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BANKS FINANCIAL SECURITY MANAGEMENT: MODELING TOOLS

Abstract. The article is devoted to the development of the complex of economic and mathematical models to support decision-making on managing commercial banks financial security. Aggregated model of management system of commercial banks financial security is presented. Basic conceptual scheme of the bank's financial security management is developed.

The proposed modern modeling tools on the bases of multivariate, econometric, simulation methods and decision making methods make possible to do integrated complex analysis at all levels of the banking market. The results of research in particular assessment and analysis of the survival and spread of crises in the banking market, the research of the particular bank financial security level dynamics in terms of external and internal factors are the basis for the formation and selection of scenarios of financial security ensuring taking into account the features, opportunities and competitive advantages of each bank. The implementation of the proposed modeling tools of financial security makes possible to improve the efficiency and effectiveness of the commercial bank activity and its financial security level.

Keywords: commercial bank, financial security, analysis, forecasting, management, economic and mathematical models

JEL classification: G21, C19, C52

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УПРАВЛІННЯ ФІНАНСОВОЮ БЕЗПЕКОЮ БАНКІВ: ІНСТРУМЕНТАРІЙ МОДЕЛЮВАННЯ

Анотація. В роботі розроблено комплекс економіко-математичних моделей підтримки прийняття рішень з управління фінансовою безпекою комерційного банку. Представлена агрегована модель системи управління фінансовою безпекою комерційного банку. Розроблена базисна концептуальна схема процесу управління фінансовою безпекою комерційного банку. Запропоновано сучасний інструментарій моделювання на основі оцінки та аналізу виживаності та розповсюдження кризових ситуацій на банківському ринку, дослідження динаміки рівня фінансової безпеки конкретного банку в умовах зовнішніх і внутрішніх факторів впливу для формування та вибору сценаріїв забезпечення фінансової безпеки, їх впровадження та оцінки ефективності реалізації.

Ключові слова: комерційний банк, фінансова безпека, аналіз, прогнозування, управління, економіко-математичні моделі
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УПРАВЛЕНИЕ ФИНАНСОВОЙ БЕЗОПАСНОСТЬЮ БАНКОВ: ИНСТРУМЕНТАРИЙ МОДЕЛИРОВАНИЯ

Аннотация. В работе разработан комплекс экономико-математических моделей поддержки принятия решений по управлению финансовой безопасностью коммерческого банка. Представлена агрегированная модель системы управления финансовой безопасностью коммерческого банка. Разработана базисная концептуальная схема процесса управления финансовой безопасностью коммерческого банка. Предложено современный инструментарий моделирования на основе оценки и анализа выживаемости и распространения кризисных ситуаций на банковском рынке, исследования динамики уровня финансовой безопасности конкретного банка в условиях внешних и внутренних факторов влияния для формирования и выбора сценариев обеспечения финансовой безопасности, их внедрения и оценки эффективности реализации.

Ключевые слова: коммерческий банк, финансовая безопасность, анализ, прогнозирование, управление, экономико-математические модели
Формул: 0; рис.: 3; табл.: 0; библи.: 17

Introduction. Current conditions of Ukraine economic development are characterized by a large number of factors which are inherent uncertainties and destabilizing. Due to instability of the external and internal environment, the emergence of extreme operating conditions the banks need to arise entry capacity for survival and resistance to negative influences, threatening the destruction of the resource potential of the bank, increasing the risk of management decisions and therefore represent a threat to the operation and therefore to its financial security.

Literature review and the problem statement. Currently there is a wide range of different approaches, methods and models for assessment the commercial banks financial security level [1, 2, 3], which are based on methodology using expert assessments methods, scoring methods and other methods [4]. However, some of them don't take into account the impact of the environment, features of the particular bank structure, others do not reveal the cause of the problems and threats, so it's indisputable fact that there is a necessity to improve tools for assessment, analysis and management of commercial banks financial security using modern economic and mathematical methods.

Research results. The complex of models of assessment and analyze of commercial banks financial security (CBFS) using modern economic and mathematical tools is proposed in this article. Because of the system of commercial bank financial security is influenced by many factors of internal and external environment, so clear formulation of tasks and functions of the system is required for effective monitoring of commercial bank financial security [1, 3, 5].

Bank financial security system is a set of financial instruments and diagnostic methods and methods for neutralizing the crisis to ensure a stable and efficient operation of the banking institution. [6]. Consequently, the main purpose of functioning of the commercial bank financial security system is the most sustainable and effective functioning of commercial bank taking into account prospective dynamics of development which is achieved by solving tasks and functions on the basis of proper organizational and legal support, including:

- identification of areas to ensure the commercial bank financial security at all levels of the hierarchy of management system and their interaction;
- achievement and maintaining of sufficient sustainability and competitiveness levels of commercial bank;
- timely and timely and adequate reaction of all bank units to emerging threats;
- development of commercial bank financial security management strategies and drawing up the appropriate strategic action plan;
- control and coordination of the development and implementation of a strategic plan of commercial bank financial security ensuring [1, 2, 7, 8].

The proposed aggregate model of the commercial bank financial security management system is shown in Fig. 1.

The policy of the National Bank of Ukraine, the current economic situation in the country and other factors are influenced on the processes at every stage of management. The input data for the model of bank financial security management are banking statistical information (amount of capital, deposits, loans, etc.) and output data are the value of financial security level, the list of regulatory procedures which bank staff should do, the decisions and recommendations for providing and improving the required bank financial security level [6, 7, 9].

The implementation of management functions which is aimed at solving local and global management problems of commercial bank financial security justifies the need to build a conceptual scheme of assessment and analysis of the commercial bank financial security. This scheme reflects continuity management process, parallel execution of various tasks, create one integrated complex of processes of management, capacity assessment and activity effectiveness. The development of conceptual positions is a prerequisite for effective assessment and analysis of the commercial bank financial security [5, 9]. The conceptual scheme of the commercial bank financial security management is shown in Fig. 2. Consider in more detail the basic blocks of the proposed conceptual scheme.

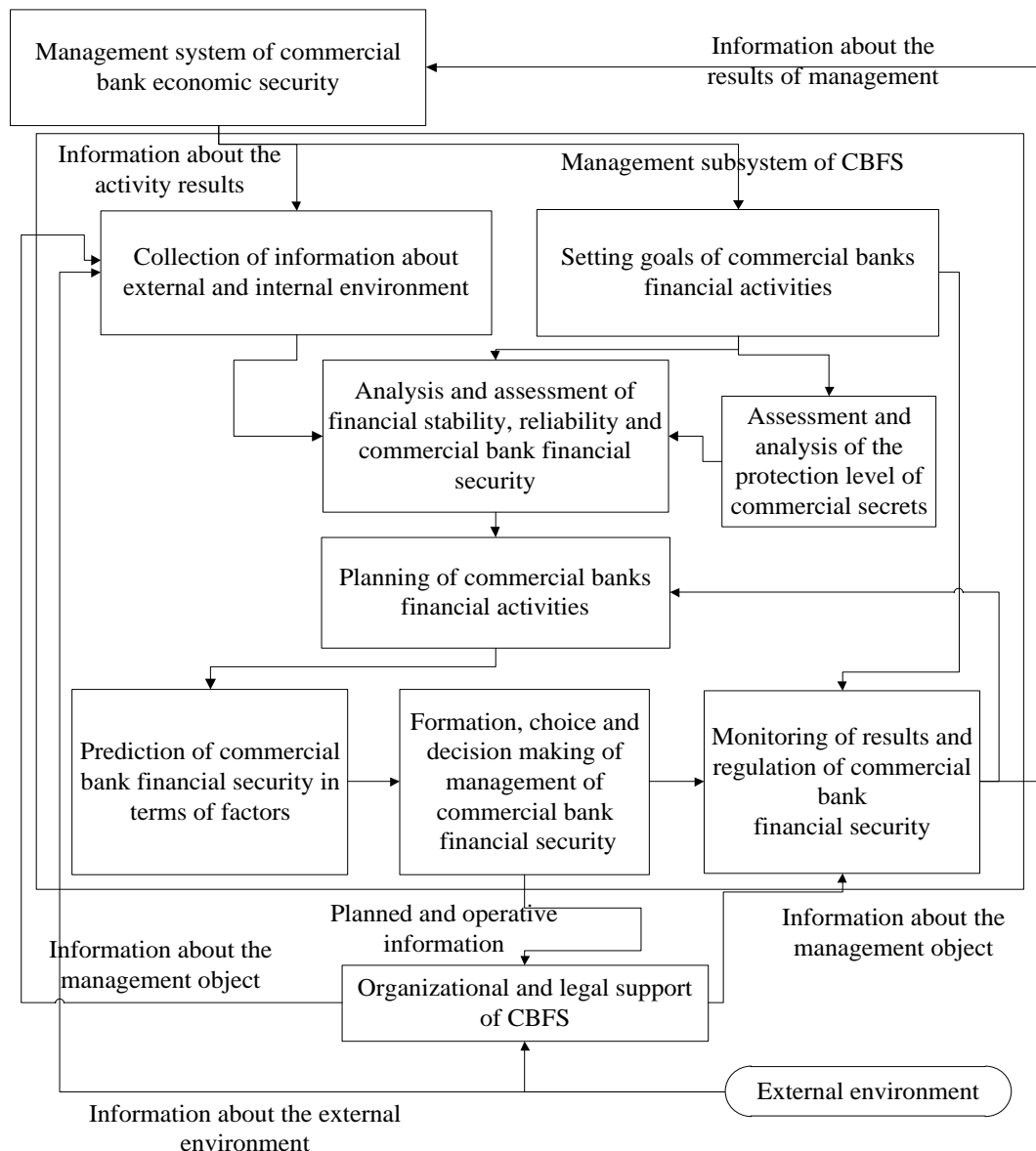


Fig. 1. The aggregate model of the commercial bank financial security management system
Source: developed by the authors

Block 1. Setting goals and objectives of commercial bank financial security management. This block combines the task of defining goals, objectives and strategies of financial security. According to the priorities of the commercial bank programs that can be seen as a system of management measures of high level, taking into account external and internal factors the complex strategy of commercial bank and organization of protection of trade secrets are formed.

Block 2. Analysis of the banking market condition. This block provides solution of such tasks:

- analysis of survival by groups of financial stability;
- modeling of panic and crisis situations on the banking market and evaluation of banking market dynamic.

Block 3. Diagnostics of the CBFS level. This block provides diagnostics of the CBFS level under the existing system of parameters and assumes the following tasks:

- formation of information space of CBFS assessment and analysis;
- evaluation of structural elements and the general level of CBFS by the groups of financial stability;

– analysis of CBFS indicators and assessment of their impact on the general CBFS level.

Block 4. Dynamics investigation of CBFS factors formation. This block provides study the dynamics of factors of CBFS using the following tasks:

- formation of system of factors for the assessment of the external environment;
- formation of system of factors for the assessment of the internal environment;
- the integrated dynamic factors assessment;
- classification and forecasting of external and internal environment.

Block 5. Monitoring of dynamic processes of CBFS. This block provides research of the nature and interaction of structural elements of commercial banks financial security through the following tasks:

- evaluation and analysis of the influence of external and internal environment factors on the commercial bank financial security level;
- analysis of trends of financial security indicator.

Block 6. Decision-making of CBFS management. This block provides the decision of problems of formation, selection and implementation of management actions on the basis of the obtained complex results by:

- formation and selection of scenarios to ensure the commercial bank financial security;
- modeling scenarios of development;
- evaluation of management decisions effectiveness.

Block 7. Control and regulation of CBFS level and its structural elements. This block provides control and regulation of commercial bank financial security and its structural elements.

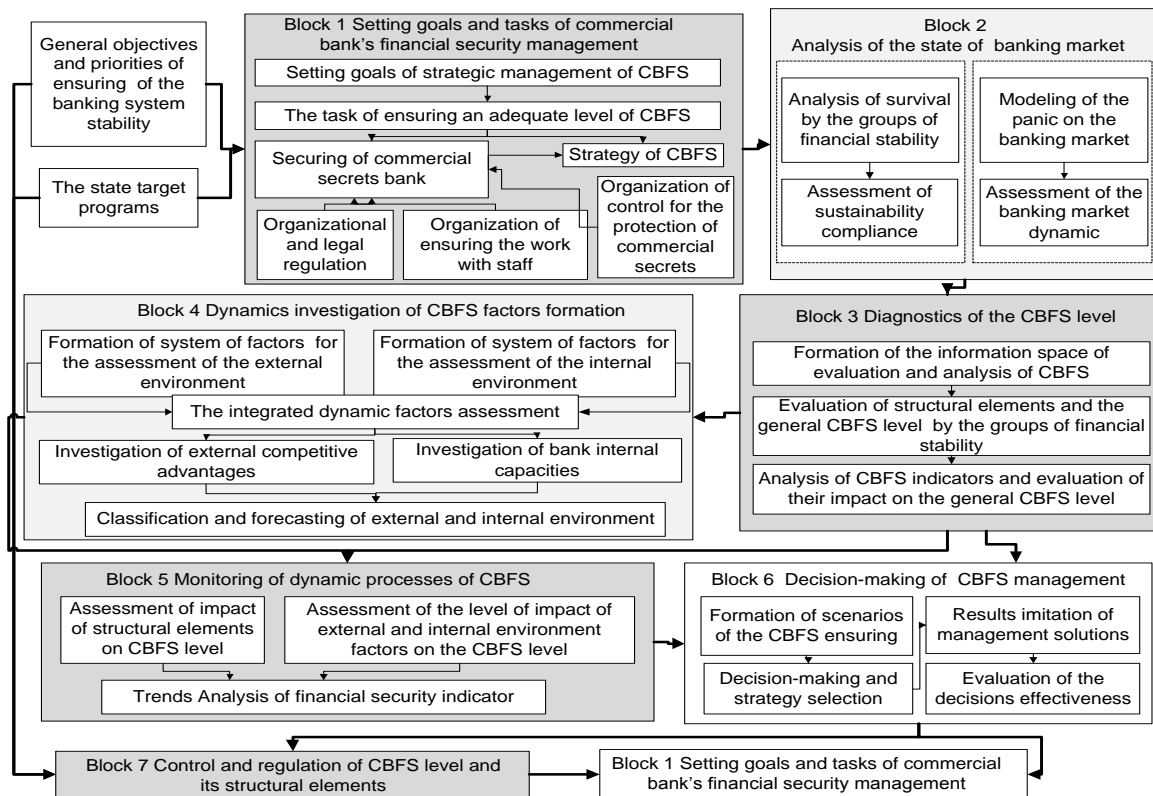


Fig. 2. The conceptual scheme of the commercial bank financial security management

Source: developed by the authors

Thus, the proposed conceptual scheme of commercial bank financial security management improves the quality and efficiency of decisions by improving the tools for evaluation and analysis. For effective functioning of management system of commercial banks financial security the solution of task should be based on the use of modern economic and mathematical methods [4, 9]. The proposed modern tools of management on the basis of model basis and information technology, to implement blocks from second to sixth are shown in Fig. 3.

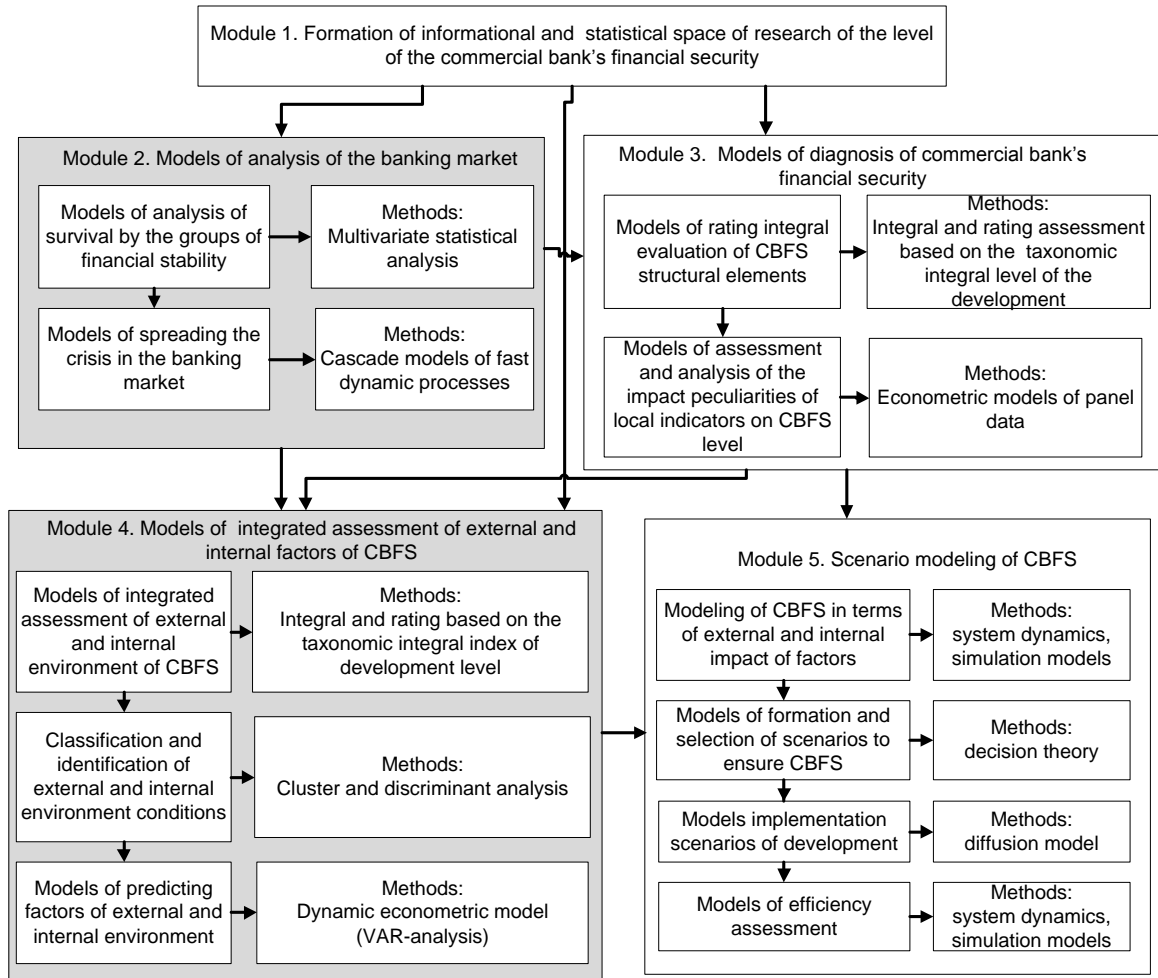


Fig. 3. Complex of models for assessment and analysis of CBFS
Source: developed by the authors

At the stage of formation of information space and objects for the construction of the proposed complex models were combined data of financial statements of Ukraine banks from 2005 to 2015 years, which are divided into 4 groups, according to the rating of NBU [8, 10]. These groups were tested for stability and for further analysis we use banks that have demonstrated strong position in a particular group. The total number of selected banks was 97. The first group (with a high level of stability during the analyzed period) includes 13 banks, the second (with sufficient level of stability) – 12 banks, the third group (acceptable level of stability) – 13 banks, and the fourth group (low level of stability) – 59 banks.

The solution of tasks which are presented in Module 2 (models of analysis of the banking market) is based on the using of multivariate statistical analysis tools [11] (construction of models of survival analyzing) and avalanche-like models of fast dynamic processes [12], which makes possible to analyze the survival by groups of financial stability and assess its compliance, simulate panic processes of bankruptcy in the banking market, assess its dynamism and speed of crises spread [13].

Solution of tasks which are presented in Module 3 (Models of diagnostic of commercial bank financial security) is based on the integrated use of tools of methods of rating on the bases of integral indicator of development level [14] and econometric panel data models [15], which provides to calculate general integral indicator of financial stability, acting indicator of financial security and to determine the impact of local indicators on the general commercial bank financial stability level. The groups of indicators of equity, assets, liabilities, financial results were used for assessment the commercial bank financial stability level.

For each of the group of banks panel data models were built. The most adequate model for each group was selected on the bases of criteria of adequacy, determination coefficient and tests of specifications (F-test, Breush-Pagan test and Hausman test) [15].

For 4 module realization (Models of integrated assessment of external and internal factors of CBFS) is used tools of methods of rating integral assessment of development level indicator [14], methods of multivariate statistical analysis (cluster and discriminant analysis) [11, 16] and dynamic econometric models (vector autoregression) [15].

At this stage the systems of factors of external and internal environment of commercial bank were formed, the models of integral assessment of external and internal factors which are influenced on CBFS were built. The states of external and internal environment factors by the degree of influence are determined. The predicted values of the dynamics of each factor and their status are obtained.

Module 5. Scenario modeling and decision making of CBFS are provided by modeling the dynamics of CBFS in terms of external and internal factors, by formation of scenarios to ensure the commercial bank financial security, by conducting simulation experiments for implementation of management decisions and evaluating their effectiveness as a whole. At this stage the comparative analysis of implementation of scenarios in terms of financial security dynamics excluding the impact of financial stability, internal and external factors and taking into account this impact and the analysis of dynamics of CBFS are done [17].

This analysis is the basis of formation of scenarios of CBFS provision and modeling of development scenarios on the bases of the diffusion of innovation as a strategy of ensuring the proper level of security.

Conclusions. Thus, the developed complex of models of assessment and analyzing of commercial bank financial security on the bases of multivariate, econometric, simulation and decision making methods makes possible to do integrated comprehensive analysis at all levels of management in the banking market, in particular, to investigate the survival and spread of crises in general and to investigate the commercial bank financial security dynamics in terms of internal and external factors and determine scenarios of development which are adapted for each of them taking into account their features, capabilities and competitive advantages.

So the conceptual model of assessment and analysis of a commercial bank financial security on the bases of modern economic and mathematical tools makes possible to ensure effective adequate assessment and forecasting of commercial bank financial security and improve commercial bank management system as a whole. The implementation of the proposed complex of models of assessment and analysis of financial security will ensure increase of efficiency and effectiveness of commercial bank activity and its financial security level.

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