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Advanced Methods of Bank Risk Management

Main approaches to building up a system for management of financial risks faced by banks are discussed. It is shown that risk management in banking is a complex process aimed at identification of risk sources, assessment and minimization of the effects of the identified risks, in order to reduce their adverse impact on the commercial bank performance. The main objective of banks is defined as maintaining the constant balance between the needs in resources and the capabilities of their acquisition. The importance and necessity of measurement and quantification of the level of specific types of risk and/or the cumulative risk is highlighted. Special emphasis is made on the credit risk caused by the probability of bank counterparties' failure to fulfill their obligations. Its usual consequence is failure to repay (fully or partially) the debt principal and the interests in terms specified by the contract. It is shown that the level of credit risk in a country is conditional on macro- and microeconomic factors, with highlighting their effects. It is demonstrated that the adverse impact of inflation is the most explicit one, as it provokes devaluation of bank assets which major share is funds and financial investment. Functional risks are caused by subjective and objective factors, and by system failures, and they cover strategic risks related with mistakes in strategic management. Financial risks can trigger unpredictable change in the amount, profitability and structure of bank assets and liabilities. The liquidity risk can occur when a bank has insufficient or surplus liquidity. The insufficient liquidity can provoke bank insolvency. The inflation risk has ambiguous effects for bank operation.

The successful risk management is a critically important condition for competitiveness and reliability of any financial organization; its objective is to identify and prevent potential adverse events, and to find the tools for minimization of their effects as part of the elaborated methodology of management. Further research devoted to problems of risks faced by the Ukrainian banking system and economic analysis of specific risks will help outline the ways of cost reduction in the banking sector and constantly extend the range of bank services.

Key words: *risk management, statistical methods, bank risks, financial risks, liquidity risk, inflation risk, credit risk.*

Introduction. The occurrence of a bank risk is an important determinant in the bank system formation and development. The monetary market is part of the circulation sphere, with the operating commercial banks being its most active and mobile segment. The commercial banks are professional actors of the financial market with the diversified operation in this market sectors. Concerned with maintaining the achieved profitability rate, the banks have to deal with problems related with searching an optimal combination of profitability and minimization of risks.

An analysis of risks currently faced by commercial banks in Ukraine needs consideration of the following points:

– compliance of the real situation with basic provisions of the legal framework;

– crisis periods in the economy development, reflected in the production recession, financial instability of many organizations, weakened economic links;

– high rate of inflation.

The above mentioned factors can significantly change a combination of the already existing bank risks and methods of their analysis. The central objective of a bank is to maintain the constant balance between the needs for resources and the capabilities for their acquisition on the condition of the secured financial viability of this bank and the interests of all the stakeholders [1].

Literature review. Issues of the essence and classification of bank risks and their impact on the bank performance have been addressed in numerous works of I. Dyba [2], A. Yepifanov and T. Vasyliev [3], V. Kovalenko [4], S. Prasolov [5], L. Prymostka [6], V. Stelmakh and V. Mishchenko [7], and other authors. These researchers elaborated the basic theoretical framework and proposed practical approaches to risk assessment in bank operation and improvements of management methods in banks. But these issues require ongoing revisions and updates in the research tools in parallel with economy advancement and changing conditions of bank operation.

Because financial risks are a category of risks with specific implications, the objective of this study is to justify main approaches to building up a system for financial risk management in banks.

Results. An analysis of bank risks has to be started with grouping of risks by type, to proceed with developing methods for their reduction in view of the specificities of each group. Because an optimal ratio of the risks level and the expected profit is a variable conditional on a set of factors, it is very important to measure and quantify the level of a particular type of risk or the cumulative risk. Analyses and assessments of the bank risk are currently performed using the tools of probability theory and methods of mathematical statistics.

Financial risks can trigger unpredictable change in the volume, profitability and structure of assets and liabilities, with the immediate effects for the bank performance (profitability and liquidity rates) and, in the final end, for the size of bank capital and bank solvency.

The financial risks include the following types:

– credit risk;
– liquidity risk;
– market risk;
– interest risk;
– exchange rate risk;
– inflation risk;
– insolvency risk.

Now we are going to elaborate on the types of financial risk. The credit risk occurs when bank counterparties fail to fulfil the obligations on repayment of the principal and the interests. The level of credit risk in a country is conditional on macro- and microeconomic factors. The risk of credit transactions will be higher when there is no well-established pledge law or effective pledge registration system.

Liquidity risk. The liquidity refers to "...the capacity for timely fulfilment of one's monetary obligations due to the balance between the terms and sums of repayment of the allocated assets and the terms and sums of the liabilities, and the terms and sums of other sources and end uses of funds" [7, p. 8]. The liquidity risk needs to be analyzed in various dimensions.

The liquidity risk "...occurs because a bank may have insufficient liquidity or excessive liquidity. The risk of insufficient liquidity occurs when bank fails to fulfil its obligations in a timely manner or the needs to sell some categories of bank assets on unprofitable terms. The insufficient liquidity makes a credit organization insolvent. The risk of excessive liquidity occurs when a bank can lose its profits due to the surplus of high liquidity assets" [7, p. 16].

In the banking practice there may probably occur a situation when a bank does not fulfill its obligations in a timely manner. Its occurrence provokes decreases in account balances and outflows of deposits, with the resulting insolvency of this bank.

Inflation risk. Inflation processes have a certain, although ambiguous, impact on the bank performance. Being adverse in the overwhelming majority of situation, this risk manifests in the decreasing value of bank assets (financial investments and other funds). But inflation can also have a positive impact, enhancing the bank's profit rate. This can occur in case of the improving solvency of intermediate firms with quick capital turnover.

The improvement of risk management requires elaborating a set of actions aimed at identification, assessment and minimization of risks, enabling to achieve an optimal profitability/risk ratio by the performed transactions. The successful risk management is critical for the competitiveness, and its central objective is to identify and prevent potential adverse events [8]. The order of management actions is shown in Figure 1 (elaborated by the author by data from [6; 7]).

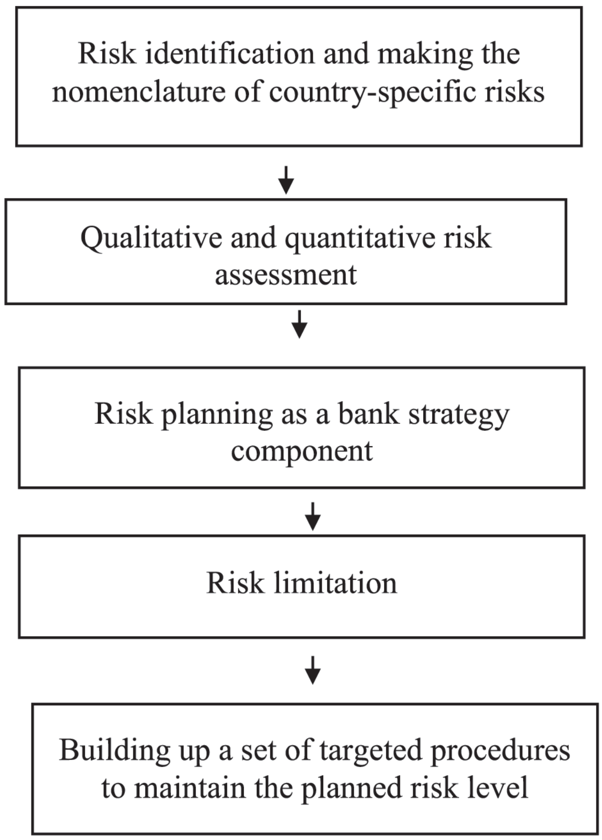

Figure 1. The order of risk management

The risk assessment is based on the determining the relationship between amounts of bank losses and probabilities of their occurrence. The relationship can be presented as a curve of the probabilities of the occurrence of a certain amount of losses. It can be built by various methods: statistical method, method of expert assessment, method of analytical calculations.

By the statistical method all the statistical data on the efficiency of bank operations are analyzed, to calculate the probabilities of the occurrence of losses. The method of expert assessment, which differs from the statistical one by techniques of data collection to build a risk curve, involves the processing of expert opinions. By the method of analytical calculation, a curve of the probabilities of the occurrence of losses for bank risk assessment is built by use of applied mathematical methods.

Risk planning is carried out on the basis of the derived qualitative and quantitative estimates. The planned margin of losses depends on the aggressiveness of a bank's operation strategy. The more aggressive it is, the higher is the planned margin of losses. The margin of losses is admittedly the bank capital when the policy is aggressive, and the bank profit when the policy is conservative. Risk limitation refers to a set of actions aimed at limiting the risk of loss of the available property or failure to have the planned performance, i. e. risk limitation can be achieved through limiting bank transactions. The final phase of the risk management process is building up a set of procedures aimed at maintaining the planned level of risk. It requires elaboration of documents and techniques regulating the process of risk analysis, an algorithm for decision making concerned with setting the limits on transactions, and a cluster of activities on risk control.

Methods for financial risk management are going to be discussed below. As lending interest is currently a central source of income for many commercial banks, credit risk management is a critically important area of risk management. Credit risks can be classified by various criteria (Table 1, constructed by the author by data from [6; 7]).

Table 1

A classification of credit risks

Classification criteria	Types of credit risks
Risk level	Risks at macrolevel Risks at microlevel
Dependence of risk on bank operation	Not dependent on the bank operation Dependent on the bank operation
Sectoral focus of lending	Industrial Trade Agricultural
Scopes of lending	Comprehensive risk Partial risk
Type of lending	By lenders By loan recipients By terms By security
Loan structure	At the phase of providing At the phase of using At the phase of repaying
Phase of decision making	Risks at the previous phase of lending Risks at the next phase of lending
Extent of permissibility	Minimal risk Increased risk Critical risk Impermissible risk

The objective of risk minimization is to achieve bank viability. It can be realized through organizational, personnel and special activities). Organizational activities are intended to specify the responsibilities of the staff involved in lending. Personnel activities pertain to training and professional development of the staff and managers involved in lending transactions, fostering and maintaining the culture of lending, establishing the procedures of control and audit of lending transactions. Special activities of credit risk management are focused on applications of the tools used by banks in lending transactions.

Special activities involve:

✓ setting limits on loans provided to one borrower or a group of related borrowers;

✓ analysis and ranking of the borrowers' creditworthiness;

✓ applications of methods for risk transfer and risk absorption;

✓ diversification of lending by industry and currency.

Setting of lending limits is the main method for control of the formation of credit portfolio, used to reduce credit risks. The limits imposed on the scopes of lending transactions of one client or a group of clients are set in view of the amount of losses acceptable for a bank due to the occurrence of credit risks. The limits can be set in form of absolute margins or target figures. Target figures are more often calculated on the basis of bank's own capital or size of the credit portfolio. The limits are usually calculated by the results of analysis of the financial performance of counterparty banks. The better is the financial performance of a counterparty bank, the higher is the amount of loan accessible to it. Although banks have individual techniques for calculating the limit, all of them consist of the same phases. At the first phase of determining the counterparty bank's creditworthiness, empirical factors giving clear evidence that the lending bank will be unable to take on the risk of this counterparty bank are defined.

If explicit negative factors are not sufficient or not found, the next phase will be analysis of the borrower's financial condition by the available forms of financial reporting. The main criteria at this phase are as follows:

- the conclusion on the financial condition of the counterparty bank, formulated on the basis of financial reporting;
- supplementary data on the counterparty bank (e. g. founders, real proprietors, administrative bodies, bank strategy, links with state power offices, the largest borrowers, management level, degree of openness, etc.);
- the existence and character of the counterparty bank's credit story;
- the established level of relations with the counterparty bank;
- the character of links between managers of the analyzed counterparty bank and the bank carrying out the analysis;
- the existence and character of links between the staff of aforementioned banks;
- the maximal limit per borrower (counterparty bank), approved in the lending bank.

An analysis of a counterparty bank is made using the formats of financial reporting compiled over several latest reporting dates. It covers subjective and objective factors determining the quality of relations of this counterparty with the lending bank. A critically important dimension of the sectoral analysis is calculations of the shares of loans by institutional sector of the economy in the aggregate gross loans according to the Classification of Institutional Sectors of the Ukrainian Economy (Table 2, constructed by data from [9; 10]).

Table 2

The structure of total gross loans in Ukraine by institutional sector of the economy

Loans by economy sector	2018		2019		2020	
	million UAH	%	million UAH	%	million UAH	%
Residents, including:	1 083 565.95	93.47	975 225.37	92.83	951 225.97	96.08
Deposit-takers	10 435.39	0.90	3 354.55	0.32	2 840.03	0.29
Central bank	0	0	0	0	0	0
Other financial corporations	9 222.14	0.80	9 576.96	0.91	5 700.54	0.58
General government	2 874.89	0.25	4 732.49	0.45	11 579.18	1.17
Nonfinancial corporations	859 740.41	74.16	744 647.77	70.88	724 156.53	73.14
Other domestic sectors	201 293.13	17.36	212 913.61	20.27	206 949.68	20.90
Nonresidents	75 718.22	6.53	75 287.19	7.17	38 845.14	3.92
Total gross loans	1 159 284.17	100	1 050 512.56	100	990 071.12	100

It is reasonable to start up with a structural analysis covering a review of analytical balances and statements, in order to assess the real amount of bank assets, liabilities, and capital. The analytical balance lays grounds for an express analysis of the balance structure in a counterparty bank. The dynamics of lending structure in Ukraine by bank group over 2017–2020 is shown in Figure 2 (constructed by data from [11]).

The main methods used in risk assessment are qualitative and quantitative analysis. The qualitative analysis is based on risk managers' opinions. It involves detailed characterizations of adverse consequences of the development of events, analysis and weighting of negative factors provoking risks.

The quantitative analysis is made to set up permissible levels of indicators for various transactions. Its results are presented in absolute and relative figures. This is the visible final result of the complex methodological effort in risk assessment.

Apart from setting limits and analyzing the creditworthiness of borrowers for minimization of credit risk, methods of risk transfer on a third party are widely used. They involve guarantee contracts for bank borrowers, concluded by third parties. Also, methods of risk absorption are used. According to the instruction of the National Bank of Ukraine on the procedure of regulation of the commercial bank's operation in Ukraine [12], banks are required to create reserves for potential losses due to lending. Besides that, lending to physical and legal entities often requires a contract on mortgage of a borrower or a third party, with the property value covering the debt principal and the interests over the term of lending.

The liquidity risk management is based on the two main methods of liquidity management:

a) management of bank assets;

b) management of volume and structure of liabilities.

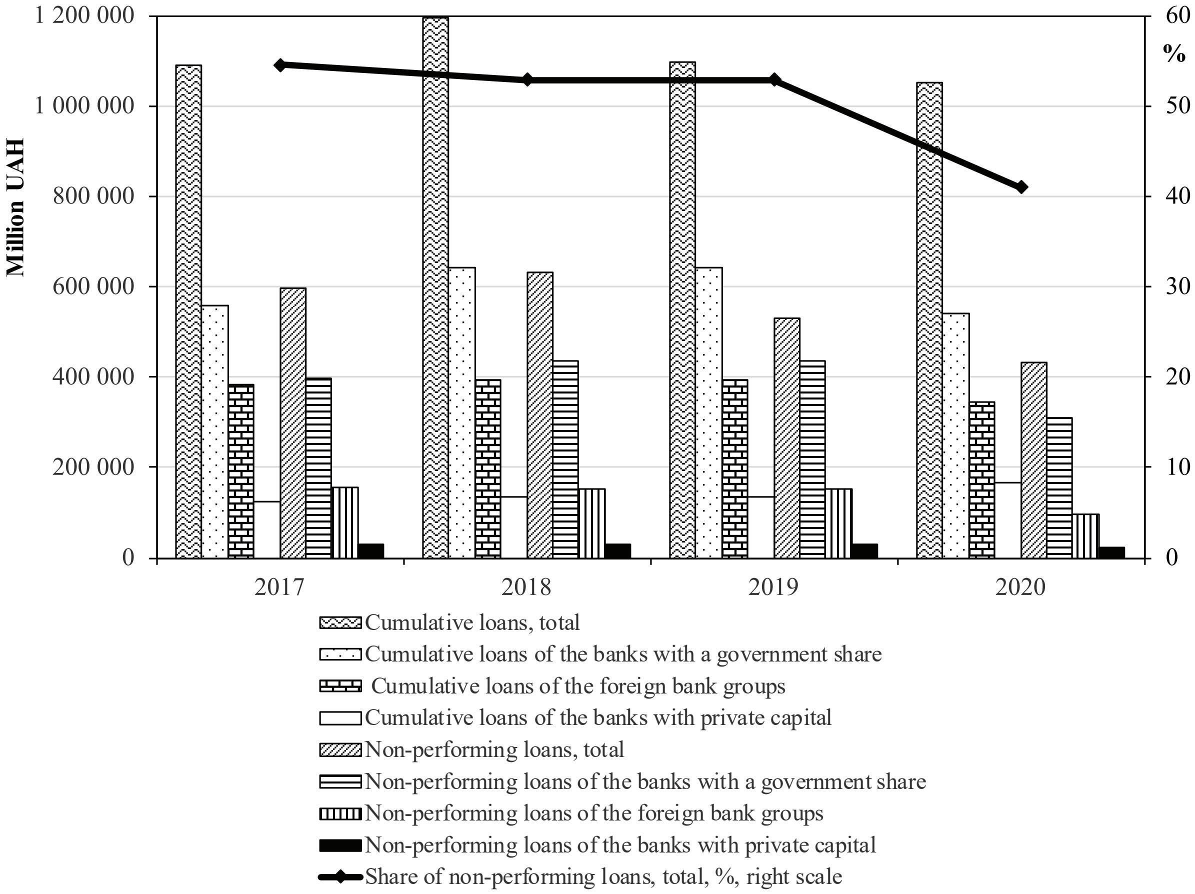

Figure 2. The dynamics of lending structure, Ukraine, 2017–2020

While the first method is currently used mainly by small banks, the second one is preferred by large and medium banks with strong positions on financial markets. When this method is used, the level of high liquidity assets will be minimized. In the liquidity risk management process, the limits of current and future liquidity are set. The limit of current liquidity is set as the absolute sum, i. e. the marginal amount of liquidity deficit (the surplus of liabilities over assets). The limit of future liquidity is set in form of a relative indicator, the marginal ratio of liquidity deficit, i. e. the ratio of the cumulative total of liquidity deficit and the bank assets.

The bank strategy in management of assets and liabilities has immediate impact on the planning of liquidity risk and liquidity limits. The limit of future liquidity is an aggregated indicator, namely the abovementioned marginal ratio of liquidity deficit. The limit size is determined by the bank policy on liquidity. This policy can be conservative or aggressive. In the former case, there is no current liquidity deficit, with the zero limit. In the latter case, the liquidity deficit must be equal to the total funds that can be potentially raised on the interbank loan market and the funds from sales of high liquidity assets. The conservatism of bank policy implies the zero gap between assets and liabilities for a given group by terms or allocation of funds for shorter terms than the terms of liabilities. The limit of future liquidity will be close to zero. The aggressive policy implies the increased limit on future liquidity, i. e. an extension of the boundaries in which the terms of assets can exceed the terms of liabilities.

The main methods for assessment and management of liquidity risk are analysis and assessment of the assets/liabilities ratio by extent of liquidity, and the break method (stairs of terms). In the analysis and assessment of assets/liabilities ratios, assets and liabilities are grouped, with account to their term and quality, by rate of liquidity reduction. The break method is based on comparisons of active and passive balance sheet items in view of the remaining term to maturity. The gaps revealed in the comparison show the period in which a bank will face a deficit or a surplus of liquid funds.

Conclusion. The above discussion demonstrates that risk management in banking is a complex process aimed at identification of the risk sources, assessment and minimization of the effects of the identified risks, in order to reduce their adverse impact on the commercial bank performance. However, even the innovative approaches to risk management, helping enhance the quality of assessment of the bank creditworthiness, are only capable to reduce the probability of the credit risk occurrence rather than eliminate it. Further studies of problems related with bank risks and economic analysis of their types, which is an area of future research, will enable to outline ways for reduction of losses in banking and constantly expand the scopes of bank services.

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Сучасні методи управління банківськими ризиками

Розглядаються основні підходи до побудови системи управління банківськими фінансовими ризиками. Показано, що управління ризиками в банківській діяльності являє собою складний процес, спрямований на виявлення джерел ризику, оцінку та мінімізацію наслідків виявлених ризиків з метою зниження їх негативного впливу на кінцеві результати діяльності комерційних банків. Сформульоване головне завдання банку, яке полягає у підтримці постійного балансу між потребами в ресурсах і можливостями їх придбання. Акцентовано на важливості й необхідності вимірювати та чисельно визначати рівень конкретного виду ризику та/або сукупного ризику. Особливу увагу приділено кредитному ризику, обумовленому імовірністю невиконання контрагентами банків своїх зобов'язань. Це, як правило, проявляється в неповерненні (повністю або частково) основної суми боргу і відсотків по ньому в установлені договором терміни. Показано, що на величину кредитного ризику в країні впливають як макро-, так і мікроекономічні фактори, та висвітлено їх дію. Доведено, що найбільш очевидним є негативний вплив інфляції, що проявляється у знеціненні банківських активів, більшу частину яких складають кошти та фінансові вкладення. Функціональні ризики зумовлені суб'єктивними й об'єктивними причинами, а також системними збоями, та охоплюють стратегічні ризики, пов'язані з помилками в стратегічному управлінні. Фінансові ризики призводять до непередбачених змін в обсягах, дохідності та структурі активів і пасивів банківської установи. Ризик ліквідності спричинений тим, що банк може бути недостатньо або занадто ліквідний. Недостатня ліквідність призводить до неплатоспроможності кредитної організації. Ризик інфляції неоднозначно впливає на банківську діяльність.

Успішний ризик-менеджмент – найважливіша умова конкурентоспроможності та надійності будь-якої фінансової організації, а його завданням є виявлення можливих несприятливих подій та запобігання ним, знаходження інструментів мінімізації їх наслідків у рамках розробленої методології управління. Подальше вивчення проблематики ризиків банківської системи України й економічний аналіз їх окремих видів дозволить окреслити шляхи зниження втрат банківської діяльності та постійно розширювати сферу банківських послуг.

Ключові слова: *управління рисками, статистичні методи, банківські ризики, фінансові ризики, ризик ліквідності, ризик інфляції, кредитний ризик.*

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