

WEIGHTED COEFFICIENT MODEL FOR BANK INVESTMENT PORTFOLIO OPTIMIZATION

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Abstract

The article investigates conceptual positions of providing financial flexibility of decision making in the bank's investment activity. It emphasizes the use of the mechanism, which includes the choice of investment strategy on the basis of institutional flexibility of decision-making; optimization of bank investment portfolio taking into account market flexibility; evaluation and regulation of managerial flexibility of decision making.

Keywords: *financial flexibility, institutional flexibility, market flexibility, managerial flexibility, investment strategy.*

1. Introduction

The modern state of the banks on the securities market is characterized by its dynamic development, as data of the National Bank of Ukraine evidenced. The significant growth in dynamics of total assets has been observed for the last ten years. During the period from 2004 to 2008 it increased to 157.2%. However, despite the substantial deceleration of increasing the value of bank assets in 2009-2012 and the deployment of financial and economic crisis, its growth amounted to 111,1%. At the same time, under the condition of general increase of total assets of banks, their investments in securities increased at a slower rate, and therefore domestic banks still do not pay enough attention to the investment activities, focusing usually on traditional operations and services. Taking into account the necessity of intensification of the activities of banks on the securities market and creation of conditions for their stable functioning, the development and implementation of measures to ensure financial flexibility of the decision making in the bank's investment activity become relevant. The aim of our research is to develop a theoretical framework and conceptual provisions to ensure financial flexibility of the decision making in the investment activity of banks.

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2. State of the art

Taking into account existing approaches, which determine the flexibility of the positions of various economic theories, it is established that the financial science has developed its own approach, which considers flexibility as the ability to change the capital structure – the possibility of company to adjust the capital structure, depending on operating conditions. This property reflects the system's ability to change their states in response to changes of factors in both external and internal environments which do not deteriorate the efficiency of its function. (Zhytar, 2014). Therefore, for a better understanding of the essence of flexibility it is appropriate to consider the concept of “financial flexibility of the decision making in the bank's investment activity” in the broad and narrow senses. In the broad sense, financial flexibility of the decision making in the banks' investment activity means different opportunities in decision-making in investment activities; in a narrow sense it is the ability to change the structure and composition of the investment portfolio of the bank at minimal cost and (or) loss of value in accordance with the changing conditions of implementation of investment activities by the banks taking into account the operation of market, institutional and managerial restrictions.

On the basis of summarizing the existing theoretical achievements and considering the inherent features of banks' investment activities, which were determined by the specifics of invested object, by the sphere of its implementation and factors of influence of institutional environment, it is useful to distinguish three types of financial flexibility in decision-making: market, institutional and managerial financial flexibility (Figure 1).

Despite the fact that financial flexibility of making investment decisions depends of such parameters as profitability, liquidity and risk, it is an integral characteristic not of the biggest financial tool, but it is a peculiar feature of decision-making process.

Actually, market flexibility absorbs the property of asset liquidity as a possibility of immediate asset realization without tangible loss of its value. Taking into account the influence of a number of factors which limit the liquidity of investment assets, we can single out systematic factors (liquidity of the stock market) and specific factors (individual characteristics of the securities, the financial condition of the issuer).

One of the first definitions of liquidity was given by Keynes, who considered liquidity as a combination of time necessary for the transaction and the costs arising in connection with it (Keynes, 1999). Besides this definition, there are other very close in content. Some authors understand liquidity as the possibility of buying or selling units of the assets at any time at fair market price, while it is understood that the difference in the prices of buying and

selling assets on the market should always be insignificant (Koch, 2002). In this case the measure of liquidity of the securities is the average daily value of course spread quotes on major exchanges.

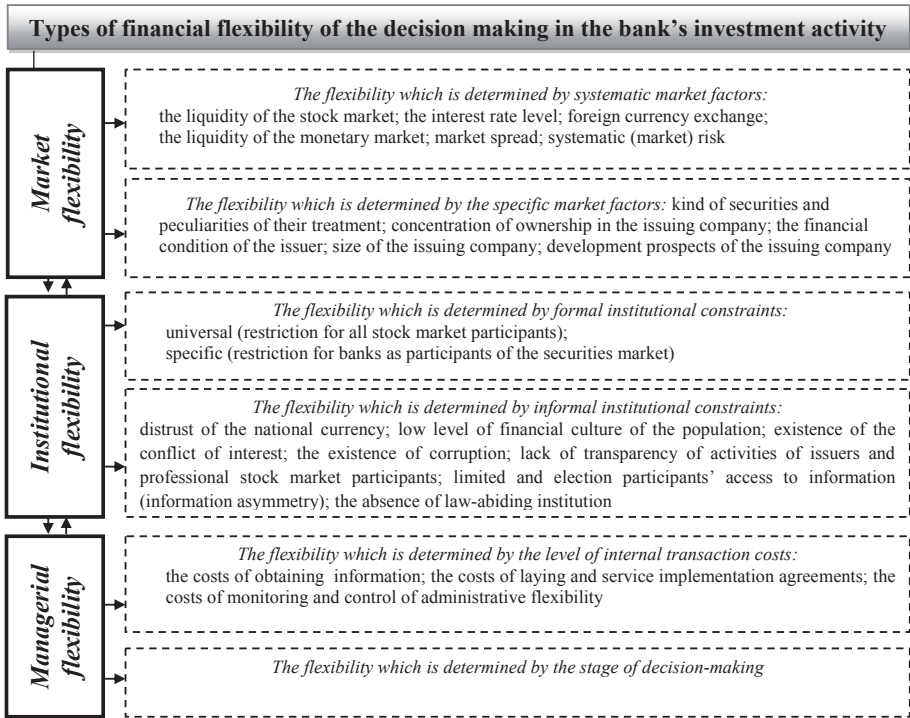


Figure 1. Types of financial flexibility of the decision making in the bank's investment activity

A number of foreign scientists give their definitions of liquidity, by which they mean possibility of selling or buying at any given time the required number of assets with insignificant fluctuations in prices (Brennan et al., 2012). Sodenberg (2011) defines liquidity as the possibility of buying or selling large quantities of assets quickly and at low cost, which will be of interest for portfolio managers and practitioners in the sphere of risk management.

The liquidity of the asset is the ability to transform into cash, and the degree of liquidity is determined by the duration of the interim period during which this transformation can be carried out (Kovalenko, 2011).

Meanwhile, all these interpretations are characterized by certain limitations of considering liquidity from only one of its sides. We should therefore appeal to the definitions which more clearly distinguish the characteristics or signs

of assets liquidity, allow moving from the abstract character of liquidity to its more understandable form.

Thus, some authors note that liquidity includes properties such as time (rapid conclusion of the agreement), transaction costs (lower transaction costs), volume (big deal size) and price (no strong influence on prices) (Chaykun, 2009). M. O'Hara points at a large volume of agreements, at the same time the agreement should not have a strong impact on the price of the asset (O'Hara, 2004). Other authors clarify, that in addition to the individual characteristics of the securities and the current state of the market, the level of liquidity depends on a given investment conditions, including the volume of the package, the supposed immediacy of investments, the activity strategy of portfolio management, the availability of this market for investors and other factors (Nord, 1997).

In turn, the main feature of liquidity, according to most scientists is efficiency, which in turn depends on two main factors: the ability of the market to absorb or provide adequate volumes of stock values (absolute market size) and the volume of the alleged transaction. Besides immediacy, the main indicator of assets liquidity, which estimates the time required for the transaction, we will identify others indicators, which, in our opinion, affect the level of liquidity of the asset, namely: the tightness, the depth and the resilience.

The indicator of depth reflects the possible scope of the agreement and does not carry a significant impact on price; the indicator of tightness is associated with the costs implementation of agreements and reflects the deviation of the contracts' prices from average market price; the indicator of resilience reflects the speed with which prices reach a new equilibrium level due to strong fluctuations, which are caused by the conclusion of major transactions (Harris, 1990).

It should be noted that these liquidity indicators are closely intertwined with such characteristics as time, transaction costs, volume and price. Therefore, in our opinion, we can accept the views of the foreign scientists Dong et al. and identify the main characteristics of liquidity which are similar to each other and, ultimately, are analogues: time and immediacy, volume and depth, transaction costs, tightness, price and resilience (Dong et al., 2007).

Institutional flexibility is determined by the general-legal, indicatively-legal, contractual and largely informal constraints which determine the speed and cost of reaction of investment activity of a bank, its adaptation to the changing macroeconomic market conditions (Madu, 1994).

General legal restrictions are presented by legislative normative acts which determine the conditions and procedure for issuance of securities (stocks, bonds, treasury bills, savings certificates); issues of regulation of mediation activities in organization of securities circulation; normative acts which define the structure of the banking system, economic, organizational and legal principles

of establishment, operation, reorganization and liquidation of banks and the procedure and size of the formation of the share capital of bank; regulations of range of banking operations (including securities transactions); normative acts which determine legal principles of state regulation and control over securities market, and forms of government regulation and structure of its implementation, powers and tasks of the National Commission on Securities and Stock Market and powers of self-regulatory organizations in the securities market.

The main administrative universal restrictions include establishment of rules and standards for transactions in the securities market and control of their compliance; limitations in the form of need to obtain licenses for carrying out a certain type of activity of stock market participants; state guarantees of conditions for implementation of investment activity, observance of rights and legal interests of its subjects; restrictions due to the conditions of suspension or termination of professional activities without a special permit for this activity.

The administrative specific institutional constraints of banks as securities market participants should include limitations on possibility of realization underwriting, brokerage and dealer activities of banks in the stock market; restrictions which arise out of the division of banks into universal and specialized; limitations which determine necessity of reorganization of the bank into a specialized one in case of excess structure of its assets in securities of a certain value; limitations of the possibility of bank investment in the share capital of subjects of non-financial economy sector, restrictions caused by the ban on the vote on shares by power of attorney. Therefore, the feature of administrative institutional constraints is their use in defining qualitative and quantitative parameters of banks. They are mostly used at the stage of making decisions about the admission of banks in the market.

Indicative and legal institutional constraints are mainly specific restrictions for banks. The standards which directly impact the investment activity in Ukraine should include investment regulations of each institution and the total amount of investments, the standards of maximum amount of credit risk on one counterparty and large credit risks in part of the bank's operations with bonds. Normative values should not exceed for universal banks – 60%, for clearing banks – 10% for investment – 90%. Such regulatory restrictions on rational diversification of the investment portfolio do not significantly affect the investment activities of banks.

The introduction of severe restrictions is caused by the necessity to form the mandatory reserve for reimbursement of losses from operations with securities. The creation of such reserve is regulated by the Regulations on the procedure for calculating the reserve to cover possible losses on securities transactions and the Regulations on the procedure for determining the fair

value for decrease usefulness of securities, approved by the National Bank of Ukraine № 629 and № 561, respectively.

Managerial flexibility involves the organization and administration of management processes that cause certain transaction costs, costs of agency conflicts and others.

Thus, for effective guarantees of financial flexibility of decision making in investment banking activities based on a synthesis of experience of different scientific schools of economic theory and by using a systematic approach we propose conceptual provisions to ensure the financial flexibility of decision-making in investment activities of banks the purpose of which is to protect the real value of bank equity capital from the impact of investment risks through the introduction of financial flexibility (Figure 2).

According to the conceptual provisions, assigned tasks can be solved with the use of the mechanism that includes: choice of investment strategy based on institutional flexibility of decision-making; optimization of bank investment portfolio taking into account market flexibility; evaluation and regulation of managerial flexibility of decision making.

The basis of the scientific and methodological approach to the choice of investment strategy based on institutional flexibility of decision making is building a hierarchical structure which consists of four stages and begins with determining the selection methods of investment strategy banks and the classification of the factors of causing it (La Porta, 1997). The final result of construction of the hierarchy is the choice of optimal alternative variants according to the classification of portfolios and types of securities.

These portfolios are classified according to the following principles: state and municipal bonds in the bank's portfolio of fixed profitability and trading portfolio; corporate bonds in the portfolio of non-fixed profitableness in the context of different industries; shares in the bank's portfolio of non-fixed profitableness in the context of different industries; corporate bonds in the portfolio of securities for sale.

The determination of weighting coefficients (table 1) made it possible to obtain an integrated assessment of the degree of attractiveness and an appropriate choice of investment strategy (P_l):

$$P_l = \sum_{i=1}^n s_{li} \cdot w_{li} \quad (1)$$

s_{li} – i -th criterion for assessing the l -th investment strategy; w_{li} – i -th weight coefficient that meets the criteria i ; n – number of selected indicators.

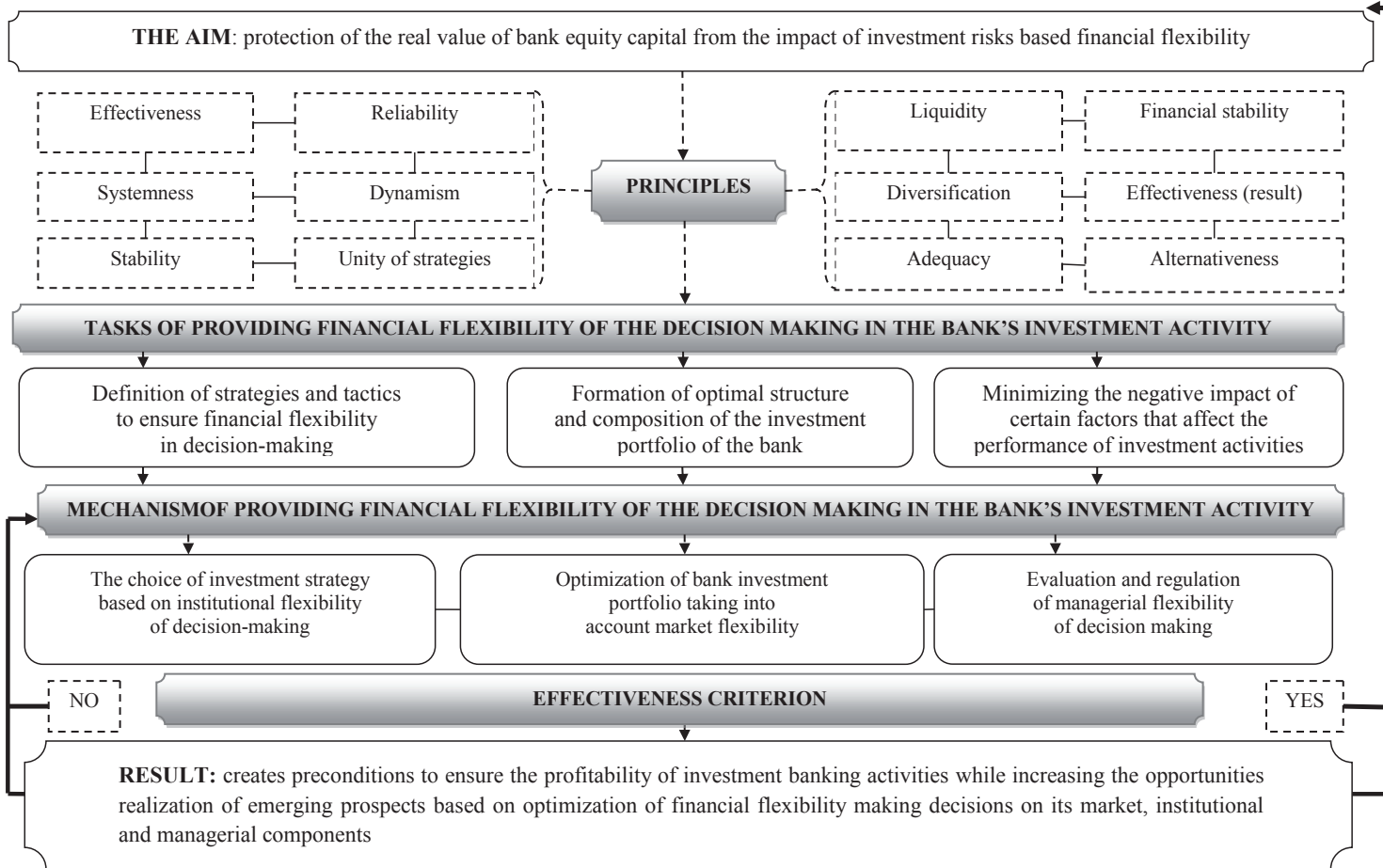


Figure 2. Conceptual provisions of providing financial flexibility of the decision making in the bank's investment activity

Table 1. Two levels of constructing a matrix of analysis of hierarchy to select the investment strategy

The criteria for selecting	The criteria for selecting (Pi)	Normalized vector (Wi)	Component of the own vector (Pi)	Normalized vector (Wi)	Component of the own vector (Pi)	Normalized vector (Wi)
	Type of investment strategy					
	Portfolio (PTBT, PTBF)	Portfolio (PCBP, PCBB, PCBM, PCBC, PCBO, PCS)	Portfolio (PSVP, PSVB, PSVM, PSVC, PSVO)			
THE EXTERNAL FACTORS						
I. Institutional flexibility (IF) – 0,57						
1. Formal universal restrictions	0,76	0,13	0,76	0,13	0,73	0,13
2. Formal specific restrictions	2,16	0,37	2,16	0,37	1,84	0,32
3. Informal restrictions	0,23	0,04	0,23	0,04	0,01	0,02
4. Indicative and legislative restrictions	2,68	0,46	2,68	0,46	3,20	0,53
Total	5,83	1,00	5,83	1,00	5,78	1,00
III. Market indicators of investment activity (MI) – 0,11						
1. Profitability	3,91	0,43	3,91	0,43	3,66	0,45
2. Liquidity	2,48	0,27	2,48	0,27	1,22	0,15
3. Level of risk	1,08	0,13	1,08	0,13	1,63	0,21
4. Stock index dynamics	0,64	0,07	0,64	0,07	0,64	0,08
5. Interest rates	0,48	0,05	0,48	0,05	0,48	0,06
6. Spread of defaulting corporate and government securities	0,43	0,05	0,43	0,05		
7. Premium for market risk					0,43	0,05
Total	9,02	1,00	9,02	1,00	8,06	1,00
IV. Macroeconomic factors (MF) – 0,05						
1. Rate of GDP growth	2,55	0,47	2,55	0,47	2,55	0,47
2. Inflation rate	1,8	0,33	1,8	0,33	1,8	0,33
3. Currency rate fluctuations	0,86	0,16	0,86	0,16	0,86	0,16
4. Balance of payment	0,23	0,04	0,23	0,04	0,23	0,04
Total	5,44	1,00	5,44	1,00	5,44	1,00
THE INTERNAL FACTORS						
II. Investment potential of bank (IO) – 0,27						
1. Resource potential	0,58	0,25	1,44	0,43	1,44	0,43
2. Reserve potential			1,44	0,43	1,44	0,43
3. Effective potential	1,73	0,75	0,48	0,14	0,48	0,14
Total	2,31	1,00	3,36	1,00	3,36	1,00

Obtained results indicate that the most important factor when choosing investment strategies depending on the classification of portfolios and types

of securities is institutional flexibility of the decision making in the bank's investment activity, which considers indicators of the institutional constraints that affect the formation of long-term strategies of the bank.

Of all financial instruments the most important one is setting limits that restrict market risk (0,13-0,16). The specific factors are the following: for domestic government bonds – exemption from reserve formation (0,15), for corporate bonds – adherence to the norms of the maximum credit risk (0,11) and reserve requirements for bank's portfolio (0,13), for shares – adherence to the norms of investment (0,16).

Among the market factors an important place is occupied by indicators of profitability and liquidity. However, it should be noted that choosing strategy which is focused on investing mainly in shares, the bank devotes due attention to assessing the level of risk. Less significant market indicators of investment activity of bank should include interest rate, spread of defaulting government and corporate bonds and premium for market risk for shares, which are on average 5% of the total volume of all market indicators. Macroeconomic factors have the same weight for all securities. The most important ones are indicators of GDP (gross national product) growth and inflation rate. In our opinion, understanding of structure with the use of method of analysis of hierarchy can be the basis for selecting long-term strategy considering institutional flexibility of the decision making in the bank's investment activity.

In modeling the optimal structure of the investment portfolio taking into account market flexibility we consider systematic factors of market flexibility (affecting all securities that are traded on the stock market, and the impact of which cannot be eliminated through diversification of investments), specific factors of market flexibility (determined by the individual characteristics of securities, the financial condition of their issuer), and resource potential of the bank. It allows to form a vector of development depending on finding actual profitableness of a positive (negative) range of values and provides substantiation of the decision making in the bank's investment activity both in the short and long term.

It is obvious that the result of the optimization of investment activity of the bank is the creation of a balanced structure of the investment portfolio sorted by the type of securities and considering external risk factors and market flexibility of the decision making in the bank's investment activity (Figure 3).

The implementation of the proposed scientific and methodical approach to the optimization of the investment portfolio allows developing options of management of market flexibility of the decision making in the bank's investment activity. These parameters are quantitatively determined basing on the value of the error of theoretical profitableness of securities taking into account the given of probability and unsystematic risk.

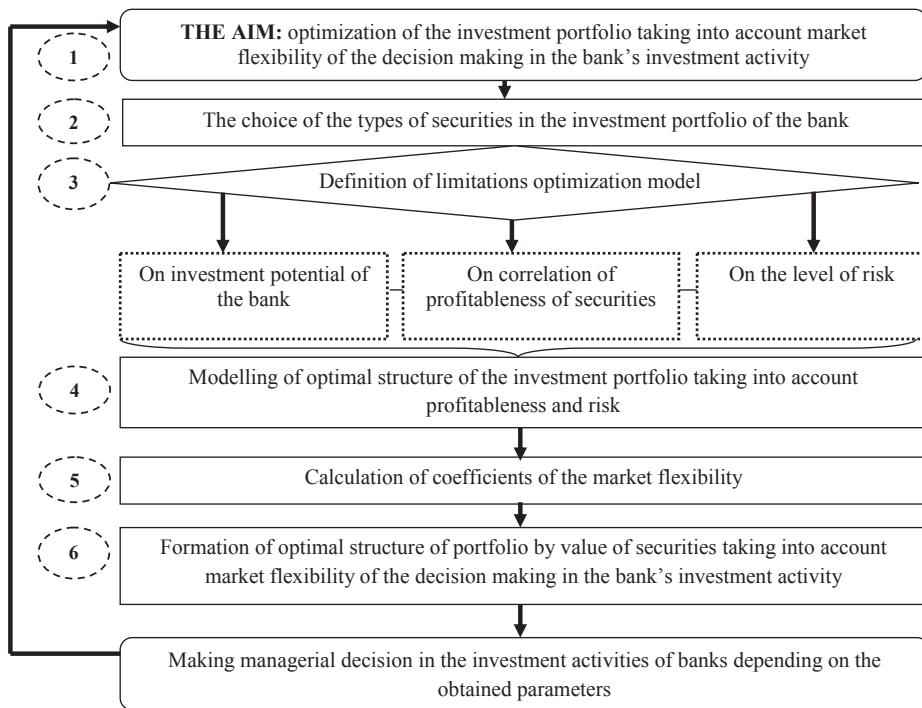


Figure 3. Scientific and methodical approach to the optimization of the investment portfolio taking into account market flexibility of the decision making in the bank's investment activity

In order to organize and administrate investment processes in the bank we improved scientific and methodical approach to the evaluation and regulation of managerial flexibility of the decision making in the bank's investment activity taking into account indicators which are elected from a position evaluation, structure, quality and quantity of the subsystem of administration of the bank (Table 2).

Proposed system of indicators can be considered as indicators of evaluation and regulation of managerial flexibility of the decision making in the bank's investment activity. However, considering the fact that it has multidirectional impact on managerial flexibility of the decision making in the bank's investment activity, it is advisable to integrate them in the general indicator:

$$F_A = \frac{1}{n} \sum_{i=1}^n \gamma_i \cdot K_i \quad (2)$$

F_A – integral indicator of managerial flexibility of the decision making in the bank's investment activity; K_i – standardized value of features; γ – weighting coefficients.

Table 2. The indicator system of managerial flexibility of the decision making in the bank's investment activity

Factors of managerial flexibility of the decision making	Indicators of managerial flexibility of the decision making	Stimulants and destimulants of flexibility of the decision making	The threshold values
Quantitative and qualitative of composition bank staff	The coefficient of quality of personnel potential (K_{KP})	+	$0 < K_{KP} \leq 1$
	The coefficient increase of level qualifications of personnel (K_{PK})	+	$0 < K_{PK} \leq 1$
	The coefficient of provision of human resources (K_{OK})	+	$0 < K_{OK} \leq 1$
	The coefficient of stability of personnel (K_{SK})	+	$0,08 < K_{SK} \leq 1$
	The coefficient of personnel turnover (K_{TK})	-	$0,03 < K_{TK} \leq 0,08$
The degree of centralization or decentralization of the bank	The coefficient of centralization of functional management structure (K_{CS})	-	$0 < K_{CS} \leq 1$
	The coefficient of functional specialization (K_{FS})	+	$0 < K_{FS} \leq 1$
	The coefficient of concentration of management functions (K_{KF})	-	$K_{KF} \leq 1$
Type of organizational structure of the bank	The coefficient of structural tension (K_{SN})	-	$K_{SN} \leq 1$
	The coefficient of operational work of the administrative apparatus (K_{OR})	+	$K_{OR} \leq 1$
The importance and the number of the decision making in the bank	The coefficient of effectiveness of implementation of decisions (K_{ER})	+	$0 < K_{ER} \leq 1$
The degree of control over the processes in the bank	The coefficient of degree of control (K_{DC})	+	$0 < K_{DC} \leq 1$

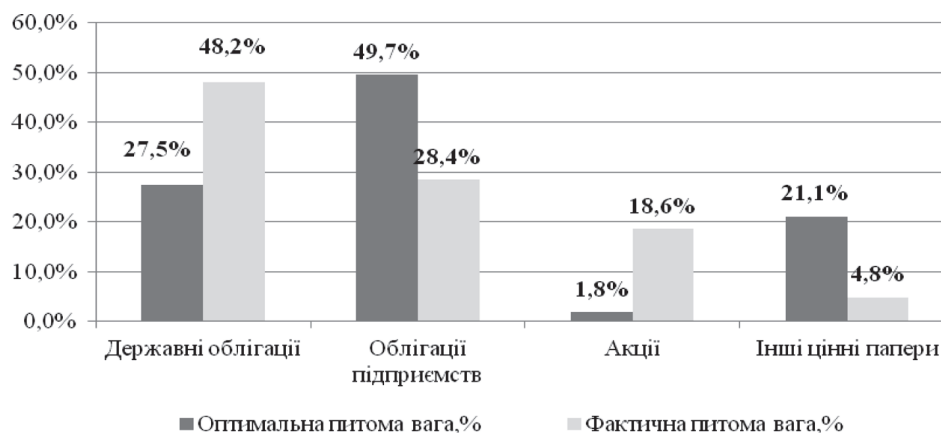


Figure 4. Optimal and actual specific weight of securities in the investment portfolio of PJSC CB «Ukrsotsbank

The presented mechanism of ensuring financial flexibility of the decision making in the bank's investment activity was approbated on the example of Public joint stock company Commercial Bank «Ukrsotsbank» (which is one of the ten largest banks in Ukraine) for the period of 2007-2014 . Based on the obtained coefficients of financial flexibility and normalized coefficients of optimization we defined the structure of securities in value in the investment portfolio of PJSC CB «Ukrsotsbank» (Figure 4).

As shown in Figure 4, optimization of investment portfolio of the bank (in 2014) involves reducing the share of government bonds from 48,2 to 27,5%, stocks – from 18,6 to 1,8% by increasing the proportion of bonds from 28,4 to 49,7%, other securities – from 4,8 to 21,1%. Basing on approbation model to ensure financial flexibility of the decision making in the bank's investment activity we made the optimization of the investment portfolio of PJSC CB «Ukrsotsbank» considering the profitability of securities, the value of non-systematic risk and market flexibility. According to the results of optimization the economic effect in amount of 83 thousand UAH was obtained, as the difference between overall incomes of investment portfolio for the optimal investment portfolio structure and actual, considering the profitability of securities and portfolio value of 5 million UAH. Calculations of economic effects during research were carried out with the help of the following algorithm:

1. Overall profitability of the portfolio R_{total} is calculated as a weighted average on the actual and optimal structures:

$$R_{total}^{fact} = \sum r^{fact} \cdot d_i^{fact} = 13,5 \% \quad (3)$$

$$R_{total}^{opt} = \sum r^{fact} \cdot d_i^{opt} = 15,16\% \quad (4)$$

2. Overall effect Ef is calculated as a result of multiplying the difference between profitability on the actual and optimal structures of the value of the investment portfolio of the bank S :

$$Ef = (R_{total}^{opt} - R_{total}^{fact}) \div 100 \cdot S = (15,16 - 13,5) \div 100 \cdot 5 = 0,083 \text{ mln. UAH.}$$

3. Conclusion

Thus, summarizing the results of the research allows the following conclusions:

- 1) we offered conceptual provisions of providing financial flexibility of the decision making in the bank's investment activity on the basis of a systematic approach, which combines general scientific and specific principles, goals, objectives, elements of the mechanism of their implementation, the criterion of efficiency, and creates conditions

- to ensure the profitability of investment banking activities and at the same time increases the possibilities of implementation of emerging prospects due to optimization level of financial flexibility of making decisions on its market, institutional and administrative components;
- 2) scientific and methodical approach to the choice of bank's investment strategy on the basis of institutional flexibility in decision-making uses method of analysis of hierarchy that takes into account the impact of market, macroeconomic factors of investment activity and investment potential of banks (resource, reserve, effective), and on the basis of the received hierarchical structure depending on the classification of portfolios and types of securities allows to substantiate the choice of strategic orientation of the investment strategy of the bank;
 - 3) scientific and methodical approach to the optimization of the investment portfolio allows to form a vector of development depending on finding actual profitableness of a positive (negative) range of values and provides substantiation of the decision making in the bank's investment activity both in the short and long term;
 - 4) scientific and methodical approach to evaluating and regulating managerial flexibility of the decision making in the bank's investment activity takes into account indicators that are selected from a position evaluation, structure, quality and quantity of bank management subsystems (numerical and qualitative composition of the staff, the degree of centralization and decentralization of bank, type of organizational structure, the importance and the number of decision making in the bank, the degree of control over the processes in the bank), which makes it possible to reduce transaction costs and the level of investment risk, increase profitability and the quality of decisions, and to ensure continuous control over personnel involved in the investment process of the bank.

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