

Stress-testing of risk financial security of regional economic development

S. V. Zenchenko

*Institute of Economics and Management
North-Caucasus Federal University
Stavropol, Russia
Zen_sveta@mail.ru*

A. G. Zaytsev

*Institute of Economics and Management
Orel State University named after by I.S.
Turgenev
Orel, Russia
cbap@bk.ru*

Y. Ur. Radyukova

*Institute of Economics and Management
Derzhavin Tambov State University
Tambov, Russia
radyukova68@mail.ru*

Abstract—This article is about stress testing method for forecasting of probability of occurrence of risk reveal. There are types of possible stress tests and scenarios for forecasting of occurrence of risks allocated in the research. The financial potential of the region is considered as a set of regional resources of budgetary, credit and investment systems that ensure sustainable regional development. Therefore, one of the serious issues in the research of the impact of risk on regional economic development is a question of assessment of risk cost of losses of the regional resource base, i.e. the regional financial capacity.

Keywords—*risk, stress testing, scenario analysis, risk management*

I. INTRODUCTION

The regional financial capacity is considered as set of resources budgetary, credit and the investment systems providing sustainable development of a territory. Therefore one of serious questions at research is an impact of financial risks on the regional economic development. It is necessary to reveal and to predict the volume of financial losses at an assessment of the regional financial capacity risk at control of resource base and cumulative influence of the factors, which are the elements of financial potential.

It is known, that one of the most important purposes of the risk management is prevention of single losses, considerable in the dimension, which can have catastrophic consequences for the regional economy. In spite of the fact that the analytical device risk-management, as a rule, it is based on tools of the mathematical statistics allowing to calculate losses with the set probability but not given qualitative information at violation of a probabilistic interval. A scenario approach is known as stress testing method allowed to estimate the maximum expected losses for probable events which directly don't keep within the current economic tendencies. In a general view a procedure of stress testing can be defined as an assessment of potential impact on availability of the regional resources changed in risk factors which correspond to the exclusive, but quite probable events aren't giving in to forecasting as, for example, in methodology of VaR (Value at Risk) [2,3, 8,15].

In the context of the impact of sanctions and the economic crisis, the most important task of the state became to ensure its economic security and financial in particular. The finance is the driver of any economic system. But their main drawback is the limited nature in solving a large number of equal strategic objectives of sustainable

development. It is necessary to create a new powerful financial block of national security given the unstable nature of political and economic relations between Russia, the United States and the European Union. At the same time, public administration of financial security should not only be a "response to Western sanctions", but should be formed an effective mechanism of public financial management within the framework of national economic policy. This determines the relevance of the chosen research direction of financial security as the basis of national economic security.

II. METHODS

The stress testing method is additional (but not mutually excluding) statistical approach in the system of an assessment of risks assuming the influence of the events existing in the market which are sharply changing a state and behavior of economic system. It is realized in the scenario analysis, which allows to estimate potential consequences of simultaneous impact of risk factors on the regional economic development. At this approach scenarios of possible risk simultaneous changes are formed both the basis of the historical events which already took place in the past and the basis of hypothetical events which probably can take place in the future. When assessing the maximum losses, possible combinations of values of several risk factors, negative trends in their dynamics, potentially capable of bringing maximum losses to the regional resource base are determined.

Stress testing procedures presuppose pre-specifying the necessary changes in risk factors that may not fit into current market trends and market conditions. Thus, stress testing allows you to "lose" the consequences of hypothetical events, the probability of which, although small, but at the same time the consequences of such events have catastrophic results for the region. Joint changes in the specified risk factors that may arise as a result of such events are combined in different scenarios for subsequent testing of the regional financial capacity [9,11].

Scenario stress tests of regional financial capacity are based on either "resource" or "event" approaches. Simplistically, the construction of the scenario begins with a discussion by regional analysts of vulnerabilities (negative situations) in the resource availability of the territory.

Having identified these vulnerabilities, possible scenarios are formulated in the framework of which stress manifestations of these vulnerabilities are allowed. For

example, in regions where regional budget is the main source of resources, scenarios are formulated regarding the tax and non-tax potential of the region. For the "event-driven" approach, the scenario is constructed on the basis of possible events and their impact on the relevant risk factors for the elements of the financial potential of the region.

Scenarios are based on:

1. Characteristic changes of risk factors and their volatility which arose during the market crises or other extreme events which were really taken place in the past;
2. Possible changes of risk factors and their volatility as a result of emergence of economic crises.

The scenarios of risk (crisis) situations should be understood as changes in the values of individual risk factors (for example, an increase in the share of debt on taxes and fees, an increase in interest rates on loans to the real sector of the economy, etc.), and changes in their dynamics: individual (volatility) and joint (correlation between factors). Ideally, a set of scenarios for stress testing of regional financial potential should be as appropriate to the individual characteristics of the region and take into account:

- consistent changes in the tax, investment and credit systems of both the region and the country as a whole;
- the impact of the crisis economic situation on the livelihoods of the regional economy;
- changes in the system of state regulation of the regional economic development;
- possible manifestation of several types of risk.

Unfortunately, in practice, it is difficult to create a system of stress testing, which is explained either by the high computational complexity of the problem, or simply by the lack of statistical material required to build scenarios.

Single-factor stress tests (sensitivity analysis simple sensitivity test) consider the impact of changes in one of the risk factors on the value of the portfolio of financial instruments [3]. Consideration of the exceptional change of one factor while maintaining unchanged other conditions (for example, the increase in the level of debt on tax and non-tax revenues, while maintaining the level of tax and non-tax, change in the level of income of the population and legal entities, while maintaining the level of regional spending, etc.) – a fairly abstract study, but technically simple and intuitive, which determines its practical distribution.

Multiple-factor stress tests (the analysis of scenarios) consider change at once of several risk factors. Multiple-factor stress tests happen two types: or the reflecting events really taking place in the past – historical scenarios, or what are under construction proceeding from plausible assumptions of the mechanism of development of the crisis situations which didn't have direct historical precedents – hypothetical scenarios. The most widespread of them are based on historical scenarios. Multiple-factor stress tests can be based on the hypothetical scenarios having more flexible assessment of possible events. Such scenarios can be applied to definition of possible events in relation to which the

considered portfolio of financial instruments is most vulnerable.

There are different views on the correlations between risk factors should change: to remain the same as under normal conditions, i.e. the situation is correct when several risk factors are subjected to stress testing, the remaining factors change according to historical values of volatility and correlations (under normal conditions) or should be changed.

III. RESULTS AND DISCUSSION

Stress testing of regional financial capacity as a tool for analyzing the financial stability of the region's economic development is considered from the standpoint of a systematic approach. The ultimate goal of this systematic approach is finding of vulnerabilities common to different territories that may threaten the stability of regional economic development.

For stress tests of the regional financial capacity can be used the following approaches: simultaneous stress testing of potential elements some regions according to the General scenario or one scenario to the total financial potential of a set of regions with certain common characteristics.

The General mechanism of stress testing of regional financial capacity includes the following main elements [4]:

- identification of the most significant risks associated with the formation of sources of financial capacity that can have a negative impact on regional development;
- formulation of stress test scenario;
- definition of a methodology or algorithm that would allow to design the consequences of the implementation of a certain risk factor on the economic development of the region;
- quantitative analysis – calculation of the consequences of the development of the selected scenario for a given algorithm;
- interpretation of the results and, if necessary, the adoption of corrective measures.

An example of a stress testing hypothetical scenario is a variable forecasting of the state of regional financial potential, taking into account the pessimistic, conservative or optimistic direction of territorial development. The pessimistic version is developed on the basis of the assumption of a negative trend in the formation of sources of financial potential and economic decline in the development of the region as a whole, formed on the basis of the historical scenario and the analysis. The conservative approach provides for the preservation of the existing level of formation of sources of financial capacity in the General economic downturn in the regional economy, which will lead to a narrowing of the resource capabilities of the territory and reduce the interest of investors in the region as a source of investment potential, reduce the volume of savings of the population and profits of economic entities as a source of credit potential. The optimistic option is calculated on the assumption of low impact or absence of crisis phenomena in the region's economy, which will lead to a radical improvement in the functioning of the region, increase in

budget revenues, increase in investment flows to the region from both the state and domestic investors, positive dynamics of income of the population, which increases the budget and investment potential, increase the efficiency of the credit system of the region, which provides additional investments in the real sector of the economy of the territory, so is the credit capacity building.

At the same time, it should be taken into account that if the risk of financial capacity decline is defined as the variability (volatility) of its formation in comparison with the expected value, the one-hundred-percent filling of the financial potential that provides financing for regional expenditures will be a risk-free financial potential, and regional financial capacities that are insufficient to Finance regional development will be risky. The greater the variability of financial capacity to cover regional development, the greater the risk.

When analyzing the risk, it should be borne in mind that the risk of reducing the financial potential is quantitatively estimated by the amount of losses on the elements of financial potential, so it is advisable to use the relative (basic) indicator – the level of real financial security of the economic development of the region when assessing the risk. Since the amount of filling of financial potential by its elements can vary significantly in absolute amounts, and the level of real financial security determines the coverage of regional expenditures, it does not depend on the element-by-element filling of financial potential and is comparable in the space-time context.

The actual formation of the regional financial potential of most regions differs from the expected.

IV. CONCLUSION

Thus, the real financial security of regional development can be considered as a random variable, subject to the law of probability distribution. The procedures and results of stress testing should form an integral part of the system of "transparency" of economic activity and also be published by the regional Executive bodies in order to improve the image of the territory and the formation of the official and unofficial rating of territorial economic development.

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