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## **Indicators of Financial Security on the Micro-Level: Approach to Empirical Estimation**

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**Abstract:**

*The article suggests an original approach to economic security system indicators formation at micro level based on the assessment of changes in households' living and financial behavior under economic crisis.*

*An econometric implementation based on the triangular recursive system of equations is used with a multivariate probit model, dealing with unobservable individual heterogeneity, with the bias attributed to omitted variables and endogeneity.*

*The estimation was performed according to the representative survey of the population "The Russia Longitudinal Monitoring Survey - Higher School of Economics (RLMS-HSE) (RLMS-HSE, 2017).*

**Keywords:** *Crisis, household, financial behavior, system of equations, endogeneity, financial safety, indicators.*

**JEL Classification Codes:** C35, C51, D14

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## 1. Introduction

External threats together with internal vulnerability of the Russian economy forward the problem of the state's financial safety in theoretical, methodological aspects as well as applied ones. Traditionally the financial safety issues are analyzed in the context of external threats such as: financial globalization impact, financial and commodity markets volatility, geopolitical confrontations.

However, nowadays the necessity to specify internal challenges, threats and vulnerabilities resulting from the population's reaction on macroeconomic shocks is becoming topical. The fact that foreign investments left the key industries emphasizes the importance of internal financial sources population's money, being deposit basis of the banks, pension savings, "mass" investments at the foreign exchange market and others (Allegret *et al.*, 2016; Boldeanu and Tache, 2015).

Methodological approach development to assess indicatively the national financial safety is realized (Alifanova and Evlakhova, 2017a) due to overcoming the existing contradictions and implementation of the complex approach to design the financial safety indicators system based on the formation of the system of selection principles and the state's financial safety indicators system as well as combination of macro- and microeconomic approaches to assess empirically the financial safety standing.

The authors formed the two-tiered system of national financial safety indicators. The indicator system complexity, singled out by the authors as one of the elements of recognized core of the methodological approach to research national financial safety, is implemented in interconnected formation; national financial safety indicators systems according to levels (global, national and regional) and types (basic, specific), system of these indicators selection principles, criteria system of the given indicators classification and indicator monitoring system to assess the financial safety level (Grima and Caruana, 2017; Gubin *et al.*, 2017; Ivanova *et al.*, 2017).

The indicative assessment of the national financial safety is a methodological problem, whose difficult side is the necessity to review the indicators systematically to react adequately on new challenges and threats. The households' financial resources together with the funds all levels of the budget system replaced the financial resources of the foreign markets have become more important for the Russian economy which is moving towards sustainable and high rates of the economic growth.

At the same time the Russian households operation at the financial market due to the certain characteristics of households as investors turned into the source of vulnerabilities for the state financial safety. The authors proposed the new group of indicators of the financial safety – the indicators showing the population savings and their operations at the credit and foreign exchange markets (Alifanova *et al.*, 2017).

This group takes into account the indicators of the International Monetary Fund, the Central Bank of Russia as well as the proposed by the authors indicators calculated from the data of the representative surveys of the population, in particular from the Russia Longitudinal Monitoring Survey - Higher School of Economics (RLMS-HSE).

According to Rosstat the population's savings in rubles on 1<sup>st</sup> January 2015 totaled to 29.27% from the 2014 GDP confirms the importance of the population's financial resources. When economic shock, the growing inflation processes, unsustainable exchange rate depreciate people's savings, the mass media impact often make the population to panic actions, when mass money emission to the consumer market, money outflow from the banks, etc. This feedback resulted in the crisis is strengthening, and again creates the conditions to worsen the population's financial standing (Thalassinos *et al.*, 2015; Thalassinos, 2014).

Reduction of the sum of credits to the population (due to income reduction, growth in debt on repayment of loans, refusal to consume in order to save and other reasons) negatively influences on some industries; housing, automobile industry, etc. Credits granted to individuals on 1<sup>st</sup> January 2015 exceeded 11.295 trillion rubles that totaled to 15.82% from the 2014 GDP. Arrears on loans for a year from 1<sup>st</sup> January 2014 till 1<sup>st</sup> January 2015 grew by 1.5% and totaled to 5.89%.

Mass worsening of the population's standard of living is becoming a threat for the country financial safety under crisis. If in the pre-crisis year of 2013 the real income index grew by 4%, in 2014 it dropped by 0.7%, in 2015 – by 3.2%, this process continued in 2016 – the drop was 6.1% (Rosstat, 2017). The population is seeking for any possible increase including not very legal ways to support the well-being, social tension is growing and in this situation the deformation of the population's financial behavior threatens to cause the “domino effect” in relation to financial system and economy as a whole.

Crisis processes do not touch different groups of population equally that is why to reveal the most suffered, makes it possible to single out the factors which had influenced the worsening standard of living and on their basis to form a new group of financial safety indicators related to financial behavior of the population. Empirical assessment of the macroeconomic indicators from this group is presented in a separate research (Alifanova and Evlakhova, 2017b; Grima *et al.*, 2017).

It is concluded that the population's financial behavior is reflected in the indicators of credit and exchange market dynamics simultaneously or with a delayed effect that allows to monitor the credit market reaction on the peculiarities of the households' financial operations under macroeconomic shocks when they emerge or deepen. This article presents econometric approach to assess financial safety indicators at micro level.

A part of households enter the crisis having some savings which help to survive hard times, others, with credit burden which worsen the difficulties of the crisis. Variations of standard of living depends both on the strategies of the households' financial behavior and on many other factors, including households' demographic, social and economic structure, type of settlement, etc.

It is necessary to perform the research of interaction of households' characteristics and likelihood of standard of living reduction during crisis taking into account the type of the financial behavior which influenced by social and demographic characteristics, but at the same time social and demographic characteristics themselves do not affect directly on the financial behavior. Moreover, non-observed heterogeneity can influence both on well-being changes and on financial behavior of households. Individual tastes, temporary preferences and expectations of negative changes in the future can influence on households' decisions about savings and credits. These moments remain hidden from a researcher.

## 2. Methodology

The econometric approach to assess the changes of standard of living during crisis can be implemented on the basis of joint equations system taking into account such methodological problems as non-observed heterogeneity, omitted variable bias and endogeneity (Ashford and Sowden, 1970). Behavioral model in this case can be realized on the basis of the econometric model of changes of the current standard of living, taking the form of a recursive system of equations. The model consists from structural form equations for the change in the standard of living between periods before the crisis and during the crisis ( $w$ ,  $s$ ), and the reduced-form equations for types of financial behavior ( $f$ ):

$$\begin{aligned}w &= \pi(s, f, x, \mu_w), \\s &= s(f, x, \mu_s), \\f &= (x, \mu),\end{aligned}$$

where  $x$  is a vector observed exogenous variables in the model, and  $\mu$  includes non-observed factors, which influence both on change in the relative position of the household in the income distribution series  $\mu_w$  and on the risk of reduction of the assessment of living standards  $\mu_s$ , and on the financial behavior function  $\mu$  (Jones *et al.*, 2013).

The system of recursive equations, realizable for binary dependent variables, can decide the endogeneity problems. In the case of standard of living reduction risk assessment in crisis it is possible to suppose the remains of probit models assessed for each risk will not be statistically independent, consequently the models are to be assessed together, that is why it is expediently to expand binary response models. If random component of the equations of financial behavior correlates with random

component equation of change in standards of living, then it means that potentially there are factors unobserved by the researcher which influence both households' financial behavior and the risk of standard of living reduction in crisis. The problem is to take into account this unobserved specific heterogeneity in the assessment procedure to restore consistent estimates of the coefficients. The potential endogeneity of the financial behavior variables in the recursive model is reflected in the correlation between the terms of error (Cappellari and Jenkins, 2003).

### 3. Results

The data on households' incomes, expenses, financial standing and financial behavior for a long period became the basis for the econometric modeling taken from the data of the project "The Russia Longitudinal Monitoring Survey - Higher School of Economics (RLMS-HSE)". In the course of further analysis two periods are considered; the year of 2013 preceding the crisis and 2015 when the recession, which had started in 2014, continued. To compare the households' economic behavior in the indicated periods the balanced panel was formed in 2015 with only the households surveyed in 2013 participated in the analysis whose social and demographic structure did not change.

The following types of the financial behavior were distinguished; absence of credits and savings, availability of loans and borrowings only. The available resources, including the assessment of natural receipts and benefits, all forms of factor and transfer incomes, as well as the amount of loans and spending for the month preceding the survey are the indicators to characterize the household income. While analyzing the household resistance to external unfavorable shocks, the variable that fixes the change in the position of the household on the decile scale of distribution of disposable resources in 2015 in relation 2013 was formed. This is a binary variable that assumes the value of 1, if the decile number the household belonged to 2015 became less than in 2013 and equal to zero in other cases. Thus, the formed variable is an indicator  $w$ , showing the household well-being reduction.

In the survey the household was asked: *"Imagine rather unpleasant situation; all family members lost the sources of income. How long will your family be able to live as good as you are living now, i.e., without reducing expenses, without selling any property, only your savings?"* with the following options: six months and longer, several months; no more than one month; no more than two weeks; no more than one week; not a single day. The worsening of the self-esteem is an indirect indicator (s) of the household "safety margin" and its change in crisis. The variable is equal to 1, if in 2015 the duration evaluation became lower than in 2013, and is equal to zero on all other cases. The following variables, as regressors, were included in the model: the type of settlement; the household demographic type; the quantile of disposable resources to which the household belonged in 2015. The estimation results are presented in Table 1.

**Table 1.** The results of the multidimensional probit model estimation

Variable	(1) Having neither loans, nor savings	(2) Having only credits and loans	(3) Estimates of the survival time without certain means of subsistence	(4) Position change on the available resources decile scale
Having neither loans, nor savings	–		–0,248***	-0,332**
having only credits and loans	–	–	-0,456***	-0,165*
Change in the survival time without a certain means of subsistence	–	–		-0,156
Type of settlement (village)				
The regional center		-0,081	-0,058	0,078
Town or city		0,051	-0,079	-0,161***
Household type (with children)				
single	0,197	-0,294	-0,097	-0,432
Without children	0,470***	- 0,921** *	0,044	-0,036
one parent families with children	-0,094	0,205	0,0001	-0,010
Quintiles of distribution of households per capita money resources (I)				
II	0,131***	0,145**	-0,106	0,400***
III	0,144***	0,068	-0,022	0,225***
IV	-0,135***	0,091	-0,024	-0,280***
V	-0,358***	0,188**	-0,024	-1,054***
Constant	0,140***	- 0,630** *	-0,118	-0,125
Correlation of error terms coefficient				
$\hat{\rho}_{21}$			0,052	
$\hat{\rho}_{31}$			0,113	
$\hat{\rho}_{41}$			0,125	
$\hat{\rho}_{32}$			-0,068	
$\hat{\rho}_{42}$			0,075	
$\hat{\rho}_{43}$			-0,891***	
-2LL			-9477,41	
Chi-square			861,83	
Likelihood Ratio Test	$H_0: \rho_{21} = \rho_{31} = \rho_{41} = \rho_{32} = \rho_{42} = \rho_{43} = 0$ , chi2(6)= 11851,9, p-value = 0,0000			

\* – 10% significance level, \*\* – 5% significance level, \*\*\* – 1% significance level

Source : authors.

Likelihood ratio test results, obtained in the model, indicate that null hypothesis about the absence of endogeneity ( $H_0: \rho_{jk} = 0$ ) deviates for financial behavior variables included in the model. It can be interpreted as support the fact that unobservable factors, which influence on the likelihood for the household to have a certain type of the financial behavior as well as influence on the likelihood of the fact that the standard of living will reduce. The correlation between the equation of the change in the standard of living in the crisis and the terms of the error in the equation of the household's availability of credits and loans is negative meaning that unobservable factors reduce the probability of the presence of credits and reduce the risk of transition to the relatively lower group. It proves that the households with credits are more rational in terms of their spending and try to avoid the fall of standard of living due to credit burden. For the equation of the absence of household loans and savings, the correlation is positive, which indicates that unobservable factors increase the risk of transition to a relatively lower income group (Nivorozhkina *et al.*, 2016).

If we turn to the interpretation of the loads of the equation in which the independent variable is an indicator of the transition of a household to a decile with relatively low incomes, then this process is closely connected with the fact the households possess neither loans nor savings.

In comparison with rural settlements the standard of living in the cities more seldom reduces in crisis, as the incomes, it concerns the households belonging to the middle, the third quantile, those who are in the first and the second more often reduced the standard of living during crisis, and those in the fourth and the fifth did it more seldom. Subjective feeling of the worsen material standing of a family in crisis reflected in the assessments of the model, where independent variable is evaluation of the survival time without a certain mean of subsistence. The presence of credit debts or absence of savings is the significant factor for negative assessment growth (Nivorozhkina *et al.*, 2017).

Households without children are less likely to be burdened with credit, and often do not have a "safety cushion" in the form of savings. What is important is the likelihood to be in this group is much higher for both, the lowest income households (the first quantile) and those with high incomes (the fifth quantile). The group of households without savings and credits often consists of couples without children, belonging to the first and the second quantiles, are likely to be pensioners.

#### **4. Conclusion**

Thus, it can be concluded that multivariate probit models represent a promising tool to assess the risks of changing the standard of living during an economic crisis based on population survey data and can be served as a methodological basis for selecting and constructing indicators of economic security at the micro level. Expanding and

changing the number of variables considered will allow us to clarify the trends of the process under study, and the results can be used to adjust social policy.

These results can be used theoretically to research the national financial safety, and practically to monitor national financial safety. The obtained results will allow to perform risk-oriented approach based on the revealing of threats, vulnerabilities and consequences, which in total form the country's risk profile in the context of the financial safety at the level of global financial system.

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