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ANALYSIS OF INTERDEPENDENT RISKS OF INVESTMENT BANKING: IMPLICATIONS FOR FINANCIAL STABILITY AND EFFICIENCY

ДОСЛІДЖЕННЯ ВЗАЄМОЗАЛЕЖНИХ РИЗИКІВ В ІНВЕСТИЦІЙНІЙ ДІЯЛЬНОСТІ БАНКІВ: ІМПЛІКАЦІЇ ДЛЯ ФІНАНСОВОЇ СТІЙКОСТІ ТА ЕФЕКТИВНОСТІ

Summary. Risk management in banks' investment activities is increasingly relevant amid market volatility and systemic uncertainty. Traditional approaches often ignore the interaction between risks, limiting management effectiveness. This study aims to enhance risk management by considering the cumulative impact of transformation, credit, interest rate, and default risks. A refined classification and quantitative framework are proposed. Findings highlight the key role of transformation risk in interest rate exposure and the importance of balanced resource strategies. Empirical evidence shows that rising default risk, if uncompensated by returns, reduces investment efficiency. Quantitative models help identify critical risk points, while decision-making quality proves vital for financial resilience and stability.

Keywords: investment banking; risk management; transformation risk; investment efficiency; default risk; financial stability; risk superposition effect; quantitative modeling.

Анотація. Управління ризиками в інвестиційній діяльності банків набуває особливої актуальності в умовах зростаючої нестабільності фінансового ринку. Традиційні підходи до аналізу ризиків демонструють обмежену ефективність через ізольоване розглядання окремих ризиків без урахування їхньої взаємодії. Це ускладнює формування адекватних стратегій ризик-менеджменту та знижує ефективність банківських інвестицій. Особливої уваги потребує феномен ризикової суперпозиції, який описує сукупний вплив взаємопов'язаних ризиків на функціонування банківських установ. Дослідження спрямоване на теоретичне обґрунтування та прикладне вдосконалення підходів до управління ризиками інвестиційної діяльності банків. Метою є перехід від фрагментарного до системного підходу, що враховує взаємозв'язки між ризиками, зокрема трансформаційним, кредитним, процентним та ризиком дефолту, а також їхній вплив на фінансову результативність. Серед завдань – розробка класифікації ризиків, визначення критичних детермінант, побудова кількісної моделі оцінки ефективності та формулювання практичних рекомендацій. Встановлено, що трансформаційний ризик, як наслідок невідповідності строковості активів і пасивів, є ключовим чинником формування процентного ризику. Структура ресурсної бази банку, виявляється, відіграє критичну роль у забезпеченні ефективного управління ризиками. Доведено, що ефективність інвестиційної діяльності зумовлена не лише прибутковістю активів, а й здатністю банку підтримувати оптимальний баланс між ризиком, дохідністю та стратегічною гнучкістю. Емпіричні дані свідчать про наявність прямого зв'язку між рівнем ризику дефолту та ефективністю інвестицій: за умов зростання ризику без відповідної компенсації доходом відбувається погіршення фінансових результатів. Моделювання з використанням параметрів волатильності, левериджу та «часу до дефолту» дозволяє виявити критичні точки у динаміці ризиків і запровадити превентивні антикризові заходи. Індикатор очікуваної втрати доцільно застосовувати як механізм раннього попередження для регуляторного втручання. Дослідження також підтверджує релевантність гіпотез «поганого менеджменту», «поганої вдачі» та «зворотного впливу ефективності», які демонструють прямий зв'язок між якістю управлінських рішень та фінансовою стійкістю банку. Таким чином, підвищення якості ризик-менеджменту не лише забезпечує прибутковість, а й формує основу довгострокової стабільності банківської системи.

Ключові слова: інвестиційна діяльність банків; управління ризиками; трансформаційний ризик; ефективність інвестицій; ризик дефолту; фінансова стабільність; ефект ризикової суперпозиції; кількісне моделювання

Problem statement. The relevance of this study is grounded in the critical importance of risk management in banking investment activity, particularly under conditions of heightened market volatility and growing systemic complexity. Traditional approaches to risk assessment have demonstrated substantial methodological limitations, as they often consider individual risks in isolation, neglecting the interdependent nature of financial risks. This oversight, known as the risk superposition effect, significantly constrains the understanding of how combined risk exposures influence the performance and stability of banking institutions.

A core issue lies in the fragmentation of risk analysis. Conventional models frequently disregard the dynamic interactions among various categories of financial risk, resulting in partial and potentially misleading assessments. In particular, the absence of empirically validated frameworks undermines the ability to draw robust conclusions regarding the relationship between accepted levels of investment risk and the efficiency of strategic decision-making in banks. This gap is further complicated by the lack of integrated models capable of reflecting the multifactorial structure of banking risk in real-world settings.

Furthermore, empirical evidence suggests that investment efficiency is determined not solely by the profitability of individual assets, but also by the bank's capacity to maintain a strategically balanced relationship among expected return, risk exposure, and adaptability in resource transformation. Notably, rising levels of financial risk, especially default risk without commensurate compensation in returns, are empirically associated with deteriorating performance metrics. This highlights the importance of continuous calibration of risk-return strategies to maintain investment efficiency of banking.

These challenges underscore the urgent need for a systemic approach to risk assessment and management. The development of comprehensive analytical models that incorporate interrelated risk parameters and account for structural asymmetries in bank operations is essential. Addressing these methodological and strategic gaps will not only strengthen the effectiveness of bank's risk-based investment decisions but also contribute to the long-term resilience and stability of the banking system in overall.

Analysis of recent research and publications. The issue of evaluating the effectiveness of investment banking has been widely explored in both domestic and international research. Practical aspects of IB have been addressed by foreign researchers like Nicholas Apergis [8], A. Damodaran [11], Arthur H. Gilbert [9], Estelle Brack [10], Ramona Jimborean [10] and Fred H. Hays [9]. Domestic scholars, including Andriychuk V. [12], Krykliy A. [13], Moroz L. [1], Bezrodna O. [14], Lutsiv B. [3] and Klioba H. [2], have contributed to the development of theoretical foundations for IB, provided practical recommendations for its effective implementation, and proposed strategies for managing investment risks. Despite the extensive body of work in this area, several issues remain unresolved, particularly the need for a deeper investigation into the theoretical and methodological foundations for improving IB effectiveness and refining its conceptual framework. The ongoing relevance of these issues has shaped the focus, objectives, and tasks of the current research.

The purpose of the article. The study aims to enhance the theoretical foundations and practical approaches to risk management in banks' investment activities, focusing on the interconnections and cumulative effects on their overall effectiveness. It emphasizes the need for a shift from isolated risk analysis to a systemic approach that incorporates the risk superposition effect. Additionally, it advocates for developing tools to quantitatively assess the relationship between accepted risk levels and investment performance.

Key objectives include:

1. Investigating the nature and structure of risks associated with banks' investment activities in the context of current financial market conditions and external economic instability.
2. Identifying and classifying investment risks based on their potential to create interrelated effects (risk factors and risk outcomes).
3. Analyzing the role of transformation risk as a key determinant of interest rate risk, and exploring the significance of the resource base structure in the risk management framework.
4. Examining the connection between default risk levels and investment performance, considering asset volatility, leverage, and the "time to default" indicator.
5. Evaluating the impact of managerial decision quality on a bank's financial stability, specifically in relation to the hypotheses of "bad management," "bad luck," and "reverse causality of efficiency."
6. Proposing recommendations for the development of comprehensive risk management systems that improve the efficiency of banking investment activities and strengthen financial stability.

The study highlights the urgent need for systematic risk management strategies that account for the interdependencies between risks and promote stability in the banking sector.

Summary of the main research material. One critical aspect of banking risk management involves logically grouping risks based on their characteristic features. This grouping allows for the clear identification of each risk's position within a broader classification system and assists in selecting effective strategies for minimizing and neutralizing risks.

L.V. Moroz, in the article [1, p. 223] underscores the escalation of interest rate risk, which compounds price risk. The researcher argues that inappropriate changes in the structure of resource and asset portfolios can lead to bank losses and reduced operational

effectiveness. We agree with this view and suggest that an excessively high resource transformation ratio may increase interest rate risk more than fluctuations in the capital market. Specifically, when short-term resources likely to be withdrawn early are transformed into long-term assets, banks must be prepared to raise funds in the next period to replace those early withdrawals. This results in additional operational costs and higher deposit interest rates as a cost for urgent resource mobilization.

Meyer Aaron, an investment fund advisor at the Bank of Canada, and Jim Armstrong in their research [15] highlight the escalation of credit and investment risks as a consequence of management risk. They argue that banks face risks by applying credit risk models designed for large corporations, which are based on methodologies for assessing individuals and small businesses. The paper notes that the unique nature of corporate activities and their responses to market fluctuations create new types of risks that cannot be accurately assessed using traditional methods. We agree with this perspective and assert that banks engaged in corporate financing face both domestic and international risks, stemming from the countries the bank operates in and from the location of the corporation's parent capital. Therefore, evaluating expected cash flow deviations should incorporate the "beta" indicator for the relevant market. This would enhance the objectivity of investment risk assessments and improve bank investment efficiency by reducing losses resulting from discrepancies between expected and actual cash flows. Furthermore, adapting risk assessment systems can help mitigate the impact of irrational management.

L. Klioba in his study [2, p. 23] suggests that investment risk arises from an imbalance between profitability, liquidity, and capital growth. She hypothesizes that high-profit investment activities are unfeasible without exceeding an acceptable risk threshold. To enhance operational effectiveness, investment priorities should shift towards less profitable and riskier assets. While we agree that increased risk may reduce investment effectiveness, we also believe that flexible investment strategies and timely managerial decisions can mitigate return volatility, especially when assets are held only during periods of maximum income generation, thus avoiding unforeseen losses.

B. Lutsiv and O. Zaslavska in their study [3, p. 23] argue that the activities of securities issuers and borrowers pose the primary risk in credit and investment activities, warranting strict control and regulation to prevent losses from defaults. The authors assert that the key to minimizing risks lies in adhering to credit and investment risk norms. While we acknowledge the importance of controlling defaults, we disagree with the idea that the primary risk stems solely from defaults. The effectiveness of investment activity is instead determined by the relationship between profit and the risk the bank accepts. We believe that the initial risk level of an asset is shaped during the resource transformation phase, and the bank can reduce this risk by attracting low-cost, long-term resources. These actions can neutralize part of the risk during resource formation and restructuring, ultimately enhancing investment activity effectiveness.

I. Kryvtsun and O. Kutnyk in their work [4, p. 107] highlight the effectiveness of asset sales in managing liquidity risk, a consequence of ineffective investment banking operations. They argue that the ability to quickly liquidate assets enhances liquidity and ensures the bank can meet its obligations.

We agree with the assertion that freeing up resources reduces investment risk. However, achieving this objective involves more than just selling low-yield and high-risk assets to increase liquidity. This should be an intermediate measure to mitigate overall risks. The next step involves altering cash flow characteristics, such as cost, term, and volume, to allow for more effective reinvestment. This process should be short-term, involving the redistribution of funds and combining them with other cash flows in line with market conditions. In the event of potential fund withdrawals by depositors, the bank should terminate the deposit agreement and raise new funds, comparing the losses from early contract termination with the expected gains from reinvestment under new terms.

Through an analysis of existing scholarly works on the nature and classification of investment risks in banking, significant discrepancies were identified regarding the sources and effects of these risks on investment activity. After reviewing the risk types proposed by both domestic and international scholars, we suggest augmenting their classification with additional risk categories, as presented in Table 1:

The interaction of various risk events and their mutual influence leads to a cumulative increase in a bank’s losses. As a result, it is crucial to develop a risk management strategy that accounts for the interdependence of individual risk events. The aim should be to achieve an additive, rather than multiplicative, effect when one risk event influences another. Banking risks rarely occur in isolation, and their combination can lead to a multiplicative, rather than an additive, impact. In managing investment risks, it is important to analyze the potential interactions between different risks, as identified in research.

Risk combinations in banks are particularly relevant to financial risks linked to changes in the ratio between assets and liabilities, such as liquidity and capital stability risks. Studies on the nature of financial risks suggest that other risks mainly serve as factors contributing to these two primary types of risk. Based on this, risks can be classified into two categories: risk factors and risk outcomes. Risk factors influence deviations between actual and expected cash flows, which in turn cause changes

Table 1 – Additional types of risks inherent in the investment activities of banks

Risk type	The economic essence of risk
Risk of missed profit	The potential emergence of a situation in which investments in securities yield an expected return significantly lower than the potential returns from credit investments. When a bank invests funds in securities, it diversifies its assets. However, by prioritizing this type of investment, despite the ability to place funds on more favorable credit terms, the financial institution loses part of its potential profit.
Risk of choosing an unobjective basis for determining the cost of the attracted funds	This type of risk arises when a bank uses a floating interest rate for an investment loan (like convertible note). Financial institutions are free to select base indicators for calculating the variable interest rate on the loan. Key base indicators include the National Bank's discount rate, UIRD, LIBOR, and others. However, the rate chosen by the bank may fail to objectively reflect the key trends in the deposit market of the bank's home country.

Source: developed by the author

in the bank's financial results, assets, and liabilities. These include interest rate, currency, credit, deposit, and investment risks. The direct impact of these risks is reflected in cash flows, while their indirect impact is seen in changes to assets and equity [5, p. 36].

Understanding the interconnections between different types of investment activity risks provides a foundation for mathematical analysis and modeling. This enables the calculation of potential losses arising from unfavorable market conditions. Identifying a common basis for all types of investment risks is essential for effective analysis and management. This foundation should be integrated into the bank's risk management system and influence the choice of analytical methods. Additionally, distinguishing between internal and external risks requires different analytical approaches to address the situation. Systemic risks are more limited in terms of their impact, but measures to control internal risks can enhance a bank's resilience to systemic risks. As a result, this study will primarily focus on the management of internal investment risks in banking.

The environment in which banks operate necessitates a balance between strict security standards and operational efficiency. Financial regulators emphasize the importance of maintaining banking sector stability by identifying high efficiency and low risk as the principal determinants for achieving this objective.

In the studies of foreign scholars, the significance of risk assessment is widely acknowledged. However, risk is typically analyzed in isolation from the productivity of banking institutions. The European academic community notably lacks sufficient evidence in the form of economic-mathematical models and empirical results that directly demonstrate the relationship between accepted risk levels and investment efficiency. As a result, the impact of risk often remains hidden within datasets produced through modeling processes. Scholars have not consistently isolated the risk component as a critical factor influencing the outcome of banks' investment activities. Moreover, the distinction between internal and external risks is challenging to determine without the support of additional analytical instruments.

For the purpose of analysis, Emmanuel Mamatzakis [6] applied a set of indicators to assess both risk (e.g., earnings per share relative to leverage, operational volatility, default risk) and investment efficiency (e.g., ratio of profit to costs of capital formation and operations). He proposed that default risk should be evaluated as a combination of different types of risk that may materialize simultaneously in unfavorable market or macroeconomic conditions. To enhance objectivity, the model was modified to include the default factor in the mathematical equation. Furthermore, the model was tested on European banking systems at various stages of financial development. It was emphasized that a well-developed financial system enhances investment efficiency while also contributing to lower risk levels. Accordingly, the role of the state and its financial policy was incorporated into the analysis.

We agree with the assertion that government actions and internal economic policy exert a substantial influence on banks' investment efficiency. Through the application of monetary instruments, the state adjusts the cost of capital, its availability in the market, and stimulates monetary demand. Moreover, targeted financing of specific economic sectors shapes the direction of banks' investment activity and provides a degree of certainty in the implementation of credit programs.

Considering previous research and conclusions about the relationship between investment efficiency and default probability, we emphasize that the instability factor fundamental to nearly all forms of investment risk is best measured using the standard deviation indicator.

The primary indicators that researchers focus on when assessing investment risk in banking are the expected cash flows from investment operations. In this context, the bank can forecast potential losses and adjust its investment strategy and resource allocation based on the anticipated return on investment. Consequently, the composition of the investment portfolio may be revised in accordance with projected market fluctuations. With access to forecast data, the bank can mitigate potential losses and, in turn, enhance the profitability of its assets, thereby increasing investment efficiency.

By calculating portfolio volatility, analysts determine the ratio between the nominal return on assets and the associated risk. This metric is foundational in identifying the impact of risk on the efficiency of investment activities in the banking sector. Accordingly, given the specifics of portfolio volatility analysis, the nominal return of a new asset must be compared not only to its individual risk level but also to the overall change in portfolio risk (delta risk) that results from incorporating the new asset. This principle applies to both investment and loan portfolio assessments.

Based on the recommendations we present, it can be concluded that an increase in risk does not necessarily correspond to a decline in investment efficiency. If portfolio volatility increases in direct proportion to profitability, the efficiency measure remains unchanged. The opposite is observed when increasing risk is accompanied by declining portfolio profitability.

The relationship between banks' risk levels and their investment efficiency has been explored through an alternative approach involving hypothesis formulation and empirical testing. Allen Berger and Robert DeYoung [7] propose that a bank's capital volume, combined with its credit risk exposure, significantly determines the efficiency of its lending and investment activities. They introduce four key hypotheses: "bad management," "bad luck," "skimping," and "moral hazard." Their findings suggest that cost inefficiency is a primary indicator of non-performing loans, with a causal link between inefficiency and loan quality deterioration particularly acute in transitional economies, where weak internal management is compounded by systemic banking sector deficiencies [7, pp. 4–5].

To further examine the risk-efficiency nexus, three hypotheses were empirically tested using econometric modeling:

a) Hypothesis 1: Rising Default Risk Increases Operational Inefficiency

This hypothesis, grounded in DeYoung's "bad luck" theory, asserts that increasing default risk leads to diminished operational efficiency. As banks face heightened risks, management tends to allocate more resources toward risk-monitoring systems, raising overall expenditures. This shift diverts attention from revenue generation toward income stabilization. When default risk is acute, managerial focus pivots entirely to avoiding collapse, even at the cost of acquiring capital under suboptimal terms. Consequently, operational efficiency deteriorates.

In our opinion, two factors critically influence this dynamic:

- The extent of regulatory support extended to the distressed bank;
- The volume of loan-loss reserves accumulated during the bank's prior operations.

Regulatory refinancing and pre-established reserves can mitigate adverse outcomes and allow management to pursue new investment avenues. Additionally, if management successfully removes problematic assets while retaining profitable investments, investment efficiency may improve even without new operations.

b) Hypothesis 2: Operational Inefficiency Increases Default Risk

This hypothesis builds on Berger and DeYoung's "bad management" theory and explores the reverse causality inefficiency as the driver of default risk. The authors argue that poor internal controls and weak oversight of operational performance impair a bank's ability to detect early warning signs of excessive risk exposure. Inefficient risk management may lead to investments in low-return, high-failure-probability projects.

As these investment decisions mature, the underlying flaws manifest in reduced revenues or unanticipated losses. We fully agree with this hypothesis, as it highlights how systemic mismanagement not external shocks can directly lead to default. Unlike Hypothesis 1, which attributes inefficiency partly to external conditions, this view underscores internal managerial failures as the primary cause.

c) Hypothesis 3: Reducing Inefficiency Increases Default Risk

This counterintuitive hypothesis suggests that enhancing operational efficiency may, under certain conditions, increase a bank's default risk. According to the authors, shareholder pressure may compel managers to expand high-risk asset holdings. To mitigate associated losses, managers reduce operational and capital costs, inadvertently increasing risk exposure.

Empirical analysis confirmed a strong relationship between financial stability and operational efficiency in European banks. Specifically, high risk levels precede rising inefficiency. The authors introduced a predictive indicator estimating time-to-default, which they propose as an early warning signal for both financial instability and inefficiency. Regulators could utilize this metric to proactively adjust market and banking system dynamics. The indicator also suggests that excessive concentration in certain asset classes despite their low profitability can exacerbate systemic risk, thus justifying regulatory mandates for diversification and portfolio expansion, particularly in lending activities.

In our opinion, high-risk asset concentration often follows probabilistic modeling and expected value calculations. If expected returns are positive, even risky assets may be included in the portfolio. This method, akin to option pricing via decision-tree analysis, allows potential losses from failed investments to be covered by gains from successful

ones. Furthermore, when risk-taking is paired with reduced funding and operational costs, additional profit can be realized irrespective of individual investment outcomes. Hence, default risk may decline due to an increased buffer for absorbing losses.

Based on the analysis of the three hypotheses, we agree solely with the second hypothesis. An ineffective management system results in persistent inefficiencies, depleting the bank's resources and compelling managers to obtain funding at higher-than-market rates. These conditions reinforce the scenario described in Hypothesis 1, where management decisions exacerbate financial distress and hinder the generation of new revenue streams. A prolonged focus on maintaining underperforming assets ultimately increases the likelihood of default.

Thus, in the course of their investment activities, banking institutions encounter various types of risks that must be promptly identified and mitigated to reduce their adverse effects. Accordingly, risk management should be conducted systematically, distinguishing between strategic, tactical, and operational methods of influence. When developing a framework for neutralizing banking risks, it is essential to consider the opportunities and threats present in the financial market environment, the bank's internal strengths and weaknesses, as well as the specific objectives of banking management.

Conclusions. The analysis of current scientific studies confirms that investment risks in banking should be viewed as interconnected rather than isolated phenomena. Their combined influence can generate a superposition effect, which necessitates a revised classification distinguishing between risk factors (such as currency, credit, interest rate, and investment risks) and risk outcomes (including liquidity and capital adequacy). This approach provides a more comprehensive understanding of how various risks affect banking performance.

A key finding highlights the significance of transformation risk, arising from mismatches in the maturity structure of assets and liabilities. Unlike traditional views that prioritize market fluctuations, this research shows that the structure of a bank's resource base plays a more decisive role in shaping interest rate risk, underscoring the importance of asset-liability management.

Furthermore, investment efficiency depends not only on the profitability of individual assets but also on maintaining a balanced relationship between expected returns, associated risk, and the adaptability of the bank's resource transformation strategy within a specific market context. Empirical results also indicate a strong correlation between default risk and operational efficiency. When risk levels rise without a corresponding increase in asset returns, overall efficiency tends to deteriorate, highlighting the need for timely adjustments in bank management strategies.

The application of economic-mathematical models that incorporate parameters such as volatility, leverage, and time-to-default indicators enables early detection of critical risk dynamics and supports the development of preventive measures. In particular, the expected loss indicator can serve as an effective early warning signal for regulatory intervention.

Finally, the analysis of competing hypotheses namely "bad management," "bad luck," and the "reverse effect of efficiency" demonstrates that the quality of managerial decision-making has a direct impact on financial stability. Sound management not only enhances profitability but also plays a pivotal role in strengthening the bank's resilience during periods of crisis.

Further research should focus on strengthening the methodological basis for assessing investment risks in the banking sector. A key direction involves formalizing risk interdependencies through mathematical models that capture the interplay and cumulative effects of various investment risks on banking efficiency.

Equally important is the differentiation between factor and outcome risks. This distinction requires empirical validation across diverse banking systems and adaptation of risk assessment models to country-specific regulatory and financial conditions.

Enhancing early warning models of bank default is another priority. These models should integrate the structure of assets and liabilities and incorporate risk indicators into broader financial stability monitoring systems to improve predictive accuracy.

Lastly, developing composite risk indicators remains essential. Such tools can offer a comprehensive view of a bank's risk profile and support strategic decision-making in environments of macro-financial instability and regulatory uncertainty.

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