{1}{m}}-1\right)},\ m=1,2,\ldots. \quad (1)$$

Expression (1) was used to study the dependence of bond duration on the parameter *m*.

Let's consider the expression for the function P_m. By definition:

$$P_m = \sum_{i=1}^{Tm} \frac{\frac{1}{m}fA}{(1+r)^{\frac{i}{m}}} + \frac{A}{(1+r)^T}.$$

This formula transforms into the form:

$$P_m = Af\left(1-\frac{1}{(1+r)^T}\right)\beta(m)+\frac{A}{(1+r)^T},\ m=1,2,\ldots, \quad (2)$$

where

$$\beta(m)=\frac{1/m}{(1+r)^{\frac{1}{m}}-1}.$$

Expression (2) was used to study the dependence of the bond price on the parameter *m*. In formulas (1) and (2), the yield to maturity of the bond *r* is defined using the effective interest rate method [15, 24].

In the paper of A. Gerard and Cahill[6] an analysis of the yields of U.S. Treasury bonds over nearly 200 years is presented. The author reports: during this period, the country experienced the Civil War, two world wars, the Great Depression, and periods of rapid prosperity. Nevertheless, the average yield of 4.62% appears reasonably close to today's market yield. Thus, in formulas (1) and (2), the bond yield *r* represents a sufficiently small value, which allows for the use of approximate equalities in obtaining proofs.

RESULTS AND DISCUSSIONS

Theorem. With fixed values of the main parameters of the bond — the term to maturity *T*, where $T>1$, the coupon rate *f* and the yield to maturity *r*, the following statements are true:

1. The sequence $\{D_m\}$ is decreasing.
2. The sequence $\{P_m\}$ is increasing.

Proof. 1. $\{D_m\}$ — this is a numerical sequence in which the sequence member number *m* coincides with the number of coupon payments in a year. Let's use the following notation: $a(m)=(1+r)^{\frac{1}{m}}-1$, $b=(1+r)^T-1$. Then formula (1) transforms into the form:

$$D_m = \frac{\frac{f}{m^2}b\left(a(m)+1\right)-Ta(m)\left(\frac{f}{m}-a(m)\right)}{a(m)\left(\frac{f}{m}b+a(m)\right)}.$$

[6] Gerard A. Cahill. Choosing a realistic discount rate. URL: http://www.cfin.ru/finanalysis/invest/realistic_disc.shtml (accessed on 27.08.2024).

The derivative of this function with respect to the variable m has the form:

$$D_m' = \frac{1}{B^2}\left[-\frac{f^2b^2}{m^4}a(m)\big(a(m)+1\big)-\frac{2fb}{m^3}a^2(m)\big(a(m)+1\big)-\frac{f^2b^2}{m^3}a'(m)-\right.$$

$$\left.-\frac{fb}{m^2}a(m)a'(m)\big(a(m)+2\big)+\frac{Tf}{m^2}a^3(m)(b+1)+\frac{Tf}{m}(b+1)a^2(m)a'(m)\right],$$

where B^2 — the square of the denominator of the function D_m, $a'(m) = -\frac{1}{m^2}(1+r)^{\frac{1}{m}}\ln(1+r)$.

We use approximate equations:

$$a(m) = (1+r)^{\frac{1}{m}} - 1 \approx \frac{r}{m},\ b = (1+r)^T - 1 \approx rT,$$

$$\ln(1+r) \approx r,\ a'(m) = -\frac{1}{m^2}(1+r)^{\frac{1}{m}}\ln(1+r) \approx -\frac{r}{m^2}\left(1+\frac{r}{m}\right).$$

Then we will get:

$$D_m' \approx \frac{1}{B^2}\cdot\frac{r^5}{m^6}fT\left(\frac{1}{m}-T\right) < 0,$$

since $m \geq 1$, $T > 1$. This means that the duration of the bond is a decreasing function of the parameter m. Then

$$D_m > D_{m+1},\ m = 1,2,\ldots,$$

— the sequence $\{D_m\}$ is decreasing. Let's note that this result does not depend on the coupon rate. The limit of the sequence $\{D_m\}$ is:

$$\lim_{m\to\infty} D_m = \frac{f\big((1+r)^T-1\big)-T\ln(1+r)\big(f-\ln(1+r)\big)}{\ln(1+r)\Big(f\big((1+r)^T-1\big)\ +\ \ln(1+r)\Big)}. \tag{3}$$

Since $\lim\limits_{m\to\infty} D_m = \inf\{D_m\}$, then $D_m \geq \lim\limits_{m\to\infty} D_m$, $m = 1,2,\ldots$. The statement is proven.

2. Let's now consider the problem of the dependence of the quoted bond price P_m on the number of coupon payments per year m. Let's show that the sequence $\{P_m\}$ is increasing.

$\{P_m\}$ — this is a numerical sequence in which the sequence member number m coincides with the number of coupon payments per year. According to the formula (2),

$$P_m = Af\left(1-\frac{1}{(1+r)^T}\right)\beta(m)+\frac{A}{(1+r)^T},\ m = 1,2,\ldots,$$

where $\beta(m) = \frac{1/m}{(1+r)^{\frac{1}{m}}-1}$. We differentiate the function P_m to the variable m:

$$P'_m = Af\left(1-\frac{1}{(1+r)^T}\right)\beta'(m),$$

where

$$\beta'(m) = -\frac{(1+r)^{\frac{1}{m}}}{m^2\left((1+r)^{\frac{1}{m}}-1\right)^2}\left[1-(1+r)^{-\frac{1}{m}}-\frac{1}{m}\ln(1+r)\right].$$

The sign of the derivative $\beta'(m)$ is determined by the sign of the expression in the square brackets. The expression in square brackets is a function of the form $\varphi(u)=1-(1+r)^{-u}-u\ln(1+r)$, where $u=1/m$. Since $m\geq 1$, then $u\in(0,1]$. To determine the sign of the function $\varphi(u)$ on the half-interval $(0,1]$, let's consider the function

$$g(u)=\begin{cases}\varphi(u), & 0<u\leq 1\\ 0, & u=0.\end{cases}$$

The function $g(u)$ is continuous on the segment $[0,1]$ and differentiable on the interval $(0,1)$. Since the derivative is $g'(u)=-\ln(1+r)\left(1-(1+r)^{-u}\right)<0$ on the interval, $0<u<1$, the function $g(u)$ is decreasing on the segment $0\leq u\leq 1$. Then for any $u\in(0,1]$ the inequality holds $g(u)<g(0)$. Since $g(0)=0$, then $g(u)<0$ on the half-interval $0<u\leq 1$. Since $g(u)=\varphi(u)$ in $u\in(0,1]$, then $\varphi(u)<0$. Then the derivative $\beta'(m)>0$, where $m\geq 1$. Hence, the derivative $P'_m>0$ at $m\geq 1$ — the price of the bond P_m is an increasing function of the parameter m. Then

$$P_m < P_{m+1},\ m=1,2,\ldots,$$

— the sequence $\{P_m\}$ is increasing. Let's note that this result does not depend on the coupon rate. The limit of the sequence $\{P_m\}$ is equal to:

$$\lim_{m\to\infty} P_m = \frac{Af}{\ln(1+r)}\left(1-\frac{1}{(1+r)^T}\right)+\frac{A}{(1+r)^T}. \quad (4)$$

Since $\lim\limits_{m\to\infty} P_m = \sup\{P_m\}$, then $P_m \leq \lim\limits_{m\to\infty} P_m$, $m=1,2,\ldots$. The statement is proven.

DISCUSSION OF RESULTS

It has been established that with fixed values of the main bond parameters, the bond's duration decreases and the price increases with an increase in the number of coupon payments per year. The proven statements about the behavior of bond duration and price are consistent with previous studies [27, 28], where methods of function expansion into power series and operations with series, such as addition and multiplication of series, were used to obtain evidence. The obtained results are confirmed by the data in the table, which presents the characteristics of

government bonds (OFZ) with close terms to maturity *T* according to the Moscow Exchange data.[7] As can be seen from the table, with an increase in the number of coupon payments in year *m*, the bond price increases, and the duration decreases. The yield *r* in the table is effective.

Table

Characteristics of Government Bonds (OFZ) According to the Moscow Stock Exchange on 18.12.2023

ISSUE	*T* (days)	*D* (days)	Price	*m*	*f*, %	*r*, %
SU 29016RMFS 1	1101	949	100	4	–	9.47
SU 26207RMFS 9	1143	993	91.75	2	8.15	11.76
SU 29020RMFS 3	1374	1145	99.68	4		9.6
SU 26232RMFS 7	1388	1230	83.40	2	6	11.82
SU 29019RMFS 5	2039	1517	99.05	4		11.74
SU 26242RMFS 6	2081	1597	89.0	2	9	11.85

Source: Compiled by the author according to the Moscow Stock Exchange. URL: http://www.moex.com/ (accessed on 18.12.2023).

A decrease of a bond's duration with an increase in the number of coupon payments per year means a decrease in the "real term" and a reduction in the bond's interest rate risk, which can attract investors in times of crisis and instability. An increase in price may indicate a rise in demand for bonds from investors and, consequently, an increase in the issuer's income with the increase in the number of coupon payments per year. According to economic theory,[8] an increase in demand raises the equilibrium price and the equilibrium quantity of the product, which may interest the issuer during periods of instability.

The interpretation of the results presented in the work aligns with the recommendations of financial engineering specialists for attracting investors: it is advisable to establish a minimum accepted coupon period to enhance the investment attractiveness of the bond through the frequency of periodic payments [7, p. 136]. The interpretation of the results also aligns with market observations. For example[9]: securities with more frequent coupon payments are more valuable.

Let's note that the results were obtained for bonds that have no credit risk, as a company with a low credit rating is unlikely to commit to paying coupons more frequently.

CONCLUSION

The bond's maturity period and coupon rate are the main controllable parameters of the bond that the bond issuer uses to attract investors and reduce risks. Based on the evidence presented in the article on the dependence of the duration and price of a bond on the number of coupon payments per year, it is proposed to consider the frequency of coupon payments as a parameter that allows reducing the risks for both the issuer and the investor. The reduction of the bond's duration with an increase in the number of coupon payments per year contributes to the

[7] Website of the Moscow Exchange. URL: http://www.moex.com/ (accessed on 18.12.2023).

[8] Tumashov A.R., Kotenko S.N., Tumasheva M.V. Economic Theory. Part I. Introduction to Economic Theory. Microeconomics. Kazan: Kazan. Uni., 2011. p. 61.

[9] OFZ Income. URL: https://ofzdohod.ru/bonds/parametry-i-dokhodnost/kuponnyi-dokhod-obligatcii/, (accessed on 27.08.2024).

bond's attractiveness for investors due to the decrease in the «real term» and the reduction of the bond's interest rate risk. The increase in bond prices with an increase in the frequency of coupon payments may indicate a rise in demand for bonds from investors and the potential for increased income for the issuer. The results of the work may be useful for practical investing, when constructing bond parameters in conditions of instability, as well as in theoretical studies of the investment properties of bonds.

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What Determines Household's Financial Behavior? A Case of Punjab, Pakistan

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ABSTRACT

The **purpose** of this paper is to answer, what determines financial behavior of Pakistani Households? Considering the interpretivism as epistemological considerations, subjectivism as ontological considerations, and induction as research approach, this study employs the qualitative research methods. 38 semi structured interviews are conducted. The results suggest that financial planning of households in Pakistan is determined by demographic and macroeconomic factors. Intentions, society and culture influence household spending, and the special purpose and availability of savings determine their savings behavior. The literature is inconclusive regarding the determinants of household financial behavior, primarily because of differences in culture. This emphasizes the importance of separately studying household financial behavior in settings of Pakistan. The originality lies in exploring the factors in determining Pakistani households' financial behavior.

***Keywords*:** household financial behavior; household financial planning; household spending behavior; household saving behavior

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INTRODUCTION

"Households are central to our understanding of Finance" [1]. As per the Household integrated Economic Survey of Pakistan (2013–2014), a household is a single person or a group of persons. A single-person household is one where an individual makes provision for his/her living essentials, including food, without combining them with any other individual, and without any usual place of residence elsewhere. A multi-person household is a group of two or more individuals who make some joint provision for living essentials without a regular place of residence elsewhere.

According to the traditional economic utility models, a household is expected to be a single unit of decision-making that pools all financial resources together to achieve utility maximization [2, 3]. As per the assumptions of these models, the household head makes financial decisions on behalf of other members [2]. A single-person household's financial behavior is very different from that of a couple or married household because marital status and having kids affect financial resources, household needs, individual preferences, and risks [4]. Theoretical and empirical literature also found that money/financial management within married households are more complicated than the money/financial management of a single individual [5].

The characteristics that affect financial behavior (money management and financial decision making) are not just economic factors, but also psychological, non-psychological and situational factors. Factors affecting financial behavior also includes the situational factors and personality traits of an individual [6], cognitive abilities [7], socio-demographic factors [8], behavioral factors [9], and cultural settings [10]. A list of socio-cultural factors is acknowledged as important determinants of household financial behavior. These factors include religiosity [11], mood states [12], social interaction [13], and trust [14]. We can conclude from existing literature that households, do not behave (in terms of saving and investing) as per the normative models (for details, see [15]), showing that normative economic models fail to explain household financial behavior.

At the same time, family system theories suggest environmental factors (like culture, community and the state of the economy) affect households' financial behavior [16–19]. Here, it is important to mention that households' financial behavior varies across different cultural settings [10]. Researcher [20] defines culture as a set of beliefs that determine the multiple behaviors of individuals/groups of individuals, and financial behavior is one of them.

Moreover, [21] highlighted the role of culture in households' financial behavior. A study [22] found similar results and showed that culture and gender play an important role in determining household financial behavior. Examples of cultural differences in household financial behavior include personality trait such as individualism/collectivism, rituals of spending money, and beliefs regarding money. These differences have been highlighted in foreign-born and native couples [23].

Another cultural factor, trust, is also found to be a determinant of household financial behavior. A study [24] established that trust has a significant effect on financial behavior. The importance of cultural effects is strengthened by [25] which depicts that households retain the cultural effect of their home country while moving across the border and shows a low tendency to adopt the cultural effect of the host country.

Literature found that social capital-intensive area's resident Italian households invest a small percentage of their wealth in cash and a large percentage of their wealth in stocks [26]. Further [26] also found a significant positive relationship between trust and the household's participation in the stock market. A study [14] added to this strand of literature by connecting sociability and trust to the significant regional differences in stockholding and concluded that to study households' stock-market participation, sociability, and trust must be taken into account. However, there remain some persistent and anomalous differences across countries [27].

In short, the literature is inconclusive regarding the determinants of household financial behavior, primarily because of differences in culture. This emphasizes the importance of separately studying household financial behavior in Pakistan. The objective of this study is to explore the factors determining Pakistani households' financial behavior. This leads to our research question: what determines households' financial behavior among Pakistani households?

It is argued by [28] that the behavior of households varies when they face different financing options. The behavior of households residing in developed and developing countries may be different because their living conditions are different, their income structure is different, and their financing opportunities are different. Different studies suggest that household behavior varies across different cultural settings [29–31].

A limited number of studies examined the behavior of household finance in developing and emerging economies and like Pakistan. Most of the studies have investigated household finance norms and behavior for individuals living in developed countries. One of the main reasons for limited literature in emerging and developing market economies is that researchers lack the information required to conduct this type of analysis. This literature gap motivates us to explore the factors involved in determining the financial behavior of Pakistani households. A study [32] found that Pakistani household saving and borrowing are far different from saving and borrowing in other developed countries' households.

Pakistan is a developing nation; thus, it is crucial to consider how Pakistani households may satisfy their financial obligations. Pakistani households have few resources, and those with extra money do not know where to put it to use. More specifically, talking about the scope of the study, this study is limited to the Punjab province of Pakistan, a province rich in culture. The reason for choosing only this province is that Punjab (the land of five rivers) is the biggest in terms of land area and in terms of culture too. According to population, 52.9% of the total country's population is situated in Punjab Province. A total of 36 districts are in Punjab, which cumulatively contributes approximately 54.2% of the GDP of Pakistan.

As per the population welfare department, a total of 32,205,111 households are in Pakistan, out of which 17,103,835 (53.11%) households are part of Punjab. So doing a study in the context of household financial behavior and exploring household financial behavior, Punjab is considered the most suitable representative province of Pakistan.

METHODOLOGY

Considering interpretivism as epistemological considerations and subjectivism as ontological considerations, the current study adopts an inductive approach with the aim of exploring the determinants of household financial behavior in Punjab, Pakistan. The population consists of Pakistani households, including individuals and groups of individuals, and the sample of study is lower mid-class households with a minimum of two family members. 38 interviews were conducted for this purpose. The interviews lasted 52 minutes on average. Keeping in view the COVID-19 restrictions, interviews are done via Zoom meetings and telephone.

All interviews are conducted in regional languages, recorded (with the consent of the interviewee), transcribed in regional languages, and translated into English. Great care is taken in translating the responses of interviewees in order to maintain the natural quality of the interviewees' contributions. The questions asked of interviewees are added in the *Appendix*.

For an exploratory nature of study, semi-structured or unstructured interviews are considered suitable [33, 34]. This study uses the semi-structured interview guide as a data collection instrument consisting of pre-structured, open-ended questions. It has the flexibility to add some more questions on the spot that must evolve from the conversation between interviewee and interviewer. Interviews are taken until the point of saturation. It is a point where additional data collection does not contribute to understanding the issue under investigation [35]. This point may conclude the number of interviews to be conducted in this study. In this study, saturation comes from 38 interviews.

The participants were invited for interviews through telephone calls. Upon receiving confirmation of the time, the researcher conducted interviews via Zoom meetings and phone calls. Before starting the interview, the respondent was to ensure that his/her identity would not be revealed on any platform. Further, the researcher gave a detailed briefing to the interviewee regarding the aim and objectives of the study and interview.

For the purpose of the purpose of qualitative data analysis, this study employs thematic analysis (TA) approach. TA is a method for systematically identifying, organizing, and offering insight into patterns of meaning (themes) across a data set. The initially generated themes are reviewed again and again to shortlist and finalize them. The final themes are explained in the next section.

RESULTS AND DISCUSSION

Thematic analysis of the data gathered via interviews reveals interesting findings in exploring the determinants of household financial behavior. While asking the questions, household financial behavior was split in three elements: household financial planning, household financial spending, and household saving behavior. *Table* provides the profile of respondents, including their gender, occupation, education, marital status, and approximate monthly income.

Exploring household financial planning, authors found households with a lower income were more conscious of financial planning and implemented the plan as it was, as compared to households with a higher income bracket. As an interviewee said "Yes, we definitely make a plan at the very start of each month. We start with enlisting all the expenses to be occurred in each month and separate a fixed amount for each head and try to strictly follow the plan." And another interviewee said "No, we don't make a plan at all. We spend as the expense occur." A clear difference could be seen between the two narratives of two different interviewees. The former interviewee who is strict about planning is the one whose monthly income is almost half of the monthly income of the later interviewee. Likewise, the households of older age were more interested towards planning for the purpose of purchasing property as compared to young households. It was found that households with kids showed a sense of responsibility towards making the financial plan at the beginning of each month as compared to households that were unmarried, or married but had no kids. Uncertainty was also seen in these respondents, whose income sources were uncertain, like income from any business as agriculture. While a different behavior was found in the group of respondents whose income source was defined or fixed (i.e. salary from job). Such respondents were quite sure in making the monthly plan.

So, the authors identified the income level, source of income, number of family members, having kids, and age as playing roles in determining household financial planning. These factors could be summed up as demographics. In a nutshell, demographics play an important role in determining household financial planning. These findings are consistent with prior findings in which demographics were found to be determinants of household financial planning. First, a study by [9] in Dutch families in the Netherlands indicated that while saving behavior is much more prevalent among baby boomers, it falls with age for all people. As a result, age and financial planning have a connection to saving habits and money management. Age is a crucial factor influencing retirement planning, according to [36]'s research of Malaysian health sector employees. Age is a crucial component, and it is consistent that as a person's age increases, he or she gets more responsible in their financial activity, according to [37], a study on the factors influencing investors' financial behavior in India. Age is positively correlated with risk aversion, which has an impact on investment planning because older investors are less willing to take risks

Table

Profile of Respondents

Gender	Occupation	Education	Marital status	Approx. monthly income
M	University Lecturer	M.Phil.	Married	100,000 to 150,000
M	University Lecturer	PhD	Unmarried	700,000 to 800,000
M	Agricultural man	M.Phil.	Unmarried	130,000
M	College Lecturer	PhD	Married	83,000
M	Banker	MS	Married	180,000
M	Businessman	MBA	Married	100,000
M	Hospital	MS	Unmarried	80,000
M	Teacher	MS	Married	45,000
M	Banker	MS	Married	300,000
M	Lecturer	PhD	Married	118,000
F	Admin Officer	MA	Married	80,000
F	Teacher	MSC	Unmarried	50,000
M	Teacher	MBA	Married	45,000
M	Senior Subject Specialist	MSc	Married	200,000
M	Businessman	BSc	Married	70,000
F	Principal	MSc	Married	45,000
M	Engineer	MS	Unmarried	180,000
M	Lecturer	MS	Married	250,000
M	Resident auditor	Masters	Married	90,000
F	Doctor	MBBS	Married	175,000
M	Lecturer	PhD	Married	250,000
F	Housewife	MA	Married	130,000
F	Lecturer	MS	Married	150,000
F	Lecturer	MS	Married	54,000
F	Lecturer	MS	Married	125,000
F	Lecturer	MS	Unmarried	86,000
M	Accounts Officer	MS	Married	86,000
M	Manager	BS	Married	200,000
F	Assistant Professor	PhD	Married	250,000
F	Lecturer	MS	Married	280,000
F	Lecturer	MS	Married	190,000
F	Assistant Professor	PhD	Unmarried	250,000
F	Staff	MBA	Married	100,000
F	Exam Head	MBA	Married	90,000
F	Program Coordinator	MS	Married	180,000
M	Assistant professor	PhD	Married	250,000
M	Assistant professor	PhD	Married	175,000
M	Assistant professor	PhD	Married	200,000

Source: Compiled by the authors.

than younger investors, according to an empirical study [38] of demographic influences on risk attitudes among Indian investors in India. However, a study [39] found that among Malaysia's Generation Y, age has no influence on retirement planning, in contrast to the findings of this study [36].

Other than demographics, interviewees mention inflation affecting their planning behavior. Inflation tells us how much prices have changed year-over-year. It's noticeable in the cost of everyday things. However, a more sudden increase in inflation can cause financial stress, due to sharper increases in the cost of living. It is important to consider what the impact of inflation will be on what you plan to spend your money on. A change in inflation will change the cost of your financial goals. Even if inflation is ignored, the financial budget is the same for all years. Planning changes as the financial goal changes. Like many of the respondents, who have younger children, their financial plans change with the cost of their children's education. And when the impact of inflation

is added, obviously, the financial plan changes over time.

In the current economic condition, the inflation rate is unexpected, which is also highlighted by the respondents, "as you know the condition of inflation, prices of every item are getting higher and higher day by day. It becomes very difficult to forecast the future or even make plan about the future… But… income is limited so we make a rough plan and we know that things will not happen as per plan", "in the current inflation condition of Pakistan, it is wastage of time to make a plan because plan does not work et al", "you are also well aware about the inflation condition of Pakistan. It becomes very harder to even survive. So, we consider to prepare a plan compulsory in order to spend the month peacefully." Authors can emphasize the importance of inflation in making household financial plans. Some of the respondents are afraid of the failure of their financial plans due to the unexpected economic condition of Pakistan, but the authors emphasize the importance of doing financial planning in order to avoid any hassle.

Moreover, when exploring household spending behavior, respondents mention that they intentionally do the savings, some respondents mention that their way of saving is "committee", which is also named "forced savings". Some also mentioned that in making the monthly financial plan, they have a separate head of savings. So, authors can say that households are intended towards savings, depicting that saving behavior is determined by household saving intention, and intention is a main construct of the theory of planned behavior. The theory of planned behavior (ToPB) was presented by paper [40], stating that a person's behavior is determined by her/his behavior intention. ToRA, which Fishbein first introduced in 1967 and which was further defined, expanded, and tested in the 1970s, is essentially what ToPB extends. It was presented by Fishbein and Ajzen in a book [41].

Results find social influence to be a factor in affecting the spending behavior of households. As interviewees stated that "… yes… it happens… when close relatives go on outing then our children make us force to go for outing and we have to do it…", "not so much… but it happens…". Literature also finds the social influence as a critical factor of consumption [42]. In the case of social influence on household consumption/ spending, households' matter, and family's matter.

The authors identify some religious motives that determine the household's sending behavior like Qurbani on Eid Ul Azha, charity, zakat, donations etc. interviewees stated that "in the month of zil hajj, we do slaughter", that is the spending that not comes in every month, so our every month spending does not include it but we do saving because we that at the time of slaughter, we have to arrange the amount…", "in every year, there are some expenses like slaughter on Eid Ul azha".

For Muslims around the world, Eid-ul-Azha is a holiday with significant social, personal, and religious connotations [e.g., 43, 44]. Literally translated as "holiday of the sacrifice", Eid-ul-Azha occurs on the tenth day of Zil Haj, the last month of the Islamic calendar, during which countless numbers of Muslims journey to Makkah each year to undertake the Haj and offer qurbani (sacrifice). These practices have their roots in Muslim tradition thanks to the Prophet Ibrahim (peace be upon him), who was willing to follow Allah Almighty to the point of sacrificing his own son, the Prophet Isma'il (peace be upon him). In the end, Allah permitted the substitution of a ram for Isma'il. Ibrahim and Isma'il afterwards rebuilt the Kab'ah (Cube), which for Muslims is the House of Allah and was initially created by Adam, where this incident took place (or, some say, by angels). Ibrahim was then given the order by Allah to proclaim that everyone should make the trip to this location (Quran 1977:22:27).

Interviewees stated that "we do spend some amount in terms of zakat each year", "…some spendings like Zakat, charity, donations, feeding poor… ". Muslims residing all around the world adhere to and practice Islam as their religion. According to the principles provided by Islamic scriptures, it is the responsibility of the state and of individuals to make financial contributions to the needy and underprivileged members of society through the practice of Zakat [45].

Another type of charitable giving is the sadaqah, which can be done in a number of ways, including donating old clothing, giving money, or giving food to those in need. The main reason for performing a sadaqah is to protect oneself from evil spirits. Another type of charitable giving practiced by Muslims is called kaffara, which might involve giving someone money or other forms of assistance after an oath has been broken. Last but not least, Waqf is an additional type of charitable giving in which mosques, hospitals, or any other type of social institution are built for the benefit of society as a whole [46]. Religious practice, and Zakat in particular, which has a strong capacity to build bonds between community members, makes its

practitioners happy and joyful [47]. Islamic scriptures do a good job of highlighting the significance of zakat. In line with what the Qur'an says: "And establish prayer, give Zakat, and bow with those who bow (in devotion and obedience)" (Al-Qur'an: Surah Al-Baqarah, Verse 43, and Chapter 02).

Further exploring household saving behavior, it was found that when saving guidelines are followed, households are considerably more likely to save than when they don't. Interviewees stated that "in case we have to purchase a certain thing, …recently I renovated my house I need a sum of amount, so we made a plan for saving", "we made a plan to purchase a plot. We did forced savings and finally we got it", "in Pakistan, if a person wants to alive, he/she must have second source of income". The likelihood of saving increases typically when one has particular saving goals, such as retirement, but the impact differs depending on the saving goal. Predictable expenses have a somewhat beneficial impact on the likelihood of saving. These findings support [48]'s findings that the most significant predictor of an increase in the likelihood of saving among the poor was the presence of a justification or motive for saving.

Further, interviews stated that "we do save to meet any emergency situation", "there could be any medical or any other emergency in home, that's why I prefer to have some amount in cash in savings", "we save for any urgent need". These findings go in line with the buffer stock theory of savings. Studies [49–51] demonstrated that target saving behavior can appear for both finite and infinite horizon models with reasonable parameter values. Using the same model and different data, [52] estimate the model and find that the buffer-stock saving phase of life lasts from age 25 to roughly age 40–45. A study [53] reports that the median household's target saving behavior continues into its 50s. In the research (e.g. [54–70] on household saving), the precautionary motive "to accumulate a reserve against unanticipated contingencies" has taken on a significant role.

CONCLUSION

This study explores the determinants of household financial behavior among Pakistani households and finds multiple determinants, including demographics, macro-economic factors, intention, social motives, religious motives, cultural motives, special purpose, and wealth increments, as the main determinants.

Household financial planning (HFP) is vital to maintaining stable financial behaviors in a household. Household financial emergencies or even financial crises at the household level could also be managed with proper financial planning. In today's financial condition in Pakistan, financial problems are very common. These may include paying bills for necessities (i.e., electricity bills, fuel bills, medical bills, grocery bills, etc.). To protect oneself from such financial distress, it is important to make a plan very carefully.

Household financial planning is a tool for household financial decision-making. Good household financial planning leads to satisfactory household financial behavior. Household financial planning plays a very important role in household financial decision making. It includes different aspects, including planning for family, planning for kids' education, investing, wealth accumulation, borrowing, repayment of borrowing, planning for children's marriage, saving for the future, etc. Financial planning provides a strategy for achieving financial objectives at various stages of life.

Apart from financial planning, spending and saving are also important aspects of household financial behavior that are explored in this study. Demographics, macroeconomic factors, intention, socio-cultural and religious factors, special purpose, and buffer are found to be major determinants of household financial behavior.

This study has several practical implications. Firstly, information on household financial behavior can help policymakers and financial institutions design targeted interventions to improve the financial well-being of vulnerable populations, such as low-income households, women, and the elderly. Secondly, understanding the financial behavior of households in Punjab, Pakistan can help policymakers make informed decisions about financial inclusion, consumer protection, and financial regulation. Last but not least, knowledge of household financial behavior can inform the design of financial products and services that are more suited to the needs and preferences of the population.

Well, this study has several limitations and future research directions. First, this study is a qualitative attempt. Qualitative research has its own kind of limitations. Secondly, this study takes interviews with respondents from the Punjab province of Pakistan. Future researchers could apply this study to other provinces, results could better represent the conclusion about Pakistani

households. Thirdly, the scope of household financial behaviors is limited to household financial planning, spending, and saving behavior. Some other aspects, like investing and borrowing, are not included in the scope. Future researchers could enhance the scope and get more comprehensive results.

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APPENDIX

Survey Questions

1. Do you make any plans for monthly spending?
2. What kind of planning do you do?
3. Do you make the proper paperwork for planning? Or just mental work?
4. Why do you prefer this kind of planning?
5. Who is the major player in planning?
6. Do you strictly follow the plan?
7. Do you do savings?
8. How do you do savings?
9. Do you prefer to have savings in the form of cash or prefer to invest?
10. Why did you wish to invest?
11. In which sector? Why this sector?

ORIGINAL PAPER

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Intention to Invest has a High Impact on Decision Making? New Contribution to the Planning Field of Financial Behavior in Indonesia

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ABSTRACT

The study's **purpose** is to determine empirical evidence on the effect of financial attitude, knowledge, and perceived risk on intention to invest, reinvestment, level of trust in the platform, and investment satisfaction. The data were collected via an Online Google form from May to July 2022, through a survey of 401 respondents from cities in Indonesia, and were analyzed by structural equation modeling with partial least squares. The results showed that financial attitude has a significant positive effect on the intention to invest and knowledge, while it is insignificant on perceived risk. The intention to invest has a high impact on decision-making. Reinvestment is significantly influenced by intention, decision-making, and trust. The effect of trust has a high impact on reinvestment, which has a significant positive influence on financial satisfaction. This study has made a new contribution to the planning field of financial behavior, regarding investment decisions in terms of monetary assets for unit analysis. However, in further study for businesses or SMEs with unique characteristics, some adjustments are needed in the aspects of testing and model improvement to increase applicability.

***Keywords*:** Intention to Invest; Reinvestment; Trust in Platform; Investment Satisfaction

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INTRODUCTION

Investment activities consist of two types, namely real and financial assets. The real assets include land, gold, machinery, and buildings [1]. Financial investments are in the form of deposits, mutual funds, stocks, bonds, options, warrants, or futures [2]. Financial assets are more liquid and relatively inexpensive on various investment platforms because of the disruption of technology 4.0. Meanwhile, interest in investing focuses on capital market investment [3–7]. The result of this study, which is still being debated, shows a significant connection between the effect of investment intention and satisfaction [8, 9]. The interest paid on investments in financial assets has a significant effect on investment decisions [2]. This is supported by a study involving 217 respondents in Indonesia, conducted using online survey data collection, which discovered that investors are interested in deposit products from Islamic banks. A further study [10] showed that investment interest is a key factor in decision-making. The study conducted by [10, 11] found that interest in investment decisions has an impact on satisfaction, which is influenced by financial literacy and commitment because it has a time horizon [9, 12–14]. Furthermore, [15] focused on investment consideration, which has a significant impact on reinvestment intention.

The study on investment intentions [16–21] is influenced by several factors, such as risk [10], online trading [22], online platforms [23], financial literacy [24–26], cognitive, and effective behavior [27]. These factors still produce inconsistent results [10].

Therefore, this study majorly contributes to the study on investment satisfaction, by demonstrating an intention to invest and reinvestment, while the three primary aims include:

1. to investigate financial attitude, knowledge, perceived risk.

2. to analyze investment decision making, intention to invest, and level of trust in platform.

3. to ascertain an empirical model of investment satisfaction.

LITERATURE REVIEW

Theory of Planned Behavior (TPB)

The central topic in the field of psychology, known as the Theory of Reasoned Action (TRA), was put forward by [28, 29]. This theory is specifically used to measure individual behavior, and its application is widely used in the fields of advertising, public relations, management, sports, and sustainability. TPB is based on three components of behavior, including attitudes, subjective norms, and behavioral control, which combine to form an individual's intentions [28, 29].

The ultimate aim of the intention is to elicit a specific behavioral response. The attitude toward the behavior dimension is defined as a disposition toward behavior that is determined by beliefs based on the consequences. Subjective norms are defined as a person's perception of the expectations of influential people. The third dimension is perceived behavioral control, where every action to be taken needs to pay attention to situations and conditions that are likely or unlikely to be controllable. The application of TPB includes the influence of financial behavior on an individual who makes an investment. This attitude of behavior is determined by knowledge of finance and understanding of management, which becomes the basis for investing. In the context of investment decision-making, an individual possesses a determinant variable that exerts a significant influence on the selection of investment options, referred to as the risk profile.

Investment Theory

Investment theory is closely related to the successful increase in a country's economic growth, as described in Introductory Economics by Paul Samuelson. Dynamic factors, such as changes in technology, declining interest rates, population growth, and other macroeconomic variables, have the potential to induce modifications in the investment landscape. Investments are made by two parties, which are state business actors and households. Although, households are not limited to individuals connected by marriage ties, anyone has the ability to make an investment, and as technology modifies, it becomes easier to invest.

Investment refers to the process of allocating monetary resources with the expectation of generating profits or returns in the future. The fundamental elements of investment include the current expenditure or resource sacrifice, the inherent uncertainty of outcomes, and the potential future returns [30]. Investment objectives are defined based on the time horizon of the investment, and they are typically categorized into three categories: short-term (1–3 years), medium-term (3–5 years), and long-term (more than 5 years). The strategy, active or passive, is able to diversify assets by creating an investment portfolio every month on a regular basis. An active strategy allows direct investment, while a passive strategy enables evaluation in making comparisons between actual returns and benchmarks.

Hypothesis Development

Financial attitude is a psychological characteristic that shapes perceptions, beliefs, and attitudes towards management, and the relationship with other aspects of life. Openness to information, understanding the value of financial management, avoiding impulsive consumption, a focus on the future, and responsibility are all indicators of financial attitudes. The mindset of managing money is a crucial component of planning to achieve financial objectives. Regarding financial behavior, attitude and managerial factors should be taken into consideration. Financial literacy that only relies on a knowledge-based approach, is not enough to change an individual's behavior unless they possess the right attitude and motivation. This is because an attitude toward money motivates the implementation of both short- and long-term financial objectives, including planning to achieve satisfaction and acquire prosperity.

Financial knowledge, in the context of literacy, is the ability to understand budgeting, savings, loans, and investments [31]. According to the Jumpstart Coalition, financial knowledge is divided into the topics of income, money management, loans or credit, savings, and investment, while the [32] study encompassed banking, deposits, credit, insurance, and taxes. A. Hasler measured financial knowledge with arithmetic, compound interest, inflation, and risk

diversification [33]. Some other comprehension is seen from information published by companies, engaging in the in the financial sector, such as banks, insurance, pension funds, financial institutions, pawnshops, and capital markets. Financial knowledge should be possessed as early as possible, starting in elementary school, in order to be applied more quickly. E. Howlett and co-authors observed that individuals who have the knowledge are more financially literate, and they handle money efficiently [34].

Financial knowledge needs to be transformed into financial skills, which are the ability to apply the knowledge to make informed decisions and take appropriate actions in daily life [35]. Making decisions about money and other economic resources rationally and effectively requires financial acumen [36]. According to A. Sanderson [37], monetary literacy is the capacity of an individual to apply the knowledge and abilities to effectively manage financial resources. A professional or individual with great economic literacy exhibits a lower propensity effect. Financial attitudes and behavior are significantly influenced by monetary knowledge. This study also found that an individual's management literacy and decision-making abilities are significantly influenced by their level of knowledge [38].

According to the study [7], the three categories of people who encounter risk include conservative, moderate, and aggressive industrialists. A study with 100 investor respondents, showed that the most common type of shareholder is the moderate, which is defined as people with a higher level of risk tolerance and commensurate returns. Furthermore, an individual with a higher rate of return than risk, is bound to invest. H. Thanki and N. Baser conducted a study on the relationship between financial risk tolerance and personality type, gender, marital status, age, education, occupation, and income, using multiple linear regression techniques on 329 investors [39]. It was discovered that these variables are used to predict financial risk tolerance, which significantly improves satisfaction [39–41]. Based on the description above, the proposed study hypothesis is:

H_1. Financial attitude has a significant effect on intention to invest.

H_2. Financial knowledge has a significant effect on the intention to invest.

H_3. Perceived risk has a significant effect on intention to invest.

H_4. Intention to invest has a significant effect on investment decision making.

Reinvestment is analogous to repurchase intention, a marketing term that typically refers to the objective to buy a product again, but in the context of finance, it refers to the goal to reinvest in a monetary value product. Borrowing the definition of repurchase intention from [42], this study defines reinvestment intention as a subjective probability that an individual continues to invest in financial assets. The intention to reinvest in assets is driven by the satisfaction obtained by investors who have achieved financial and personal goals [10]. The intention to reinvest takes two forms, namely the objective to put money back into a financial instrument and to engage in positive word of mouth, i.e., referral [43, 44].

H_5. Intention to invest has a significant effect on reinvestment.

In this digital era, it is possible to invest quickly, conveniently, and easily, therefore, ensuring the level of trust in the platform is an important factor before investing. Trust provides confidence that investors are loyal to the contractual relationship [10]. Given the importance of trust in facilitating the platform used for investment, it has become an important factor. Over the past few years, several studies have explored the important factors influencing platform trust from different theoretical perspectives. One stream of analysis focuses on public impressions to build commercial trust, such as reputation, technical features of third-party payment systems, and institutional mechanisms implemented on platforms [45, 46].

H_6. Intention to invest has a significant effect on the level of trust in the platform.

H_7. Trust in the platform has a significant effect on reinvestment.

H_8. Investment decision making has a significant effect on reinvestment.

RESEARCH METHOD

Participants were approached by simple random sampling, aged = 17 years >= 40 years, and were required to fill out the questionnaire form. The targeted group was of productive age with some level

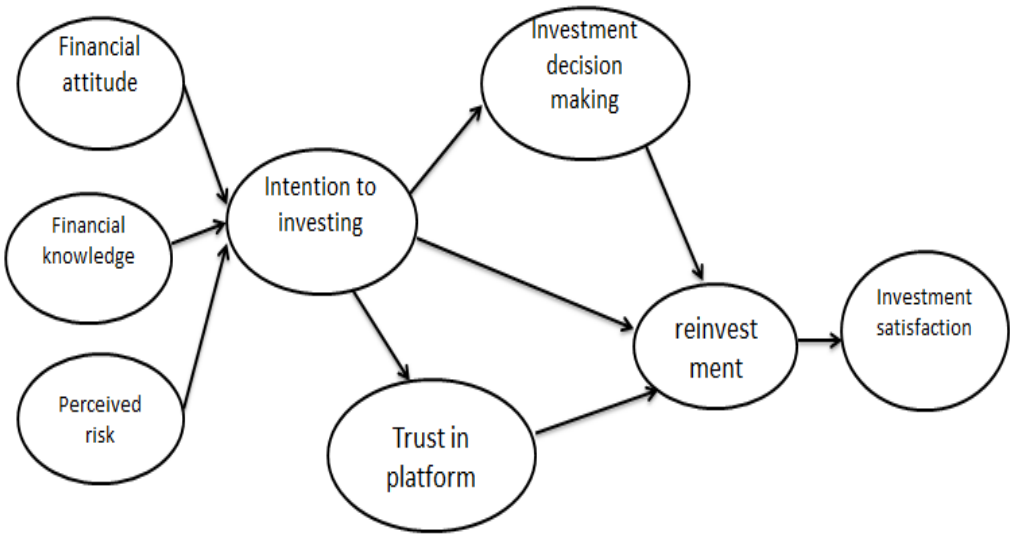

Fig. 1. **Empirical Study**

Source: Compiled by the authors.

of income. In total, 401 respondents were willing to fill out online questionnaires using Google-forms, with data collection occurring between May-July 2022. There are eight variables employed, namely financial attitude, knowledge, perceived risk, intention to invest, trust in the platform, decision making, reinvestment, and investment satisfaction. Each variable was measured using the established questionnaire from the previous study, operational definition of variables (*Table 1*). Prior to the primary test, validity and reliability tests were conducted. Because the average variance extracted (AVE) values are above 0.5 and the composite reliability (CR) values are above 0.7, the SEM results show that the questionnaire items used are valid and reliable [47].

RESULTS

In total, there were 401 participants, which encompassed the sex category of female (55%), male (45%). The age range of participants was from = 17 to >40 years (*Table 2*). Those aged 26 to 32 were the highest category (37%), followed by participants aged 17 to 25 years (33%). The education level of participants ranges from high school graduate/ diploma to doctoral degree (*Table 2*). The bachelor degree dominated (50.4%), followed by participants from senior high school (17%). The highest employment status of participants was 25%, which are entrepreneur, followed by permanent employee (52%). The participants who are not yet married are 57%, and those who are married are 43%.

The results of inferential statistics using SMART-PLS began with testing the validity and reliability of the instrument used, as shown in *Table 3*. It also shows the results of the model measurements used to obtain the quantifying information for each variable. The outer loading value is the reflection of the variable being measured, and the determination of the loading factor <0.7 was also performed. The indicators that were also considered include FK1, FA1, FA4, PR 3, IT2, DM2, DM3, TP3, and IS 2. The CR, AVE, and Convergent Validity values were confirmed. The discriminant validity test is based on two methods, which are observing the Furnell HTMT value and cross loading.

The cross-loading values to determine the index of the construct are shown in *Table 4*. The validity value is achieved when the index of the construct variable is more than 0.7.

After evaluating the model measurement and testing the structure by observing the NFI value, it was discovered that the higher the NFI index, the better or fit the study model. The test to see how much influence the exogenous variables have is carried out by considering the value of R^2. This study has five equations of R^2, and to calculate R^2, Q^2 is used, which is the total coefficient of determination. The NFI and R^2 and Q^2 values are shown in *Table 5* below.

Table 1

Definition of Operational Variables

Variables	Indicators	Adapted source
Intention to invest	Attitude behavior Knowledge of finance Perceived risk	[28]
Financial Attitude	Fear and worry Economical and thrifty Convenient Easy and fast Have debts. Emotional attachment	[48]
Financial Knowledge	Knowledge of banking Knowledge of investment Knowledge of insurance Capital market knowledge. Knowledge of pension	[49]
Perceived Risk	The courage to bet. The courage broke. Risk is more important than return. Return is more important than risk	[40, 50]
Investment Decision Making	Restrain consumption. Have short, medium, long term financial goals. Allocation of funds according to financial goals Financial portfolio according to plan Start investing from high returns	[51]
Reinvestment	Desire to reinvest. Intention to reallocate some of the assets into investments in financial instruments. Recommend others to invest in financial instruments	[52]
Trust in platform	Transparency of company management Company honesty Company reputation Experience as an investment company	[10]
Investment Satisfaction	Return on investment. Investment security Ease of payment and liquidity Regulations and statutes Investment well-being	[10]

Source: Compiled by the authors.

Table 2

Distribution Frequencies of Participants Profile

Variables	Characteristics	Frequency	%
Sex	Male	181	45.14
	Female	220	54.86
Age	= 17–25	132	32.90
	26–32	147	36.70
	33–36	59	14.70
	37 – >=40	63	15.70
Education	Doctoral degree	12	2.99
	Master's degree	50	12.47
	Bachelor's degree	202	50.37
	Diploma High School Graduate	67 70	16.46 17.46
Employment status Married status	Permanent employee Not permanent employee Entrepreneurs Not yet married Married	210 91 100 229 172	52.37 22.69 24.94 57.11 42.89

Source: Compiled by the authors.

Table 5 shows that the equation based on exogenous variables is able to predict endogenous factors, which is an investment satisfaction of 92%. It is interpreted that very high exogenous variables are able to be predicted endogenously. Model fit is indicated by an NFI value of more than 50%. The results of testing the hypothesis are presented in *Table 6*.

DISCUSSION

The influence of financial attitude on the intention to invest is significantly positive. This shows that the intention to invest is influenced by the monetary attitude of the respondents. The financial attitude is reflected in the dominant indicator, which includes managing finances for the future, with a loading factor value of 0.831. The better an individual's attitude towards financial management, the more interested they become in investing, although knowledge has no significant effect on interest in investing.

Financial knowledge, including the understanding of several investment products in the capital market, banking, insurance, pensions is important, according to the respondents, because planning for old age or retirement is fundamental, hence, it has no significant effect on interest to invest (H_2 is rejected). The effect of perceived risk on intention to invest is not significant

Table 3

Testing the Measurement Model

Variables	Indicators	Loading Factor	Cronbach's Alpha	CR	AVE	Convergent Validity (Ave > 0.5)
FK	FK2 FK3 FK4 FK5	0.812 0.826 0.871 0.878	0.869	0.910	0.718	Valid
FA	FA2 FA3 FA5	0.729 0.744 0.831	0.696	0.813	0.592	Valid
PR	PR 1 PR 2 PR 4	0.837 0.668 0.752	0.639	0.798	0.570	Valid
IT DM TP RV IS	IT1 IT3 DM1 DM4 DM5 TP1 TP2 TP4 RV1 RV2 RV3 IS 1 IS 3 IS 4 IS 5	0.877 0.856 0.831 0.792 0.765 0.801 0.806 0.745 0.852 0.791 0.814 0.761 0.754 0.738 0.789	0.668 0.712 0.691 0.755 0.758	0.858 0.838 0.828 0.859 0.846	0.751 0.634 0.616 0.671 0.579	Valid Valid Valid Valid Valid

Source: Compiled by the authors.

(H_3 is rejected). This finding provides an explanation for why the attitude of the respondents toward providing tolerance for risk does not have an impact on their intention to invest.

The findings of this study are in line with and also different from several previous studies. It is in line with the study that affirms financial attitude to have a significant effect on an individual's intention to invest [25, 52, 53]. However, this is not in line with the study conducted by [13, 54], which states that the H_2 and H_3 hypotheses were rejected in contrast to the TPB theory, which emphasizes that an individual with an interest in investing is expected to focus on and have the financial knowledge for investment products, and also recognize the risks to be encountered.

The intention to invest has a significant positive effect on investment decision-making, hence, H_4 is accepted. Respondents, after having the discretion to expend, immediately make investment decisions. The dominant indicator of the intention to invest is that the respondents immediately open a financial account, which is considered one of the proofs of the importance of investment. This study also found that the intention to invest has a significant positive effect on the level of trust in the platform (H_6 is accepted). This is consistent with the findings of [45, 46] that trust in platforms is

Table 4

Validity of Discriminant with Cross Loading

Indicators	FK	FA	PR	IT	DM	TP	RV	IS
FK2	**0.812**	0.497	0.466	0.295	0.420	0.393	0.463	0.448
FK3	**0.826**	0.405	0.503	0.270	0.476	0.328	0.446	0.370
FK4	**0.871**	0.479	0.531	0.366	0.533	0.420	0.534	0.498
FK5	**0.878**	0.481	0.61	0.349	0.632	0.443	0.562	0.495
FA2	0.537	**0.729**	0.449	0.267	0.488	0.339	0.401	0.417
FA3	0.488	**0.744**	0.434	0.240	0.428	0.365	0.328	0.387
FA5	0.347	**0.831**	0.280	0.497	0.365	0.476	0.410	0.475
PR1	0.499	0.438	**0.837**	0.313	0.494	0.426	0.494	0.448
PR2	0.447	0.329	**0.668**	0.156	0.386	0.247	0.321	0.319
PR4	0.484	0.266	**0.752**	0.238	0.545	0.274	0.398	0.342
IT1	0.509	0.444	0.516	**0.877**	0.536	0.489	0.582	0.525
IT3	0.464	0.453	0.51	**0.856**	0.387	0.443	0.489	0.447
DM1	0.493	0.359	0.483	0.325	**0.831**	0.384	0.507	0.441
DM4	0.507	0.433	0.419	0.495	**0.792**	0.501	0.580	0.564
DM5	0.325	0.411	0.322	0.458	**0.765**	0.488	0.467	0.518
TP1	0.241	0.394	0.263	0.377	0.356	**0.801**	0.424	0.512
TP2	0.335	0.438	0.302	0.423	0.428	**0.806**	0.573	0.458
TP4	0.327	0.389	0.266	0.367	0.385	**0.745**	0.526	0.433
RV1	0.479	0.455	0.451	0.560	0.570	0.581	**0.852**	0.619
RV2	0.454	0.368	0.439	0.531	0.500	0.480	**0.791**	0.510
RV3	0.535	0.388	0.461	0.468	0.557	0.488	**0.814**	0.535
IS1	0.381	0.424	0.378	0.423	0.454	0.519	0.575	**0.761**
IS3	0.392	0.395	0.330	0.373	0.419	0.524	0.462	**0.754**
IS4	0.385	0.448	0.344	0.375	0.384	0.494	0.485	**0.738**
IS5	0.482	0.438	0.454	0.390	0.543	0.529	0.533	**0.789**

Source: Compiled by the authors.

Table 5

Total Determination of Coefficient

Variables	R 2	Q2	NFI
Intention to Investing	0.252	0.917	0.695
Investment Decision Making	0.221		
Investment Satisfaction	0.462		
Reinvestment	0.607		
Trust In Platform	0.326		

Source: Compiled by the authors.

Table 6

Hypothesis Testing Results

Variables	β	P value	Decision
financial attitude –> intention to invest	0.372	0.000	H1 accepted
financial knowledge –> intention to invest	0.131	0.096	H2 rejected
perceived risk –> intention to invest	0.075	0.200	H3 rejected
intention to investing –> investment decision making	0.470	0.000	H4 accepted
intention to invest –> reinvestment	0.320	0.000	H5 accepted
intention to invest –> trust in platform	0.571	0.000	H6 accepted
trust in platform –> reinvestment	0.241	0.000	H7 accepted
investment decision making –> reinvestment	0.379	0.000	H8 accepted
reinvestment –> investment satisfaction	0.680	0.000	H9 accepted

Source: Compiled by the authors.

found to have a significant impact on reinvestment (accepting H_7). This indicates that respondents believe in an effective and smart investment platform, which makes it easier to continue investing. This finding broadly supports the work of other studies in this area, linking trust in the platform with reinvestment [10]. The effect of investment decision-making on reinvestment is significantly positive (H_8 is accepted). This explains that when making investment decisions, the respondents continue to invest, making it a habit that is continuous. These results support those of [15], who also found the positive effect of investment decision making on reinvestment.

An individual who continues to invest achieves investment satisfaction, hence, the findings of this study are significantly positive (H_9 accepted). They explain that the dominant indicator for achieving financial satisfaction in old age is the purpose of investing. Respondents feel satisfied when financial comfort are achieved, and this is consistent with the Spanish study [55], China [56], Germany [57], Bangladesh [58], Indonesia [59].

CONCLUSION

Based on findings, interest in investing, which ultimately guides investment decisions, is primarily influenced by financial attitude. It has been observed that investments that are made on a routine basis tend to be accompanied by continuous reinvestment, ultimately leading to a sense of financial satisfaction. This study also highlights the existence of trust in platforms because of the revolution in the industrial and digital worlds. The existence of an investment platform makes it more effective in carrying out financial activities.

This study has uncovered two significant suggestions based on its findings. Firstly, the study found that financial knowledge does not have any significant effect on investment intentions. These findings provide important insights for future studies in this area and highlight the need for exploring different perspectives for variable measurements, particularly since each investment product has its own unique characteristics. Secondly, perceived risk is not an important factor for investment intentions. These findings differ from the commonly held concept of risk in investment, which suggests that every financial venture carries some level of risk. Meanwhile, financial knowledge was found to have no significant impact on investment intentions, it is possible that risk perceptions still play a role in decision-making. Therefore, it is necessary for future analysis to carefully review the measurements used, particularly with regard to risk perception, to gain a more comprehensive understanding of the factors that influence investment behavior.

IMPLICATION FOR THEORY AND PRACTICE

This study provides theoretical and practical implications. The theoretical implication of the Planned Behavior (TPB) is that interest in investing is determined by the financial attitude of the respondents. A positive financial attitude often correlates with a greater interest in investing. This interest in investing prompts informed investment decisions and continues to regularly initiate reinvestment of earnings, ultimately leading to greater financial well-being. This study contributes to the TPB theory, but monetary knowledge and perceived risk have not been able to prove the theory. When investing, it is important to understand the risk profile because compensation for accepting the threats faced is an important factor in financial satisfaction.

The practical implications for this study include the government, in this case the OJK, a national agency whose job it is to protect the public from various offers and investment schemes. The government, by issuing alerts, provides the public with a reliable resource to investigate and identify illegal investment offers.

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Methodological Issues in Analyzing Financial Development in the Context of ESG

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ABSTRACT

The sustainable development goals formulated by the UN are embodied in various spheres of human life and economic activity. In finance, this movement has led to the emergence of a sustainable finance market in recent years. Its boundaries are set by the uniqueness of the tools and products of this market and the formation of its own rules and standards. The purpose of this study is to develop approaches to assess the development of the sustainable finance market and integrate indicators characterizing the state of individual segments of this market into the system of financial development indicators promoted by the World Bank. To achieve this goal, the paper analyzes the structure and scope of the sustainable finance market, examines the experience of monitoring the state and dynamics of this market in different aspects, and clarifies the place of existing and proposed indicators in the system of financial development metrics. As a result of the study, it was revealed that the modern practice of monitoring and analyzing the sustainable finance market is not fully adapted to the purposes of both country-based and cross-country analysis, since it is not systematized and relies mainly on absolute indicators. The authors propose the development of a methodology for analyzing the sustainable finance market by complementing existing approaches and preferentially using structure indicators and GDP-weighted indicators. Taking into account these proposals, the work presents a modernized system of financial development indicators of 5×4 dimensions, which is intended to replace the 5×2 matrix used so far in the literature on financial development. This will make it possible to more systematically accumulate information on the functioning of the sustainable finance market and use it, among other things, to find answers to the questions regarding the contribution of this market to financial development and the effects of its development on inclusive economic growth.

Keywords: financial sector; financial development; ESG; sustainable finance market; financial development indicators

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INTRODUCTION

Over the past two decades, the attention given to ESG issues has continuously grown worldwide. The impact of ESG on the financial market has led to the emergence of a distinct concept known as the *"sustainable finance market"* (SFM), encompassing tools, institutions, norms, and codes of conduct related to the implementation of ESG principles. In its structure, SFM encompasses bank lending (green loans), the capital market (sustainable bonds, ESG investment funds, The United Nations Sustainable Stock Exchanges (SSE) initiative), and insurance (insurance products with a "sustainability" label).

Commitment to ESG principles influences the behavior of companies and investors, becomes a subject of activity for international organizations, and modernizes the priorities of national financial regulators' policies. The regulatory environment is adapting, and institutions of the financial market infrastructure are beginning to take an active stance on ESG issues. Overall, there is a significant influence of the ESG agenda on financial development. Despite the obviousness of this impact, the methodological apparatus for measuring financial development has not yet adopted the innovations brought about by the process of SFM formation. Thus, addressing this issue appears to be relevant, which defines the objective of this study — the development of principles and approaches for integrating the set of SFM development monitoring metrics into the financial development indicators system.

This is particularly important in connection with the issues addressed by a significant portion of the literature on financial development, namely: the relationship between financial development and economic growth [1], productivity growth [2], and overcoming the problem of inequality [3]. Indeed, in recent years, studies have emerged that focus on the issue of the relationship between the development of individual segments of the sustainable finance market and economic growth [4–7]. However, there is still a significant lack of such work, as it covers a small number of markets and countries. Finally, the depth of research on the issue remains insufficient to comprehensively reveal the mechanisms of transmission for a "sustainable" transition to inclusive "green" economic growth.

STRUCTURE AND SCOPE OF THE MODERN SUSTAINABLE FINANCE MARKET

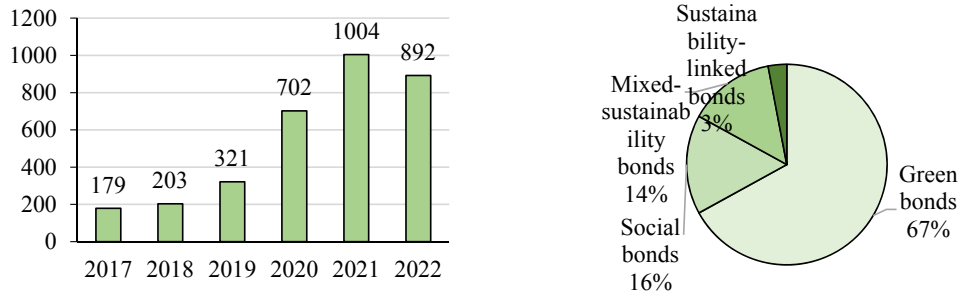
Among ESG sectors, the fastest growth is characteristic of debt instruments known as *sustainable bonds* (*Fig. 1*). This concept includes debt instruments, the net proceeds from the issuance of which are used for the partial or full financing of projects that meet environmental or social criteria. The concept encompasses: (a) *green bonds* (raising funds for projects that provide environmental benefits in accordance with the Sustainable Development Goals (SDGs)[1]); (b) *social bonds* (for projects aimed at addressing a specific social issue or mitigating its consequences, improving food security, access to education, healthcare); (c) *mixed sustainable bonds* (projects that bring both environmental and social benefits).

The growing class of products in this market is sustainability-linked bonds, issued for projects transitioning to sustainable development. The total amount of outstanding debt on all these instruments in 2022 was $ 3.3 trillion (approximately 2.4% of the global bond market).[2]

The overwhelming majority of sustainable debt instruments are accounted for by

[1] Sustainable Development Goals of the UN. URL: https://www.un.org/sustainabledevelopment/ru/sustainable-development-goals/ (accessed on 10.01.2024).

[2] UNCTAD. World Investment Report. Investing in sustainable energy for all. New York. UNCTAD. 2023. URL: https://unctad.org/system/files/official-document/wir2023_en.pdf (accessed on 2023.12.29); BIS Statistics. Debt Securities. URL: https://stats.bis.org/statx/srs/table/c1 (accessed on 12.12.2024).



a) production volume, 2017–2022, billion USD

b) issuance structure, Q3 2023, %

Fig. 1. **Sustainable Bond Market's Features**

Source: Compiled by the authors based on UNCTAD.

developed countries. The leaders in the issuance of sustainable instruments are European countries — in 2022, they accounted for 45% of all issued sustainable bonds, 23% for Asia and Oceania (mainly due to China), the USA and Canada for 15%, and international organizations for 12%.

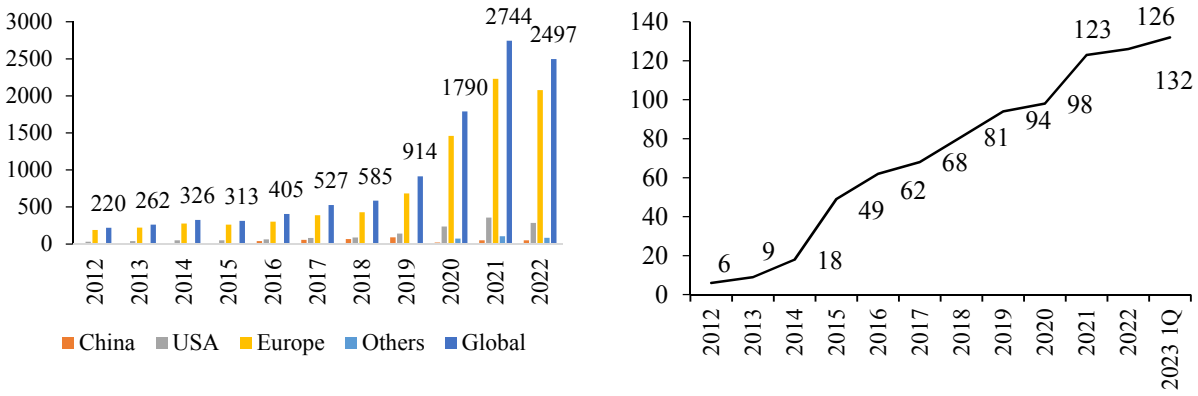
France, the Netherlands, and Germany were among the top five countries by cumulative issuance volume in 2022. A significant player in the green bond market has been China, which, along with Germany and the United States, entered the top three leaders in new issuances in 2022–2023. China accounts for a significant share of all issuances of these instruments in the group of emerging markets. The total volume of green bonds issued in China is estimated at 1.6–2.7% of GDP (2022), depending on the use of international (CBI — Climate Bonds Initiative) or national classification. Similar indicators in Russia, according to a study by IMF experts, are the lowest among BRICS countries and a number of other emerging market economies [8].

Additional growth momentum in the sustainable instruments sector is expected from the adoption of the European Green Bond Standard. Similar events, such as the implementation of China's Green Bond Principles and the passing of the Inflation Reduction Act in the United States, could potentially accelerate growth in other regions. On a long-term growth trajectory with nearly a 14-fold increase in annual issuance from 2017 to 2022, social bonds and mixed-sustainability bonds remain. They account for approximately one-third of all sustainable bond debt. The growth of the "social" bond market was stimulated by efforts to mitigate the consequences of the coronavirus pandemic. Although the majority of the market is in the public sector, there is a noticeable increase in the issuance of social bonds by corporations and financial institutions.

A significant part of SFM is carbon markets, which are understood as complex systems where emission quotas, carbon credits, and financial instruments based on them are bought and sold. Article 6 of the Paris Agreement on Climate Change 2015 opens up the possibility for countries to use international carbon markets to meet their national commitments.[3] Countries are increasing investments in modern digital infrastructure to ensure participation in international carbon markets.

Carbon markets are divided into two main types: *compliance carbon markets* (CCM) and *voluntary carbon markets* (VCM). Mandatory ones are specific to a particular jurisdiction. Voluntary markets meet the demand for carbon credits outside of regulated

[3] Paris Agreement. United Nations. 2015. URL: https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf (accessed on 18.01.2024).



a) assets under management of RIFs, billion USD

b) the number of exchanges participating in the UN SSE Initiative

Fig. 2. **Institutional Players of the Sustainable Finance Market**

Source: Compiled by the authors based on UNCTAD and SSE database. URL: https://sseinitiative.org/data/ (accessed on 30.01.2024).

schemes and allow the buying and selling of emissions credits issued under projects aimed at reducing emissions. Participants in the voluntary market are companies and governments seeking to reduce their carbon footprint [9].

Compliance markets in 2022 were estimated at $ 979 billion in carbon credit issuance per year.[4] VCMs, valued at $ 2 billion, are a rapidly growing element of the financial landscape, providing an opportunity that most CCMs do not have: directing investment capital abroad to finance new projects aimed at reducing or preventing emissions. Thus, voluntary markets provide a cross-border channel for financing renewable energy and other climate-related projects.

One of the fundamental trends in the development of SFM is the increasing role of institutional investors in total assets, along with a slight reduction in the share of banks. Satisfying the growing demand from clients for sustainable labeled instruments, an increasing number of institutional investors are adhering to the rule of considering ESG factors in the investment process [10]. Leading managers — BlackRock, Vanguard, State Street — have established responsible investment funds (RIFs). From 2012 to 2022, the number of funds entirely focused on RIFs increased by 4.5 times. 82% of the funds are allocated to Europe, 12% to the USA, and 2% to China. The value of assets under the management of such funds in 2022 approached $ 2.5 trillion (*Fig. 2*).

State pension funds and sovereign wealth funds are also showing increasing interest in SFM. They are involved in the standardization of sustainability reporting in accordance with international standards. The Principles for Responsible Investment (PRI[5]) and the Task Force on Climate-related Financial Disclosures (TCFD)[6] are the two most commonly used reporting frameworks, followed by the Global Reporting Initiative (GRI)[7] and the Sustainability Accounting Standards Board

[4] Finance Yahoo. URL: https://finance.yahoo.com/news/global-carbon-credit-market-2023–104800429.html (accessed on 06.02.2024).

[5] Principles for Responsible Investment (PRI) — supported by the UN, an international network of financial institutions working on the implementation of six principles related to ESG investing. URL: https://www.unpri.org/ (accessed on 20.01.2024).

[6] Task Force on Climate-Related Financial Disclosures (TCFD). URL: https://www.fsb-tcfd.org/ (accessed on 20.01.2024).

[7] Global Reporting Initiative (GRI). It is an independent international organization that helps companies and organizations take responsibility for the consequences of their activities by providing them with standards to inform about these impacts. (GRI Standard). URL: https://www.globalreporting.org/how-to-use-the-gri-standards/gri-standards-english-language/ (accessed on 24.01.2024).

(SASB).[8] More than half of the funds publish information about climate risks either in a separate section of their annual reports or in a special report on climate risks. Almost a quarter of funds specify target indicators for investments in renewable energy sources and fossil fuels.

The SFM infrastructure relies on *specialized exchanges or sections of existing exchanges*. By 2023, 69 exchanges had written recommendations on ESG reporting (compared to 10 in 2012); more than a quarter impose mandatory ESG requirements at listing. The work of stock exchanges is at the center of the UN Sustainable Stock Exchanges Initiative (SSE). The number of SSE participants in Q1 2023 was 132, meaning it is a global reach.

One of the main issues in the field of ESG development is disclosure. Securities regulators and international standard-setting bodies have made progress in codifying sustainability reporting. ISSB, preparing global ESG standards, aims to meet the need for consistent, comparable, and reliable sustainability disclosure standards. Together with the GRI standards, they are intended to form a comprehensive corporate reporting system for disclosure.

The most advanced experience is that of the EU, where the Directive on Corporate Sustainability Reporting has been in effect since 2023. The document requires large companies to report on their ESG activities. Developing their sustainability reporting requirements, the EU and the US are collaborating with the ISSB to achieve functional compatibility. Measures requiring financial institutions and companies to report on sustainability, including CO_2 emissions reports, are being introduced by the governments of developing countries (India, China, Egypt, Bangladesh, and Malaysia). Companies are actively trying to draw attention to their sustainability efforts. In 2020, 92% of firms from the S&P 500 list and 70% of firms from the Russell 1000 published sustainability reports.

Overall, in the past 15 years, there has been an active phase of the formation of SFM, which encompasses both the market for debt instruments and loans, as well as the capital market and its infrastructure. The boundaries of SFM are defined by the uniqueness of the instruments and products of this market and the establishment of its own rules and standards, aimed at distinguishing products and instruments labeled as sustainable from the broader continuum.

THE ROLE OF SFM IN THE SYSTEM OF FINANCIAL DEVELOPMENT INDICATORS

Despite the growing popularity of SFM and, obviously, its role in the financial systems of many countries, possibly due to the rapid growth of this market, there is a lag in the development of a monitoring system that could be used for statistical analysis of this process.

The emergence of SFM is part of the profound changes in the nature of the modern financial system and its role in economic development, observed since the large-scale liberalization of financial markets in the 1980s, which has gradually affected various countries and regions of the world. Financial liberalization opened up the possibility for the expansion of financial institutions into different markets and, consequently, into various sectors of the economy, stimulated financialization [11], and led to the formation of a process referred to in the literature as "financial acceleration" [12], which essentially resulted in the rapid and, apparently, unjustifiably excessive deepening of financial markets [13]. Indeed, financial markets have been actively growing in their absolute sizes and relative to the economies of their

[8] Sustainability Accounting Standards Board (SASB). International organization developing and promoting reporting standards that reflect aspects of sustainable development (SASB Standards). URL: https://sasb.org/standards/ (accessed on 24.01.2024).

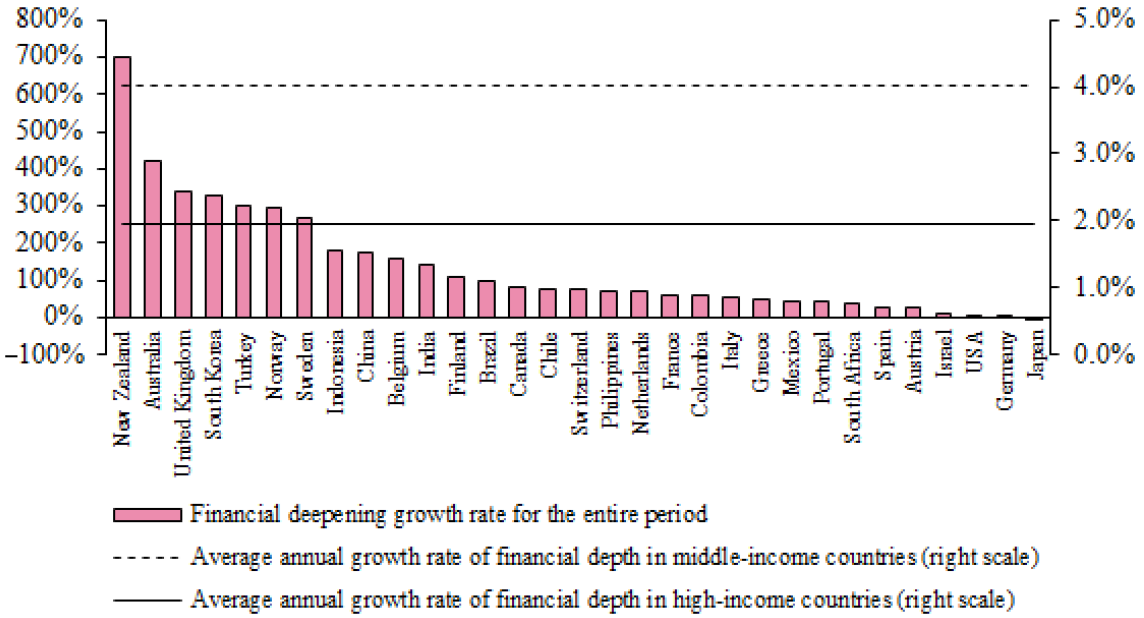


Fig. 3. **Increase in Financial Depth Across Countries, 2021 to 1981**

Source: Compiled by the authors based on the World Bank. URL: https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database (accessed on 21.12.2023).

Note: Private credit by deposit money banks to GDP is taken as a benchmark for financial depth.

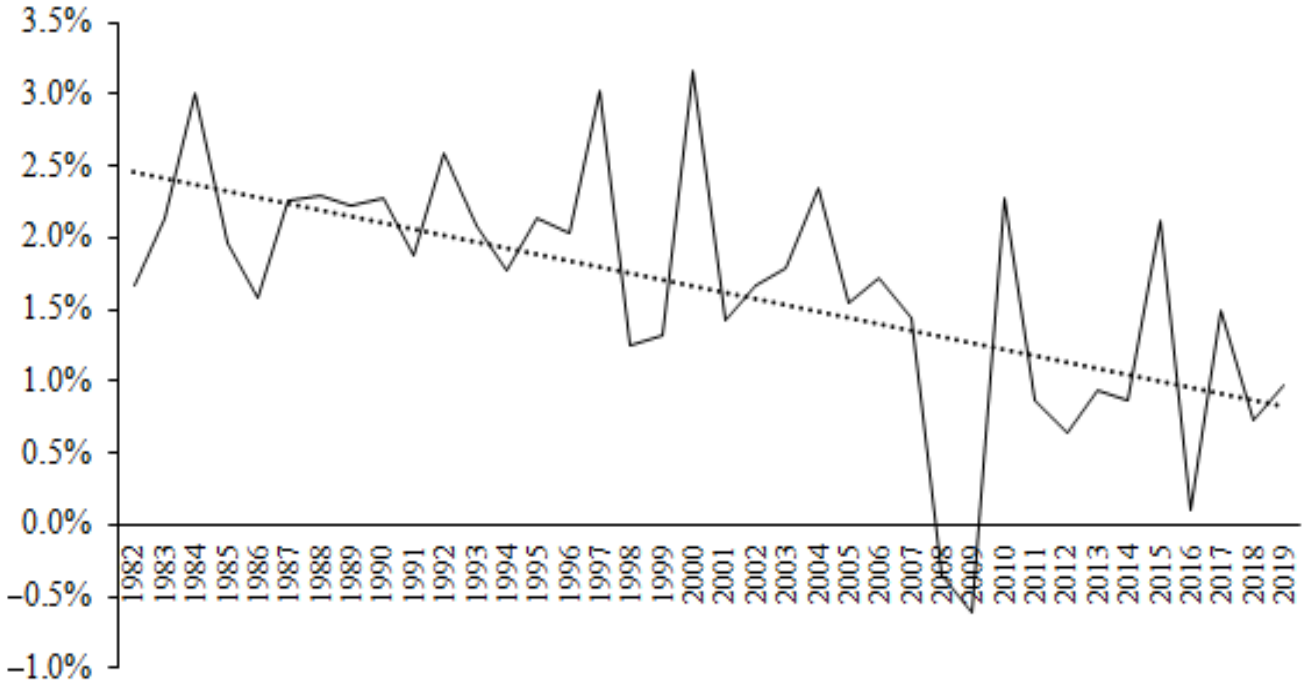


Fig. 4. **Labor Productivity Growth Rate**

Source: Compiled by the authors based on OECD. URL: https://data.oecd.org/lprdty/gdp-per-hour-worked.htm (accessed on 03.02.2024).

Note: The labor productivity indicator is "GDP per hour worked"; calculated for a sample of OECD countries for the period from 1981 to 2019; the dotted line is the trend line.

presence, although this process has not been uniform across countries (*Fig. 3*).

At the same time, the analysis shows that the real sector of the economy did not manage to effectively utilize the opportunities of growing financial depth and progressing inclusivity, considering that this progress did not necessarily lead to an increase in economic productivity, but rather, when evaluating global trends, was accompanied by a diminishing returns effect (*Fig. 4*).

The damage inflicted on the environment, which arose as economies grew, constitutes another aspect of economic development driven by financial acceleration [14]. The awareness of the need to respond to this type of externalities has led to a broad movement for environmentalization, supported by the global community.[9] In this context, the sprouts of ESG segments in the financial market should be seen as a result of rethinking its role as a mechanism supporting economic growth. Essentially, the social demand that has been forming in recent years is prompting the modernization of the economic financing mechanism, the settings of which are being supplemented with components for monitoring environmental, social, and governance aspects of development.

Approaching the problem from the perspective of assessing the adequacy and sufficiency of the tools used to measure financial development and subsequently project its results onto growth aspects, one can note a significant lag of the existing assessment tools behind the current agenda set by ESG. As sources of the relevant metrics and generators of the methodologies used to construct them, in most cases, the IMF and the World Bank are referred to. The IMF accumulates a significant amount of information regarding financial development and provides the opportunity to use it in the form of databases: International Financial Statistics,[10] Financial Development Index Database,[11] and Financial Soundness Indicators.[12] Not long ago, a dataset titled "Climate Change Indicators Dashboard" was added to these databases.[13] In the section Climate Finance, it contains statistics on green bonds (Green Debt) and the carbon footprint of bank loans. (Carbon Footprint of Bank Loans).[14]

The World Bank supports a project called the "Global Financial Development Database" (GFDD).[15] The formation of GFDD was preceded by immense intellectual work, which traces back to the efforts of outstanding representatives of the scientific field of the *finance-growth nexus*. Among them is R. Goldsmith [15] with his discovery of comparative financial morphology, the methodology for calculating the coefficient of financial interconnections in the economy, and innovations in the use of metrics for cross-country studies aimed at explaining the financial component in the economic growth of countries; R. King, R. Levine [16], R. Atje, B. Jovanovic [17], S. Zervos [18], who introduced key indicators designed to track financial development, such as "Liquid liabilities of the financial system to GDP", "Bank credit to the sum of bank credit and central bank domestic assets", "Volume of credit allocated to private companies to GDP", "Market capitalization of the stock market to GDP", "Turnover of the stock market to GDP".

The number of financial development indicators (hereinafter — FDI) rapidly

[9] The most vivid manifestation of this movement is the UN climate conferences.

[10] URL: https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9–52b0c1a0179b

[11] URL: https://data.imf.org/?sk=f8032e80-b36c-43b1-ac26–493c5b1cd33b

[12] URL: https://data.imf.org/?sk=51b096fa-2cd2–40c2–8d09–0699cc1764da

[13] URL: https://climatedata.imf.org/pages/climate-finance/#cf2

[14] The carbon footprint of bank loans reflects the banks' exposure to transition risk (the shift to a low-carbon economy), which is comparable between countries. The higher this indicator, the higher the carbon intensity of the banking portfolio of the respective country.

[15] URL: https://www.worldbank.org/en/publication/gfdr/data/global-financial-development-database

Table 1

ESG Indicators Collection Designed for Financial Development Analysis

No.	Systematization criterion	Indicator, calculation method	Sources
–	**Group 1. Секторы SFM**		
1	Release of ESG tools	The volume and dynamics of issuing green, social, and sustainable bonds; the issuance of green, social, and sustainable loans. The share of ESG instruments in the total volume of bonds (loans). The ratio of the volume of outstanding ESG bonds (ESG loans) to GDP	Climate Bond Initiative, Environmental Finance, authors' developments
2	ESG investing	Volumes and dynamics of ESG investing: absolute and relative indicators; total net assets (TNA) of ESG funds. The share of ESG investments in the total volume of net assets of funds. Private TNA of ESG funds to GDP	UNCTAD; Environmental Finance, authors' developments
3	Effectiveness of ESG funds	The return on ESG investments and ESG funds in the form of an annual rate and spread to the benchmark.	Bloomberg, Refinitiv, S&P, MSCI, Morningstar
4	Trading carbon units	Volumes and dynamics of carbon credit trading	European Union Emission Trading System The Chinese national carbon trading scheme, Chicago Mercantile Exchange, European Energy Exchange, other climate exchanges
–	**Group 2. The involvement of economic entities in the sustainable agenda**		
5	Disclosure of information in accordance with TCFD	The number of companies disclosing information according to TCFD recommendations. The share of the capitalization of such companies in the total market capitalization.	Financial Stability Board, authors' developments
6	Commitment to PRI UN	The number of PRI signatories; the amount of assets under their management. The share of assets under the management of PRI signatories from the total assets of financial intermediaries.	United Nations Environment Programme Finance Initiative, UN Global Compact, FSB, authors' developments
7	Commitment to the UN SSE Initiative	The number of subscribers and their share in the financial market (number of listed companies)	Stock and futures exchanges
8	Participation in NGFS	Number of subscribers	Central banks

Source: Compiled by the authors.

Table 2

Modernized Matrix of Financial Development Indicators

Category	Sector			
	Financial institutions		Financial markets	
	GFDD Indicators	ESG Classification Indicators	GFDD Indicators	ESG Classification Indicators
Financial inclusion	AI.01 – AI.36	The share of ESG lending in the total volume of loans	AM.01 – AM.04	The share of ESG fund assets in the total volume of net assets of collective investment institutions
Financial depth	DI.01 – DI.14	ESG lending to GDP, % ESG fund assets to GDP, % Assets under management of PRI signatories to GDP, %	DM.01 – DM.16	The volume of outstanding sustainable bonds to GDP, % The volume of outstanding green bonds to GDP, % The volume of outstanding social bonds to GDP, % The volume of outstanding sustainable ETFs to GDP, % The capitalization of companies listed on exchanges that have joined the SSE to GDP, %
Efficiency	EI.01 – EI.10	The return of ESG funds in the form of an annual rate and distance from the benchmark The volume of carbon unit trading to the volume of CO_2 emissions	EM.01	Publication of ESG reports,% of the number of companies (separately for large companies and those in the SME category) The share of companies disclosing information according to TCFD recommendations among the total number of large companies, %
Financial stability	SI.01 – SI.07	–	SM.01	–
Other	OI.01 – OI.20	The share of PRI signatories among the total number of financial institutions, % Participation in the Network for Greening the Financial System (NGFS) (binary indicator)	OM.01 – OM.02	The market share of sustainable bonds in the total volume of outstanding private sector bonds (by market value) The market share of sustainable bonds in the total volume of outstanding public sector bonds (by market value)

Source: Compiled by the authors.

Note: The indicators in the 3rd and 5th columns are calculated based on individual countries data; the indicators are calculated on a quarterly or annual basis.

increased, prompting attempts to structure them into a unified system. Thus, T. Beck et al. proposed distributing the financial development indicators (FDIs) within a 2 × 3 matrix, in which they were divided into those related to financial institutions or liquid capital markets, and then categorized by depth, efficiency, or accessibility [19, 20]. The extended classification of FDI was presented by M. Chihak et al., who added a fourth category of FDI addressing financial stability [21]. The 4 × 2 classification was used by the World Bank in labeling GFDD indicators. Later, GFDD was expanded to a 5 × 2 dimension with the addition of "other" indicators and currently includes a total of 112 different metrics; however, none of them indicate an attitude towards the climate agenda.

Thus, we find that, since the indicators related to the SFM category appeared only in one of the IMF databases, and the coverage of these indicators is more than limited, work in this direction, considering the significance of the ESG agenda and the relevance of developing research on the role of SFM expansion for the economy, has great prospects.

MODERNIZATION OF THE FINANCIAL DEVELOPMENT INDICATORS SYSTEM

As part of this study, the authors undertook work on monitoring and systematizing approaches to measuring the development of the SFM and the corresponding indicators. For this purpose, reports from international organizations that facilitate the mobilization of global capital to combat climate change (Climate Bonds Initiative), materials from major business information aggregators (Bloomberg, Refinitiv, Morningstar), rating agencies (S&P), specialized exchanges (European Energy Exchange, Global Carbon Credit Exchange, etc.), and media outlets specializing in sustainable investing, green financing, and the activities of companies in environmental markets (Environmental Finance), among others, were analyzed.

Such analysis allows for the extraction of numerous sets of indicators, which are represented by several related classification groups. We use two out of many possible criteria: the classification of indicators (1) into different SFM sectors and (2) into measuring participants' commitment to principles and initiatives that reflect a sustainable agenda. By supplementing the metrics used in the sources with those that would best suit the tasks of cross-country comparisons, we will obtain a catalog of ESG indicators (*Table 1*).

Thus, the authors' position is that the prevailing method of using absolute indicators of the value volumes of SFM or quantitative statistics of participants who have demonstrated commitment to ESG principles should be supplemented by an approach that allows for the assessment of the weight of the SFM segment in the corresponding sector of the financial market (structure indicators), the significance of such a segment in the economy (depth indicators), and the measurement of market participants' engagement in ESG initiatives (inclusivity indicators).

The existing experience in assessing SFM progress is proposed to be supplemented by a methodology for evaluating financial development implemented by the World Bank, with a range of quantitative and qualitative indicators (*Table 2*) that take into account the positions of countries regarding the depth of SFM and the effectiveness of the penetration of the ESG agenda into the sphere of investors, corporations, financial institutions, and regulators.

CONCLUSION

Let's summarize the results of the conducted analysis. ESG tools, products, and mechanisms (green and social bonds, sustainable loans, investment funds, etc.) are gaining an increasing share of the financial market. Work on establishing principles of responsible behavior and standardization allows for a clearer definition of the boundaries of SFM

compared to what it could have been seen as 10 years ago.

The rapid growth of SFM has led to the system of indicators reflecting this process lagging somewhat in its development, complicating analysis at the country level or by country. As shown in the study, documents covering ESG markets rely on a poorly structured system of metrics, largely using absolute quantitative indicators. The authors have conducted a systematization and classification of the existing SFM development indicators, compiling a catalog of indicators based on two groups of classification criteria: (1) SFM sectors and (2) the commitment of participants (companies, regulators) to principles and initiatives reflecting the "sustainable" agenda (PRI, Equator Principles, SSE), participation in intergovernmental coordination bodies (NGFS). This catalog is filled with indicators, the approach to constructing which is based on the principle of structure and significance in the economy, making these indicators more suitable for intra- and inter-country analysis.

Taking into account the need for the unification of the FDI system and relying on their own classification of SFM development indicators, the authors proposed a modernized FDI system in which the 2x5 matrix is transformed into a 4x5 matrix, highlighting separate subgroups within the "financial institutions" and "financial markets" groups, consisting of indicators taken from ESG classifications. This will allow for the inclusion of aspects arising from the progress of SFM in the analysis of financial development, assess the impact of the establishment of SFM on financial depth and accessibility in specific countries, make cross-country comparisons, and build models to evaluate the relationship between SFM dynamics and economic development.

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