METHODOLOGICAL APPROACHES TO THE ANALYSIS OF STABILITY BOUNDARIES OF FINANCIAL AND ECONOMIC SYSTEMS

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In this article the approaches to a solution of the problem of ensuring stability of economic and financial systems are considered. It is proved that the direction of development of any economic and financial system is defined by a ratio of the factors prevailing at present to time providing stability or instability of this system. It causes need of search of borders of stability for the purpose of the forecast and management of a condition of economic system, and also demands identification of the major external and internal stabilizing and destabilizing factors.

Keywords: stability boundaries, financial system, economical system, Russia

In the last decade, the global financial system, economy and society as a whole have encountered unprecedented global challenges and real threats to modern civilization, which can't be analyzed with the methods of classical and non-classical science.

The world changes and developments are characterized by the increasing non-linearity. The recent global financial crisis of 2008-2009 has swept the whole world. Its consequences require a revision of the methodological inconsistencies of the current system of global financial regulators and joint efforts to resolve the complex problems caused. The new class of problems requires new non-linearity and complexity approaches in the study of stability of the financial and economic systems. This causes an increasing scientific interest and new developments in the new fields of economics including evolutionary economics, nonlinear economics, synergetic economics, and the theory of self-organization, dedicated to the investigation of linearity and non-linearity, stability and instability, bifurcations and chaos. The disciplines consider nonlinearity and instability as a source of diversity and complexity of the economic dynamics, while traditional economic theory treats them a source of random events.

A stability state reflects the essence of an economic and financial system characterized by its determined behavior in the present and in the foreseeable future. According to the self-organization theory, a stability state of a complex dynamical system is its ability to keep its directed movement along the specific

trajectory, i.e., support the intended mode of operation despite ongoing pressure from the environment.

Let's review some of methodological approaches to predict the stability boundaries of an economic system. The system is considered to be stable, when the movement of majority of its elements is unidirectional, but it is unstable when the movement direction is disagreeable and interrupted. Any interruption in the system can produce new movement directions, but the system's elements integration is achieved only when there is consistency among previously mismatched directions.

The problem of sustainability of an economic system is exacerbated by the increasing instability, constant changes and challenges of its environment. Any economic system is characterized by the unity of its stable and instable elements, when under influence of external factors its movement may deviate in any direction. There is a set of conditions for the system to be in either stable or unstable elements. For instance, the system is in the stable state, if it continues its direction along the same path with small deviations, and it becomes unstable when the deviations from the previous state builds up over time.

The sustainability property of a modern economic system is largely determined by its ability to adapt to the rapidly changing environment and, therefore, directly depends on its ability to continuously develop and improve. Thus, the economic system's stability exists, when there is internal correspondence between its elements and processes, and when the system's internal development parameters are compatible with changing environmental conditions.

Any self-organizing system, including an economic one, is driven by the individual and systematic interactions of its elements and subsystems. As a result of these interactions, a few local disturbances might result from these system's fluctuations. These disturbances are initially weak and short-lived, but their sum might start to oscillate the system off its stable equilibrium state. Therefore, fluctuation amplification is the most important principle of non-linear system development. It states that, under certain conditions, even very minor variations and changes may lead to serious macroscopic implications for the system. In addition, certain classes of non-linear systems have an important feature called sensitivity threshold. Below this threshold, the system's fluctuations are reduced and minimized leaving no trace, but above the threshold, they are increased dramatically, strengthened and can be explosive over time.

The system and its elements are exposed to both internal and external fluctuations or changes. Depending on the strength of these fluctuations, the system might experience different consequences. For instance, if these fluctuations are not strong enough, the system returns to its equilibrium state or behavior, which is the root cause of the failure for many economic reforms. However, if the

fluctuations are strong, the system may collapse. An alternative is to build a new system's dissipative structure with a new composition and behavior. The structure is a new dynamic state of the system, which adapts to the changing conditions of the environment.

As the number of fluctuations increases, the system becomes unstable and sensitive to even minor shocks. Thus, it evolves to the excited state, a preparation state for the system's further development. When the fluctuations of the economic parameters gradually increase and reach a certain critical value, an arbitrarily small change in the parameters might lead to an abrupt system's transition to a qualitatively new state. This is a bifurcation point, i.e., a turning and critical point of the system's development. At this point, the system goes beyond its stability boundaries and might change its development path.

The following laws describe the behavior of nonlinear self-organizing systems, including economic systems, at the bifurcation point.

1. A bifurcation point is often triggered by a change in either a control parameter or in a control subsystem [1].

2. If a system reaches a bifurcation point, its future development trajectories and states can't be accurately predicted, since the effects of the environment are random.

3. The higher dimensionality and complexity of the system, the greater the number of states, where it might bifurcate. Thus, the system is more unstable, when its elements are more diverse and their relations are more complex.

4. A system can move along the same development trajectory multiple times.

5. A system's organization might be decreased, when there is a sudden change or a catastrophic event.

6. The temporary boundary of the catastrophic event can be determined by "the principle of maximum delay" [2], which states that the system makes a jump only when it has no other choice.

Nonlinearity of economic and financial systems also implies a possibility of emergent and unexpected changes in their processes. This makes any prediction, based on extrapolation of the prevailing trends into the future, unreliable and inaccurate. Long-term projections of the systems' future development based on this extrapolation have failed, when the systems' development trajectories change, and the system transitions to the next phase of its development.

A viable and promising alternative to predicting the future state of a system is the approach based on the laws of cyclic-genetic dynamics. The approach is capable to better capture the real trajectories of a complex economic system, and it has higher accuracy of medium and long-run forecasts. It assumes that the

development of economic systems is carried out through a random path selection at the bifurcation point, and this random event may not be repeated.

The nonlinear property of the system's processes is also closely related to the possibility of its ultrafast development at certain stages. The major mechanism of this development is non-linear positive feedback, which leads to a deviation of the system from its stable equilibrium into the unstable region. It is known that the nonlinear positive feedback can lead to the accelerated and explosive growth of matter and energy in the environment, becoming the source of their rapid development. Therefore, the analysis and modeling of economic system's stability boundaries should take this mechanism into account.

A state and development trajectory of any complex system is defined by a combination of prevailing at the time factors, characterizing its stability or instability states. Thus, it is required for the analysis of stability boundaries to identify these major internal and external factors.

The factors determine the stability or instability of a system and might produce stabilizing or destabilizing effects on its development. The factors are different from the conditions for stability of economic systems from both theoretical and practical points of view. The conditions are important circumstances that create the environment where the development of financial and economic systems occurs. If factors can only be identified and predicted, while conditions can be created. Thus, in order to create the conditions for increasing stability of Russian economic and financial systems, the factors that determine the systems' stability boundaries need to be identified and classified.

The current stability factors might become the conditions for the future stability of an economic system and help to create the appropriate conditions for its sustainable development through additional investment opportunities, increased employment, higher productivity, etc.

The analysis of these stability factors is required to expand the system's capacity for stability, determine its stability boundaries, and build a management system using sustainability as one of the key criteria of its effectiveness.

In order to analyze and model these stability boundaries, it is necessary to take into account the complex and diverse interactions of economic, political, social, legal, and other factors. A complex interdisciplinary approach with the use of modern computer science techniques, systems analysis, computer tools to present information in observable and measurable format for analysis and modeling is required.

The self-organization theory has a few limitations and makes mathematical modeling rather difficult. However, it still contributes to the understanding of the crisis processes development, and a reliable forecast about the future most likely

development directions of financial and economic systems can be constructed. In the analysis of the systems' processes, it is important to have an idea about the scope and magnitude of the systems' potential transformations as a result of specific changes in control variables and operating parameters.

The foundations of socio-economic systems underlies the duality of objective and subjective principles. On the one hand, these principles are subject to the general laws describing the functioning of complex systems, on the other, their dynamics is shaped under the influence of a subjective factor. According to the system laws, accumulation of quantitative changes leads to a system's qualitative transformation at some point. At this point, it is important to introduce necessary changes and push the socio-economic system on the right development path. If it is not done promptly, self-organization mechanisms and spontaneous choice of development path will prevail.

The stability of economic and financial systems can be characterized by the following parameters including utilization degree of stability for capacity, availability of tools for external and internal environment monitoring, availability of reaction mechanisms to the ongoing changes, timely risks identification and their inclusion in decision-making. The stability boundaries of a system are determined by its adaptability to the changing internal and external environments, availability of resources, timely implementation of management decisions, innovation, etc.

The qualitative conclusions drawn from the described approach to the study of system stability are of great importance for the analysis of the stability boundaries of economic and financial systems, their forecasting and simulation.

Literature

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