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PROJECT MODELING OF THE COMMERCIAL BANK'S FINANCIAL SECURITY ON THE BASIS OF CHOOSING AND IMPLEMENTING THE VECTOR OF STRATEGIC PRIORITIES

Abstract. The model of strategy selection which is based on complex assessment of the financial security level in terms of internal and external factors of commercial bank is realized in this paper. This model is based on building of strategic priorities vector via finding the polygon's center of gravity which is constructed in an appropriate coordinate system on the basis of the calculated estimates for each of the studied components. The vector of strategic priorities determines strategy, which commercial bank must choose at the current development level and appropriate influence degree of all selected factors. Therefore, the vector determines the direction of investment to enhance the commercial bank financial security. The simulation model that makes possible to realize basic scenarios of development for innovative changes strategy is built. It is proved that the implementation of this strategy will reduce the negative impact of internal and external factors on the bank financial security and ensure effective and competitive activity of the bank.

Keywords: vector of strategic priorities, simulation model, commercial bank, financial security, internal and external environment factors, diffusion of innovations

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ПРОЕКТНЕ МОДЕЛЮВАННЯ ФІНАНСОВОЇ БЕЗПЕКИ КОМЕРЦІЙНОГО БАНКУ НА ОСНОВІ ВИБОРУ ТА РЕАЛІЗАЦІЇ ВЕКТОРУ СТРАТЕГІЧНИХ ПРІОРИТЕТІВ

Анотація. В роботі реалізовано модель вибору стратегії на основі комплексної оцінки рівня фінансової безпеки в умовах дії внутрішніх та зовнішніх факторів комерційного банку, яка ґрунтується на побудові вектора стратегічних пріоритетів шляхом знаходження центра ваги багатокутника, побудованого в відповідній системі координат на основі розрахованих оцінок за кожною з досліджуваних складових. Вектор стратегічних пріоритетів визначає стратегію, яку доцільно вибрати комерційному банку при поточному рівні розвитку та відповідному ступеню впливу усіх виділених факторів, отже, дозволяє визначити напрямки інвестування коштів з

метою підвищення рівня фінансової безпеки комерційного банку. Побудовано імітаційну модель, що дозволяє реалізувати основні сценарії розвитку для стратегії інноваційних змін, доведено, що впровадження цієї стратегії дасть змогу зменшити негативний вплив внутрішніх та зовнішніх факторів на рівень фінансової безпеки банку та забезпечити ефективну і конкурентоспроможну діяльність банку.

Ключові слова: вектор стратегічних пріоритетів, імітаційна модель, комерційний банк, фінансова безпека, фактори внутрішнього та зовнішнього середовища, дифузія інновацій

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ПРОЕКТНОЕ МОДЕЛИРОВАНИЕ ФИНАНСОВОЙ БЕЗОПАСНОСТИ КОММЕРЧЕСКОГО БАНКА НА ОСНОВЕ ВЫБОРА И РЕАЛИЗАЦИИ ВЕКТОРА СТРАТЕГИЧЕСКИХ ПРИОРИТЕТОВ

Аннотация. В работе реализована модель выбора стратегии на основе комплексной оценки уровня финансовой безопасности в условиях действия внутренних и внешних факторов коммерческого банка и построения вектора стратегических приоритетов путем нахождения центра тяжести многоугольника в соответствующей системе координат на основе рассчитанных оценок по каждой из исследуемых составляющих. Вектор стратегических приоритетов определяет стратегию, которую целесообразно выбрать коммерческому банку при текущем уровне развития и степени влияния всех выделенных факторов, следовательно, позволяет определить направления инвестирования средств с целью повышения уровня финансовой безопасности коммерческого банка. Построена имитационная модель, позволяющая реализовать основные сценарии развития для стратегии инновационных изменений, внедрение которой позволит уменьшить негативное влияние внутренних и внешних факторов на уровень финансовой безопасности банка и обеспечить эффективную и конкурентоспособную деятельность банка.

Ключевые слова: вектор стратегических приоритетов, имитационная модель, коммерческий банк, финансовая безопасность, факторы внутренней и внешней среды, диффузия инноваций

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Stable development of the commercial bank, its performance stability, achievement of qoals, which correspond with both owners' and clients' interests, is impossible without developing and introducing a complex of strategic measures, the implementation of which in the current transformational economy, is determined to a great extent by the level of its financial security. Fast development processes of the banking market, aggressiveness of external environmental factors and unpredictability of internal environmental factors provide for the development of a set of effective management tools for the financial security, of both separate commercial banks and the banking system on the whole. For the adequate management of commercial bank's financial security it is necessary to have a clear statement and formalization of tasks as well as different functions of management of different types and different time horizons. Thus, both external and internal environmental factors significantly influence the commercial bank performance, they are interconnected and have a mutual

influence. That is why it is necessary to analyze all these factors together, in order to provide the adequate decision-making. Continious diagnostics and monitoring of possible threats, as well as the implementation of corresponding development strategies, adequate for the situation is a prerequisite for ensuring a sufficient level of the commercial bank's financial security.

All the above-mentioned stipulates the necessity for creating conditions to prevent instability and developing a system, which is able to resist negative impacts on the commercial bank. That is, a clear starategical planning and management is a prerequisite for the commercial bank's financial security under the dynamic development. Moreover, the analysis has to determine the commercial bank's current financial condition and to predict the future one as well as to solve tasks tosupport managerial decision-making [3]. Timely and adequate diagnitics of financial security will enable to determine basic directions of the security strategy. A security strategy is a complex of long-term objectives and managerial approaches, the implementation of which provides protection of credit-financial institution from potential threats of divulging commercial and bank secretsas well as from causing it any other forms of property and non-property damadge [4].

Thus, the aim of the research is to develop the models of forming and choosing scenarios for providing financial security of the commercial bank on the basis of the assessment and analysis of the banking market, internal and external environment and the level of financial security of the commercial bank, which will allow to prevent possibile crisis situations, and to increase the quality of decisions aimed at ensuring its financial security and effective performance in spatial-comparative profile and at corresponding levels of management hierarchy.

The choice of the strategy of ensuring financial security is closely connected with the ability to make rational decisions, which stipulates the necessity: to determine the aiml and content of the threat or problem; to determine factors, dependencies and limitations; to collect data within the framework of imposed limits and to carry out their analysis; to find out the most favourable decisions and assess them according to the profitability index; to choose the optimal decision [8].

While developing the strategy it is necessary to take into consideration the following aspects:

– the reactions to the changing conditions of internal and external environment – both favourable and threatening;

– the methods of competition in every sphere of the commercial bank activity to provide competitiveness and adequate reaction to threats from the competitors;

-       the ways of resource allocation subject to the sphere of activity, and also among subdivisions and departments to ensure a more effective utilization when reaching strategic objectives [12].

It should be mentioned, that the strategy is often not formalized in commercial banks; key indices are not balanced and are not aimed at the chosen strategy; there is a lack of conceptual and technological connection between the chosen strategy and decisions, which are being introduced and used. All of this is considered as disadvantages of the strategic management system. Kovalenko V.V. [3]claims that the application of strategic management concept must have the following features:

– the choice of situational, system and purpose-oriented approaches to management;

– the analysis of commercial banks subject to their stability on the market of banking services with the purpose of creating an adequate and effective system of strategic management;

– the collection and application bases of strategic information bases;

– the ability to forecast consequences of decisions, which are being made;

– the establishment of the effective relationships;

– the formation of the strategic behavior;

– the application of the tools and methods of ensuring financial stability and security of the commercial bank as an agent of management [3].

Thus, in every particular case it is necessary to choose a certain strategy, which is the most suitable one for the given problem situation. The comparative analysis of the basic strategies of ensuring the commercial bank's financial security is presented in table 1 [2, 3, 6].

Table 1

Strategies of ensuring of the commercial bank's financial security

Strategy	Advantages	Disadvantages
«Of preventive counteractions», foresees the possibility of using the most active methods of prevention and counteraction of possible threats by the security servise	The possibility of effective solution of problems, arising in the bank and to ensuring personal security, almost without the participation of the state; providing priority for methods of preventive counteraction to the potential threats	A great probability of an adequate response from the victims of a similar policy of competitors; inevitable contradictions with the valid law and thus potential problems with law enforcement, judicial and administrative agencies
«Of the passive protection», foresees the priority for the bank orientation to the protection by the state in the form of law enforcement and judicial agencies	Minimum expenses on its practical implementation; the absence of threats of certain sanctions for the bank applied by the state as a result of its total law obedience as an entity in the given sphere of activity	The total dependence of the bank's security on the performance of state law enforcement agencies; orientation to methods of counteraction to existing threats, which are less effective comparing with the preventive and suppressive ones
«Of the adequate response», foresees the possibility of using the whole complex of legitimate methods of potential threats prevention by the security service	The variant is a compromise between the first and the second strategies, minimizing their radical disadvantages	Minimizing disadvantages of the first two strategies, doesn't allow to use their advantages in full
«Of innovative changes», foresees the reaction to the possible changes in the internal and external environment by implementing constant technological innovations	The increase in the financial profit of the bank; attraction of new clients; expansion of bank's market share; cutting costs	High expenses on development and introduction of innovations; the search for or creation of software; the need in generating ideas and being one step ahead

In the process of choosing a development strategy of commercial bank a lot of different approaches are used, however, a situational approach is the most popular one [11]. The situational approach enables to evaluate and predict the state of enterprise as a system in dynamics. Providing for the devlopmant of scenarios, concerning decision-making on different situations, the situational approach is not directed at managing the organization's resources within the structured system of objectives.

The further development of the scenario approach is a situational-resource approach, suggested by V.S. Ponomarenko [10]. Its componets are considered as its specific features: it provides for the work with the nviron situation, which describes the condition of all possible resources. A functional-resource adaptive approach, developed by O.M. Trydid is considered to be the development of this direction in choosing strategies [11] . On the basis of the

praisions, describing situational-resource and functional-resource adaptive approaches to choosing and developing the strategy of the commercial bank subject to the methodology for the assessment of the bank's financial security level and its constituents [7, 13]we suggest a model of choosing the strategy to ensuroverall assessment of the commercial bank's performance, its internal and external environment and the whole banking market. Thus, on this stage the dynamics of the development is studied according to the following constituents: the level of banking system development (LBSD), the level of the commercial bank's security (LCBS), the level of the development of external environmental (IEEF) and of internal environmental factors (IIEF) on the basis of the integral index of the development level, calculated with the method of total reduction of factor (method of taxonomic assessment), which provides for quantitative level assessment of the development dynamics in every sphere as an integral rating index, which generalizes various effects of different factors [1, 4]. The value of the integral index varies from 0-1, the closer the value to 1 is, the higher the level of the banking system development and financial security of the bank is, and the more favourable external and internal environmental factors are [5]. The classification of conditions according to the studied constituents has been developed on the basis of variations of corresponding integral indices, in particular:

     5)   the level of banking system development (LBSD), has three conditions – growth, stability and recession. That is, the index of the level of banking system development has the following gradation and interpretation:

– improvement of banking system condition (development or positive changes);

5) consistency of banking system conditions (stability);

– worsening of the banking system condition (crisis or negative changes).

The variation of this index can be caused by many reasons, among which are the following ones: changing situation in the country's economic security; changing economic conditions, that is changing situation in other spheres of the economy.

2) the level of the commercial bank's financial security (LCBS), is classified as high, sufficient, average and low. The work deals with the following groups according to the level of financial stability:

– a high level of the commercial bank's financial security: a bank is in compliance with standards of capital sufficiency, there are high indices of dynamics growth, the structure of obligations corresponds to the optimal one, risks of the reduction of financial stability level are mimimal;

     5)   a sufficient level of the commercial bank's financial security: indices of capital sufficiency are normal; temporary worsening of the financial stability level is possible as a result of standard requirements or unfavourable market conditions, but a bank is able to cope with them on its own in the short run;

– a satisfactory level of commercial bank's financial security: values of the majority of the coefficients significantly deviate from the standard ones, on the whole, the commercial bank of this group has a certain reserve of resource stability base, but it requires the intensified attention from management and regulating authorities;

– an unsatisfactory level of the commercial bank's financial security: the commercial bank, which already experiences problems, or of the existing trends continue, will have problems with the compliance to the standards in future. The necessity to take immediate measures to solve the mentioned problems is caused by a high probability of the transition of such commercial bank to the group with the lowest index of the financial stability level and the increase of bankruptcy risks.

3) the level of external environmental factors (IEEF) is classified according to the scope of impact – aggressive, moderate, weak. External environmental impact factors are grouped into three and the following aggregated factors are considered: generating (formative) factors – the factors which determine the dynamics of financial stability (are

directed connected with the process of international trade); regulating factors – the factors, which influence the change of generating factors and regulate the mechanism of setting a currency rate; preventive factors – their threshold values indicate disturbing the dynamic equilibrium of economic system and the possibility of crisis phenomena in the economy. The characteristic of the condition of external environment on the basis of the defined scope of impact is interpreted as follows:

– an aggressive condition of external environmental factors – is characterized by the worst index of destructive factors, critical values of which disturb the banking system equilibrium the most and their consequences are very difficult to remove;

– a moderate impact of external environmental factors is characterized by unfavourable influence of preventive factors, particularly provocative ones, that is those which characterize the first symptoms of a crisis.

– a neutral condition of external environmental factors – is characterized by moderate values of indices of preventive factors, which disturb the economic system equilibrium.

4) the level of internal environmental factors (IEF) can have a destabilizing, neutral and positive impact on the level of financial security. Internal environmental impact factors are grouped into four aggregated groups: informative, investment, personnel and innovative. Since, internal environment is a complex of factors, which are created and controlled by the organization itself, constituents of internal environment of the firm directly influence the its performance:

- a destabilizing impact of internal environmental factors is characterized by the crisis in indices dynamics, which results in the reduction of the financial security level and thus inability to counteract negative factors of external environment;

- a neutral impact of internal environmental factors is characterized by the stable dynamics of indices and thus the commercial bank can easily adapt to the changes of external environment and provide the necessary level of security;

- a posistive impact of internal environmental factors - ascending dynamics of informative, investment, personnel and innovative sphere indices contributes to the increase in the financial security level of the bank, and thus has available potential for the counteraction and prevention of threats.

The implementation of choice model is based on building a vector of strategic priorities by finding a gravity center of the polygon, built in the corresponding system of coordinates on the basis of the calculated assessments of each studied   nvironment on the basis of the following algorithm:

1) it is necessary to divide a quadrangle into two triangles, to find a point of medians' intersection for each triangle, this point is a gravity center of the triangle;

2) on the next stage coordinates of a gravity center of each triangle are found according to the formula:

$$x_c = \frac{\sum x_1}{3}, \quad y_c = \frac{\sum y_1}{3}, \tag{1}$$

where x_c, y_c - coordinates of a gravity center of the triangle;

x_i, y_i – coordinates of apexes of the triangle

3) triangle areas are determined according to the formula:

$$S = \frac{1}{2}[(x_1 - x_3)(y_2 - y_3) - (x_2 - x_3)(y_1 - y_3)], \tag{2}$$

where S – the area of the triangle

4) a vector of strategy choice is determined by finding a gravity center of the quadrangle, built in the four-sector system in accordance with to the calculated assessments of each group of indices according to the formula:

$$X_{GC} = \frac{\sum x_i \times S_i}{\sum S_i}, \quad Y_{GC} = \frac{\sum y_i \times S_i}{\sum S_i}, \tag{3}$$

where X_{GC}, Y_{GC} – coordinates of a gravity center of the quadrangle of factual values in the two-dimensional system of coordinates;

x_i, y_i – coordinates of a gravity center of each of two triangles in the two-dimensional system of coordinates;

S_i – the area of each of two triangles

5) a vector of strategic priorities is drawn through the center of coordinates and a gravity center, that provides for determing the strategy of the commercial bank, proceeding from the reached development level. Thus, the starategy, which can be ensured subject to any factor, is determined. In the direction, opposite to the vector of strategic priorities, there is a strategy, which should be chosen for increasing the level of CBFS by smoothing the level of factors development.

The vector of strategic priorities determines the strategy, which is rational for the commercial bank with a current level of development and a corresponding scope of impact of all distinguished factors. Let's look at the scenarios of choosing a strategy subject to values of all the calculated constituents, obtained on the basis of building a complex of assessment models and the analysis of structural elements of the financial security [7] on the basis of statistical data for the First Ukrainian International Bank [14, 15] (table 2).

Table 2

Values of integral indices for modeling scenarios of choosing a strategy of CBFS

Scenario	Index value			
	The level of banking system development (LBSD)	The level of commercial bank's financial security (LCBFS)	The impact of external environmental factors (IEEF)	The impact of internal nvironmental factors (IIEF)
1	2	3	4	5
Scenario 1 (S1)	0,25	0,4	0,8	0,3
Scenario 2 (S2)	0,7	0,8	0,2	0,8
Scenario 3 (S3)	0,6	0,5	0,3	0,45
Scenario 4 (S4)	0,4	0,7	0,7	0,2

Calculations of indices for the formed scenarios are presented in Table 3.

Table 3

Calculations of indices for choosing a strategy

Index	Calculation
Scenario 1 (S1)	
A gravity center of the triangle	$x_{c1} = (-0,8 + 0 + 0,3)/3 = -0,17;$ $y_{c1} = (0 + 0,25 + 0)/3 = 0,083;$ $x_{c2} = (-0,8 + 0 + 0,3)/3 = -0,17;$ $y_{c2} = (-0,4 + 0 + 0)/3 = -0,133$
The area of the triangle	$S_1 = \frac{1}{2}[(-0,8 - 0,3)(0,25 - 0) - (0 - 0,3)(0 - 0)] = 0,138;$ $S_2 = \frac{1}{2}[(-0,8 - 0,3)(-0,4 - 0) - (0 - 0,3)(0 - 0)] = 0,22$
Coordinates of a gravity center of the quadrangle	$X_{цт} = \dfrac{(-0,17) * 0,138 + (-0,17) * 0,22}{0,358} = -0,17;$ $y_{цт} = \dfrac{0,083 * 0,138 + (-0,133) * 0,22}{0,358} = -0,05$

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Scenario 2 (S2)	
A gravity center of the triangle	$x_{c1} = 0{,}20;\ y_{c1} = 0{,}233;$ $x_{c2} = 0{,}20;\ y_{c2} = -0{,}267.$
The area of the triangle	$S_1 = 0{,}350;\ S_2 = 0{,}400$
Coordinates of a gravity center of the quadrangle	$X_{цm} = 0{,}20;\ y_{цm} = -0{,}03.$
Scenario 3 (S3)	
A gravity center of the triangle	$x_{c1} = 0{,}05;\ y_{c1} = 0{,}200;$ $x_{c2} = 0{,}05;\ y_{c2} = -0{,}167.$
The area of triangle	$S_1 = 0{,}225;\ S_2 = 0{,}188$
Coordinates of a gravity center of the quadrangle	$X_{цm} = 0{,}05;\ y_{цm} = 0{,}03.$
Scenario 4 (S4)	
A gravity center of the triangle	$x_{c1} = -0{,}17;\ y_{c1} = 0{,}133;$ $x_{c2} = -0{,}17;\ y_{c2} = -0{,}233.$
The area of the triangle	$S_1 = 0{,}180;\ S_2 = 0{,}315$
Coordinates of a gravity center of the quadrangle	$X_{цm} = -0{,}17;\ y_{цm} = -0{,}10.$

Fig. 1 represents quadrangles, built on the basis of the model of choosing a strategy to ensure financial security according to the first and the second scenario.

Thus, a vector of strategic priorities indicates, that for the factors from the first scenario, the strategy of innovative changes is a priority for the commercial bank. Meanwhile, for increasing the level of CBFS by smoothing the level of factors development, the bank should choose the strategy of preventive counteraction. The implementation of this strategy will enable the bank to increase the level of financial security, and to maintain it on the necessary level, reducing consequences of the impact of external environmental factors.

According to the second scenario, a priority strategy for PC "PUMB" is the strategy of passive protection, and for increasing the level of CBFS by smoothing the level of factors development, the bank should choose the strategy of adequate response. The implementation and application of this strategy will provide for the reduction of the impact of internal and external factors on the level of the bank's financial security and to maintain the necessary level of financial stability and security, which will provide the effective and competitive performance of the bank.

Quadrangles of choosing a strategy according to the third and the fourth scenario are presented in the fig. 2.
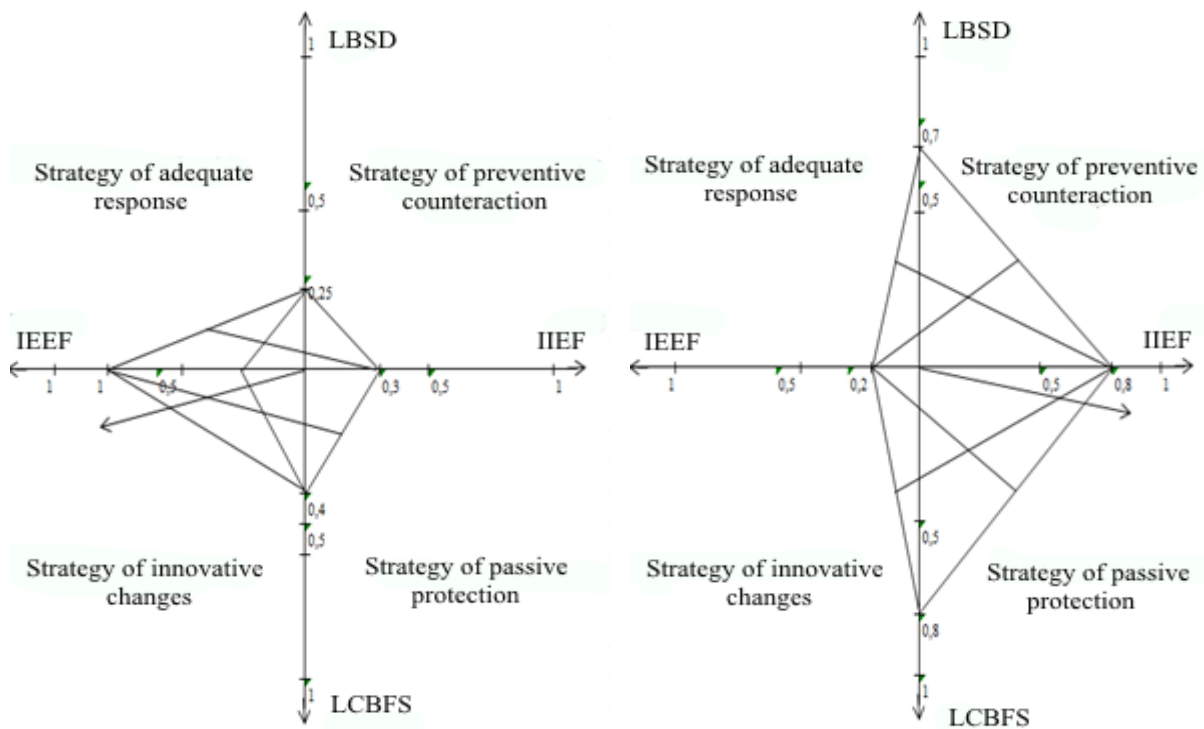
Fig. 1. The quadrangle of choosing a strategy to ensure financial security according to the first and second scenario
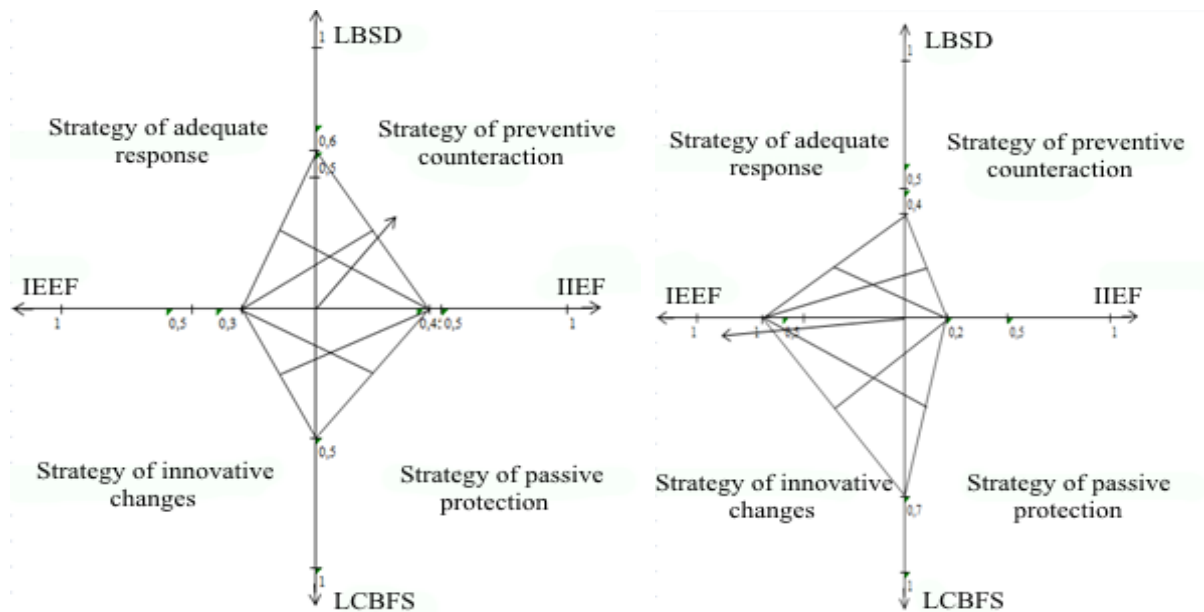

Fig. 2. The quadrangle of choosing a strategy to ensure the financial security according to the third and the fourth scenario

According to the third scenario, a priority strategy for PC "PUMB" is the strategy of preventive counteraction and, in order to increase the level of CBFS by smoothing the level of factors development, the bank should choose the strategy of innovative changes, which will enable the bank to reach the high level of financial security faster, to prevent and reduce consequences of the impact of external and internal environmental factors, and also to provide effective and profitable performance.

According to the fourth scenario, a priority strategy for PC "PUMB" is the strategy of

innovative changes, and in order to increase the level of CBFS by smoothing the level of factors development, the bank should choose the strategy of preventive counteraction. The choice of this strategy will enable the bank to improve the level of financial security, increase income and improve competitiveness and stability on the banking market.

Thus, the model of strategy choice on the basis of a complex assessment of the level of financial security under conditions of internal and external factors of the commercial bank with the help of the developed model enables to determine directions of money investment with the purpose to increase the level of the commercial bank's financial security.

On the basis of the developed model, and with regard to a current situation, for PUMB bank nowadays, the strategy of "Innovative changes" is the most reasonable one. The implementation and application of this strategy will provide for the reduction of the negative impact of internal and external factors on the level of the bank's financial ssecurity and to provide effective and competitive performance of the bank.

In banking innovations are considered as economic realization of a new banking product or service, significant implement of already existing one, and also the introduction of a new technological, marketing, managerial or organizational method of doing business [10]. Thus, innovations are the result of intellectual labor and technological developments, aimed at improving performance of the bank. Meanwhile not every novelty is an innovation. The innovation has a set of necessary features, which include [13]: certain degree of novelty; ability to satisfy the market demand; ability for commercial realization.

Interdependence, dual nature and a certain life cycle are typical features of banking systems . The introduction of innovative policy and, as the result, the creation of the banking innovations aimed at achieveing certain positive economic or strategic effect, which includes [12]: increase in the bank's financial income; attraction of new clients; expansion of market share of the bank; costs reduction.

Solving problems of providing effective use of scientific and technical knowledge available for the country is connected not only with fostering practical mastering of new knowledge by separate entities, but also with the creation of channels for knowledge distribution among elements of social system – in order to avoid the disproportion of development of different spheres of national economy and to reach the fullest use of results of scientific and technical progress. In other words, solving this task is connected with managing the diffusion process of novelties. The diffusion of innovations is a process, which the novelty spreads the novelty through communication channels among members of a social system in time [2]. That is why studing the diffusion of banking innovations as a factor of economic development and a tool of improving the level of the commercial bank's financial security under modern conditions is an important and acual problem.

There exist different methods and models of modeling the diffusion of innovations, which include kinetic models of spreading innovations, kinetic-diffusional models of innovations distribution etc., but they don't always take into account the impact of external factors and the importance of internal parameters of a banking institution [9]. The paper suggests the development of the imitational model of the diffusion of banking innovations with the use of system dynamics tools, with the purpose to assess the scale and speed of innovation diffusion processes within the decision-making about its commercial production, promotion and sale.

Formalization and modeling of the detected regularities of diffusion processes and principles of interaction of innovation process participants have been carried out with the use of tools of the "VensimPLE" program. The of cause-and-effect relation is persented in the Fig. 3.

The given model allows to assess the effectiveness of innovation commercialization subject to the introduction of internal managerial decisions and the impact of external

environment as well as the scale and speed of innovation diffusion processes. The given characteristics can be influenced by the regulation of specific internal parameters available for the producer of innovative products (intensiveness of informing, production capacities, volumes of financing etc.), and, by taking into account external parameters (limit of innovation distribution, amount of potential receipients etc.).
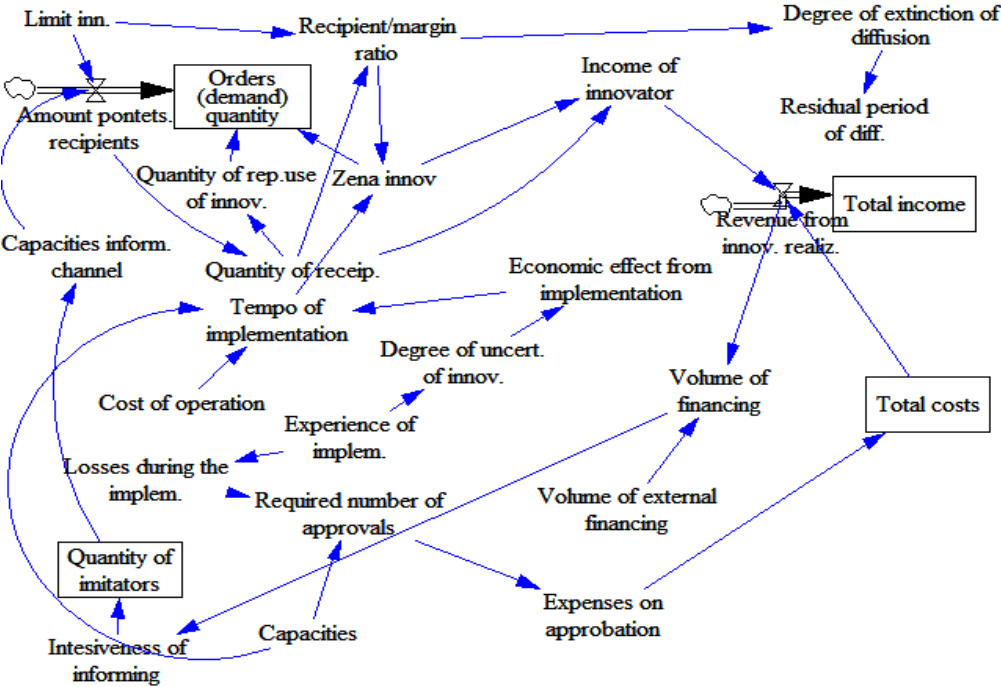

Fig. 3. The simulation model of banking innovations diffusion

The paper offers the analysis of the simulation experiments according to the following scenarios of the impact of internal and external factors for the innovator: Scenario 1 - a stimulating impact of each internal and external environmental factor; Scenario 2 - a destimulating impact of factors; Scenario 3 - a stimulating impact of internal environmental factors and a destimulating impact of external environmental factors; Scenario 4 - correspondingly a destimulating and a stimulating impact of internal and external environmental factors. Fig. 4 shows comparative dynamics of changes in the level of demand for a banking innovation based on the implementation of the selected scenarios for the development of the internal environment.

Thus, according to Scenario 1, which is the most optimistic one, The quantity demanded of the banking innovation exceeds the value of 100,000. According to the second scenario, which can be considered as the most pessimistic one, the demand for the innovation is a little bigger than the value of 60,000. The third and the fourth scenarios are similar in terms of quantity demanded for innovation, but still the value of quantity demanded is bigger than in Scenario 4, subject to a stimulating impact of internal environmental factors. It suggests that the volume of demand for banking innovations is significantly influenced by internal factors, therefore a banking institution has to constantly monitor and increase values of the given factors.

To calculate the effectiveness of the suggested model, simulation experiments in the model of dynamics of the commercial bank's financial security (CBFS) have been carried out subject to changes in revenue from innovation introduction. Fig. 5 presents the comparative dynamics of PC "PUMB" financial security level, where S1 is the scenario, which takes into account the impact of internal and external factors on the level of financial security, S2 is the scenario which takes into account the revenue from innovation introduction. Thus, the level of

the bank's financial security subject to the revenue from innovation intoduction has increased, which suggests the effectiveness of the development and realization of banking innovations even under the of aggressive impact of factors.
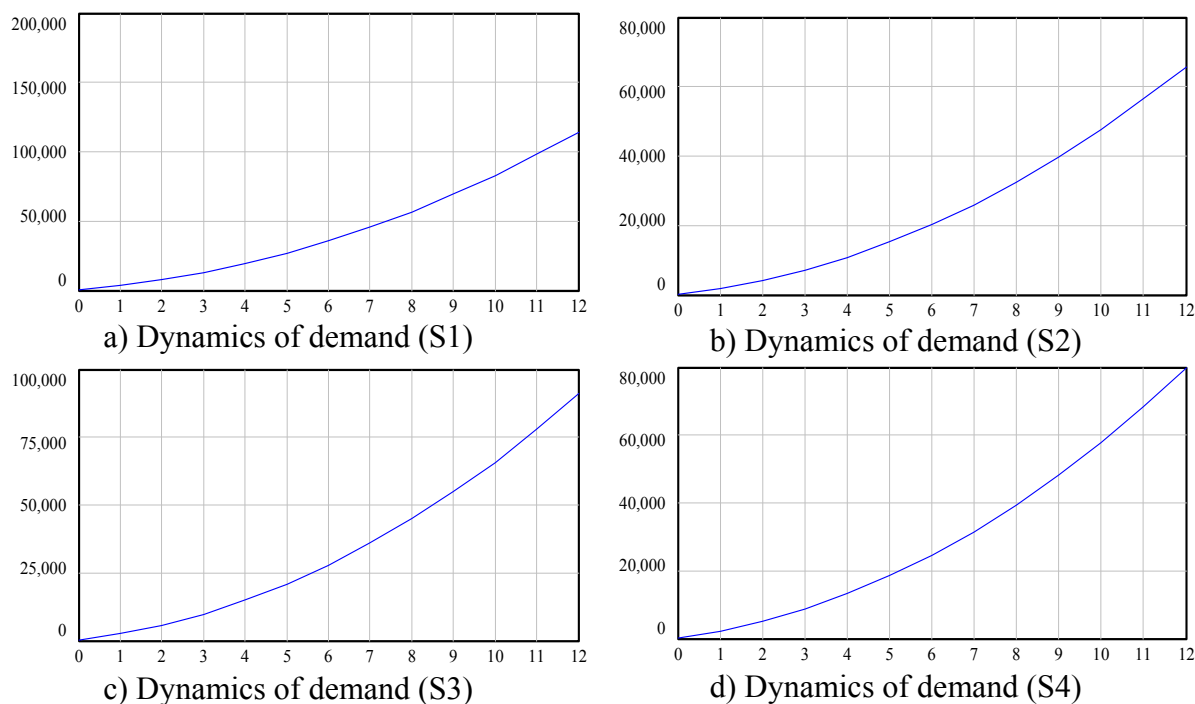

a) Dynamics of demand (S1)

b) Dynamics of demand (S2)

c) Dynamics of demand (S3)

d) Dynamics of demand (S4)

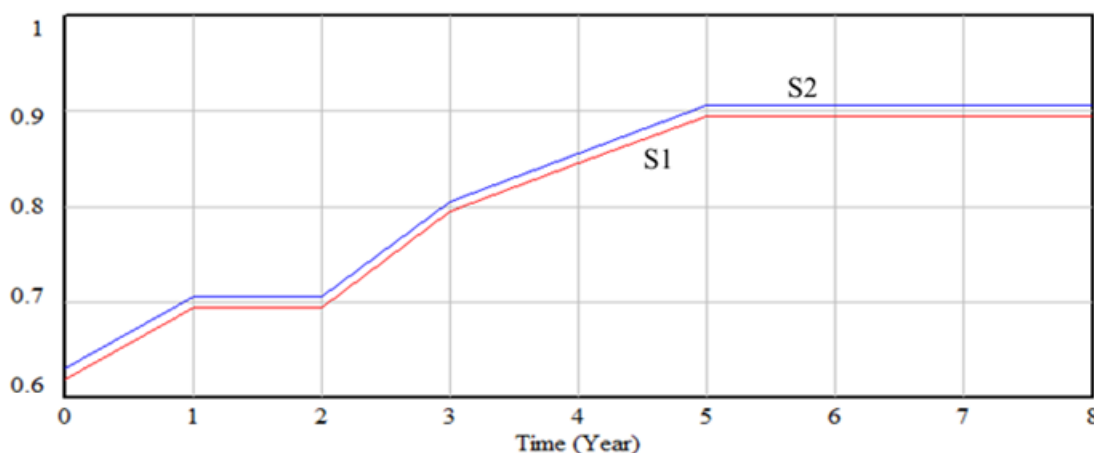Fig. 4. Comparative dynamics of demand for innovation

Fig. 5. Comparative dynamics of PC "PUMB" financial security level

The developed simulation model can be adapted to any bank as well as to any type of banking innovations. It will enable banks, even on the stage of making a managerial decision, to determine the economic expediency of introduction and application of some or other innovations in practice, and also to reduce the impact of internal and external environmental factors on the level of the bank's financial security.

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