

DOI: 10.26794/2587-5671-2024-28-5-133-145
UDC 336.018(045)
JEL C30, D12, Q41, Q48

Financial and Investment Model for Social Security and Sustainable Economic Growth

J. An^a, A. Yu. Mikhaylov^b, N.B.A. Yousif^c

^a College of Business, Hankuk University of Foreign Studies, Seoul, South Korea;

^b Financial University, Moscow, Russia;

^b Western Caspian University, Baku, Republic of Azerbaijan;

^b Baku Eurasian University, Baku, Republic of Azerbaijan;

^c College of Humanities and Sciences, Ajman University, Ajman, United Arab Emirates;

^c Humanities and Social Sciences Research Centre (HSSRC), Ajman University, Ajman, United Arab Emirates

ABSTRACT

The **subject** of the study is the models of social security of the population. The **relevance** of the research is derived from the fact that states are increasingly faced with global problems requiring more government funding and restricting how much social risk is covered by state social security mechanisms and models. The **purpose** of the study is to form a financial and investment model of social security that promotes sustainable economic growth. The task is to systematize the aspects of the formation of an optimal financial and investment model of social security. The authors use the methodology of the analysis of the functioning environment (DEA) and the methods of neo-institutionalism, which is the most promising and complete concept for studying structural changes and investment strategies. The main results of the study show that inflation can have a negative impact on the social protection system. An optimal model of social security is proposed to stimulate economic growth. It is **concluded** that regardless of the division of the social security system into the state and non-state sectors, the proposed model of social security will achieve a synergistic effect and can have a positive impact on the quality and life expectancy of the population, which will favorably affect the indicators of economic activity and economic growth.

Keywords: social security models; sustainability; economic growth; neo-institutionalism

For citation: An J., Mikhaylov A. Yu., Yousif N.B.A. Financial and investment model for social security and sustainable economic growth. *Finance: Theory and Practice*. 2024;28(5):133-145. DOI: 10.26794/2587-5671-2024-28-5-133-145

INTRODUCTION

The system of benefits and other social payments provides financial support to the population in various situations, such as unemployment, disability, the death of a breadwinner, and the birth of a child. It can vary depending on the country and region. The insurance coverage system provides financial support for workers who have been harmed as a result of their professional activities.

The system of medical and pharmaceutical provision, as well as sanatorium-resort treatment, ensures the accessibility and quality of medical services and medications for the population. It can include various types of health insurance, coverage for medication expenses, and spa and resort treatment.

The system of social indicators provides the population with access to various types of social services, such as assistance in caring for the elderly and support for those raising one to three children. It can include various types of social insurance, as well as government support for providing social services [1].

The subject of the research is the selection of the most effective model of social security. A hypothesis has been put forward that the income level of the population is an important factor influencing the approaches to the formation of financial and investment models for both state and non-state social security. For many years, discussions on this topic have been ongoing among leading Russian researchers. The greatest contribution to the formation of the mechanism for state and financial regulation of the social sphere was made by Z.A. Arsakhanova [2].

The novelty of this research lies in the systematization of the aspects of forming an optimal financial and investment model for social security. The relevance of the research is determined by the need to reform the social security system in Russia.

The methodological basis of the research is data envelopment analysis (DEA) of social security and the theory of sociological institutionalism.

Sociological institutionalism is a subtype of new institutionalism that examines how institutions give meaning to individuals. It is believed that institutions developed similarly across all organizations, even though they evolved differently. Institutions are seen as crucial for maintaining and disseminating cultural norms.

At the same time, there is the concept of new institutional economics. This is an economic perspective that focuses on the social and legal norms and rules underlying economic activity. This is an attempt to take economic theory beyond the confines of earlier institutional economics and neoclassical economics by expanding its scope. It differs from functionalist theories and approaches to rational choice in that it emphasizes that many outcomes are possible, small events and coincidences can have significant consequences, actions taken once are difficult to reverse, and results may be ineffective.

BENCHMARK OF SOCIAL SECURITY

Next, we described the methodological foundations of the functioning of benchmark models of social security in more detail.

Bismarck model is based on the principle of equality, which means that all citizens have the right to social protection and benefits, regardless of their social status or income [2]. Employers and employees share a common responsibility for funding social funds. Employers pay contributions for their employees, while workers' pay for themselves. The state controls and regulates the activities of social funds, ensuring social protection for all citizens, including pensions, unemployment benefits, health insurance, and social benefits (*Table 1*).

In the *Beveridge model*, the state invests in education, science, infrastructure, and other public goods. These investments create a favorable environment for the development of the private sector, which begins to produce more goods and services. State support for

Table 1

Bismarck Model Mechanism

Mandatory social insurance>	Employees and employers >
State regulation>	Principles of the model>

Source: Compiled by the authors.

Table 2

Beveridge Model Mechanism

Government is investing >	Increase in tax revenues to the budget >
< Development of the private sector	<Growth in production and income

Source: Compiled by the authors.

Table 3

Social Support Model Scheme

State funds		Social Fund of Russia	Government, Social Fund of Russia
Financing >	Investment in social program	Management	Supervision and control
Non-state funds		Non-state social protection funds	Auditor

Source: Compiled by the authors.

all citizens means that every citizen has the right to a certain level of social protection, regardless of their income or status. The state provides a minimum income for all citizens, allowing them to cover basic expenses for housing, food, and other essential needs.

The growth of production and income in the private sector leads to an increase in tax revenues to the state budget [3, 4]. The government uses these tax revenues for the further development of public goods and investments in the economy. Thus, the Beveridge model suggests that the state and the private sector interact with each other, creating a favorable environment for economic growth and an increase in the standard of living for the population [5, 6] (Table 2).

At the same time, there are also alternative models of social security. For example, the model of the social security system in the USSR (*USSR model*) was based on the

principles of state social protection and equality of citizens and included the following elements:

1. State social insurance includes insurance for workers against workplace accidents, illnesses, disabilities, and pension provision.
2. State social security implies government assistance to low-income citizens, including children, pensioners, disabled individuals, and other categories of the population.
3. Public healthcare includes medical institutions, treatment, and disease prevention.
4. Public education. Education in the USSR was state-run and free for all citizens. The education system included schools, vocational schools, technical colleges, universities, and other educational institutions.
5. Public housing. Housing provision in the USSR included government support for housing construction and the provision of housing on preferential terms. [7–10].

The mechanism of functioning of the *financial and investment model of state and non-state social security* includes the following elements (Table 3):

1. Financing. State social security is funded from the state budget, while non-state social security is financed through contributions from employers and employees, as well as donations and charitable contributions [11, 12].

2. Investing. Market pension funds invest in production and other projects, then receive interest, which goes towards pension payments [13, 14].

3. Management. Financial and investment management is carried out by specialized institutions established for this purpose. For example, these can be state social insurance funds or non-state social protection funds [15, 16].

4. Control. The control over the use of funds and the effectiveness of programs is carried out by government bodies and independent auditing firms [17, 18].

METHODOLOGY

The DEA methodology [19, 20] includes a basic DEA model focused on optimizing input parameters. (1–4). Formulas (1, 2) represent an input-oriented model with constant returns to scale (CRS), based on which a piecewise linear boundary of relative efficiency is formed:

$$\tau_x(x^0, y^0) = \min_{\theta, \lambda}(\theta) \quad (1)$$

$$\begin{cases} \sum_{j=1}^N \lambda_j y^j \geq y^0; \\ \sum_{j=1}^N \lambda_j x^j \leq \theta x^0; \\ \lambda \geq 0; \\ j = 1, 2, \dots, N \\ \theta \in [0; 1] \end{cases} \quad (2)$$

The article employs an input-oriented model with variable returns to scale (VRS),

which creates a convex frontier of relative efficiency (3), (4):

$$\tau_x(x^0, y^0) = \theta^*, \text{ where } \theta^* = \min_{\theta, \lambda}(\theta) \quad (3)$$

$$\begin{cases} \sum_{j=1}^N \lambda_j y^j \geq y^0; \\ \sum_{j=1}^N \lambda_j x^j \leq \theta x^0; \\ \sum_{j=1}^N \lambda_j = 1; \\ \lambda \geq 0; \\ j = 1, 2, \dots, N \\ \theta \in [0; 1] \end{cases} \quad (4)$$

Output-oriented constant returns to scale (CRS) model, on the basis of which a piecewise linear boundary of relative efficiency is formed (5), (6):

$$\tau_y(x^0, y^0) = \frac{1}{\varphi^*}, \text{ where } \varphi^* = \max_{\theta, \varphi}(\varphi) \quad (5)$$

if

$$\begin{cases} \sum_{j=1}^N \lambda_j y^j \geq \varphi y^0; \\ \sum_{j=1}^N \lambda_j x^j \leq x^0; \\ \lambda \geq 0; \\ j = 1, 2, \dots, N \\ \theta \in [0; 1] \end{cases} \quad (6)$$

A results-oriented model with variable returns to scale (VRS), which creates a convex frontier of relative efficiency (7), (8):

$$\tau_y(x^0, y^0) = \frac{1}{\varphi^*}, \quad (7)$$

where $\varphi^* = \max_{\theta, \varphi}(\varphi)$,

if

$$\left\{ \begin{array}{l} \sum_{j=1}^N \lambda_j y^j \geq \varphi y^0; \\ \sum_{j=1}^N \lambda_j x^j \leq x^0; \\ \sum_{j=1}^N \lambda_j = 1; \\ \lambda \geq 0; \\ j = 1, 2, \dots, N \\ \theta \in [0; 1] \end{array} \right. \quad (8)$$

where θ — input-oriented DEA model parameter;

$\frac{1}{\varphi^*}$ — parameter of the output-oriented DEA model;

x^j — parameter of the input variable vector;

x^0 — object's input parameter;

y^j — parameter of the output variable vector;

y^0 — object's output parameter;

λ_j — constant constraint in VRS models.

The DEA methodology appears to be the best approach for evaluating the effectiveness of investments in social security and financial models in terms of their complexity and the ability to utilize multiple factors. As part of economic-mathematical modeling using the input-oriented DEA model with the aim of optimizing budget expenditures. The volume of budget expenditures on social policy directly depends on the decisions and effectiveness of the government, as well as on the efficiency of the financial and investment model of social security. Conducting a comparative analysis using the DEA model allows for obtaining data on the efficiency (economic and effective) use of budgetary funds to address the issues of poverty and income inequality, as monetary indicators of the effectiveness of social policy. The DEA methodology can be expanded within the framework of cross-country analysis by including a more extensive list of socio-economic indicators, for example,

by adding the income loss substitution rate, the average annual return on pension asset management, physical morbidity indicators, specific poverty rates (families with children), the level of population coverage by social services in various sectors of social protection, and unemployment. Conducting an inter-country analysis will allow for a comparison of all sources of funding for national models, including state, extrabudgetary, and non-governmental sources, with the indicators of the country's socio-economic development.

The econometric analysis of panel data is applied at each of the two stages of the main phase of the research. In the previous paragraph, it was noted that in some studies this method is used as a supplement to DEA analysis in the form of Tobit regression, a censored regression where specific constraints will be imposed on performance indicators, for example, to filter out the most efficient (benchmark) objects of the study. The panel regression format is also possible, but for performance indicators using the DEA method, a model with constant returns to scale is the most suitable (9).

$$y_{i,t} = \alpha + x'_{i,t} \beta + z'_i \gamma + c_i + u_{i,t}, \quad (9)$$

where z'_i — parameter vector; c_i and $u_{i,t}$ — random variables; $E(c_i) = 0, E(u_{i,t}) = 0$; in random effects models assumes that $E(c_i | z'_i, X_i) = 0$; in fixed effects models, it is allowed that $E(c_i | X_i) = 0$; depends on X_i ; fixed effects model does not allow to evaluate α and γ ; in the through regression assumes that $c_i = 0$. Before conducting the regression analysis, we ensured that the data series under examination are stationary using the Dickey-Fuller test.

RESULTS. FORMATION OF A FINANCIAL-INVESTMENT MODEL OF SOCIAL SECURITY THAT CONTRIBUTES TO SUSTAINABLE ECONOMIC GROWTH

The directions of social security system development can be explained from the

Table 4

Sources of Financing for Financial and Investment Models of Social Security for the Population

Government funding sources	Social sphere	Non-government funding sources
Federal budget	Social policy	Private pension funds
Regional budget	Health	Private insurance funds
Local budget	Education	Non-profit organizations
Extrabudgetary funds	Culture	Population, enterprises

Source: Compiled by the authors.

perspective of neo-institutionalism. The systems of social security institutions are an important element of public life in most countries around the world. They are the foundation for providing various social services, social protection measures, and financial assistance to the population in the following areas [5–7]:

Old age — pension payments, assistance with household tasks and care;

- disabled population (due to disability or illness) — disability benefits (sick leave), home assistance and care;
- unemployed — benefits, early retirement;
- family — benefits (one-time payment, monthly allowance, payments to a single parent), paid maternity leave;
- healthcare — the provision of medications for treatment and prevention, and the delivery of medical assistance;
- housing — benefits, subsidies (for rent, utility payments) and others.

A methodologically sound approach to the formation of a financial-investment model should take into account the requirement for its long-term financial sustainability; therefore, the volumes of social services and financial assistance provided must be aligned with the sources of funding. In accordance with the Federal Law “On the Basics of Social Services for Citizens in the Russian Federation”, there are four main sources of funding for the social security system for the population:

- funds from various levels of the budget system;
- charity and voluntary contributions;
- funds provided by the recipient for the provision of social services;
- income from the activities of organizations engaged in social services.

The state also employs various administrative levers (setting insurance contribution rates) and social incentives (higher returns compared to state benefits) to influence employers’ participation in the development of the country’s social policy and to enhance the economic and social independence of households for their self-sufficiency.

The scale of state social support directly depends on the capabilities of the state budget. Developed countries have a higher quality social protection system, and the government is more capable of influencing the development of financing mechanisms [18].

In the broadest sense, the financing mechanism of the social security system can include sources from both the public and private sectors of the economy (*Table 4*).

State funding for social welfare in European countries is more developed compared to other regions of the global economy. In Europe, all programs are provided to some extent through state mechanisms and are funded by the state budget (*Table 5*).

The “other” section typically includes three types of programs, among which are programs

Table 5

Volume of Social Security Programs in Various Regions of the World Economy

Field	Europe		America		Asia and Oceania		Africa	
	Total	Other	Total	Other	Total	Other	Total	Other
Pension benefits	100% (45)	–	100% (38)	–	98% (50)	–	100% (50)	–
Sickness benefits	100% (45)	–	100% (38)	11% (4)	88% (45)	45% (23)	92% (46)	64% (32)
Maternity benefits	100% (45)	–	95% (36)	3% (1)	90% (46)	37% (19)	98% (49)	34% (17)
Medical benefits	100% (45)	–	89% (34)	–	96% (49)	4% (2)	82% (41)	8% (4)
Payments related to workplace injuries	100% (45)	16% (7)	100%	24% (9)	92% (47)	37% (19)	100% (50)	28% (14)
Unemployment benefits	100% (45)	–	42% (16)	3% (1)	49% (25)	–	20% (10)	2% (1)
Family benefits	98% (44)	–	71% (27)	8% (3)	61% (31)	2% (1)	62% (31)	2% (1)

Source: Compiled by the authors [2].

Table 6

Comparative Characteristics of Social Security Models

No.	Name	Activity
1	Social security insurance model	Based on the principle of compulsory insurance, where employer and employee contribute to a social fund which is then used for pensions, benefits and other social benefits
2	Social security investment model	Involves investing social fund funds in various financial instruments such as stocks, bonds, real estate. This model allows to increase the return of the social fund and ensure its financial sustainability in the long-term
3	Social partnership model	Based on the cooperation of the state, employers and unions in solving social security issues. This model involves the establishment of special commissions and councils that are responsible for developing and implementing social programmes
4	Income redistribution model	Suggests the use of a tax system to redistribute income to the most needy. This model allows social justice and reduces social inequality
5	Capitalization model	The funds collected from taxes and contributions are invested in various financial instruments such as stocks, bonds and real estate. Income from these investments is used for pensions and other social benefits
6	Hybrid model	The funds collected from taxes and contributions are invested in various financial instruments, but also used for immediate payment of pensions and other social benefits. This model combines the advantages of capitalization and distribution models
7	Individual account model	Each employee has his or her own personal account to which his or her contributions are credited. These funds are invested in various financial instruments and retirees receive payments from their individual accounts. This model allows employees to control their savings and choose investment strategies

Source: Compiled by the authors.

Table 7

Methodological Features of Social Security Models for the Population

Model/Criterio	Russian model	USSR model	Bismarck model	Beverage model
The principle of determining the size of benefits	At the expense of the minimum subsistence level	At the expense of the minimum subsistence level	At the salary and insurance volumes	At the expense of the minimum subsistence level
Categories of recipients of social support measures	Whole population	Working population	Working-age population	Whole population
Source of funding	Government budget and funds	State budget	Social contributions	State budget

Source: Compiled by the authors [2].

provided by financial intermediaries, reserve funds, and exclusively by employers. These types of programs are based on private mechanisms for funding social security and are not sponsored by the government. In other words, “others” reflects the number of countries where certain social programs are provided solely through private initiatives.

For the countries of Africa, Asia, and the Pacific region, particularly for programs related to sickness and/or maternity benefits, as well as compensation for work-related injuries, the situation is completely different compared to Europe. The governments of most countries in these regions do not have sufficient funding sources, which is why a significant number of programs are supported solely by private companies [5–7].

Unemployment benefits are a category of social payments that are less represented in the analyzed regions, with the exception of European countries.

The methodological aspects of choosing a specific form of financial-investment model for constructing the sectoral components of the social security system depend on a multitude of different factors, most of which are related to the country-specific characteristics of the economy, the size and demographic composition of the population, the economic potential of the country within the system of international division of labor, the extent of coverage of the population by

types of social protection, and the peculiarities of financing social services (*Table 6*).

Initially, the foreign state social security mechanism was based on one of two benchmark financial-investment models of social security – the continental Bismarck model and the Atlantic Beveridge model. The methodological approach to building financial and investment models of the Bismarck type is based on the implementation of the principle of mutual assistance and insurance for employed citizens who have stable jobs and labor income. The methodological basis for constructing financial and investment models, such as the Beveridge model, was based on supporting the least advantaged segments of the population and ensuring a minimally acceptable standard of living for all citizens, regardless of their labor income.

USSR model and Russian models of social protection have some differences from the benchmark models of Bismarck and Beveridge (*Table 7*).

The social system in the Soviet Union established a number of important standards and basic principles that became the foundation for the further development of the domestic social protection system. In the modern world, pure models of Beveridge and Bismarck do not exist. Countries are shaping social security models that combine features of both benchmark systems, endowing them

with certain unique characteristics, traits, and traditions that have developed over a long period of time within these nations.

Despite the fact that the systems of many countries originated from one of two models — Bismarck or Beveridge — the modern practical experience of their application varies significantly: in some countries, a substantial share of social benefits is guaranteed by the state, while in others, private sources of funding are well-developed. To some extent, this is related to the characteristics, history, and individual traditions of nations, as well as the worldview and beliefs of the population, but the most important role is played by macroeconomic factors, the development of the economy, and the government's efforts to enhance welfare.

The development of effective financial and investment models for state and non-state social security should be carried out with consideration of the following recommendations.

1. Ensuring stability and financial sustainability. Social security systems may face the issue of insufficient financial sustainability if their obligations to the population exceed the available funding sources over the long term. This problem is characteristic of the models of modern developed countries that excessively use debt financing to address current social welfare issues.

2. Assessment of the financial needs of social security. At this stage, an assessment of the financial needs of social security is conducted, which must be met to achieve the established goals and objectives.

3. Focus on all layers of society. The model must be inclusive — it is essential to take into account the characteristics of specific groups of people and the presence of difficult life circumstances. The level of coverage by social support measures for the population is one of the key indicators of the effectiveness of the social security system in contemporary conditions.

4. Availability of financial incentives. To increase the scale of using the financial-investment model, it is necessary to develop financial incentives. The characteristics of financial incentives should reflect the needs and savings capabilities of different subgroups of the population.

5. Establishing a basic investment strategy, the principle of financing — accumulation. Social strata that do not want or cannot choose an investment strategy within the model should receive a basic strategy in accordance with the goals of the social security system.

6. Definition of a fixed lifetime income level as the default value for payment. Lifetime income can be secured through annuities with guaranteed or non-guaranteed payments — as agreed. Flexibility can be achieved through a partial, deferred lifetime income combined with the option to withdraw funds for immediate use.

7. The model parameters should incorporate relevant and regularly updated assumptions about mortality and birth rates that take into account future improvements in life expectancy. Government authorities should regularly update data on natural population growth and loss.

8. Providing the opportunity for consultation on the possibilities of conducting operations within the framework of the model. Establishing effective, personalized, regular, consistent, and impartial communication. Comparison tools for various investment and savings programs should provide standardized information that allows users to compare performance, costs, investment allocation, and possibly other parameters, such as ESG factors.

9. Transparency and openness. Ensuring oversight of compliance with legislation regarding the use of funds within the framework of the model.

10. The flexibility of the system and its ability to adapt to various shocks and changing external conditions. Social security systems may be insufficiently flexible, which

can lead to an inability to adapt to changing conditions.

11. A sufficient level of financial literacy, trust, and engagement among the population. Social security systems play an important role in societal development and provide social protection and assistance to the population in various areas of life. It is important to continue research and develop effective social welfare models, taking into account the changing needs and demands of the population. It is important to collaborate with society and take into account the opinions of the population, as well as to ensure a high level of governance and control over social welfare systems.

CLASSIFICATION OF PARAMETRIC FEATURES OF FINANCIAL-INVESTMENT MODELS OF STATE AND NON-STATE SOCIAL SECURITY

The parameters of the social security model include various quantitative and qualitative characteristics of its functioning mechanism, which can be assessed using typical social security indicators, such as the parameters of financial-investment models in different countries.

There are many factors that influence the functioning of the social protection system. These factors can be exogenous and endogenous. Exogenous (external) factors, such as international trade, can have a significant impact on the social protection system. If a country actively participates in international trade, it can boost economic growth and improve conditions for social protection. Endogenous (internal) factors, such as the demographic situation and income levels in the economy, can also have a significant impact on the social protection system. If there is a large number of unemployed people in the economy, it can lead to a decrease in the financial resources available for social protection.

The income level of the population is also one of the key factors influencing the

approaches to the formation of financial and investment models for both state and non-state social security. In high-income countries, government social security systems typically provide a wide range of services and benefits, including pensions, health insurance, and unemployment benefits. In these countries, there are also non-governmental social security systems, such as private pension funds and health insurance companies.

The criticism of social welfare models in low-income countries is that government social security systems can be limited and unable to provide a wide range of services and benefits. In these countries, non-governmental social security systems may be more developed, as they provide services and benefits that government systems are unable to offer. Thus, the income level of the population is an important factor that influences the approaches to the formation of financial and investment models for both state and non-state social welfare. In high-income countries, government social security systems are usually more developed, while in low-income countries, non-governmental social security systems may be more advanced [7–10].

CONCLUSION

The research includes several points of scientific novelty: a systematization of the aspects of forming an optimal financial-investment model for social security has been conducted. The results of the study show that inflation can have a negative impact on the social protection system. The level of income in the economy can be of great importance for the social protection system. If there is a high level of income in the economy, it can contribute to improving the conditions for social protection of citizens. Various cultural and social factors can influence the demand for social protection and the availability of social services. The results show that neo-institutionalism methods are the most

promising and comprehensive concept for studying structural changes and investment strategies.

The article confirms the thesis that the income level of the population is an important factor that influences the approaches to the

formation of financial and investment models for both state and non-state social security.

Further research could focus on current trends in the formation of financial and investment models for social security in BRICS countries.

ACKNOWLEDGEMENTS

The research of Jaehyung An was supported by the Hankuk University of Foreign Studies Research Fund. Hankuk University of Foreign Studies, Seoul, South Korea.

A. Yu. Mikhailov's research is based on the results of budgetary research under the state assignment of the Financial University. Financial University, Moscow, Russia.

REFERENCES

1. Roik, V.D. Social policy. Social security and insurance: textbook and workshop for universities, Moscow: Yurait Publishing House, 2023, 522.
2. Arsakhanova, Z. A.; Azieva H.H. Formation of the mechanism of state and financial regulation of the social sphere in the Russian Federation, *The economics of sustainable development*, 2020; 4(44), 181–185.
3. Samuelson P.A. The Pure Theory of Public Expenditure. 1954, <https://www.jstor.org/stable/1827127>
4. Romp W.; Beetsma, R. Sustainability of pension systems with voluntary participation. *Insur. Math. Econ.*, 2020, 93, 125–140, https://www.researchgate.net/publication/340896821_Sustainability_of_pension_systems_with_voluntary_participation
5. Pigou, A.C. The Economics of Welfare. 1920. <https://www.jstor.org/stable/1827127>
6. Musgrave, R.A. The Theory of Public Finance. 1959. <https://www.jstor.org/stable/1827127>
7. Moiseev, N., Mikhaylov, A., Dinçer, H., Yüksel, S. Market capitalization shock effects on open innovation models in e-commerce: golden cut q-rung orthopair fuzzy multicriteria decision-making analysis. *Financial Innovation*, 2023; 9, 55. <https://doi.org/10.1186/s40854-023-00461-x>
8. Mikhaylov, A., Dinçer, H., Yüksel, S. Analysis of financial development and open innovation oriented fintech potential for emerging economies using an integrated decision-making approach of MF-X-DMA and golden cut bipolar q-ROFSs. *Financial Innovation*, 2023, 9, 4. <https://doi.org/10.1186/s40854-022-00399-6>
9. Mikhaylov A. Efficiency of renewable energy plants in Russia. *Anais da Academia Brasileira de Ciências*. 2022; 94(4): e20191226. DOI: 10.1590/0001-376520220191226
10. Kritzer, B., Kay, S., Sinha, T. Next generation of individual account pension reforms in latin america. *Soc. Secur. Bull*, 2011; 71 (1), 35–76, [http://refhub.elsevier.com/S0167-2681\(20\)30102-5/sbref0020](http://refhub.elsevier.com/S0167-2681(20)30102-5/sbref0020).
11. Wallis, J.J.; Fishback, P. & Kantor, S. Politics, Relief, and Reform: The Transformation of America's Social Welfare System during the New Deal, 2005, DOI 10.3386/w11080. URL: <https://www.nber.org/papers/w11080>
12. Friedman, M. The Role of Government in Education. 1955. URL: <https://www.jstor.org/stable/1827127>
13. Fenge, R.; Peglow, F. Decomposition of demographic effects on the German pension system. *J. Econ. Ageing*, 2018; 12, 61–76, https://www.researchgate.net/publication/322903998_Decomposition_of_Demographic_Effects_on_the_German_Pension_System.
14. Coelli, T., Prasada Rao, D.S., Battese G.E. An Introduction to Efficiency and Productivity Analysis, 1998, Springer New York, NY.
15. Bernal, N.; Olivera, J. Choice of pension management fees and effects on pension wealth. *J. Econ. Behav. Organ.*, 2020; 176, 539–568, https://www.researchgate.net/publication/342260702_Choice_of_pension_management_fees_and_effects_on_pension_wealth.
16. Béland, D, Kimberly, J. M., Obinger, H., Pierson, C. The Oxford Handbook of the Welfare State / Daniel Béland, Oxford University Press, 2021. URL: <https://books.google.ru>

17. Attias A., Arezzo M.F., Pianese A., Varga Z. A comparison of two legislative approaches to the solidarity pension system in terms of adequacy. The Italian case. *Insur. Math. Econ.*, 2016; 68, 203–211, <https://www.researchgate.net/publication/299470583>
18. Akerlof G.A. The market for “lemons”: Quality uncertainty and the market mechanism. *Q.J. Econ.*, 1970; 84: 488–500.
19. An J., Mikhaylov A. Technology-Based Forecasting Approach for recognizing trade-off between time-to-market reduction and devising a scheduling process in open innovation management. *Journal of Open Innovation: Technology, Market, and Complexity*, 2024; 10, 1, 100207, <https://doi.org/10.1016/j.joitmc.2024.100207>
20. An J., Mikhaylov A., Chang T. Relationship between the popularity of a platform and the price of NFT assets. *Finance Research Letters*, 2024; 61, 3, 105057, <https://doi.org/10.1016/j.frl.2024.105057>

ABOUT THE AUTHORS



Jaehyung An — Cand. Sci. (Econ.), Assoc. Prof., College of Business, Hankuk University of Foreign Studies, Seoul, South Korea
<https://orcid.org/0000-0001-5410-7506>
jaehyung.an@yahoo.com



Alexey Yu. Mikhaylov — Cand. Sci. (Econ.), Assoc. Prof., Financial University, Moscow, Russia; researcher, Western Caspian University, Baku, Republic of Azerbaijan; Baku Eurasian University, Baku, Republic of Azerbaijan
<https://orcid.org/0000-0003-2478-0307>
Corresponding author:
alexeyfa@ya.ru



Nagwa B.A. Yousif — PhD, Assoc. Prof., Department of Sociology, College of Humanities and Sciences, Ajman University, Ajman, United Arab Emirates; Humanities and Social Sciences Research Centre (HSSRC), Ajman University, Ajman, United Arab Emirates
<https://orcid.org/0000-0001-5237-5347>
nagway37@gmail.com

Authors' declared contribution:

J. An — methodology.

A. Yu. Mikhaylov — writing original paper.

N.B.A. Yousif — resources and visualization.

Conflicts of Interest Statement: The authors have no conflicts of interest to declare.

The article was submitted on 21.02.2024; revised on 21.03.2024 and accepted for publication on 26.05.2024.

The authors read and approved the final version of the manuscript.