UDC 338.2(476)+316.42(476)
JEL classification: H10, J58, P35, Z13

SOCIO-ECONOMIC SECURITY OF THE HIERARCHICAL SYSTEM

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СОЦИАЛЬНО-ЭКОНОМИЧЕСКАЯ ЗАЩИЩЕННОСТЬ ИЕРАРХИЧЕСКОЙ СИСТЕМЫ

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Abstract. The paradox of financial and economic reality lies in the fact that it coexists and phenomena of financial evolution, and processes of conventional (non-transient) type. On the one hand, the economy is changing technologies, goods, organizations and structures. In this sense, it is evolutionary. On the other hand, the acts of these shifts do not exhaust the essence of financial and economic functioning. The huge role is played by the moments of economic strength of financial entities, coordination of costs and results, demand and supply, anti–crisis formation. The study of these moments is the prerogative of classical science. This means that science as a whole is not able to refute the classical approaches and absolutize fresh, non-traditional views (synergetic, evolutionary) on the concept or Vice versa. The synthesis of classical and fresh non-standard financial and economic doctrines is necessary.

Аннотация. Парадоксальность финансово-экономической реальности заключается в том, что в ней уживаются и феномены финансовой эволюции, и процессы обычного (непереходного) типа. С одной стороны, в экономике случается смена технологий, товаров, организаций, структур. В данном значенииона эволюционна. С иной стороны, акты этих смен не исчерпывают суть финансово-экономического функционирования. Гигантскую роль играют моменты экономической прочности финансовых субъектов, согласования расходов и результатов, спроса и предложения, антикризисного становления. Исследование данных моментов — прерогатива классической науки. А это значит, что наука в целом не имеет возможности опровергать классические подходы и абсолютизировать свежие, нетрадиционные взгляды (синергетические, эволюционные) на концепцию или же наоборот. Необходим синтез классической и свежей нестандартной финансово-экономической доктрин.

Keywords: socio-economic security; the government, society, enterprise, employee; threat, security, interests, economics, analysis, system.

Ключевые слова: социально-экономическая защищенность, государство, общество, предприятие, работник, угроза, защищенность, интересы, экономика, анализ, система.

Structural configurations in a hierarchical system affect the relationships between segments and levels, the number of components at all levels. The configuration of the interconnections irreversible effect on the conditional number of components of various values on the performance of the entire system.

We are dealing with a system formed to solve a specific problem - a purposeful system.

The basic analysis model of a hierarchical system set out in detail in the scientific literature [1, S. 85]. Let's say that the system has only one degree and the components of the system are Autonomous.

Then the efficiency of each element of the system can be characterized by some value is, I = 1,..., p, where p is the number of components of the system. Let the elements be the same. This means that s1=s2= ... =sp=s. Then the performance of the entire array of Sp elements is equal to

$$S_p = ps, \tag{1}$$

Due to the linear dependence, the increase in the number of similar interacting components leads to an extensive rise. But specialization, division of labour between segments must lead to a dynamic rise, to a fairly obvious increase in the effectiveness of the whole. Hence, there may be a nonlinear dependence.

As an elementary dependence that does not take into account the details of the structure, it is possible to use the formula for a two-level system

$$S_{p_1,p_2} = (s_1p_1 + b_1)(s_2p_2 + b_2) - b_1b_2, \tag{2}$$

where P1 is the number of elements at the sixth level;

s1-performance of each element of the i-th level in the absence of the others, i=1, 2.

If one of the levels is missing, for example, P1 = 0, the system continues to function. The formula will describe this situation if b1 and b2 are coefficients of the order of one. To the situation one level of dependence was close to linear, laying s_1≫b_1,s_2≫b_2.

The final term in the formula will provide the equality S 0,0 = 0 in a situation where the system has no elements (P1 = P2 = 0).

Generalization of this formula to the system of n levels will lead to a relationship

$$S_{p_1,p_2,\dots,p_n} = (s_1p_1 + b_1) \times \dots \times (s_np_n + b_n) - b_1 \dots b_n, \tag{3}$$

The existence of hierarchy can give the system advantages. In the opposite case, it would be possible to have an elementary system devoid of a hierarchical structure. There may be a certain ratio of the number of different levels (p _1,p _2,...,p _n), in which the performance is greater than in the case of a single-level system.

To measure the impact of changes in the structure of the system on the effectiveness of its functioning, we will assume that the total number of components of the system is constant

$$\sum_{i=1}^{n} p_i = P\ , \tag{4}$$

The condition of hierarchy effectiveness, which determines the validity of its existence, can be formulated as a system of inequalities:

$$\begin{cases} S_{\bar{p}_1,\dots,\bar{p}_n} \geq S_{P,0,\dots,0}; \\ S_{\bar{p}_1,\dots,\bar{p}_n} \geq S_{0,P,\dots,0}; \\ S_{\bar{p}_1,\ ,\bar{p}_n} \geq S_{0,\dots,P,0}; \\ S_{\bar{p}_1,\ ,\bar{p}_n} \geq S_{0,\dots,0,P}; \end{cases} \quad (5)$$

To find the structure (vector $(\bar{p}_1, \bar{p}_2,..., \bar{p}_n)$), in which the existence of the system is most effective, it is possible to solve the extreme problem

$$S_{\bar{p}_1,\dots,\bar{p}_n} \to max \quad (6)$$

under the constraints (4).

The formula (3) should be presented in the form of

$$S_{p_1,p_2,\dots,p_n} = s_1 s_2 \dots s_n \left(p_1 + \frac{b_1}{s_1}\right) \times \dots \times \left(p_n + \frac{b_n}{s_n}\right) - b_1 \dots b_n, \quad (7)$$

It follows from the Cauchy - Bunyakovsky inequality that

$$\frac{1}{n}\sum_{i=1}^{n}\left(p_i + \frac{b_i}{s_i}\right) \geq \sqrt[n]{\prod_{i=1}^{n}\left(p_i + \frac{b_i}{s_i}\right)}, \quad (8)$$

In formula (8), equality can be achieved if the factors in the ratio (7) are equal

$$p_1 + \frac{b_1}{s_1} = \dots = p_n + \frac{b_n}{s_n} = \frac{1}{n}\sum_{i=1}^{n}\left(p_i + \frac{b_i}{s_i}\right) = \frac{1}{n}\left(P + \sum_{i=1}^{n}\frac{b_i}{s_i}\right) \equiv \bar{a}, \quad (9)$$

Thus, the maximum efficiency of the system is calculated by the ratio

$$S_{p_1,p_2,\dots,p_n} = s_1 s_2 \dots s_n \bar{a} - b_1 \dots b_n, \quad (10)$$

Applying Taylor series expansion to the neighbourhood of a point $(\bar{p}_1, \bar{p}_2,..., \bar{p}_n)$, get a simpler expression

$$S_{\bar{p}_1+\Delta p_1,\dots,\bar{p}_n+\Delta p_n} = s_{\bar{p}_1,\dots,\bar{p}_n}\sum_{i=1}^{n}\frac{s_1 D}{s_1\bar{p}_1 + b_i}\Delta p_i, \quad (11)$$

where $D = \prod_{i=1}^{n}(s_i\bar{p}_i + b_i)$.

Thus, the strategy of increasing the performance of the system is clear: it is possible to work in coordination with the method of gradient descent. This means that the greater the contribution of the provided value in the system, the greater the share of the resource it is obliged to receive at the expense of the least effective levels of the hierarchy. Thus, it is considered an understandable outcome. So, for example, it is now believed that the vector is important for us to make a specific situation and predictability of demand in certain markets, in certain sectors of the economy, so that investors have formed guidelines. The important measures that the authorities are able to implement in this regard include public procurement and state investments, which must be focused on priority

areas and have a significant impact on the current situation in the sectors in certain markets. The priority for authorities will be those segments of the economy, which are more effective from the point of view of the formation of jobs and prepare the ground for post-crisis development: roads, transport infrastructure in General, and, in addition, the investment plans of monopoly, where the radical can be enhanced the effectiveness of implementation and orientation to purchase products of own production, housing construction and landmark programs (target), aims to help technology segments [2].

Due to the fact that structural adjustment in the channels is not expected, the macro-system moves to the attractor. In this case, the lower values develop or degrade, they accumulate quality and quality configurations, which as a result have a good chance to lead the macrosystem in the segment of the mixing layer. Here there is a possibility to appear danger for social and economic security of all macro-system. In the mixing layer has the ability to happen the restructuring. In this case, the macrosystem makes a qualitative leap in its own development. Depending on the adopted opinion and its own dynamics, it has the opportunity to get into a fresh, different channel. In the mixing layer the macrosystem develops (in the meaning of changes). Micro-level in this case replaces personal goals, because in the dynamically changing criteria of the external environment the issue of survival is considered to be the first priority. If the socio-economic security in weighty systems is in most cases guaranteed by the method of removal of risks and inefficient processes in other associated systems, then this is not always possible. At the same time, they are more dynamic and adapt rather, but have every chance not to react to the configuration of situations. Creating criteria for measured formation and resistance to threats of financial and economic instability, which are associated with force majeure circumstances, economic conditions, scientific innovations and discoveries, etc., all this is involved in the socio-economic security segment of the lower value of the financial and economic macro-system [3].

In the scientific literature [4, p. 531] it is shown that within the framework of the updated financial and economic doctrine-evolutionary - there is a possibility to form an economically meaningful type of macro — level as an evolutionary system that forms a social product and determines its dynamics, regresses and UPS. Based on the results of a special model depicting the behavior of the macro level as an evolutionary system [5, p. 105], it is shown that the formation of the macro level of the economy of a certain country (statistical information on the gross national product of the United States for 1870-1994 was used) is consistent with the claims of the evolutionary approach.

It is expected that the macro level of the economy can be decomposed into a certain array (set) of unidentified, but similar macro-economic subsystems (microgeneration), any of which owns the property to appear, exist and disappear. In addition, it is expected that in the framework of this array of macroeconomic subsystems operates financial and economic "quality selection", ie there is competition between subsystems, displacement 1-their other, complex and productive. Apart from this, let any macroeconomic subsystem in the process of its own activity continuously take part in the formation of GNP, and the entire volume of one and the same time functioning macroeconomic subsystems creates an absolute volume of GNP during the t-the year.

If the formulated assumption is correct, it means that the macro level is an evolutionarily developing system, and the above macro generation are the key actors in the evolution occurring at the macro level of the economy. According to the proposed assumption, the life of any macro generation is limited in time, a separate macro generation contains specific dates of birth and disappearance. If we assume that N macro generation function in the economy of the state During the year $\{x^t, i = \overline{1,N}\}$, that total GNP for the t-th year can be formulated as follows:

$$\text{ВНП}_t = \sum_{i=1}^{N} X_t^i, \quad (12)$$

where X_t^i — the appropriate products $\{x^t, i = \overline{1, N}\}$, formed in the t-th year.

Classical science represents the GNP of the state, without resorting to microgeneration. GNP is generally regarded as the combined income of all financial and economic agents or as the total cost of all products and services. In statistics, there is a procedure for determining GNP, when information on the income of individual financial and economic agents is aggregated by industry in such a way that, as a result, GNP looks like the sum of profits generated by a specific set of macro sectors: agriculture, industry, construction, motor transport, Finance, communications, etc. Macroeconomics differ from macro generation in that they operate for a long period of time and will continue to exist further, because they meet a set of permanent basic activities of the society. At the same time, within any macro-industry, over time, there is a change in technologies and variants of industrial products, the composition of macro-sectors remains the same.

From the point of view of the evolutionary alignment, the composition of macro-sectors can be considered as an original genotype of the macro level, which can be characterized by any macro generation and which it is able to transmit by inheritance to the next generations of microgeneration.

The evolution of microgeneration was simulated by means of an economic and mathematical model consisting of a system of nonlinear differential equations (each equation describes the birth, life and disappearance of a separate macro generation), the equation of the relation of the sum of products (annual) of microgeneration with the total size of GNP (annual) and the statistical aspect evaluating the level of proximity of the calculated and actual rates of GNP growth. In the end, a series of retrospective calculations turned out to be detected by this system, Kateryna and so the estimated GDP, the correlation coefficient between the annual rates of increase in estimated and actual GNP of the United States amounted to 75.8%. This suggests the feasibility of the proposed assumption of the probability of representation of the macro level in the form of a set of microgeneration.

The proportion of macro trace in various Kateryna different. In this case, certain varieties of products change in part from macro-generation to macro-generation.

The paradox of the evolution of microgeneration is interesting both from the point of view of the formation of the financial and economic doctrine, and to solve practical problems of financial and economic political activity. In particular, in contrast to the conventional notion that nonequilibrium processes in the economy are destructive and must be carried out in all available ways, with the support of the paradox of the evolution of macrogenerations, it is proved that the nonequilibrium process between the necessities and the probabilities of production is a permanent, creative force that contributes to the recovery of the economy, its productivity, technological and organizational progress, and institutional changes.

Evolutionary Economics studies the peculiarities of transition processes. Her interest was the phenomenon of instability, imbalance, disorderly conduct, which tended to drive those transitions. If the financial and economic system is structurally stable in relation to the penetration of innovators (persons carrying innovative technologies, ways, etc.), the innovation regime is not fixed, and the innovators are killed, in particular, are bankrupt. Hence, the transition process involves the instability of the financial and economic system. The evolutionary macroeconomic doctrine is a component of the evolutionary economy-an innovative vector in science, ideologically similar to evolutionary biology and at the same time opposing the classical financial and economic doctrine, based on the concept of static equilibrium and the model of traditional (Newtonian) dynamics.

One of the most important qualities of financial and economic evolution is that it is irreversible in time. Only in exceptional cases is it possible to monitor the impoundment of the qualities of irreversibility. In these cases, there is a short-term stop of evolution.

Unlike the evolutionary economy, the classical economy is interested in the processes of persistence, order, equilibrium. Non-equilibrium, unstable, disordered condition of the classic economy are perceived as unwanted processes which need to resist with all available means.

There is no doubt that dynamic and mixing layers have a chance to manifest on any level of a hierarchical system subject to the formation of the appropriate segments of the system. It is likely that the components of the lower basis more often fall into the field of jokers, the higher the level of hierarchy. Here a significant role is played by horizontal ties. They have a chance to help build the intensity of appearance of mixing layers.

Knowledge of the model mixing layer has the opportunity to be quite necessary. In the scientific literature [6, p. 285] it is shown that the mixing layer plays an important role in the processes of information array generation and its value evolution (information array generation - random selection).

Thus, the approach to the problems of socio-economic security of different levels of the financial and economic macro-system from the standpoint of the concept of channels and jokers demonstrates the following:

First and foremost, in the highest degree important period approaches the region of the Joker, and relevant variables by which it is possible to talk about this approach, because there is a region of jokers, are better to avoid. When an evolving system becomes unstable, it becomes necessary to choose. The choice is made from a large number of variations. Subsequently, the produced selection system is developing steadily and followed up to the bifurcation. Here again, the choice is made, but from a different array of varieties. This array depends on the total of the first selection. For the socio - economic security of the system, the meaning is not the characteristics themselves, but their thresholds-limit values, the violation of which prevents the usual course of formation of various components of reproduction, leads to the formation of unfavorable, destructive trends in the field of socio-economic protection. So, for example, from the point of view of external hazards as indicators are likely to be the highest possible level of public debt, savings or loss of positions in the major market, the dependence of the state economy and the loss of state control over its important segments.

In-2, the time gap before entering the box, the Joker is considered to be favorable for the adoption of opinions, due to the fact that immediately afterwards the entrance of the subsequent behavior of the system is entirely unpredictable, and subsequently, output is entirely predictable.

Thirdly, the gap of time before leaving the mixing layer is important for making a conclusion, because at this time it is possible to significantly increase the possibility of a suitable outcome.

This scenario allows to analyze a number of scenarios of the events to evaluate their probability and to produce a control effect, capable of direct action on the desired path.

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Работа поступила
в редакцию 08.05.2018 г.

Принята к публикации
14.05.2018 г.

Cite as (APA):

Shvaiba, D. (2018). Socio-economic security of the hierarchical system. *Bulletin of Science and Practice, 4*(6), 248-254.

Ссылка для цитирования:

Shvaiba D. Socio-economic security of the hierarchical system // Бюллетень науки и практики. 2018. Т. 4. №6. С. 248-254. Режим доступа: http://www.bulletennauki.com/shvaiba-d-n (дата обращения 15.06.2018).