

# *The economic security of households: results in the research of the performance of household functions*

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**Abstract** — The issues of household economic security are a major focus of interest of the government and scientific community. The research object is the Russian households that are functioning in actual conditions, reflecting the state of the Russian economy. The research subject is the processes which feature the safe conditions of households, performing their socially and economically important functions.

To analyse the economic security of households, the efficiency of the processes dealing with the functioning of households, the authors use the method of the eigenstates. The special feature of the method resides in creating the reference model. The multiple-factor model is applied in terms of the group of the indicators describing the parameters of production, business, consumption, saving, and financial activity of a household for creating the reference models of the interaction of the processes determining the functioning of a household.

The research reasons that the key indicators of the functions performed by the households and the complex of the measurements reflecting the degree of their efficiency or otherwise - the condition of economic security of households can be presented by means of a reference model.

The research stages include the preliminary data processing, the calculation of the correlation matrix, the determination of eigenvectors, the justification for the selection criteria of eigenstates, the analysis of eigenstates, the calculation of key components, the calculation of model values of the indicators for the key components, and the analysis of the reliability of forecasting results.

The results of the analysis are confirmed with a high degree of match for the results on three eigenstates. The authors draw a conclusion that households may ensure their economic security in the long term. Nowadays, it is supported by the effective performance of the financial, production and saving functions of households. For further strengthening of the economic security it is necessary to create the conditions for more effective implementation of business and consumption functions.

The proposed methodical approach was tested at the macrolevel of the Russian economy and can be used for the assessment of the state of household economic security in a certain region with a high degree of efficiency and reliability of the results.

**Keywords** — *economic security, household, household functions, sustainable development*

## I. INTRODUCTION

The issues of the assessment of the state of household economic security are still gaining the increasing scientific and practical relevance. A large number of scientific papers are devoted to the studies of economic security in terms of financial wellbeing [1], [2] and financial risks [3]. The series of researches add a political context to the security, including the study of such a phenomenon as "American dream" [4], are complemented with the national peculiarities of the country under study [5], are detailed on social groups of society (middle class) [6], and consider the trends of the globalization [7].

A lot of researches are focused on the development of the criteria for assessing the states of the economic security of a household: the existence (absence) of guarantees of health care, robbery, employment (loss of work) [8]; the level of income of household members, education level, the level of English skills, and physical abilities [9].

In terms of the common research objectives of the economic security of households [10], [11], [12], taking into account the complex of the parameters previously considered within methodological approaches, and using general and theoretical experience of the concept of economic security [13], we took the processes reflecting a safe state of a household in the course of its performance of socially and economically significant functions as an object of the research. The process of production involves the realization of labour potential of a household [14]; business activity process – the business interaction between a household and the variety of economy subjects [15]; consumption process – the end use of market goods and the creation of demand [16]; saving process – the process of saving that stabilises the economic and social state of a household [17], [18]; financing process – the relationship in the payments, the participation in the investment processes, the processes of redistribution of the gross domestic product and national income [19], [20]. The authors' system of assessing the indicators of realization of household function performance relies on the considering of a household as a social and economic system.

We specified the characteristics of effective functioning with the indicators which reflect the facility of households to participate in the processes of production, exchange, consumption, distribution and redistribution. When choosing initial indicators we used the open source data provided by the Russian institutions of the state statistics.

## II. MATERIALS AND METHODS (MODEL)

For the analysis of economic security of households, the efficiency of the processes dealing with their functioning we used the method of eigenstates which represents one of the directions in the analysis of key components [21].

Both methods, which we grounded our research on, make up the key components. Each component is interpreted as the one-factorial model that describes the trend in the processes related to the functioning of households. The weighting coefficients of key components are treated as characteristics of the eigenstate of a household. The first property of eigenstates – the key components are independent – allows us to create a reference model, rejecting the eigenstates which do not meet the specified requirements. The second property – the proportional change in the condition of the object (on change of the key components of a certain eigenstate) and coefficient of the corresponding eigenstate – enable to carry out the check of eigenstates on their compliance to the formulated requirements. The advantage of the model created by means of the method of eigenstates consists in the potential to show the cause-and-effect relationships of the interaction between the processes of household functioning.

The multiple-factor model is applied on the basis of the group of the indicators, which reflect the parameters of production, business activity, consumption, saving, financial activity of a household, to create the reference models of interaction between the processes determining the functioning of a household. Using the reference model, it is possible to express the key indicators of the performance of the functions by a household as well as the complex of the measurements which describe the degree of their efficiency or in other words the state of economic security of households.

## III. RESULTS AND DISCUSSION

We selected thirty-seven parameter characteristics of indicators of the production, business, consumption, saving, and financial activities of a household for the period of 2007-2017. The following indicators should be noted: the income of households of various origin (business, labour, from property, and public assistance); the expenses of households in various areas (purchase of goods and services and compulsory payments); the social expenses of the federal budget (financing of education, health care, housing services); the availability of educational (number of students of higher and secondary professional education) and medical services (the number of bedspaces in hospitals, disease incidence, routine check-ups of citizens); the price indexes in various goods and money markets.

The parameters of a household activity describing it as a system are precised in the form of the social and economic

characteristics of the Russian economy that are a part of the external environment of a household. Each indicator has a functional role in the process of modelling. The fragment of the dynamics in the main social and economic processes of the Russian economy is presented in Fig. 1.

The result of the analysis of dynamics in the initial indicators of the parameters of the processes characterising the production, business, consumption, saving, and financial activities of a household shows an unstable state of the economic security. On the one hand, there is the growth of monetary income of the citizens, salaries, social insurance benefits, and the income from property. On the other hand, the trend of persistent high unemployment rate, the debt gain in loans, the growth of the citizens' dependence on the government grants for the payment of housing services and residential rental payment, the growth of disease incidence, the reduction of expenses from the state budget on the education, the reduction of consumer loans, and the growth of past-due payments on mortgage loans are relevant.

Then we applied the method of eigenstates to assess the economic security of households depending on the parameters of the production, business, consumption, saving, and financial activities of households. The research was roughly divided into eight stages.

At the first research stage the regression matrix was used for the calculation of coefficients of the eigenstates. While calculating the eigenstates, the preliminary data processing was carried out where the operations of centering and normalization were applied.

At the second stage, the correlation matrix was calculated.

At the third research stage we determined the eigenvectors on the basis of the equation solution:

$$(A - \lambda I) \times V_0 = 0 \quad (1)$$

where A is covariance matrix (initial);

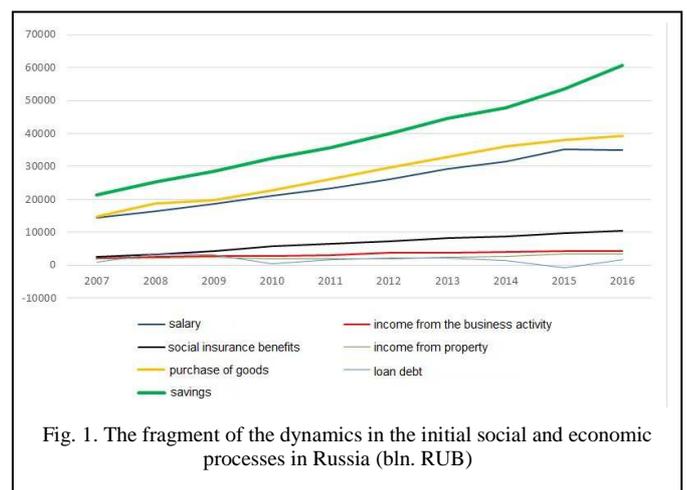


Fig. 1. The fragment of the dynamics in the initial social and economic processes in Russia (bln. RUB)

$\lambda$  – matrix reflection of eigenvectors;

I – identity matrix;

$V_0$  - eigenvector.

By using the “MIDAS-2-16+” programme, we solved the problem of the determination of eigenvalues of vectors. The result is the obtained coefficients of thirty-seven eigenstates which fragment is given in Table 1. The eigenstates describe the deviations of the indicators from their average values. The obtained coefficients of the indicators in various eigenstates have various values (positive and negative). It proves the interrelation where the growth of the parameters with positive values of a coefficient within this eigenstate provides the growth of the other indicators and vice versa. Such change of the parameters highlights the trends of this eigenstate.

At the fourth research stage we determined the criteria of the selection of eigenstates according to the requirements imposed to the production (unemployment reduction, increase in the number of students of higher and secondary professional educational institutions, reduction of disease incidence), business (growth in incomes from business activity), consumption (growth of purchases of goods and services, stabilisation of consumer prices), saving (growth in incomes from property, increase in deposits of the citizens), and financial activities (reduction of past-due payments on loans, including mortgage loans) of a household.

For the creation of economic model it was reasonable to conduct the analysis of eigenstates according to the chosen criteria of the identification of processes of a household functioning. It should be considered that the state of economic security is described by all set of key components (KC), and each eigenstate from the presented set reflects the set of initial parameters as well as their dynamics in general.

TABLE I. THE COEFFICIENTS OF EIGENSTATES

Дисперсия	KC	1,19E+07	1,09E+06	2,42E+05	2,26E+05
rate, %		87.81	8.006	1.777	1.659
cumulative rate, %		87.81	95.816	97.593	99.252
eigenvectors		1	2	3	4
monetary income of the citizens, bln. RUB	2131	0.29	0.02	0.09	0.04
income from the business activity, bln. RUB	2134	0,18	0,07	-0,04	-0,12
salary, bln. RUB	1438	0.19	0.01	0.05	0.00
social insurance benefits, bln. RUB.	2478	0.65	-0.00	-0.32	0.36
income from property, bln. RUB.	1893	0.12	0.05	0.68	0.08

At the fifth stage we made the analysis of the eigenstates according to the selected criteria of the identification of processes of a household functioning. The first eigenstate characterises the top trend of the household activity (87.81% of variability of all the indicators) and reflects the efficiency of the financial activity of households.

The second eigenstate specifies the trend of the household functioning (8.006% of variability of all the indicators) and the efficiency of the production activity of a household. The

third eigenstate reflects the trend of household functioning (1.777% of variability of all the indicators) and demonstrates the performance efficiency of the savings activity of a household.

The analysis of the rest of the eigenstates is not relevant as they give the insignificant values (no more than 1.659% of variability of all the indicators). The research of three eigenstates which have a high degree of variability of all the indicators led to the following conclusions. The first eigenstate characterises the efficiency of the financial activity of a household; the second one – the production activity of a household; the third one – the savings of a household.

Therefore, the activity of a household in the area of consumption and business does not contribute to the strengthening of economic security of a household. An extra argument of this conclusion is the open source data provided by the institutions of the Russian state statistics on the consumer expectations of the citizens [22]. The negative and decreasing value of indexes of the current state of the Russian economy, the expected change in price (in a year), the current personal financial situation, the favourable conditions for large purchases, and favourable conditions for savings confirm the growth of the consumer pessimism of households in Russia.

At the sixth stage we calculated the key components for the period under analysis. The parameters of the matrix of the key component were determined from the formula:

$$Z = X V_0 \tag{2}$$

where Z is the matrix of the key components.

A key component represents a linear combination of the initial parameters therefore we calculated its value by the following formula:

$$Z_{ki} = \sum_{j=1}^n v_{ij}^0 x_{kj} \tag{3}$$

where  $Z_{ki}$  means the value of k-key component at i moment.

The fragment of the values of the selected key components according to the criterion of the relevancy of values is presented in Table 2.

TABLE II. VALUES OF KEY COMPONENT

Years	Number of the key component				
	1	2	3	4	5
2008	-5226.676	+855.545	+508.211	-602.525	-258.070
2009	-4526.083	+280.527	+535.748	+596.689	+387.900
2010	-2363.298	-1924.995	-206.671	+233.508	-298.546

The first key component is characterised by the steady, increasing dynamics. The assessment of the first component speaks for the ability of a household to strengthen its economic security in the long term. The second and third components show periodic but not extreme fluctuations. As it

was noted above, the conditions needed in this instance are the improvement of the efficiency of the financial, production and saving types of household activity.

The seventh stage of our research involved the calculation of the model values of the indicators for the selected key components. The created model represents the idealisation of the real activity of a household and serves as its standard. In our case it is the first, second and third key components. The fragment of the obtained results is depicted in Fig. 2. The actual value of an indicator is showed by the solid line, and the value received when using model – by dotted one.

The graph in Fig.2 represents the comparison of the actual values of monetary income of the citizens within the period under consideration and their received model parameters. The salaries, social insurance benefits, income from property, cash expenditures and savings, compulsory payments and contributions (thirty-seven characteristics of the indicator parameters of the production, business, consumption, saving and financial activities of a household) were similarly compared.

The calculations show that the actual values for the review period slightly deviate from the values received with use of the reference model. The values of expenses of the consolidated budget on housing and communal services and disease incidences of the citizens are an exception. The calculation models of indicators are the basis to draw the conclusion about the considerable influence of these processes on the selected parameters within three eigenstates.

At the eighth stage we analysed the adequacy and reliability of the forecasting results by employing the method of assessment of proximity of actual data arrangement to the model values. For this purpose we calculated a mean absolute percentage error (MAPE). The average error of approximation keeps within the range from -0.01% to 2.27% that allows to conclude that the activity of a household complies with the model of safe functioning.

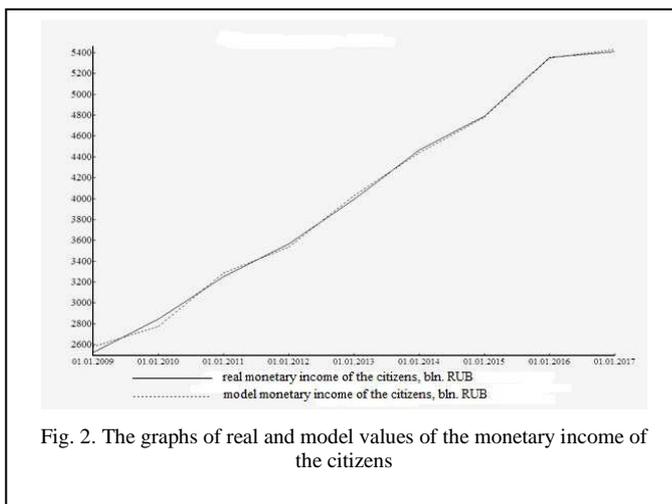


Fig. 2. The graphs of real and model values of the monetary income of the citizens

#### IV. CONCLUSION

The results of the analysis confirm our conclusions about the full matching of the results for three selected eigenstates. The research undertaken proves the facility of a household to ensure the economic security in the long term. It is currently supported with the effective performance of financial, production and saving types of the household activity. For further strengthening of the economic security it is necessary to create the conditions for more effective performance of business and consumption functions.

In the undertaken research, the technique for the analysis of the state of economic household security was tested at the level of the Russian economy. The proposed methodical approach can be used with a high degree of efficiency and reliability of the results for the assessment of the state of household economic security of a certain region when the household of a certain region and the application of the corresponding indicators characterizing the state of regional economy are selected as a research object.

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