

MATHEMATICAL FORECASTING MODELS IN THE FINANCIAL INSTITUTIONS' ECONOMIC SECURITY SYSTEM

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Introduction. Security as a socio-economic phenomenon is one of the global problems of civilization, which is comprehensive and applying to all spheres of human life. Ensuring the financial institutions' economic security is a purposeful, ongoing process aimed at controlling and monitoring the results of the institution with the detection of any deviations from the norm and their further elimination.

Achieving these goals involves the creation of its own security system, which will guarantee the protection and maintenance of stable economic activity with the detection of all possible manifestations of internal and external threats. If the protection system can be individually formed to the institution specifics, the forecasting methods can be universal. The forecasting application will enable tracing the trend activities of the financial institution and identify possible destabilizing factors manifestations in the next period.

Analysis of recent research and publications. The issues of assessing the economic security at financial institutions were investigated Mishin O. Yu. [1], Biloshkurska N.V. [2], Novikova O.F. [3], Zachosova N.V. [4], Migus I.P. [5], Sorokivska Z. [6], Melnyk S.I. [7]. Further research is needed to explain the importance of using mathematical forecasting models in the system of economic security.

The aim of the article is to analyze and identify potential forecasting methods to identify threats and prevent their negative impact on the financial institutions' economic security. Determining the role of forecasting in the system of ensuring the institution's stable operation.

Research results. Financial market development, the complexity of its infrastructure, competition caused by the increase of the traditional and non-traditional financial intermediary's number, encourages new solutions, technologies and methods. However, the main advantage remains stable operation and economic security of customers. Therefore, modern financial institutions' must make great efforts to develop comprehensive and effective systems to ensure their own economic security, which is necessary for their proper functioning.

Since 2016, the financial market has tended to reduce financial institutions (Table 1), which in turn leads to a reduction in assets of the state financial system. It undoubtedly affects the level of economic security of Ukraine. That is why the problem of domestic financial institutions economic security in general and in times of economic imbalances needs to be studied in detail.

Table 1

Financial institutions quantity in 2016-2021

Financial institutions	Period, year					
	2016	2017	2018	2019	2020	2021
Banks	117	96	82	78	75	73
Insurance companies	310	294	281	233	215	210
Credit unions	462	378	358	337	327	316
Financial companies	809	818	940	986	1031	976
Pawnshops	456	415	359	324	304	298
Leasing companies	202	183	167	157	144	144
Together	2356	2184	2187	2115	2159	2082

*compiled by the author based on [8]

According to main objectives definition of the institution, the financial institutions' economic security should be described as a set of conditions under which a stable environment, and potentially dangerous threats, are prevented or reduced to a level at which they cannot harm the established order of operation.

The processes of setting goals for the future and making decisions to achieve them in conditions of uncertainty are the starting point of any business entity. Depending on the degree of specification, it can be considered as a sequence of interrelated actions for forecasting, plans and programs. Achieving the pre-set goal is achieved by creating an appropriate structure of elements that enable performing the tasks, based on the established and effective system of internal motivation for effective action aimed at full implementation to plans.

Financial institutions' economic security purpose is to guarantee stable and most efficient operation with parallel provision of potential for future development. Accordingly, taking into account the current requirements for the financial institutions, it is proposed to identify the following components in the economic security system:

1. Digital component is digital transformation of the institution, which enables you to accumulate time, increase productivity and communication between departments and customers.

2. Media marketing component includes not only the "profile" of the institution on the Internet but also in general the dissemination of information in media space, social networks and the right marketing message for potential customers.

3. Energy efficient component includes the company's policy on the implementation of an energy efficiency measures and personal contribution to the energy efficient industry development.

The proposed components are necessary for inclusion to the system of economic security at this stage of state economic policy development, as they totally meet modern global challenges.

Effective financial institutions' economic security management tools need to be developed. This is due to the unpredictability and aggressiveness of the environment. On the one hand, the need for studying economic security management systems is determined by the dynamism of changes in the external environment. On the other hand is resource efficiency. Building a comprehensive forecasting system is an urgent task that requires a variety of approaches and solutions.

In order to form an effective set of measures to prevent threats and minimize their impact on the financial institutions' economic stability, scientists [9] propose to use a predictive mathematical model of exponential smoothing.

Ensuring the real achievement of institution economic stability is carried out through a continuous process of measuring and evaluating the actual results of activities and their comparison. This is a necessary condition for the implementation of specific measures to control and prevent losses, ensuring the institution's economic security. Thus, receiving the result adjusted to the updated performance indicators, a new forecast is developed.

In addition to obtaining certain parameters possible future estimates of socio-economic processes, forecasting purpose is to analyze what may happen in the implementation of possible forecasts in the future and what consequences it will lead to. Therefore, forecasting can reduce possible risks, improve the quality of management, and ensure the ability to respond quickly to possible changes.

The forecast is based on an assessment of the actual entity situation, and the plan is on the forecast of future changes in its operating conditions, there is a constant need to monitor and analyze key current indicators and forecast their changes in the future. Therefore, the forecast should be revised according to the new information received at any of these stages. It will require appropriate changes to pre-approved plans and programs.

Thus, forecasting is a basic management function and an effective tool for ensuring the economic security of the institution.

In the financial institutions' economic security system (given the realities of today: unfair competition, pandemic, low staff motivation, poor information policy) forecasting occupies an important place. Forecasting methods usage in the economic security system will provide many benefits, which are shown in Fig. 1.

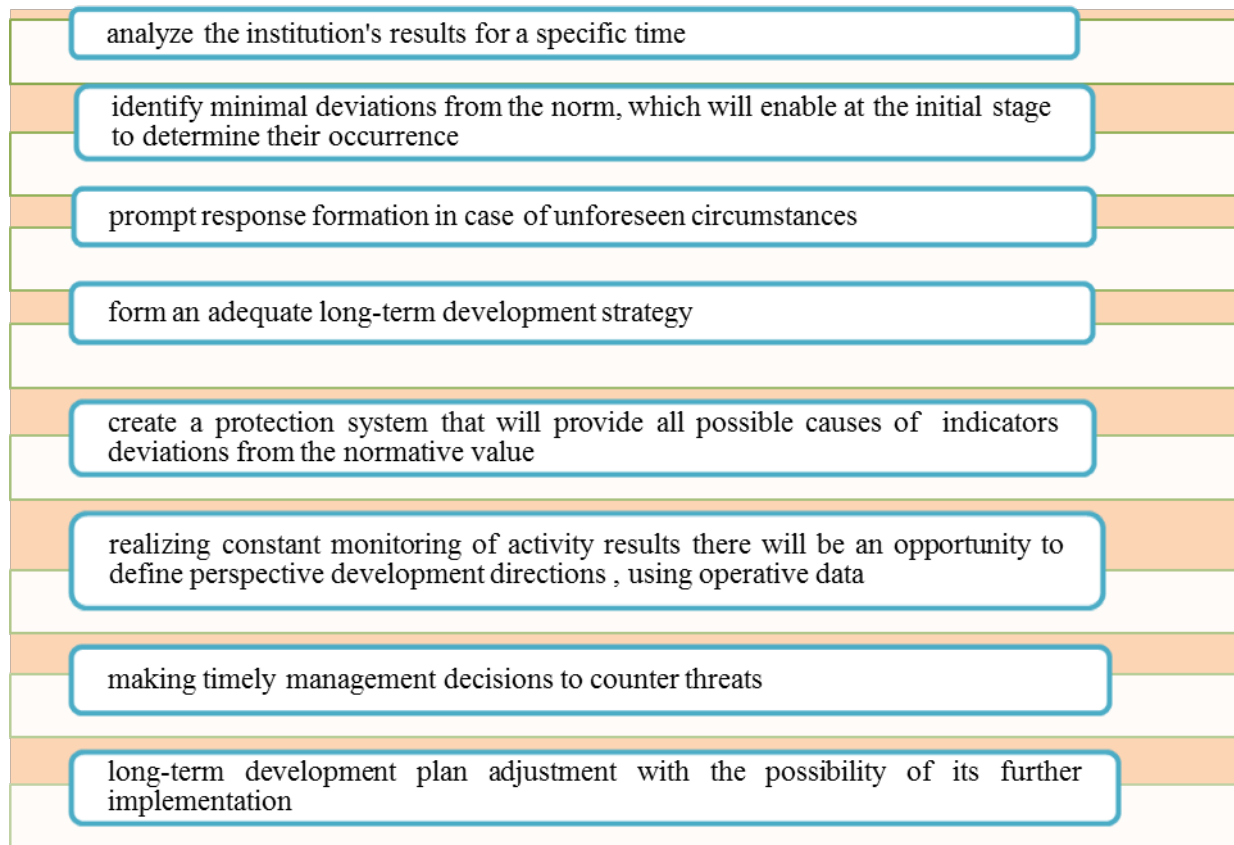


Fig. 1. Positive aspects of using forecasting at economic security system

The system of economic security must be considered comprehensively in combination with a short-term and long-term control system. Only with the interaction and simultaneous functioning of these two systems, will an adequate and prompt assessment of the institution's activities be provided.

The financial institution's economic security system must perform clearly defined functions, the main of which are forecasting, detecting and preventing various dangers and threats, ensuring the security of the institution and its staff, preserving its assets, creating a favorable competitive environment, eliminating the consequences of losses, etc. [10].

Let us dwell, first, on the usual understanding of forecasting functions and features of their implementation in conditions of uncertainty. Usually distinguish the following forecasting functions [11]:

- information-analytical function, which involves the collection and initial processing of information from various sources (both official and indirect) on the level of various macro-financial indicators that reflect the state and trends of the institution during a certain period of time. The essence of primary processing is to verify reliable information about macro-financial indicators, as well as its systematization, comparison and structuring;

- identification and warning function - aims to identify possible hidden threats to stability and develop certain measures to eliminate their negative impact;

- the regulatory function is to develop measures that enable the assessment of hazards and aimed at eliminating these shortcomings and the development of measures aimed at improving stability indicators;

- advisory function - is the possibility of considering alternative and multivariate measures that are developed as a result of identifying threats in order to prevent them or minimize the consequences.

That is why, in order to make the necessary management decisions in order to ensure the appropriate level of economic security of the financial institution, it is necessary not only to assess the current situation but also to forecast a possible "scenario" of the institution.

Conclusions. Today, economic security is the basis for the corporate culture in modern business. Given the instability of the external environment, the pandemic, the socially concerned situation of the population, uncertainty about the future, the financial institution's economic security system reaches a completely different level. Since the main component of the system is forecasting, the main role begins to play analytical work. It is extremely important to control the sources of information and methods according

to which the analytical data is obtained. After all, misinformation can lead to greater consequences than their untimely detection.

Forecasting is the most important element in the system of financial institution's economic security. In addition to the possibility of forming a comprehensive development plan of the institution, the minimum deviation from the norm is also determined. Mathematical forecasting models should apply comprehensively to the institution's financial results and to the system of economic security. During such an analysis, it will be possible to trace the connection between the results obtained.

The system of economic security must identify risks to determine the conditions for sustainable operation of the entity, to model threats and crisis scenarios, to identify factors. The main task is to determine the time, place and probability of a crisis to make operational management decisions.

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Черв'як Анна Володимирівна, аспірантка. Національний університет «Полтавська політехніка імені Юрія Кондратюка». **Математичні моделі прогнозування у системі економічної безпеки фінансово-кредитних установ.** Розглянуто систему економічної безпеки комплексно, у поєднанні короткострокової та довгострокової систем контролю. Схарактеризовано необхідність взаємодії й одночасного функціонування цих двох систем для забезпечення адекватного та оперативного оцінювання діяльності установи. Досліджено питання необхідності використання методів прогнозування для забезпечення контролю й моніторингу економічної безпеки фінансово-кредитної установи. Визначено роль прогнозування у системі забезпечення стабільної діяльності установи. Наведено переваги від упровадження прогнозування у систему контролю за стабільністю діяльності. Виділено основні функції прогнозування та особливості їх реалізації в умовах невизначеності. Зазначено необхідність постійного контролю й аналізу основних поточних показників діяльності фінансово-кредитної установи та прогнозування їх змін у майбутньому. Прогноз повинен переглядатися відповідно до отриманої нової інформації на всіх етапів аналізу. Зауважено необхідність оперативної адаптації перспективних планів і проектів розвитку установи

відповідно до результатів прогнозування. Прогнозування визначено як дієвий інструмент забезпечення економічної безпеки установи.

Ключові слова: система економічної безпеки, складові системи, прогнозування, математичні моделі прогнозу.

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Cher viak Anna, Postgraduate student of Finance, Banking Business and Taxation Department. National University «Yuri Kondratyuk Poltava Polytechnic». **Mathematical forecasting models in the financial institutions' economic security system.** The system of economic security is considered a complex combination of short-term and long-term control systems. The necessity of interaction and simultaneous functioning of these two systems for ensuring adequate and operative assessment of the institution`s activity is characterized. The paper examines the need of using forecasting methods to ensure control and monitoring of financial institutions` economic security. The role of forecasting in the system of ensuring stable activity of the institution is determined. The advantages of introducing forecasting into the stability control system are presented. The main functions of forecasting and features of their realization in the conditions of uncertainty are allocated. The need for constant control and analysis of the main current indicators of the financial institution and forecasting their changes in the future. The forecast should be revised according to the new information at all analysis stages. The need for rapid adaptation of long-term plans and projects for the institution development in accordance with the results of forecasting. Forecasting is defined as an effective tool for ensuring the institution's economic security.

Keywords: economic security system, system components, forecasting, mathematical forecast models.