Analysis and forecasting of state extrabudgetary social insurance funds in terms of structural and dynamic development of determining factors

Análise e previsão dos fundos extra-orçamentais de segurança social do Estado em termos de desenvolvimento estrutural e dinâmico dos factores determinantes

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ABSTRACT:
The given paper presents the results of economic and statistical analysis of the structural and dynamic development of extrabudgetary funds of the Russian Federation, as well as the impact of factors on receipts of mandatory social insurance funds. The authors focus on extrabudgetary funds, the most important element of the social insurance system. The particular importance of the chosen research target is due to the fact that the state extrabudgetary funds are the only form of social protection of the population.
Keywords: analysis, forecast, extrabudgetary funds, social insurance, inflation, factors impact.

RESUMEN:
O presente artigo apresenta os resultados da análise económica e estatística do desenvolvimento estrutural e dinâmico dos fundos extra-orçamentais da Federação Russa, bem como o impacto dos factores nas receitas dos fundos obrigatórios de segurança social. Os autores centraram-se nos fundos extra-orçamentais, o elemento mais importante do sistema de segurança social. A importância particular do objectivo de investigação escolhido deve-se ao facto de os fundos extra-orçamentais do Estado serem a única forma de protecção social da população.
Palavras chave: análise, previsão, fundos extra-orçamentais, segurança social, inflação, fatores de impacto.

1. Introduction
A modern system of social protection of the population as an effective mechanism of social, economic and financial relations of extrabudgetary funds is being developed in the Russian Federation. Development of the existing extrabudgetary sphere involves remodeling of legal relations and implementing effective policies to improve the population welfare in the form of social guarantees.
Extrabudgetary funds are a part of the state financial system to build, use and redistribute funds to ensure the welfare of participants in social policies (Fornero, 2015). At the moment there are three federal extrabudgetary social insurance funds in the Russian Federation, as in most countries of the world: FSS (social insurance fund), PFR (Pension Fund), FOMS (federal mandatory health insurance fund).

A new model of extra-budgetary funds redistribution and a personalized approach started in Russia in the early 1990s as course of introducing a market economy due to changes in the state policy. In the early 1990s, the Soviet Union legislator made a decision to divide the state social insurance system into the pension insurance system and the social insurance system (in the narrow sense).

Decentralization in the sphere of social insurance meant, first of all, the abolition of the former system of financing and the establishment of new, extrabudgetary relations. The rigid link between the social insurance budget and the state budget that had existed during the Soviet period was severed and a decentralized extrabudgetary system with differentiated insurance rates was introduced. As extrabudgetary funds gained experience as independent financial entities, they also became more autonomous as administrative institutions. The country has passed the first stages of reforming the system of social protection of the population with both positive and negative results. These common and distinctive preconditions can provide important experience and forecasts to develop the system in the future.

2. Literature review

In scientific research, social insurance and support in transitional and developing economies have been widely studied both in terms of theory and practical application.

In most countries contributions are collected by central government institutions. Local or regional governments are engaged in contribution collection only in some countries. As a rule, there is a national agency that collects social taxes and accumulates funds in trust funds. Mostly these are tax services.

Reforms of the Russian social insurance system are discussed by domestic and foreign scientists. Today, pension systems having been operating in most countries for more than 40 years are sufficiently mature. This means that the majority of employed are covered by pension plans and entitled to full benefits. The population has grown old and the share of people contributing to the pension scheme is decreasing. This is the way the pension insurance is disclosed in Müller K. studies (Müller, 2014). Problems and results of pension reform are revealed by Pallares-Miralles M., Romero C., Whitehouse E. (2012), Williamson B. J. (2006). They identified issues of funds redistribution, share participation in pension savings development.


Grishchenko N. stands out a special opinion on the domestic pension insurance system (2016). The scientist identifies conditions for preferential pension provision.

In fact, many developed countries have adopted a pension system that combines state-managed pension schemes with privately managed workplace pension plans and personal savings accounts to meet the needs of middle-and higher-income groups. However, the decisive role in ensuring the income of pensioners belongs to the state distribution (solidarity) pension system.

There are also a lot of works on health insurance. Thus, Borda M. reveals the role of private health financing in Central and Eastern Europe (2008). Cook L. considers inequality, informality and failures of reforms in the field of mandatory health insurance (2015).


Health system reforms in Central and Eastern Europe and the former Soviet Union are studied by Kutzin J., Jakab M. & Cashin C. (2010), Rechel B. & McKee M. (2009), Wagstaff A. & Moreno-Serra
R. (2010). The scholars focus on the fiscal balance, the need to decentralize the budgets of the extrabudgetary sphere.


Bielawska, Guardiancich, Fultz E., Schmähl W., Horstmann S. provide an overview of the insurance systems in European countries (Bielawska, 2014).

The basics of applicable research and forecasting models are described in works of I. Gabitov, E. Khasanov, I. Chudov and others (Mudarisov et al., 2017; Gabitov et al., 2018; 2018b).

The present premium system is 26%, namely 20% to the Pension Fund, 2.9% to the social insurance fund and 3.1% to the mandatory health insurance fund.

The transition from taxes to insurance payments in 2010 allowed to balance the pension system of the Russian Federation. The present-day analysis of socio-economic development in the Russian Federation shows a minimum deficit of extrabudgetary funds associated with accumulated liabilities.

3. Discussion

The given paper relies on the works of the above-mentioned authors and their scientific schools. The results do not contradict the general economic laws. They provide an overall picture of budgets for each state extrabudgetary social insurance fund.

The used analysis methods are fundamental and reliability of the results is undeniable for being based on the official data of the Federal state statistics service. There are developed two multiple correlation and regression models of payments to extrabudgetary funds of the Russian Federation and factors having a significant impact are identified.

The aim of the research is an economic and statistical analysis of the factors influence on contributions to the state extrabudgetary social insurance funds and the forecast of receivables in the short term.

4. Research methods and methodology

The studies were conducted in accordance with statistical, econometric, computational and constructive research methods as well as comparative forecasting based on the obtained models. To take into account the influence of factors on the receipts to the state extrabudgetary social insurance funds, an economic and statistical analysis was conducted on the basis of official state statistics for the period 1995-2017. The first stage of the study on receipts and expenditure was performed according to time series for each individual fund. In the second stage, trends in receivables and spending were built separately for each fund as well. Then, based on the obtained trends a forecast for receipts and expenditure of extrabudgetary funds was built, the cause-effect relationships of stable trends were identified.

At the final stage, multiple correlation and regression models were constructed based on the average annual data of the Russian Federation for 2001-2017. They were designed separately for every fund in two options. In the first one, the following factors were considered: x1 - Money supply M2 total, billion rubles; x2 - inflation rate, %; x3 - gross domestic product (current prices), billion rubles; x4 - premium rate, %. The second option considered the following factors: x1 - Money supply M2, total, bln. rubles; x2 - the inflation rate, %; x3 - premium rate, %.

The calculations are made according to the official Russian Federal Statistics Service, section Finances on receipts and expenditure of state extrabudgetary funds.

5. Research results

In the course of the study, three extra-budgetary funds were analyzed: Pension Fund of the Russian Federation, social insurance fund, and mandatory health insurance fund. Figure 1 presents receivables and spending of the funds. The source of information is the data of the official Federal
state statistics service that is to provide objective and complete statistical information to the authorities and management, the media, the population, the scientific community, commercial organizations and entrepreneurs, international organizations. The system of state statistics, including the Federal office and the territorial bodies of the Russian Statistics Service, located in all regions of the Russian Federation, is used to solve this problem.

Figure 1 shows that the main changes in the dynamics take place in the Pension Fund. Until 2000 there was budget deficit, since 2001, 2003-2013 – surplus and in 2014-2017 – deficit. A significant deficit was in 2015. It amounted 5433636 million rubles; in 2016 the deficit was 204425 million rubles.

The social insurance and mandatory health insurance funds maintain a relatively stable level of low deficit.

The highest deficit in the social insurance Fund is observed for the period from 2007-2010, but a significant deficit was in 2015 (70859 million rubles).

There can be distinguished three periods of budget deficit in the mandatory health insurance fund: the first period in 1995-1998; the second period in 2007-2010; the third period in 2014-2015.

These changes can be associated with a set of specific factors, that will be discussed hereafter in the second part of the given paper. The next step was to build trends in receipts and expenditures separately for each fund. On the basis of the obtained trends, we predict the volume of receivables and spendings in subsequent periods.

In 2017, the share of the pension Fund budget in GDP of Russia (in current prices) was 8.9 % in receipts, and 9.0 % in expenditure. Change tendencies in receivables and spending of the Russian Pension Fund are clearly illustrated in built trends for the study period 1995-2017. A polynomial trend was built in Excel that showed most accurately the trend of changes in receipts and expenditure of the Pension Fund (figure 2).
The R-squared value is 0.9818 indicating good agreement between the trend line and the source data. The forecasts must be accurate.

The change in the expenditure of the Pension Fund is described by the equation in the form of a second-order parabola approximating the actual data by 98.7% (figure 3).

Since obligations of the state extend social coverage of the population, it is of particular interest to compare trends in receipts and expenditure of the Social Insurance fund. The social insurance fund is being built up from premiums, tax payments, deposits and other financial investments, from the Federal budget, as well as other arrivals.

As to expenditure, the following costs were considered: financing pension and benefits payments to the population; financing payments of benefits in excess of the established rates, sanatorium treatment and improvement at the expense of the Federal budget; financing the Executive Management of the Fund; other expenses.

The receivables of the mandatory health insurance fund include: premiums, tax payments; incomings from the Federal budget; other arrivals.

A polynomial trend of receipts and expenditure of the mandatory health insurance fund is built in Excel. The spending trend is represented as a parabola of the second order, approximating the original data at 93.1%. It indicates the minimum approximation error. There are calculated pointwise values of forecast receipts and expenses of the funds.

The Pension fund budget is approved by the State Duma of the Federal Assembly of the Russian Federation. It is done by a separate law adopted together with the Federal budget. Accordingly (Federal law No. 363, 2017), there are approved total revenues and expenditures of the Fund.
budget for 2018-2020. The budget deficit is expected to be 106 573.9 million rubles in 2018, 73 843.6 million rubles in 2019 and 44 596.3 million rubles in 2020.

Our forecasts also stipulate the budget deficit in the Pension fund of the Russian Federation being rising year after year (figure 4).

In accordance with (Federal law No. 363, 2017) main characteristics of the budget are defined. They show yearly increase of the budget deficit. However, the opposite trend is observed for the predicted values (figure 5).

The main budget characteristics of the federal mandatory health insurance fund are approved by the federal law (Federal law No. 363, 2017). According to the federal law (Federal law No. 363, 2017) there is a decrease in the budget deficit. By 2020 the budget is planned to achieve a balance.
The forecast values indicate possible budget surplus (figure 6). This forecast was calculated based on the received polynomial trend of receipts and expenditure of the Mandatory Health Insurance Fund in Excel.

**Figure 6**

Accordingly, making up the budget with a surplus also entails negative consequences, as it leads to a decrease in the efficiency of budgetary funds, as a consequence, an increase in the burden on the economy. Therefore, a balanced budget is an ideal option, but it is not easy to achieve in a real economy. A balanced budget is the basis for the proper functioning of extrabudgetary funds. However, if even a small part of the budget is not balanced, this may result in a delay in funding social insurance, failure to meet deadlines, the non-payment problem. The ideal option would be, of course, a completely deficit-free budget, where the amount of expenditure is fully consistent with the amount of incomings. However, in a real economy, it is not easy, and sometimes impossible, to achieve. If a budget with a deficit is unavoidable, sources of financing for the budget deficit have to be brought in to balance.

### 6. Results

In accordance with Chapter 34 "Insurance premiums" of the Russian Tax code as well as the world practice, employee benefits are recognized as the basis to calculate insurance premiums. Thus, the monetary income of the population is a direct factor affecting the amount of payments to social insurance and security funds.

Figure 7 demonstrates debt-to-income ratio of extrabudgetary funds.

**Figure 7**
Dynamics of debt and receipts to extrabudgetary social insurance funds, billion rubles (according to the official Federal state statistics service of the Russian Federation)
The data shows that the population's cash income in 2017 increased by 12.3 times compared to 2001, while receivables to social funds increased by 5 times. The debt rate tends to decrease since 2005 and by 2016 reached its minimum for the period being 15.2 billion rubles or 240.8 million dollars compared to the level of 2001. In 2017 the debt on payments to state extrabudgetary social funds amounted to 803.3 million dollars excluding inflation (the dollar-ruble exchange rate in Russia is 63.129 rubles per 1 dollar as of July 24, 2019). To a greater extent, these changes were due to the application of effective state policy in relation to extrabudgetary funds. Namely, increase in premium rates to 34% and heavier penalties for concealing premium basis.

It should be noted that the amount of current obligations to pay premiums includes debts of previous periods as well. Therefore, besides meeting current liabilities, receivables to extrabudgetary funds take into account the debts paid in previous periods, including fines and penalties. Accordingly, as in the world practice, it is necessary to rely on the amount of obligations of the current period.

When comparing the share of receipts and the share of debt to the total amount of cash income of the population, there is revealed a downward trend. This may be due to an increase in the share of tax-exempt activities and a regressive scale used. Money incomes of the population have a steady growth in comparison with the base year 2001 (to the base period). But there is a trend to reduce their share (to the previous period) when calculating the chain growth rates of this indicator. The inflation rate is abrupt for the period under study, but it significantly decreases from 84.5% in 2001 to 2.5% by 2017. However, the share of money incomes of the population is inversely related to the inflation rate (figure 8). Thus, with a decrease in inflation, there is an increase in money incomes of the population.

Figure 8
Inflation rate in the Russian Federation, %
Since 2001, the inflation rate has been gradually decreasing and by 2017 it was 2.5%.

In order to identify the dependence of receipts to the extrabudgetary funds on factors as well as indicators affecting them, a correlation and regression analysis of significant factors was conducted. There were built models on the basis of official data of the Federal state statistics service for the period 2001-2017 under study in two versions. In the first one, the following factors were considered: \( x_1 \) - money supply \( M_1 \), total, billion rubles; \( x_2 \) - inflation rate, %; \( x_3 \) - gross domestic product (current prices), billion rubles; \( x_4 \) - premium rate, %.

The relevance of factors was tested with the help of the Student's criterion. \( \beta \)-coefficients were calculated to determine their impact.

\[
\tilde{y}_x = -3007688 + 241x_1 - 29253x_2 + 40x_3 + 94126x_4 \\
(2,02) \quad (-0,61) \quad (0,74) \quad (2,30)
\]

\( R^2 = 0.988; F_{\text{inf att}} = 240.5 \)

\( F_{\text{table}} = 3.26 \), \( t_{\text{table}} = 2.18 \) at the significance level of 0.05.

In the resulting equation there is a close relationship. The relevant factor was the \( x_4 \) - premium rate, since other factors were insignificant according to the \( t \)-criterion of the Student.

The second option considered the following factors: \( x_1 \) - money supply \( M_1 \), total, billion rubles; \( x_2 \) - the inflation rate, %; \( x_3 \) - premium rate, %.

\[
\tilde{y}_x = -2116566 + 326x_1 - 35521x_2 + 81896x_4 \\
(23,33) \quad (-0,77) \quad (2,23)
\]

\( R^2 = 0.987; F = 332.2 \)

\( F_{\text{table}} = 3.41 \), \( t_{\text{table}} = 2.16 \) at the significance level of 0.05.

The amount of receipts was greatly influenced by money supply (\( \beta_1 = 0.984 \)) and the premium rate (\( \beta_4 = 0.074 \)). The inflation rate (\( \beta_2 = -0.033 \)) is a less significant factor, being less than \( x_1 \) and \( x_3 \). We applied the standardization method of \( \beta \)-coefficient variables and constructed the equation in a standardized scale.

Thus, among the factors considered, the money supply turned out to be the determining one in terms of the beta coefficients, while the non-significant factor was the inflation rate.

Thus, the initial group of factors is the amount of receipts and expenditure for each extrabudgetary fund separately, as discussed above.

7. Conclusions

Thus, based on the results of the study, it can be concluded that the most significant factors that determine the level of receivables to the state extrabudgetary social insurance funds are the following:

- the rate of social insurance contributions to the state extrabudgetary social insurance funds, as this indicator determines which part of the income is payable;
- gross domestic product – according to the results of the correlation analysis, this indicator is in direct close relationship with the level of social insurance contributions to the state extrabudgetary social funds;
- the inflation rate, as the dependence on the level of receivables to the state extrabudgetary social insurance funds is opposite, that is, the lower the inflation rate, the higher are arrivals;
- the population income (wage fund) – this indicator determines the premium rate.

The studied factors are not static and change under the influence of legislation (insurance premium rate), the results of economic production (gross domestic product and income of the
The conducted analysis made it possible to identify significant factors affecting the level of receipts to the state extrabudgetary social insurance funds. This provides a way to study insurance premiums as an object of accounting in terms of practice and develop ways to improve their calculations.

According to the received forecasts, it should be noted that there will be a budget deficit the Pension Fund and its further growth, while in the social insurance and the Federal mandatory health insurance fund there will be a surplus.

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