

## MULTICRITERIA IN BANK LOAN PORTFOLIO MANAGEMENT

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*This paper is devoted to a review of the Multicriteria Framework of financial decisions of bank loan portfolio management as a financial model supporting financial decision-making, which builds pointed models taking into account the peculiarities of a problem. The goal here is to bridge the gap between decision-making disciplines of financial economics and the need for adequate decision support. Finance has traditionally recognized the two-objective situation of risk versus return, with the fundamental goal of wealth maximization. However, not well known are the new ways of approaching financial problems when three or more criteria exist. The modern portfolio management approach involves complex goals where they interact with one another; each has its own possible interpretation of wealth maximization, subjects to concern about risk, safety, liquidity, profitability, social responsibility, environmental protection, employee welfare, and so on. Consequently, it may well be appropriate to pursue a multiple objective approach to many financial decision-making problems. This article is concentrated upon building up a model with multicriteria analysis that provides financial decision makers and analysts with a wide-range methodology well suited to the complexity of modern bank loan portfolio management decision-making.*

Due to lax credit standards, poor portfolio risk management, or weakness in the economy, loan portfolio problems have historically been the major cause of bank losses and failures.

Lending is the principal business activity of most commercial banks. The loan portfolio is typically the largest asset and the predominant source of revenue. As such, it is one of the

greatest sources of risk to a bank's safety and soundness.

Loan portfolio management and the multicriteria framework approach should be addressed with specific attention for the following reasons:

- while analyzing banking crediting activity many of scientists have analyzed only credit risk management and the methods how to mitigate it [1, 5, 7, 14, 18]. Credit risk management is the main aspect of loan portfolio management, but a mere evaluation of borrower's creditability and probability of one's abilities to return loan do not assure the efficiency of loan portfolio management
- loans are the assets category that ordinarily presents the greatest credit risk and, therefore, potential loss exposure to banks. Moreover, pressures for increased profitability, liquidity considerations, and a vastly more complex society have produced great innovations in credit instruments and approaches to lending. Loans have consequently become much more complex [11]
- economic and banking studies usually analyze the portfolio as collection of assets [1, 3, 5, 8, 18]. The attention in scientific studies of portfolio management is focused on investment management. In financial terms both loans and investments are assets, however, some aspects of investment and loan portfolio management may differ [2, 18]. Bonds and stocks have a liquid secondary market
- traditionally banks have focused on oversight of individual loans in managing their overall credit risk. While this focus is important, banks should also view credit risk management in terms of portfolio segments and entire portfolio. The focus on managing individual credit risk did not avert the credit crises [8]. However, had the portfolio approach to risk management augmented these traditional risk management practices, banks might have at least reduced their losses
- there is an extensive literature devoted to studying the multiple aspects of banking performance and loan portfolio management. It exhibits a great diversification, since there are many procedures for the identification of problem banks and consequently the measurement of soundness of the commercial banking system
- over the past decades the complexity of financial decisions has increased rapidly, thus highlighting the importance of developing and implementing sophisticated and efficient quantitative analysis techniques for supporting and aiding financial decision making. Finance has traditionally recognized the two-objective situation of risk versus return, the risk–return efficient frontier, and the necessity to tradeoff risk against return in order to achieve a final solution. Such risk–return aspects have been extensively studied with the aid of single-criterion and parametric solution techniques that have long been known. But what is not well-known are the new ways dealing with financial problems in the presence of three or more criteria
- many normative decision models assume that a financial institution pursues the single objective – wealth maximization. However, a modern bank loan

portfolio management involves complex goals and objectives where they interact with one another; each has its own possible interpretation of wealth maximization, subjects to concern about risk, safety, liquidity, profitability, social responsibility, environmental protection, employee welfare, organization reputation and so on. Consequently, it may well be appropriate to pursue a multiple objective approach to many financial decision making problems.

**The object** of this study is bank loan portfolio management. **The purpose** of this paper is to disclose the nature of the multicriteria framework of financial decisions of bank loan portfolio management as a financial model supporting financial decision making and to construct a model with multicriteria analysis to provide financial decision makers and analysts with a wide-range methodology suited for the complexity of modern bank loan portfolio management.

However, this study does not deal with the selection of multiple criteria for the implementation of the model. For the purposes of this study, liquidity as an additional criterion in the risk–profitability analysis will be analyzed.

**The objectives:**

- to highlight the main parts of bank loan portfolio management process
- to describe the multicriteria framework of bank financial decisions
- to define the multicriteria based bank loan portfolio model.

The framework of the model facilitates the promotion of an integrated global approach to portfolio management, which is gaining importance as the world of finance becomes more mathematical.

**The methods** used in the study are analysis of scientific literature, practical researches, comparative analysis, data grouping and processing.

**The process of bank loan portfolio management**

The safety and soundness of a bank is ultimately dependent upon an effective loan portfolio management. Traditionally, loan portfolio is defined as a total of all bank's loans [1, 18]. There are three main parts: credit instruments in corporate banking, business banking and personal banking, which comprise the commercial bank loan portfolio.

Usually the corporate banking loans are not numerous, but they are the source of a great undiversified risk, because the credit amount is significant and the failure of such projects would tremendously affect the bank's results or even existence. Business banking usually represents funding SMEs. Their risk is not so concentrated as in corporate banking. Risk concentration is considerably lower in personal banking because of moderate amounts. In this sector, a few increased risks or default projects would not have a great impact on bank results (see Fig. 1).

The historical progression of the bank loan portfolio management function is as follows: in the olden days, banks just used to lend money and what was the door as basically counted across their clients or across their geographies. The banks didn't usually give away opinions to draw down in the event that borrowers required additional money.

For decades, good loan portfolio management has concentrated most of their effort on prudently approving loans and carefully monitoring loan performance. Although these ac-

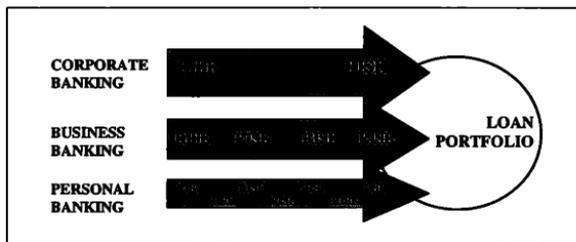


Fig. 1. The structure of bank loan portfolio

tivities continue to be the mainstays of loan portfolio management, the analysis of past credit problems has made it clear that portfolio managers should do more [11]. Traditional practices rely too much on trailing indicators of credit quality such as delinquency, no accrual, and risk rating trends [18]. Banks have found that these indicators do not provide sufficient lead-time for a corrective action when there is a systemic increase in risk.

In order to have an efficient management of bank loan portfolio according to scientific studies and practical examinations, a bank should have credit culture; portfolio objectives; lending policies and procedures; internal credit review process [13, 21].

Understanding the **credit culture** of the bank is essential for a successful loan portfolio management. Because of the significance of a bank's lending activities, the influence of credit culture frequently extends to other bank activities. A bank's credit culture is the sum of its credit values, beliefs, and behaviours. It is what is done and how it is accomplished [18]. Credit culture exerts a strong influence on a bank's lending and credit risk management. The values and behaviors that are rewarded become the standards and will take precedence over written policies and procedures. Credit culture varies from bank to bank. Some banks

approach credit very conservatively, lending only to financially strong, well-established borrowers. Growth-oriented banks may approach lending more aggressively, lending to borrowers who pose a higher repayment risk. These cultural differences are grounded in a bank's objectives for asset quality, growth, and earnings [11, 19]. Consistently successful banks achieve a balance between asset quality, growth, and earnings. They have cultural values, credit policies, and processes that reinforce each other and that are clearly communicated, well understood, and carefully followed. The culture, risk profile, and credit practices of a bank should be linked. If the credit practices and risk-taking activities of a bank are inconsistent with the desired culture and policies, management should find out why and initiate change to bring them back in balance.

Typically, **goals, objectives, and strategies** should be established for the loan portfolio to address the following areas:

- quality. Goals and objectives should be directed at the desired level of credit risk in the portfolio. This level of risk should be determined through the bank's review of internal and external factors, with a particular emphasis on the bank's capital adequacy, profitability, and overall risk-bearing capacity;

- the desired portfolio mix and level of diversification to limit concentrations of credit relative to the bank permanent capital or risk funds. Commodity or product concentrations within a loan portfolio exist when a group of similar borrowers has the same sources of repayment, collateral, economic, or geographic characteristics that would cause their ability to meet contractual obligations to be similarly affected by changes in economic or other conditions;
- the desired profitability of the loan portfolio. These goals and objectives should be based on the level of risk in the loan portfolio, costs of operations, capital needs, and competitive position of the bank. Strategies that can be employed to achieve goals and objectives in this area include modifying loan pricing policies and procedures, identifying and monitoring profitability on a loan-by-loan and portfolio sector basis, or adjusting the interest rate spread or method of interest collection on loans;
- growth and market share are necessary for banks to survive in the constantly changing and competitive industry of financial services. The opportunities for growth or increased market share should be identified through the bank's review of external and internal factors.

**Lending policies and procedures** are the key elements of loan portfolio management. Lending policies and procedures provide a valuable management of and control over lending operations. Also, policies and procedures should specifically address the bank's analysis and documentation of loans, loan servicing requirements, and the collateral evaluation process. However, to a minimum, the direc-

tion provided by lending policies should be commensurate with the program's impact on lending operations and espouse the principles of sound lending. Lending policies should be flexible to enable management to react to changing competitive situations. However, at the same time, the board's policies should define the levels and types of risk and lending practices that are acceptable and affordable by the bank. This is accomplished through well-defined operating parameters that address risk parameters, loan-underwriting standards, and credit administration standards.

**The Internal Credit Review (ICR)** process is one of the most crucial components of a bank's control system. The ICR process has the responsibility of ensuring that risk has been properly identified, serviced, and reported to management and the board. An effective ICR process is critical to the board's ability to monitor the quality of the bank's assets, management's compliance with lending policies and procedures, and the adequacy of lending policies and procedures. The process should provide for a periodic review of the portfolio by qualified people who are independent of the credit decision processes of the bank and who, for ICR purposes, report directly to the board.

While smaller banks may not have the resources necessary to support a comprehensive program and/or a full-time reviewer, these banks should consider a process that utilizes employees on a part-time or rotational basis, or outside reviewers on a contract basis. The ICR must include sufficient testing of lending and loan servicing practices to detect noncompliance with established policies and procedures, violations of law and regulations, and adherence to sound business practices. The reviews should be sufficient in frequency and

scope to determine the adequacy of credit administration and the reliability of asset classifications, performance categories, and the allowance for loan losses. The ICR should include an assessment of the system of internal controls over the credit function, the status of corrective action on previously identified weaknesses, and the cause of any deficiencies or adverse trends.

Besides, most of case scientists have analyzed the process of loan portfolio management that consists of planning, doing and controlling. It is very important to gain a continuous improvement. For this reason the loan portfolio may be approached using Deming's Cycle (Fig. 2).

The **planning** of loan portfolio includes the determination of the bank's loan portfolio size and limits and assurance of risk diversification.

Portfolio segmentation and risk diversification are the basic principles of portfolio management. A concentration of credit risk occurs within a portfolio when otherwise unrelated loans are linked by a common characteristic [21]. Managing the loan portfolio in-

cludes managing any concentrations of risk. For many banks, "portfolio segmentation" has customarily meant dividing the loan portfolio into broad categories by loan types such as commercial and industrial loans, real estate loans, and consumer loans [11]. As the segmentation techniques became more sophisticated, banks identified industry concentration. Although these divisions are a good starting point, the benefits of portfolio segmentation can be realized in full only if the bank is able to form segments using a broader range of risk characteristics.

The stage of **doing** involves the loan granting process, starting from the request for a loan and leading to signing a loan agreement. The evaluation of a potential borrower's creditability by using quantitative and qualitative indexes is included in this stage. The scientific literature frequently refers to the five Cs: capacity (to pay back), character (willingness to pay back), capital (assets), collateral and conditions (environmental situation) [19, 20, 21].

The **controlling** process includes the monitoring of the fulfillment of plans, bank strat-

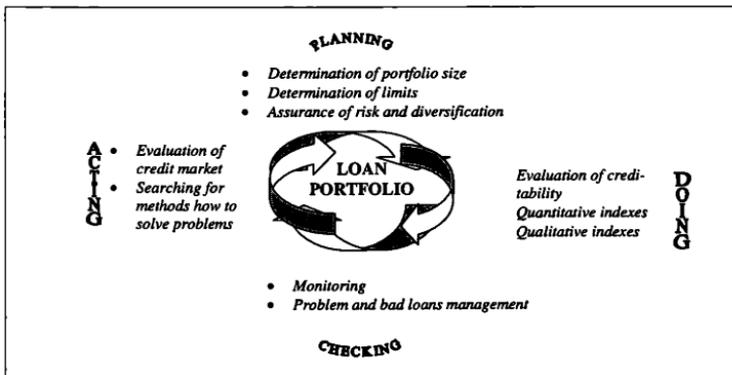


Fig. 2. The cycle of loan portfolio management

egy, credit culture, control of every loan and all portfolio, and especially risk identification. Activities with problem and bad loans are also performed in this stage [15].

The **acting** helps banks to find ways and methods to reduce the total size of bad and problem loans in the whole loan portfolio and to find more profitable and less risky crediting activities.

### **Multicriteria framework of financial decisions of bank loan portfolio management**

In every stage of the Cycle of Loan Portfolio Management there are financial decisions to be made regarding the issues to be considered on that stage. The consideration of the issues and the evaluation of the special criteria, requires a multidimensional approach, which should be applied for an effective portfolio management. However, the most obvious application of multidimensional approach is required in the Planning and Doing stages.

By multicriteria we mean multiple criteria with three or more objectives. In finance, the two-objective situation of risk versus return, has been traditionally analysed, i.e. the risk-return efficient frontier and the necessity to trade off the risk against return in order to achieve an optimal solution. The difficulty encountered as we transit from two to three or more criteria is that the "efficient frontier" is no longer a frontier but becomes a surface. While it is possible to parameterize a frontier, it is not possible to parameterize a surface. This then leads to the methods and techniques of MCDA (multi-criteria decision analysis or multiple criteria decision aid).

The multidimensional approach may be applied not only as a tool for achieving the conflicting fundamental goals and objectives,

but also it may be successfully applied in the in-depth analysis with the decomposition of internal criteria of the problem.

Risk evaluation could be an example of analysis with internal decomposition where the multicriteria approach may be used. According to most researchers possibility of the philosophy of risk, risk is the potential that events, both expected and unexpected, may have an adverse impact on the bank's earning or capital. Scientists have defined nine categories of risk: credit, interest rate, liquidity, transaction, compliance, strategy, reputation and also country and transfer risk. These risks are not mutually exclusive, because any bank product or service may expose the bank to multiple risks. The key challenge in managing risk and portfolio is to understand the interrelationships of the nine risk factors. Often risks will be either positively or negatively correlated to one other. Actions or events will affect correlated risks similarly. When two risks are negatively correlated, reducing one type of risk may increase the other. Risk evaluation in management decisions is usually used as an aggregated criterion, but for an appropriate evaluation of the risk level an MCDM technique should be used in order to have an objective support for decision-making.

According to the application stage and the methodological approach, the multicriteria application could be classified on the methodological basis.

**Goal programming.** GP is useful in financial planning, because many financial criteria can be expressed in terms of goals. This is the primary stage of multicriteria framework application. In recent works there has been presented a two-stage GP applied to the assets and liability management in a bank [10], including multiple goals such as expected profit,

risk, liquidity, capital adequacy, growth, customer relationships and other aspects of a bank's operations.

**Multiple objective programming.** In multiple objective programming, we compute or sample an efficient set and present the results, in whole or in part, to a decision maker for selection of the final solution. In early works scientists have focused the attention on the bank's financial planning, with multiple objective programming models [16]. The models covered portfolio analysis from a multiple objective perspective, commented on the possibility of multiple objectives beyond risk and the bi-criterion risk–return efficient frontier [9].

**Multi-criteria Decision Analysis (MCDA).** Multi-criteria decision analysis (MCDA) refers to the family of methods addressing multiple criteria problems for in-depth analysis.

Despite the many simplifying single-criterion “bottom line” or bicriterion “risk–return”, the world of finance, particularly in its most important and complex managerial aspects, resides fundamentally within an environment of multiple (i.e. more than two) conflicting objectives. One major affected area is, of course, contemporary portfolio selection where, beyond risk and return, additional criteria such as to maximize upper-tail skewness, maximize liquidity, minimize the number of securities in the portfolio, and maximize perhaps the social responsibility quotient may well be present. The significance here, as in any other area whose theory is directly tied to the risk–return efficient frontier, is that the efficient frontier is no longer a curvilinear line segment, but must now be thought of as a surface. Because of the challenge posed by multiple objectives to the theory of conventional risk–return efficient-frontier finance [17], the research opportunities in exploring the application of the multicriteria technologies in fi-

nance appear at this time to be particularly substantial.

Overall, the main advantages that the MCDA paradigm provides in loan portfolio management decision making, could be summarized in the following aspects:

- 1) the possibility of structuring complex evaluation problems
- 2) the introduction of both quantitative (i.e. financial ratios) and qualitative criteria in the evaluation process
- 3) transparency in the evaluation, allowing good argumentation in financial decisions
- 4) the introduction of sophisticated, flexible and realistic scientific methods in decision-making process.

This article shows the implementation of multicriteria framework based on the Multiple Objective Programming integrating the third objective – liquidity to the traditional risk–return frontier.

### **Coordination of main objectives for loan portfolio management**

As every profit-seeking organization, a bank is trying to have the highest profits by managing its loan portfolio. But for a successful and reliable activity and in a long-term perspective, the profits are not enough for a commercial bank, as it is even more important to assure bank's liquidity to fulfill its obligations every moment it may be necessary. And undoubtedly, besides the mentioned two principles of profitability and liquidity, it is of high importance for a bank to be safe, i.e. to minimize its risk [20, 21] (see Fig. 3).

It is rather difficult to find the optimal interrelation of these factors due to their contradictory nature [12, 20, 21]:

- wishing to achieve a higher profitability, a bank must maximize the quantity of the long-term loans (higher percents);
- wishing to keep required liquidity, a bank must optimize (maximize) the quantity of short-term loans;
- wishing to assure safety, a bank has to be selective in choosing its clients.

Depending on the situation, every single bank may prefer one or another objective to the rest.

The main tasks for an effective loan portfolio management is the effective usage of credit funds achieving the maximum benefit with minimum inputs for a bank (the highest economic effect) and also by providing clients with the most favorable conditions for their business developments.

### Interaction of principles and the process of loan portfolio management

We predict that the principles of profitability, liquidity and safety should be included in and their influence should be estimated within all stages of loan portfolio management. The interaction of these factors is shown in a matrix form in Fig. 3.

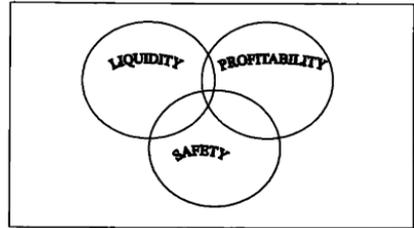


Fig. 3. Main objectives for loan portfolio management

Summarizing the above, an effective process of loan portfolio management should include the stages of planning, doing, checking, and acting, and in every stage evaluation and coordination of profitability, liquidity and safety should be performed. The evaluation of these criteria requires a multidimensional approach; therefore the methodological framework of MCDA is well-suited to the growing complexities encountered in financial decision-making, which requires appropriate support for financial decisions. As a result of this study, an integrated loan portfolio management model with a two-layer multicriteria framework application may be proposed (Fig. 5). It should be recognized that financial decision problems

	<i>Planning</i>	<i>Doing</i>	<i>Checking</i>	<i>Acting</i>
<i>Profitability</i>	Foresight of most profitable crediting fields and their size	Crediting of most profitable fields	Evaluation of crediting fields and their size	Evaluation of market and search for more profitable crediting fields and products
<i>Liquidity</i>	Bank's cash flow management	Using the bank funds	Control of funds usage and balancing bank's cash flow	Analysis of bank funds
<i>Safety</i>	Mitigation of risk by determining the lowest and the highest credit risk points	Assurance of risk management	Monitoring for identification of increased risks. Problem and bad loan management	Search for more effective methods of risk management and problem loan reduction

Fig. 4. Interaction of principles and process of loan portfolio management

in loan portfolio management are of a multi-dimensional nature.

Therefore the third fundamental goal, liquidity, is incorporated in the portfolio management model applying the Multiple Objective Programming method. This results in a shift from the traditional risk–return frontier to a three-goal surface, where each fundamental goal has an intersection area with the other two.

goals should be evaluated using the MCDA methodology.

### Conclusions

Crediting activity is the core business for most of commercial banks. To ensure an efficient management of the bank loan portfolio, according to scientific studies and practical ex-

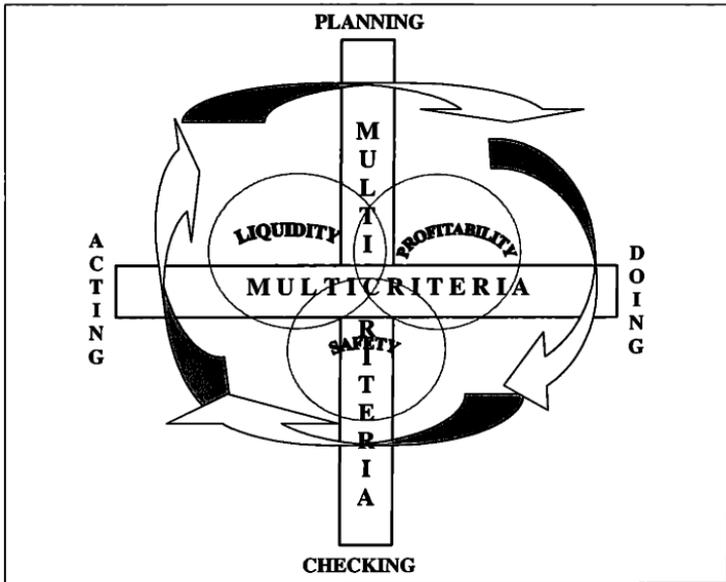


Fig. 5. Integrated loan portfolio management model with the multicriteria framework

The second adaptation of the multicriteria framework is applied at each step of the management cycle. Evaluation of profitability, liquidity and safety at each step of the management cycle also requires a multidimensional approach. The fundamental goals have their subgoals with possible internal conflicts. Therefore the achievement of fundamental

aminations a bank should possess credit culture, know the portfolio objectives, lending policies and procedures and an internal credit review process.

Loan portfolio management may be approached using Deming's Plan-Do-Check-Act Cycle, which is a set of activities designed to drive continuous improvement. The planning of the

loan portfolio includes determination of the bank's loan portfolio size and limits and assurance of risk diversification. The stage of doing involves the loan granting process starting from the request for a loan and leading to the signing of a loan agreement. The checking process includes monitoring the fulfilment of plans, bank strategy, credit culture, control of every loan and of the whole portfolio, and particular risk identification. The acting helps banks to reduce the total volume of bad and problem loans in the whole loan portfolio and to find more profitable and less risky crediting ways of activities.

An effective process of loan portfolio management should include stages of planning, doing, checking, and acting, and in every stage the evaluation and coordination of profitability, liquidity and safety should be performed. The evaluation of these criteria requires a multidimensional approach, therefore the methodological framework of MCDA is well-suited to the growing complexities encountered in financial decision-making, which requires an appropriate support for financial decisions.

The current study has revealed the contribution of MCDA to solving financial decision-

making problems, focusing on the verification of the multidimensional character of an effective process of loan portfolio management and the use of different MCDA methodologies to support it.

The MCDA methods seem to have a promising future in the field of financial management and particularly in portfolio management, because they offer a highly methodological and realistic framework to decision problems. Nevertheless, their success in practice heavily depends on the development of computerized multicriteria decision support systems. Financial institutions acknowledge the multidimensional nature of financial decision problems. Nevertheless, they often use optimization or statistical approaches to address their financial problems, MCDA methods to support real financial decision-making, calls upon the development of integrated user-friendly multicriteria decision support systems specifically designed to address the problems of an effective loan portfolio management. The development and promotion of such systems is the key issue in a successful application of MCDA methods in finance.

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## **BANKO PASKOLŲ PORTFELIO VALDYMO MULTIKRITERIJAI**

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**S a n t r a u k a**

Straipsnio tikslas – atskleisti daugiakriterinio metodo taikymo įtaką banko paskolų portfelio valdymui. Straipsnio autoriai išsamiai atskleidė problemas, kodėl turi būti analizuojamas paskolų portfelio valdymas, bei remdamiesi Demingo ciklu išskyrė pagrindinius banko paskolų valdymo etapus. Straipsnyje taip pat supažindinama su daugiakriterinio metodo koncepcija ir šio metodo taikymo ypatumais. Daugiakriterinio metodo taikymas banko paskolų portfeliiui valdyti teikia gali-

mybę išplėsti vertinamų fundamentaliųjų kriterijų skaičių, pereinant nuo klasikinio „pelno–rizikos“ įvertinimo prie platesnį integruotą požiūrį atspindinčio trijų kriterijų modelio. Įvestas trečiasis kriterijus – likvidumas padeda užtikrinti paskolų portfelio valdymo efektyvumą. Straipsnio autoriai pateikia modelį, kuriame yra integruoti minėti kriterijai, geriausiai atspindintys paskolų portfelio valdymo tikslus, bei daugiakriterinio metodo taikymo principai.

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