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CONCEPTION OF MODELING THE SYSTEM OF ENSURING FINANCIAL ECONOMIC SECURITY

Urgency of the research. *Functioning of the mechanism of ensuring financial economic security within the system of strategic management of a business entity is based on the use of information and analytical support along with economic mathematical modeling.*

Target setting. *Economic mathematical modeling has a significant cognitive potential to describe the laws and patterns of the studied systems functioning. Its use leads to the formation of the main tasks for ensuring the financial economic security system and the creation of the concept of modeling such a system as a theoretical foundation to shape a model basis of its description.*

Actual scientific researches and issues analysis. *The issues of the managerial mechanisms for the financial economic security formation and the modeling tools use are highlighted in the scientific publications by O. Zyhriy, T. Vasyltsiv, L. Menggang, D. Nanto, J. Jürjens, O. Illiashenko, V. Heiets, and many others.*

Uninvestigated parts of general matters defining. *The issue of creating a holistic system of scientific and theoretical positions regarding the use of means of economic mathematical modeling is not sufficiently studied now.*

The research objective *of this article is to identify the main tasks of modeling the composing parts of the financial economic security system and to shape conceptual provisions aimed at designing the appropriate modeling toolkit.*

The statement of basic materials. *A description of the conceptual provisions regarding the modeling of the system of financial economic security in the context of the solution of the main tasks is presented.*

Conclusions. *The presented conception allows identifying the structure of the model basis as a part of the mechanism of ensuring financial economic security. This contributes to the selection of models for solving the issues of forming managerial decisions to provide the required level of security.*

Keywords: *business entity; financial economic security; conception; economic mathematical modeling.*

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КОНЦЕПЦІЯ МОДЕЛЮВАННЯ СИСТЕМИ ЗАБЕЗПЕЧЕННЯ ФІНАНСОВО-ЕКОНОМІЧНОЇ БЕЗПЕКИ

Актуальність теми дослідження. *Функціонування механізму забезпечення фінансово-економічної безпеки в рамках системи стратегічного управління суб'єктом господарювання ґрунтується на використанні інформаційно-аналітичного забезпечення та економіко-математичного моделювання.*

Постановка проблеми. *Економіко-математичне моделювання має значний пізнавальний потенціал для опису законів і закономірностей функціонування досліджуваних систем. Його використання зумовлює формування основних завдань забезпечення системи фінансово-економічної безпеки та створення концепції моделювання такої системи як теоретичного підґрунтя для формування модельного базису її опису.*

Аналіз останніх досліджень і публікацій. *Питання формування механізмів управління фінансово-економічною безпекою та використання засобів моделювання висвітлені в працях О. Зигрій, Т. Васильціва, Л. Менеганга, Д. Нанто, Дж. Юргенса, О.Ілляшенко В. Геєця, та багатьох інших.*

Виділення недосліджених частин загальної проблеми. *Питання створення цілісної системи науково-теоретичних положень щодо використання засобів економіко-математичного моделювання є недостатньо вивченими на даний час.*

Постановка завдання. *Метою роботи є визначення основних завдань моделювання складових забезпечення системи фінансово-економічної безпеки й формулювання концептуальних положень, спрямованих на визначення відповідного модельного інструментарію.*

Викладення основного матеріалу. *Представлено опис концептуальних положень щодо моделювання системи забезпечення фінансово-економічної безпеки в контексті вирішення основних завдань.*

Висновки відповідно до статті. *Представлена концепція дозволяє визначити структуру модельного базису, як складовою механізму забезпечення фінансово-економічної безпеки. Це сприяє вибору моделей для вирішення завдань формування управлінських рішень щодо забезпечення необхідного рівня безпеки.*

Ключові слова: *суб'єкт господарювання; фінансово-економічна безпека; концепція; економіко-математичне моделювання.*

Urgency of the research. An important characteristic feature of the successful long-term functioning of the business entity in the market in the conditions of instability and destructive environmental disturbances is the high level of its economic security. This allows maintaining competitive advantages, providing sustainable growth, and responding on time to external and internal challenges and threats.

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Effectiveness of the development policy of an economic entity implies the existence of an integrated system of strategic management, based on the set of organizational and economic management mechanisms in all areas of activity. One of them is the mechanism for ensuring financial economic security. The functioning of such mechanisms makes it necessary to solve the tasks on planning the financial and economic indicators of the enterprise activity and assessing the resources necessary for it; prediction of internal and external environment factors, risks identification and assessment; forecasting the financial economic security system behavior in destabilized influence of external disturbances and assessing its sustainability. The solution of these problems is possible through the effective use of appropriate information analytical support and modern cognitive tools, which important element is modeling.

Target setting. The expediency to use the means of economic mathematical modeling for shaping scientific and methodological support, and analytical basis in the tasks of developing a strategy and tactics to manage financial economic security of the entrepreneurship entity is determined by the significant epistemological capacity of such toolkit capable to detect and describe the laws and patterns of the functioning of the investigated system, properties and the relations between its components.

Modeling is important means to assess the state and level of financial economic security system on the all stages of management. This necessitates designing a concept for modeling a system of financial economic security as a theoretical base to shape a model basis for describing this system.

Actual scientific researches and issues analysis. The deepening of integration processes, increasing competition in the domestic and foreign markets, the of development of the national economic and financial systems instability, and the consequences of the global economic crisis have led to an increase in the interest in solving the issues of ensuring financial economic security at the macro-, meso- and micro- levels, which has been reflected in lots of publications in this area. In particular, special attention is paid to the problem of identifying and neutralizing threats to financial economic security, and risk management. In this field we note research publications of O. Zyhriy, Ye. Kartuzov, D. Nanto, L. Menggang, collective monograph edited by K. Raczkowski and S. Schneider [1-5]. Designing the mechanisms for the provision of financial economic security are reflected in studies of Z. Zhivko, O. Illiashenko, a team of scholars led by T. Vasyltsiv [6-8], and many others. In these studies, the components of the mechanisms, explored the principles and functions of management of financial economic security, the implementation stages of the general scheme of the mechanisms were investigated.

The theoretical and methodological aspects of using economic mathematical modeling to describe the system of ensuring economic security, experience of applying different methodological approaches for solving this problem, set of indicators for modeling financial economic security in particular are highlighted in the monograph under V. Heiets' edition, studies by J. Jürjens, A. Ahmadian and others [9, 10]. The assessment of the state of the enterprise financial economic security system by the integral indices is investigated in papers by O. Illyashenko [11], O. Golovko, A. Gubarev, A. Krivonos [12]. Using econometric models to describe financial economic security of business entities are presented in studies by I. Moyseyenko and M. Demchyshyn [13], L. Chagovets with co-authors [14].

Uninvestigated parts of general matters defining. Paying tribute to a significant researchers' contribution, it should be noted that the focus is made mainly on assessing the level and state of financial economic security in their studies. At the same time, insufficient attention has been paid to the creation of a holistic system of scientific and theoretical positions for the complex use of the mathematical modeling tools.

The research objective of this article is to identify the main issues of modeling the composing parts of the financial economic security system and to shape conceptual provisions aimed at designing the appropriate modeling toolkit.

The following tasks are set and accomplished to reach the research objective of this research: 1) to identify the main tasks of providing financial economic security; 2) to identify the main issues of modeling the components of the financial economic security system; 3) to formulate conceptual provisions for modeling the system of financial economic security.

The statement of basic materials. Financial economic security we understand as the state of the economic system with the stable functioning of all its subsystems ensured, the necessary and sufficient preconditions for financial stability and the possibility of preventing, avoiding and confronting both

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external and internal threats created, and also the system's ability to achieve financial and economic goals, and facilitate to its development. The system of financial economic security does not exist in isolation, it should be integrated into the overall system of the enterprise economic security, interacting with all its subsystems. In turn, each individual component of the economic security subsystems also serves as a functional component of the financial economic security system.

Particular attention among them should be paid to the information component. Recent events related to the computer systems attack by Petya.A virus highlighted the importance of this direction. According to V. Yakushev, the expert on information security and counteraction to cyber threats, more than 60 countries in the world have suffered from the attack of this destructive program, and the losses estimated are $ 8 billion [15]. That is why the scientists pay attention to the study of information security issues [16-18]. The essential characteristics of information security reflect the protection of the rules which take place in the information processes, the protection of all activity's areas of business entities in the information space from real and potential threats, and, finally, the safety of the enterprise information space. Outside influence on the enterprise information infrastructure can cause its financial losses and give a significant advantage to competitors in doing business.

In our opinion, the main tasks to be solved in the financial economic security system formation are shown in Tab. 1.

Table 1

The main tasks for ensuring the financial economic security system

Task code	Task description
Z1	the enterprise operation goal achievement and its financial and economic interest protection;
Z2	identifying the priority financial interest that require protection in the enterprise financial and economic activity;
Z3	assessing enterprise financial stability and solvency and determining ways to ensure its sustainable economic growth;
Z4	providing the enterprise with financial and material resources sufficient to meet the needs and fulfillment of existing obligations;
Z5	identifying, assessing and forecasting the external and internal threats to the enterprise financial and economic interest, developing the necessary measures for their prevention and neutralization;
Z6	confidential information protection assurance;
Z7	crisis phenomena detection and prevention;
Z8	justification of the strategy choice and tactics for the gradual and stable development of both the economic system as a whole and its separate subsystems.

Source: developed by the authors taking into account [8; 9]

The presented set of tasks is not exhaustive and provides for expansion and additions depending on the specific conditions of enterprises operation. Z1 is a key task, and actually, it determines the solving other tasks.

The formalization of the tasks listed in Tab.1 leads to a set of tasks that can be solved by means of modeling shown in Tab. 2.

Table 2

The main tasks of modeling the components of the financial economic security system assurance

Task code	Task description
1	2
MZ1	modeling the behavior of the financial economic security system taking into account the challenges of the external and internal environment;
MZ2	identifying risks of enterprise financial and economic activity, and assessing their impact on the state of financial economic security;
MZ3	assessing the necessary level of financial and material resources, and their distribution for ensuring financial economic security;
MZ4	assessing the state of the financial economic security system and its level by calculating a set of defining characteristics and developing measures to prevent way outside the established limits;

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Продовження Таблиці 2

1	2
MZ5	the classification of threats to financial economic security by some integral characteristic or set of characteristic and the class of threats identification;
MZ6	assessing the enterprise financial sustainability and solvency, and identifying the level and state of financial economic security by these characteristics;
MZ7	modeling the processes of choosing the most suitable alternative as a strategy component for managing the system of financial economic security assurance;
MZ8	assessing the enterprise financial and economic capacity;
MZ9	assessing the protection level of enterprise information environment.

Source: developed by the authors

For the formation and development of model toolkit, a system of conceptual provisions proceeding from the presented tasks is proposed.

1. The model basis we will understand as a set of model tools designed to solve typical tasks of a specific subject field and aimed at a description of problem situations in this area. The basis formation should be done in accordance with the methodological principles of both fundamental and applied levels. Their regulatory function creates the theoretical foundation for the basis formation. Heuristic function of methodological principles defines the directions of the basis formation, contributing to the process of conceptualization in identifying its components. Coordination function is aimed at avoiding one-sidedness in choosing the instrumental filling of the basis and determining the means to solve specific problems of financial economic security on its base. The logic-epistemological function of methodological principles provides the substantiation of conclusions regarding the inclusion of certain components into a basis, based on the application of general scientific methods of cognition, in particular, the system approach.

2. The substantive content of the model basis is proposed to be considered for solving issues of analytical support to meet the main goal of the financial economic security system – ensuring maximum functioning stability to achieve the enterprise objectives, creating the basis for sustainable growth, maintaining a stable state in the market and high competitive positions. This leads to a use of a wide range of different economic mathematical models for the complex solution for problems that arise in providing financial economic security.

3. Study of the subject matter area related to the provision of financial economic security provides for its formal description, aimed at identifying problem situations, obtaining clear objectives and a well-founded set of models for their solution. This involves the use of visualization tools for the subject area, in particular, using a unified UML simulation language, info-logical modeling tools, cognitive and mental maps, and other formalized modeling tools.

4. Application of a models complex involves the use of a large set of diverse data, which determines the need to form an information basis for the financial economic security system.

Such basis can be presented as a hierarchical three-tier structure. The first level consists of "raw" data obtained from a variety of internal and external sources. The second level of the information base is data that has been processed by the relevant tools and thus are information resources. The content of the first and second levels is the information bank of ensuring financial economic security system.

Organizationally, it may be filed in the form of a set of information modules, which have such characteristics as logical completeness, informativeness, accessibility. The third level of the hierarchy is knowledge – information that was used to solve certain managerial tasks, that is, which has practical application and interpretation within the framework of specific directions.

Solving this problem requires the use of a variety of methods of data collection and analysis in order to shape and fill the indicator space of the subject matter area of the study.

5. Multidimensionality of indicator space for describing the processes of providing financial economic security leads to the need to solve the non-trivial task of selecting appropriate methods and models for processing multidimensional data in the chain of "data – information – knowledge".

6. The discrepancy between the conditions for obtaining data and the requirements of the probability theory postulates leads to the need to use heuristic methods for processing data that do not fore-

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see the use of the classical probabilistic model of the studied processes, that is, the adaptation of statistical methods in the form of methods of multidimensional data analysis.

The multidimensionality of data on the one hand is due to the objective result of collecting various data characterizing the system of financial economic security, and, on the other hand, it is the result of a combination of different types of information obtained as a result of the formation of the indicator space. It is necessary to get the most significant information from the accumulated ideas and knowledge and apply it to the analysis of the initial data.

Such purified and formalized knowledge represents an information model of data reflecting financial economic security. It provides a context for choosing the most appropriate method from the set of possible multidimensional or other methods of data analysis.

7. The discrepancy between the conditions for obtaining data and the requirements of the probabilities theory postulates leads to the need to use heuristic methods for processing data, that is, the adaptation of statistical methods in the form of methods of multidimensional data analysis.

Multidimensional processing of data can be conditionally submitted as a sequence of two stages: information and functional. In the first stage, preliminary data processing is carried out: the identification of the properties of the received multidimensional sample aggregate, clearing and correction of data, etc. In this case, widely used methods of one-dimensional statistics, after all, in most cases, the sample for each indicator involves processing independently of other samples. Multidimensionality of data is used when calculating similarity measures and identifying the relationships between data. The purpose of this stage is the formation of an information base for the actual application of methods of multidimensional statistics. Second stage uses specific multi-dimensional methods depending on the tasks of ensuring financial economic security.

8. An important property of the system of financial economic security is the comprehensive provision and protection of the economic system from internal and external threats, ensuring the stability of its functioning and the possibility of its development. Due to the objective unpredictability of the environment, this requires taking into account uncertainty and assessing risks, in particular, using models of fuzzy set theory, game theory, risk-taking, etc.

9. Ensuring the financial economic security of the entrepreneur structure is largely determined by the level of its capacity, which is a combination of resources and capabilities to achieve the expected characteristics of its development in a high dynamic environment. It implies the necessity of using models for assessing the level of financial economic security in relation to various components of economic capacity, indicators of competitiveness, financial sustainability of the entrepreneur entity.

10. Significant influence on the ensuring financial economic security of the business structure carries out planning of activities both in the operational and strategic periods, which envisages widespread use of forecasting methods, models of system dynamics, correlation and regression analysis, etc.

The basis of long-term planning of financial economic security is the forecasting its main indicators, reflecting:

− The effectiveness of the financial strategy of the enterprise and assessment of its prospects for each kind of activity;
− System of enterprise priority financial interests;
− Efficiency of enterprise internal and external financial policy;
− Market situation and company position in a specific market;
− Changes of the internal and external environment, assessment of possible risks and threats.

11. The identification of the level of financial economic security is one of the final results of assessing its state. Complexity, versatility and different nature of the factors and indicators that determine this level, variability and contradictory criteria of evaluation determine the use of data integration methods, in particular, complex integrated assessment.

12. The presence of substantial amount of information flows in the modeling financial economic security, the requirements to the efficiency of obtaining the modeling results determine the automation of data processing and justify the need of projection a model basis into information technologies in order to identify a model profile aimed at solving specific problems.

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13. The final result of the modeling is the managerial decision in relation to the identified problem situation. This implies the use of a model decision support toolkit. The presented conception defines a procedure for the modeling of the ensuring financial economic security, which consists of several stages. At the first stage, the structuring and formal presentation of the subject matter area are carried out, the problem situation is identified, the specific tasks of modeling within it framework are allocated, the interrelations between tasks are established and the expected results are identified. The second stage contains the procedures for determining the indicator space and for the formation of an information basis. The third stage is the selection of specific tools for solving the tasks. The fourth stage provides for the synthesis of the results, their analysis and the appropriate decision-making.

Conclusions. As a result of the research, the tasks of ensuring financial economic security and corresponding tasks of modeling the components of the system of ensuring financial economic security have been identified. It is concluded that it is expedient to create a model basis to solve the problems of modeling. Its theoretical foundation is the conception of modeling the components of the system for ensuring financial economic security. The presented conception allows identifying the structure of the model basis, as a part of the mechanism of ensuring financial economic security. This contributes to the selection of models for solving the issues of forming managerial decisions to provide the required level of security.

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