

## Evaluation of Systemic Risks in Financial Markets: The Comparative Analysis of Approaches

<sup>1</sup>E.N. Alifanova and <sup>2</sup>U.S. Evlahova

<sup>1</sup>Head of the chair “International economic relations”, doctor of economics,  
professor, Rostov state economic university

<sup>2</sup>Docent of the chair “Banking”, PhD, Rostov state economic university

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**Abstract:** Article is devoted to a comparative analysis of approaches to assessing systemic risk in the financial market, developed by foreign and Russian researchers, based on criteria such as: the area of systemic risk; used statistical base, theoretical and methodological approaches.

**Key words:** Systemic risk • Financial markets • Financial institutions

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### INTRODUCTION

The concept of “systemic risk” is widely included in the scientific revolution in the global financial crisis of 2007-2009. While scientists and researchers considered the essence of systemic risk in the financial market and developed terminological system, national governments have been forced to urgently look for adequate tools reduce systemic risks that can reduce their negative impact on the stability of the financial system. After a few years, researchers are quite advanced in the study of the phenomenon of systemic risk and are able to scientifically substantiate the tools to reduce them and to develop practical recommendations for regulatory agencies. However, discussion of many aspects of the theory and methodology of the study of systemic risk in the financial market is maintained, which creates a difficulty for the practical implementation tools for their regulation. Methods for assessing systemic risk in the financial market - one of the most complex and important issues, a variety of solutions which, on the one hand, contributes to the development of tools of regulation, on the other hand, does not guarantee effective reduction of systemic risk in the financial market. In this context, the aim of this article is a comparative analysis of methods for assessing systemic risk [1].

The most complete approach to the assessment of systemic risks disclosed in the works of American and

European researchers. Thus, the agency Fitch, regularly compiles a report on systemic risks in the banking systems of different countries, uses two indicators of systemic risk assessment. Indicator of the banking system (BSI) is used to assess the quality or stability of the internal state of the banking sector, it is measured from the level of “A”(very high quality) to “E”(very poor quality). Macroprudential indicator (“MPI”) indicates the extent to which trends in credit growth, asset prices and the real exchange rate make the banking system is potentially vulnerable to a correction in asset prices and exchange rates, as well as to the effect of the economic downturn, which may follow such correction. MPI indicator evaluated on a scale from “1” (low) to “3” (high). Two indicators are put together in a matrix of systemic risk, which emphasizes the complementary nature of both measures. Interpretation of systemic risk matrix is based on the notion that banking systems characterized by higher quality and stability, are better able to cope with sudden changes than systems with low quality and less stability. In the latter systems, even a moderate increase in tension may be enough to cause a full-blown systemic crisis [2].

Approaches to risk assessment systemically important financial (systemically important backbone) institutions rely on multi-variant identification of a financial institution as a “systemically important”. In one study, the International Monetary Fund provides the

following range of options to help identify the financial institution as systemically important: size, interconnectedness (interconnectedness), which allows determine the extent to which the bankruptcy of a financial institution may lead to the destruction of the financial markets and the degree of substitutability (substitutability) services offered certain financial institution [3].

Other studies include parameters such as: the size of the assets or liabilities of the bank, the number of species of its activities, its role as a contractor in business operations. In essence, a financial institution recognized systemically important if its bankruptcy could lead to a chain reaction in one or more channels:

- Direct communication with other financial institutions affected organization;
- Urgent sale of assets affected organization that reduces the cost of similar assets, forcing other organizations to incur losses on their assets;
- Support other organizations to continue to provide the affected organization such financial services as credit, insurance and payment services;
- The rising cost of financing and massive withdrawals of deposits from other organizations after the bankruptcy of a systemically important organization.

Moreover, the researchers note that those parameters which allow to determine the financial institution as systemically important in a period of stability may change in times of crisis.

An interesting research professionals Bank for International Settlements, which proposed a method for measuring and stress testing the systemic risks of important financial institutions. Systemic risk is measured as the size of payment for insurance against financial crisis, which is based on the expected performance of individual banks default probability and expected correlations with income assets. Theoretical results of the study will determine the insurance premium that would be paid to protect against loss of 12 major U.S. banks in the crisis year 2008 was about 15 % of their total liabilities.

In another study, the IMF prepared Jorge A.Chan-Lau, the main source of systemic risk called the interconnectedness of financial institutions in the financial system. In order to assess the level of systemic risk, the author proposes to measure the gradually increasing contribution of the financial institution in systemic risk through the category of “costs of regulatory capital”. Costs of regulatory capital author considers it

possible to consider the social loss through using tools such as risk assessment model of the loan portfolio, network analysis, CoRisk analysis. In developing the concept of Too-big-to-fail (“too big to fail”) introduces the concept of Too-connected-to-fail (“too interconnected to fail”). Copyright interest calculations and analysis, illustrating the probability of default caused by the devastation of another institution and the amount of regulatory capital costs for 26 global financial institutions of developed countries for the period 02.05.2003-27.02.2009.

Analysis of the data shows that the most vulnerable and to external and internal financial shocks are U.S. financial institutions. Busting U.S. banks more than banks in other countries, due to the grave consequences for the global financial system. Systemic risk caused by the devastation of banks in other countries (except the United States, Germany and Canada), about the same. The results of this study are consistent with our findings in other studies that the analysis of the  $\beta$ -coefficients of the stock indices of developing and developed countries on the global (world) index of FTSE Group indices shows that the level of systematic risk of highly concentrated global equity market depends on the level of systematic risk, which is formed by the developed markets, especially the U.S. stock market, Western Europe and Japan.

It is worth noting that Citigroup in 2009 was recognized as a financial institution with the highest cost of regulatory capital, which is due primarily to the high probability of default. Close-level largest VaR portfolio is Spanish (BBVA and Santander) and French (Credit Agricole, SocieteGenerale) banks, but because the probability of default lower by several orders of regulatory capital costs are significantly lower than Citigroup.

Thus, it should be noted that the study “Regulatory Capital Charges for Too-Connected-to-fail institutions: a practical proposal” shows the impact on economic growth not only of financial integration, but also the concentration of financial assets and financial institutions. In our opinion, as in the case of financial integration, the impact of financial concentration is contradictory: on the one hand, a positive effect, as it promotes the qualitative and quantitative growth of the financial system and overall economic development, on the other hand, the negative impact as increases the vulnerability of the financial system due to the close relationships between financial institutions [1].

Special attention is given method to identify global systemically important banks, developed by the Basel

Committee on Banking Supervision in 2011. The technique includes 5 groups of indicators, each of which has a total weight of evaluation

- Indicators of international activities (international assets and liabilities);
- Indicators of the size of the bank (ie, total assets);
- Interdependence indicators (financial assets, financial liabilities and the share market finance in total liabilities);
- Indicators of substitutability (assets deposited at the bank, the amount of payments made through the payment system, the volume of orders placed on the securities market);
- Indicators of the degree of complexity of the organization (the nominal value of derivatives in the OTC market, illiquid assets whose value cannot be determined using market prices or model, the volume of trading portfolio and securities held for sale).

Comparing the indicators methodology of the Basel Committee on Banking Supervision to the indicators used in other methods, we note two innovations - indicators of international activity, acting obviously filter for global banks and indicators complexity of the organization.

Next technique involves ranking banks by their importance - of the original 73 selected international credit organizations global systemically important banks was recognized 28, which in turn were divided into four groups. For each group, set their own capital requirements, since it allows to reduce the possible negative consequences of the problems in the operation of such banks by reducing the probability of default.

Methods for assessing systemic risk of the financial sector, systematized in this paper include:

- Assessment of systemic risk through financial stress index proposed by the International Monetary Fund;
- Estimate of its currency imbalances, reflecting the extent to which national economies are taking systemic risks to the global financial system;
- Assessment of the real and financial systemic risk.

International Monetary Fund (IMF) expects the index of financial stress, which, in our opinion, can serve as a tool to assess the level of systemic risk in the national financial system. Index to determine the breadth and intensity of the crisis, as well as identify problem segments of the financial market (banking, stock, currency markets), which become a source of systemic risk.

Methodology for calculating the index of financial stress for both developed and developing countries have some differences. In the calculation of the index of financial stress for developed countries included seven sub-indices pertaining to the banking sector, the stock market and the volatility of foreign exchange. Among the indicators of the banking sector are taken into account the volatility of bank shares, the spread between the interbank rate and the rate on Treasury bonds, of stock market indicators - spreads on corporate bonds, the yield on the stock market and the volatility of stock returns.

The method of constructing an index of financial stress for developing countries has the following features. First, in the calculation of index compression is enabled the currency market, as it is a frequent source of stress in developing countries. While many developing countries have officially adopted flexible exchange rate regime, but regulators often allow only minimal movement of the exchange rate (the "fear of free navigation"). Secondly, the calculation does not take into account sub-index of corporate bonds due to the insignificance of this indicator in developing countries [4].

Critical value of the index of financial stress is exceeded polutorakratnoe size standard deviation of its value. Dynamics of financial stress index for groups of developing countries shows values of the unidirectional changes in 1997-2009. (with the exception of financial stress in Latin America in 2002)

A detailed study of the index of the last group of indicators to determine the problematic segments of the financial market, which have become a source of financial stress, the banking sector and the stock market.

It should be noted that the IMF in the future with the help of financial stress index explores the transmission of the crisis from developed to developing economies, noting the influence of both global factors (global interest rates, global GDP, commodity prices) and factors arising from national specificity (economic characteristics, financial and trade linkages).

In the next study the exchange rate disparities, reflecting the extent to which national economies take on systemic risks of the global financial system. The authors calculated the currency imbalances in the banking sector example, using figure of net liabilities denominated in foreign currencies. The paper analyzes the dynamics of the indicator only 10 European emerging economies (except for Russia). Analysis of the currency disparities largest developing countries, including Russia, representing the greatest interest to us, we carried out independently and the results are described in the papers

[5]. In general, the analytical findings suggest that the Russian economy, in contrast to other rapidly developing countries, takes on more systemic risk the global financial system.

A study by Gianni De Nicolo and Marcella Lucchetta, systemic risks are real systemic risk to GDP-at-Risk (risk that the shock will lead to a significant decrease in business activity) and financial systemic risk FSaR (the risk that the shock will lead to a loss of economic efficiency, a loss of confidence in the financial system and a concomitant increase in uncertainty). Separation of systemic risk into two types allows, according to the authors, identify the source of the financial shock on the real sector and the financial system. To measure the real systemic risk indicator is used GDP-at-Risk, which is the worst predicted value of real GDP growth in the quarter with a 5 % probability of a predefined forecast horizon. For the calculation of financial systemic risk model also applies VaR.FSaR indicator is the worst predicted value of the indicator of financial risk across the system with 5 % probability in a predefined forecast horizon. The application of these indicators to the data series of indicators of financial activity and business activity in 7 developed economies of the world (U.S., UK, Germany, France, Japan, Italy, Canada) allowed the researchers to calculate the level of systemic risk for the period 1 kv.1980 kv.2009 3 years and predict its value to 1 m. 2011.

Thus, most of us considered systemic risk assessment methods built on the basis of macro-economic indicators, i.e. the likelihood of future crises is determined based on historical data.

Of Russian works on issues of systemic risk should be noted research scientists Bank of Russia and the Center for Macroeconomic Analysis and Short-Term Forecasting.

Representatives of the Central Bank said its research priority identification of systemically important financial institutions and assess their level of financial risk. To this end, they use cutting-edge foreign financial science, especially the use of network analysis for the study of the banking market. Thus, in the Mosaic SR, EA Snow disclosed key theoretical and methodological principles of network analysis, the international experience of its application [6], as well as the results of calculations on the data of the Russian ruble money market. Since the theory and methodology of network analysis is not scientific development representatives of the Central Bank, the greatest interest to us is its practical application, namely, the results of research by the Bank of Russia ruble money market to determine systemically important financial institutions. They are as follows:

- Ruble money market is characterized by low density (more fragmented and less centralized). Behavior of the average market participant can be characterized as low activity - on average, each player has a small number of counterparties and holds a small volume of transactions. On 01.04.2013 in the money market were 55 active players, or 6.8 % of the total participants.
- Ruble money market has a hierarchical structure of "core- periphery", with 10 players formed the core of the money market (systemically important financial institutions) and 794 players - the periphery,
- The ruble money market has reduced the potential "contagion effect". Accident arising shock online money market reaches a market participant, the average passing through two or three intermediaries.

In another study by the same researchers [7], representatives of the financial stability of the Bank of Russia, responsible for the reduction of systemic risk in the Russian financial market, disclosed two different approaches to the identification of the systemic importance of money market, the first of which uses the Shapley to identify systemically important financial institutions in the market interdealer REPO, the second approach relies on the use of the vector for the study of Snow interbank market. The need for different approaches due to the fact that the repo market - short-term and the size of positions in this market is highly volatile, in contrast to the interbank market.

Thus, the method implements the principle of optimality Shapley payoff distribution between the players in the theory of cooperative games. To determine the systemic importance of financial institution in addition to the calculation of the Shapley value (distribution in which each player's payoff is equal to its average contribution to the total welfare of the coalition in a certain way of its formation) is also taken into account other factors, namely the number of bonds in the market, the total size of the market position of financial Institute, the structure and the volatility of the portfolio.

Vector Snow is a method of analysis of network relationships in the interbank money market, which allows to characterize a negative financial impact in the event of default by one or more counterparties debt. Unfortunately, the use of these methods is given in conventional examples [2].

In contrast to the control scientists Center for Macroeconomic Analysis and Short- assess systemic risk in relation to specific segments of the financial market, credit, monetary and foreign exchange, summing up the general level of threat to the PivotChart. Methodology of

constructing composite leading indicators of systemic risk [16] is based on the signal and econometric approaches, as well as macroeconomic data of Russian statistics. In turn, the composite leading indicator of systemic credit risk is based on such factors as: the ratio of the sum of consumption and investment expenditure to GDP for the year and the deviation of the growth rates of lending reached a peak, the share of consumer spending growth in disposable income for the year, decreased balance current operations related to the GDP, compared with the average value for the year; growth rate of oil prices over three months.

In contrast, the combined indicator leading indicator of systemic currency risk includes the following indicators: the growth of non-oil ratio of the current account to GDP for the year; current account balance divided by GDP for the year; swings in capital account in relation to GDP growth ratio private sector external debt to exports of goods and services per year [8]. Consolidated leading indicator of systemic liquidity risk is also formed of a number of indicators: changes in security deposits of the population absolutely liquid assets and changes depending on the foreign liabilities of banks, the dynamics of the share of net exports to GDP growth, the dynamics of the money multiplier, the intensity of monetary emission factors.

Analysis of the leading indicators for November 2013, conducted by scientists from the Center for Macroeconomic Analysis and Short- indicates a high probability of a systemic banking crisis, which, however, is not accompanied by negative values ??of GDP growth. As for the probability of systemic credit risk, currency risk and systemic systemic liquidity risk, then at a certain time interval, their probability is estimated as the average.

Author's comparative analysis of approaches to assessing systemic risks was conducted based on criteria such as:

- The occurrence of risks,
- The data used for risk assessment and
- Used the theoretical concepts and methodological tools.

The results of the comparative analysis are as follows:

- Researchers, focuses primarily two areas of systemic risk: first - the financial market as a whole or its individual segments, the second - the financial institutions that have a significant importance for the stability of the financial system in the implementation

of financial risks. In our view, both approaches are necessary and complement each other. Assessment of systemic risk to the financial market allows an indicative basis to monitor the level of risk and accumulate historical data base for further in-depth analysis of this phenomenon. At the same time risk assessment of systemically important financial institutions allows regulatory agencies to develop and adopt specific measures to minimize risk, including, if necessary, carry out financial support to systemically important financial institutions.

- As the statistical basis for the calculation of various valuation methodologies used indicators of systemic risk of financial institutions or indicators of macroeconomic statistics. It should be noted that the development of new assessment approaches often need more information than that which is collected statistics agencies or state regulators. For example, the central bank usually collects data on interbank transactions on a quarterly basis and does not provide detailed operation, which is not enough when you try to use graph theory to analyze interbank networks.
- Despite the diversity of theoretical approaches to developing methods for assessing systemic risk is obvious that the mainstream is a combination of system and network approach. Assess the relationship between elements of the system (or network of agents) underlies most considered methods, exploring the problem from different perspectives, namely:
  - Domestic financial system as part of the global financial system;
  - The relationship of different types of national economic systems to each other (both developed and developing economies);
  - National financial system as part of the economic system of the country and its relation to the real economy;
  - Financial institutions such as the elements of the national financial system;
  - Segments of the financial market as elements of the national financial system.

However, the combination of system and network approaches to the assessment of systemic risk has certain methodological contradiction. Thus, the system approach to develop methodology for assessing systemic risk, taking into account the different levels of the system generalizations would have undoubted practical

significance, since such a technique is an effective tool for managing systemic risks to national and global regulators. Moreover, the expansion of systemic risk to the components in accordance with the levels of generalization system, especially at the level of the global financial system, it allows for diversification of the national financial system and thus provides a framework to reduce systemic risk.

However, recent studies in the field of network analysis show that the increase in the degree of interaction between network elements under certain conditions, there is a contradiction between decreasing individual risk (through the distribution of risk) and increasing systemic risk (because of the spread of financial difficulties in more dense and thus more sensitive to perturbations of the network). The greater the number of partners agent, the less the risk of collapse of the individual, but it may be higher systemic risk and therefore the lower the resistance network. In other words, the relationship between the degree of interaction between agents and the amount of systemic risk is regarded as a cone-shaped relationship, i.e., decreasing at a relatively low degree of interaction and then increasing.

To summarize, we note that the final say in selecting the most effective approaches to assessing systemic risk in the financial market is always in practice.

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