ЕКОНОМІКА ТА УПРАВЛІННЯ НАЦІОНАЛЬНИМ ГОСПОДАРСТВОМ

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APPLICATION OF TURBULENT APPROACH TO THE KNOWLEDGE OF THE ECONOMIC SYSTEMS

Urgency of the research. *Importance of the turbulent approach use to the cognition of the regularities of the economic systems development becomes the component of their research considering existence of these systems during the recent time in extremely and chaotic conditions of functioning .*

Target setting. *Taking into consideration high stochastic level of the economic processes which can be observed in the development of many economic systems and which are due to the external and internal factors, it is appropriate to deepen the theoretical component of the turbulent approach use of the scientific researches for the cognition of such systems.*

Actual scientific research and issues analysis. *To the scientists that were involved in the research of the turbulence phenomena by cognition the economic objects should be related the following ones : Grosul V. A., Demianchuk I .A., Zhuravliova G. P., Zakharchenko P. V., Kaslione J. A., Masliuk Ye. V., Yaroshenko R. F. and others. Theoretical aspects of the turbulent approach use and grounding its essence are met in the scientific researches of Gerasymov E. B., Burlachkov V., Trubetskov D. I., Makarov N. N.*

Uninvestigated parts of general issue defining. *However, notwithstanding numerous scientific works within which the regularities and peculiarities of the turbulence phenomena on the development of the systems of different nature are investigated, deepening require theoretical principles of the essence identification of the turbulent approach, definition the peculiarities of its use for studying the objects of different nature.*

The research objective. *Thus, the actual become issues of the theoretical grounding of the turbulent approach use to the economic systems cognition.*

Statement of the main material. *Within the article essence of the turbulent approach is grounded and peculiarities of its use to the cognition of the economic systems are defined. In particular, the conceptual approaches of the turbulence identification as a separate phenomena are detailed. As well, the scheme of the turbulence influence on the systems of different nature is described, factors of the turbulent processes are identified. It was suggested to consider the turbulent process as the algorithm of study of the systems of different nature essence of which lie in cognition of such systems that function in not predictable, chaotic and changeable conditions that threaten its stability and lead to arise of the high entropy level in their frames.*

Conclusions. *Use of the turbulent approach to the economic systems cognition gives the possibility to deepen the system of the methods of the economic researches by new approach that is directed to the investigation such systems in chaotic world where further transformations of the environment are hardly predictable.*

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ЗАСТОСУВАННЯ ТУРБУЛЕНТНОГО ПІДХОДУ ДО ПІЗНАННЯ ЕКОНОМІЧНИХ СИСТЕМ

Актуальність теми дослідження. *Важливість застосування турбулентного підходу до пізнання закономірностей розвитку економічних систем стає важливою складовою процесу їх дослідження, враховуючи перебування таких систем останнім часом у надскладних та хаотичних умовах функціонування .*

Постановка проблеми. *Враховуючи значний рівень стохастичності економічних процесів, що на сьогодні спостерігаються у розвитку багатьох економічних систем та зумовлені внутрішніми та зовнішніми факторами, доцільним є поглиблення теоретичної компоненти використання турбулентного підходу наукового досліджень до пізнання таких систем.*

Аналіз останніх досліджень і публікацій. *До вчених, які займалися вивченням явища турбулентності при пізнанні економічних об'єктів варто віднести наступних: Гросул В. А., Дем'янчук І. А., Журавльова Г. П., Захарченко П. В., Каслионе Дж. А., Маслюк Е. В., Ярошенко Р. Ф. та ін. Теоретичні аспекти використання турбулентного підходу та обґрунтування його сутності зустрічаються у наукових працях Герасимова Е. Б., Бурлачкова В., Трубецкова Д. І., Макарова Н. Н.*

Виділення недосліджених частин загальної проблеми. *Проте, не заважаючи на численні наукові роботи, в межах яких досліджуються закономірності та особливості впливу явища турбулентності на розвиток систем різної природи, поглиблення вимагають теоретичні засади ідентифікації сутності турбулентного підходу, визначення особливостей його використання для дослідження об'єктів різної природи.*

Постановка завдання. *Таким чином, актуальними стають питання теоретичного обґрунтування застосування турбулентного підходу до пізнання економічних систем.*

Виклад основного матеріалу. *У статті обґрунтована сутність турбулентного підходу та визначені особливості його застосування до пізнання економічних систем. Зокрема, деталізуються концептуальні підходи до ідентифікації турбулентності як окремого явища. Також описано схему впливу турбулентності на розвиток систем різної природи, ідентифіковано чинники формування турбулентних процесів. Турбулентний підхід запропоновано розглядати як алгоритм вивчення систем різної природи, сутність якого полягає у пізнанні таких систем, що функціонують у непередбачуваних, хаотичних та мінливих умовах, які загрожують їх стійкості та призводять до виникнення високого рівня ентропії в їх межах.*

Висновки. *Застосування турбулентного підходу до пізнання економічних систем дає змогу поглибити систему методів економічних досліджень новим підходом, який спрямований на вивчення таких систем у хаотич-*

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Keywords: *scientific approach; turbulence; economic turbulence; economic system; turbulent approach.*

ному світі, де подальші трансформації зовнішнього середовища є складно передбачуваними.

Ключові слова: *науковий підхід; турбулентність; економічна турбулентність; економічна система; турбулентний підхід.*

Urgency of the research. Science as sphere of human activity has always been regarded by the scientists as a dynamic system, which is constantly in the process of continuous development. Despite the most fundamental and applied sciences that in synthesis make the scientific sphere itself always parallel with them the development of the methodology as a separate but as a common part for other sciences, sphere of cognition takes place. The methodology itself as a separate science that develops new tools , cognition methods of objective phenomena and laws of our life , give to the scientists instruments of different nature for cognition such phenomena and separate complex systems. Actually, having originated from synthesis of separate theoretical and applied aspects of different sciences functioning, at the present moment methodology itself plays a role of integrated science, in other words “science about science”.

Taking into consideration the above mentioned, it should be noted that methodology as a science has all peculiarities of the complex science, that are common for different individual by their essence sciences. One of such peculiarities is dynamic, the essence of which lies in the continuous development of methodology, its constant spreading of different instruments complexity, methods and principles of cognition of different phenomena. At the present moment the scientists have already created a significant amount of such methods of its investigation, a significant number of diversified approaches and methods have been theoretically proved and tested in practice that allow to produce new knowledge about the phenomena of our objective reality. During quite a specific period of time we can observe as well synthesis process of individual methods of cognition and creation at this base new, more unified approaches to investigation different phenomena. The defined process is taking place continuously.

Methodology as a science as well does not stop at the achieved and is continuously developing, its theoretical base of functioning constantly is added by new innovations and achievements , the need in them arise as a result of modern processes development, that we can observe actually in all spheres of our society functioning. Reality demands producing new means of scientific cognition receiving for producing useful and, what is more important, actual information about our environment and its use in the process of decisions making of different nature.

Target setting. Ukraine at the present moment is in new, quite difficult conditions of functioning that penetrate all spheres of our society. Such conditions can be characterized not stable, complex, chaotic, changeable, not foreseen, difficult for prediction. The outlined situation is due to a number of political, economic and social factors that in complexity exercise a powerful influence on the stable processes of the Ukrainian society development. However, considering these actions objectivity, their non ability to change quickly and cardinally in positive direction demand from the scientists development and deepening of those methods of scientific researches that will allow to cognate the system of different nature in such difficult conditions of functioning.

Turbulent approach. In our point of view, allows to create definite theoretical platform of investigating the complex systems in not stable, and what is more important, difficult for predicting conditions of its functioning. The most actual becomes using the defined approach in sphere of cognition economic systems, behavior of which in most cases is described by quantitative indexes , in role of which act statistic data and that are used in normal conditions of these systems functioning for their further development predicting. In periods of considerable fluctuations that can be observed in the society, use of traditional methods of predicting of the economic systems comes out to be impossible. This factor demands the search of new methods of scientific researches, borrowing and adapting of already existing and created within the frames of other scientific researches on condition if they are appropriate to be used in the cognition process of economic systems. It becomes especially possible taking into consideration that methodology as a science is universal by its context and potential use and penetrates all spheres of scientific cognition.

Actual scientific researches and issues analysis. Turbulent processes investigation at the present moment are actively implemented , in first turn, in technical sciences by studying turbulence exertion as a natural phenomena in functioning technical systems of different nature. In Economics the defined phenomena is used by investigating the relevant systems. To the scholars that were involved to the studying of the defined phenomena by cognition economic objects the following should be related : Grosul V. A., Demianchuk I. A., Zhuravliova G. P., Zakharchenko P. V., Kaslione J. A., Masliuk E. V., Yaroshenko R. F. and the others .

Theoretical aspects of the turbulent approach use and grounding its essence can be met in the researches of Gerasymova E. B., Burlachkovs V., Trubetskovs D. I., Makarova N. N.

Uninvestigated parts of general matters defining. However, notwithstanding numerous scientific works, in frames of which regularities and peculiarities of the influence of the turbulence phenomena on the systems development of different nature are being investigated, theoretical factors of the essence identifying of the turbulent approach, peculiarities definition of its use for investigating the objects of different nature should be deepened.

The research objective. Thus, the actual ones become issues of theoretical grounding of the turbulent approach use to the economic systems cognition.

The statement of basic material. We consider to be appropriate to start the investigation from identifying the definition essence «the turbulent approach». With this purpose let's investigate the definitions context «approach», «scientific approach» and «turbulence». Within this article the approach is being considered as defined by definite means algorithm of any phenomena, process cognition. Accordingly, *scientific approach – algorithm of investigation the scientific processes and in general individual objects, systems, that are cognized by the scientists, in the base of which own theoretical concept of using is being stated*.

Lets define the category essence «turbulence». In translation from the Latin word *turbulentus* means rapid, chaotic. In public electronic vocabulary of the Ukrainian language turbulence is suggested to be considered as form of the liquid or gas movement, under which separate of them move rapidly, disordered, by complex trajectories [9].

In majority cases the defined category is accepted to be considered in the context of studying, first of all, physical phenomena, that takes place in air, water and in other spheres. Treatment of this category is defined taking into consideration phenomenon nature in context of which is being researched. In particular, Burlachkov states that in natural sciences under turbulence is considered the movement in continuous medium under which one can observe vortices formation as a result of the speeds pulsation in separate spheres [1].

Trubetskov D. I. notes that turbulence – a phenomena that can be met, wish we that or don't, in extremely different conditions, both in applied (for instance, in aerodynamics, hydraulics, naval science and chemical production), and in natural conditions (in geophysics, especially in metrology and oceanography, and in astrophysics ...) [8, p. 77].

Rosenau N. D., having investigated turbulent processes in the world politics , comes to conclusion that in general turbulence – is more than shock that follow changes in key variable components . Such deviations make every day existence of any system, either it is social, or meteorological [7]. We share the author's position, and consider that not all changes of the behavior of the envisaged object from the planned trajectory of its development are turbulent ones. Actually, such processes take place always, especially in economic sphere. However, as it is noted further by the scholar : when the borders of the system don't include the deviations of the changeable components, the anomalies arise and the irregularities are formed, at the same time as the structures are disturbed, new processes are created, the results become not continuous, and the system comes in the period of prolonged imbalance. All these are specific imbalance peculiarities. In metrology it is manifested in the form of hurricanes, tornadoes, tidal waves, droughts and other natural disasters that transform the land surface there where they take place. From the social point of view it is not manifested in technological advances, power crisis, agreements violations, revolutions, generation conflicts and other forces that transform human lives against which they occur [7]. In other words, turbulence, in our point of view, is always connected with peak changes that cardinally influence those economic processes within which

they occur. Development of such objects becomes impossible in the near future since the level of entropy in the system is too high.

Gradually the category of turbulence became to be used by the scholars by investigating the diversified processes that took place not only in the natural world, but as well in the society as objects of the scientific cognition. As it is noted by Zhuravliova G. P., terminological diffusion as manifestation of interdisciplinary manifestation increase in modern science lead to that fact that definition turbulence from the far from economics sphere of cognition – mechanics of liquids and gas – was started to be used concerning the economic systems. In the most general point of view under turbulence is understood very wide-spread phenomena of self-organization as a result of which regular or irregular (chaotic) transformations from chaos to order and vice versa take place [4, p. 24]. Thus, as a result of the above mentioned processes, turbulence as an individual category started to be used by investigating economic processes, by description their peculiarities and identification of the regularities of the behavior. However, it should be noted that unlike the technical sphere within which turbulence is considered from the position of its manifestation within behavior of the natural objects, that are under studying (gas, air, water, different liquids, etc.), in the social sciences, including Economics, phenomena of turbulence is studied from the position of investigating not envisaged, chaotic exogenous and endogenous processes that influence on the economic objects, processes and systems. So, the investigation has got more abstract character and high level of theoretical ability as the cognition process itself, and the results received while its conducting. Burlachkov V., having studied the theoretical aspects of the economic processes turbulence on this issue notes that, at the present moment definition «turbulence» is widely used in sphere of economic researches. But its use is based not on worked out theoretical and methodological base, but only on intuitive understanding" [1]. We also agree with the thinking of Yaroshenko R. F., who, having analyzed turbulence in management of the development of the financial institutions, notes, that in the social-economic systems of turbulence quite wide-spread is the phenomena (for example, revolutions, wars, change of social modes, crisis). Turbulence in physical and social and economical systems have got a lot of common features. That allows us in the researches use the analogies and build on this base relevant models. Turbulence of the environment in interaction with the system creates disturbance – influence that can be formalized and has got clear source [10, p. 283].

Zakharchenko P. V., investigating turbulence processes in economics of resort and recreation systems, notes that turbulence in the economics of resort and recreation systems can be defined as a disordered process for which are characteristic quick changes of the market tendencies and strong deviations of the economic indexes, and it is very difficult to influence on them by means of economic regulating [5, p. 78]. Zhuravliova G. P. states that turbulence is understood as a peculiar complex of the movement trajectory both of the national economy, and a separate form in «the vortex flow» of various changes, where they have to constantly survive and provide the forward movement ahead. Turbulence means extreme border of instability of the global economic situation, when the availability of reaching the point of its bifurcation and/or fracture is too high. Turbulence is characterized by the pervasive risk in various sectors – both financial and actual, which is able to provoke degradation and even fracture of this system, new configuration of the global world repartition, class resources, strengthening the conflict of different cultures, forcing regional armed conflicts [4, p. 24].

Makarova N. M., investigating the use of turbulence approach to studying the system of economy safety providing of the economic entities, notes that turbulence – is spread in nature phenomena of self-organization as a result of which regular and chaotic transformations from disorder to order and vice versa take place [6, p. 397].

So, turbulence in our understanding , first of all, is considered from the position of arising by the researched object in the process of its development chaotic fluctuations, that ate difficult to be explained and predict. Thus, taking into consideration the given approaches to treatment turbulence as a separate category, within the article *turbulence is considered as a phenomena that arises in sphere of functioning the systems of different nature (technical, economic, social, etc.), that by its nature is not predictable and quick in development , influences on the stability of the defined systems and leads to arise of the high level of entropy, that influences quite negatively on their stability and makes impossi-*

ble the process of predicting of further behavior of such systems. Thus, the defining characteristics of turbulence in nature are: aggressiveness, unpredictability and randomness. The same characteristics are peculiar for the turning points in the phases of business cycle [5, p. 77].

On figure 1 is given the scheme of turbulence influence on the development of the systems of different nature.

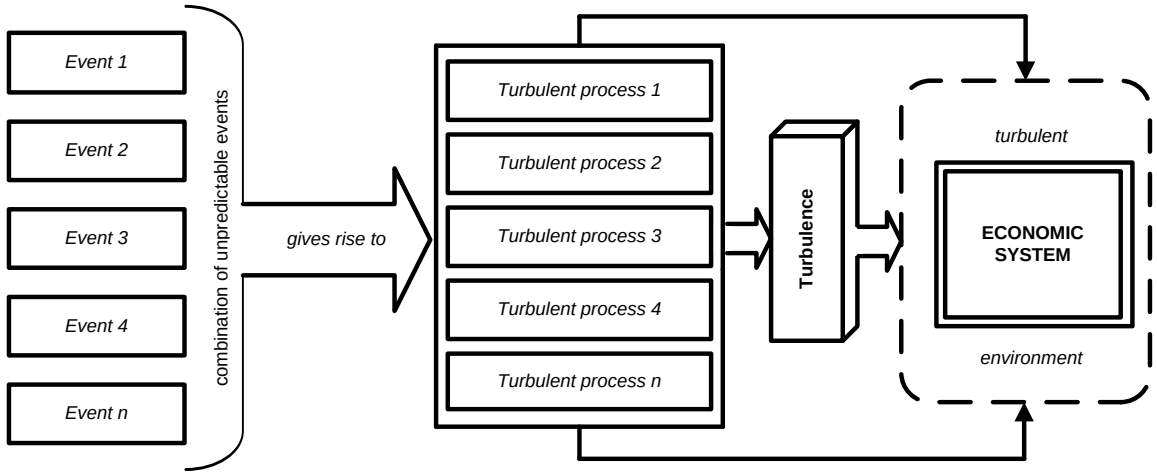

Fig. 1. Conceptual model of turbulence creation and its influence on the economic system functioning
Source: compiled by the authors

Thus, in the process the turbulence phenomena can be considered as the following. At first, in space where the investigates object functions there arise different events, combination of which starts to create on the environment in which the studied system functions. In general, combination of the defined events in synthesis between each other in different variations flavor the creation of number of turbulent processes which already negatively influence the development of the specific systems . Amount of all turbulent process makes by its essence phenomena of turbulence as a unified object of cognition. Actually, in case of availability turbulent processes in the environment of the object functioning under investigation, such environment should be considered as turbulent and difficult to be predicted.

Let's consider the peculiarities of origin and continuation of the turbulent processes. Actually, by investigating turbulence within different system such key aspects of the cognition of this phenomena should be considered. Turbulence by its content as a category describes the abstract system that arises as a result of significant number of different phenomenon and processes arise in internal and external environment of the definite system functioning. Connection between these phenomena and processes is extra complicated and that's why – complicated for the investigation. Sometimes impulses of outer environment implement negative influence on the internal processes of the system, that as a result only influences on the level of entropy within the system, negative influence on the elements of the outside environment, that in their turn again create non favorable disturbances on the inner structure of the system. We've got the vicious circle, but its availability is characteristic not for all systems and turbulence manifestations. As it was mentioned above, turbulence is always a set of the processes that start to influence on the system and by their nature such processes, conditions of theirarise are difficult to be predicted.

It should be also considered that in majority cases systems of different nature in most cases develop in the environments that are not finally defined as investigated. Element of unpredictability is always left. Actually, a certain level of ignorance is a source of risk arise, that the predicted action, process will be performed in the other way. However, for the turbulent environment level of ignorance of further system functioning is extremely high. This peculiarity differs turbulence from instability, uncertainty and variability, that are, as well at the present moment, are being investigated actively by the scholars in the context of cognition of the regularities of the different systems development. Turbu-

lence as a phenomenon is always characteristic for those situations within which the actions have already taken place and those were difficult to be predicted. As a rule, in most of the cases turbulence arise as a result of a simultaneous action of several non-predictable events, that lead to the significant entropy increase within the system and impossibility to predict its further behavior, since the factors influence has not been studied to the end.

Naturally, if one wants to understand patterns of turbulence influence on the development of economic systems themselves, then to our point of view, it is appropriate to speak about the economic turbulence, which is different in principal in its manifestation of its phenomena in the economic systems of different nature. Thus, considering availability in the nature considerable amount of different economic systems that are as well different between each others by various peculiarities and characters, then the manifestation and influence of the turbulence on such systems is also not identical. We'd like to note that in conditions of the economic turbulence traditional logic and usual chronology of many economic processes are disturbed [4, p. 24].

Activity of modern economic systems is performed in the conditions of general instability. Determined connections between the cause (influence) and circumstance (reaction) give way to uncertainty. As a turbine that converts into mechanic work kinetic energy of steam, gas or water, modern organization receives the development vector not only for and not under the influence of the ruling system, but in greater extent under the influence of the environment. This new turbo environment transforms the linear process (actions of which are conducted strictly sequentially) into not linear, turbulent one (is performed with a number of perspective trajectories of evolutions) [2, p. 183].

Let's define reasons of turbulent processes and the turbulence itself arise. Zhuravliova G. P. and Manokhina N. V. state, that one of the main reasons of the economic turbulence is connected with globalization of the modern economic space that takes place against the backdrop of a huge and growing gap in the technical and technological development of the country, their national economics. The authors also note that the main reasons of the turbulence arise are : financial capital which flows are transformed in the world practically immediately, followed by the change of the working forces, materials, energy flows; increase and complication of the resource wars; global social and ecological crisis that is manifested as a scale use of the resource technologies of the mass production [4, p. 24]. Demianchuk I. A. relates to the prerequisites of the economic turbulence the following ones : political instability, budget deficit, investors untrusty, low profit level of the majority of the population, increase of the outer debt, inadequate currency rate policy, outdated technology base of the active sector of economy, weakness of the domestic financial sector [3, p. 91].

However, in our point of view, defined by the authors prerequisites of the turbulent processes arise are not sufficiently grounded, since in majority of cases they are described by commonly known and by already existent in our society during the continuous time factors and events. Turbulence as a phenomena is on the contrary connected with the existence of the turbulent events. Determined above prerequisites, in our point of view, in general create the conditions for further arise of the turbulent processes and sending the speed of their spreading in space and time. However, it is not appropriate to consider them as the turbulent processes. That's why in our point of view, to the factors of the turbulent processes creation should be related the following ones: aggravation of the political situation in the country; arise of the military conflicts on the territory of the country; availability of the high level of terroristic thread; existence of the political instability; aggravation of the political and economic relations between the defined countries ; arise of the internal confrontation in the country; increase of the corruption level; increase of the economic pressure on the business entities; pressure increase of the other countries on the development of the national economy; influence increase of the international organizations on the state development; increasing the size of the shadow economy, capital offshoring; increase of raiding scale and others .

The defined factors are actually by their nature negative and circumstances of their influence increase on the development, in first turn, of the economic systems, are extremely destructive and hardly envisaged. That's why actual become the issues of appropriateness of the turbulence approach use to understanding the peculiarities of functioning and development of the economic systems and work-

ing out the measures of their further activity. Operating the categories «scientific approach» and «turbulence», let's determine the essence of the turbulence approach.

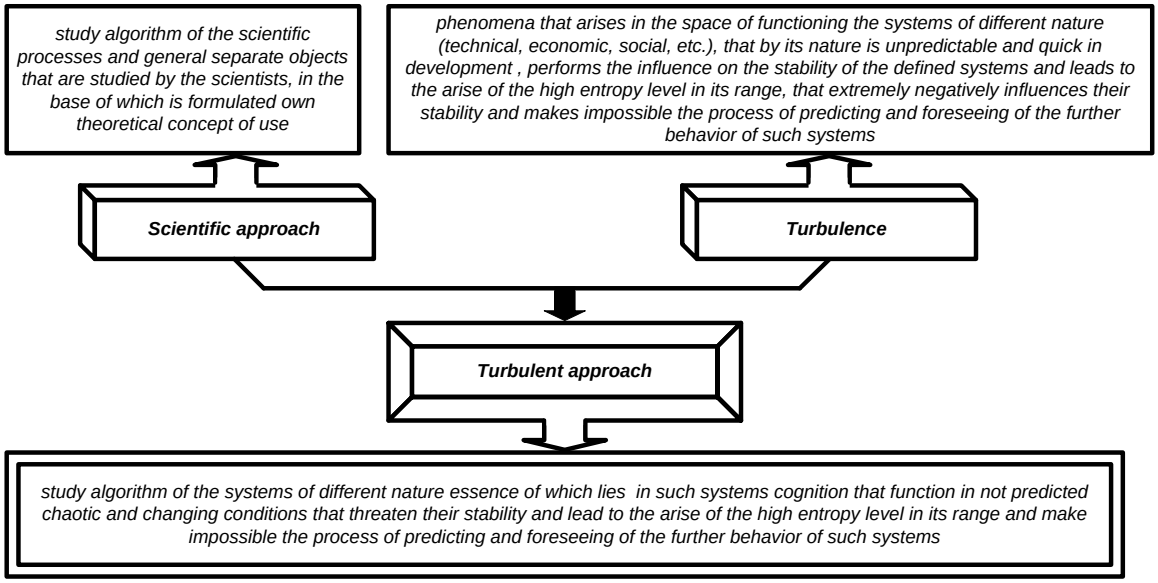

Fig. 2. Essence of the turbulent approach
Source: compiled by the authors

Thus, to the peculiarities of the turbulent approach use to study the economic systems the following ones should be related:

1) those that should be used in such case when the level of uncertainty of the environment uncontrollably rises of the economic system functioning;

2) the environment where there is the economic system becomes difficult to be predicted and envisaged , in short period of time considerable amount of destructive factors take place that influence the stability of such system;

3) that one that should be used only in that case when the environment where the economic system functions is really turbulent , since not stable processes are not always turbulent ones, but the turbulent processes are always not determined, not stable and chaotic;

4) there are no possibilities to perform planning and predicting of the future behavior of the economic system and its environment;

5) availability of the turbulent processes that cannot be changed or it not possible to implement the mechanism of their controlling, one can only adapt to them and considering that to prepare various scenarios of the further actions. We fully agree on that issue with the position of Demianchuk I. A., who notes the strengthened turbulence of the economy at the present moment cannot be avoided, one can only adapt to it [3, p. 89].

6) it is not possible to influence on the turbulent processes by means of the economic regulating on the level of the state authorities, they are in majority cases not characterized by exclusively economic character, and in the process of such processes creation the considerable role is played by political, social, mental and psychological factors.

Conclusions. Thus, the essence of the turbulent approach is grounded within the article and the peculiarities of its use to study the economic systems are defined. In particular, the conceptual approaches to the turbulence identification as an individual phenomena are detailed, that if considering the studying of the scientific works has been suggested to look through a phenomena that arise in the space of the systems of different nature functioning (teal, economic, social, etc.), which by its nature is non predictable and development , influences the stability of the defined systems and leads to the high entropy level in its ranges , that extremely negatively influence its stability and makes impossible to make the process predictable or envisaged of such systems behavior.

As well, in the article the scheme of the influence of the turbulence on the development of the systems of different nature is described, the factors of the turbulence processes creation are identified. It is suggested to consider the turbulence process as a study algorithm of investigating systems of different nature, essence of which lies in cognition such systems, that function in not predicted, chaotic and changing conditions that threaten their stability and lead to the high entropy level in its ranges and make impossible process of predicting and foreseeing of the further behavior of such system, peculiarities of the turbulent approach to study the economic systems are determined.

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