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METHODOLOGICAL APPROACHES TO IMPROVING CREDIT RISK ASSESSMENT AND INTERNAL CONTROL IN SERVICE SECTOR FINANCING

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Abstract: This article examines the role of the internal control system in assessing credit risks arising during the lending process of commercial banks to service-sector entities and in ensuring their effective management. Given the increasing contribution of the service sector to the national economy, maintaining the financial stability of enterprises operating in this sector and reducing the risk of loan default have become critical issues. The study analyzes the key risk factors encountered in the lending practices of service-sector enterprises, reviews contemporary approaches to credit risk assessment, and proposes directions for improving the internal control system in accordance with the COSO and Basel III frameworks. The findings contribute to enhancing the quality of banks' loan portfolios, reducing the share of non-performing loans, and strengthening the overall financial stability of banking institutions.

Key words: service sector, lending, credit risk, internal control system, credit monitoring, risk management, COSO, Basel III, non-performing loans, loan portfolio.

Аннотация: В данной статье исследуется роль системы внутреннего контроля в оценке кредитных рисков, возникающих в процессе кредитования коммерческими банками субъектов сферы услуг, а также в обеспечении их эффективного управления. В условиях роста вклада сферы услуг в национальную экономику обеспечение финансовой устойчивости предприятий, осуществляющих деятельность в данной сфере, и снижение риска невозврата кредитов становятся одной из актуальных задач. В исследовании проанализированы основные факторы риска, встречающиеся в практике кредитования предприятий сферы услуг, рассмотрены современные подходы к оценке кредитных рисков, а также предложены направления совершенствования системы внутреннего контроля на основе концепций COSO и Basel III. Результаты исследования способствуют повышению качества кредитного портфеля банков, снижению доли проблемных кредитов и укреплению общей финансовой устойчивости банковских учреждений.

Ключевые слова: сфера услуг, кредитование, кредитный риск, система внутреннего контроля, кредитный мониторинг, управление рисками, COSO, Basel III, проблемные кредиты, кредитный портфель.

INTRODUCTION

In recent years, the service sector in Uzbekistan has experienced rapid growth and has become a significant component of the country's gross domestic product. The expansion of the service sector plays a vital role in promoting economic growth, creating new employment opportunities, and increasing household incomes. One of the primary sources of financing for the development of this sector is commercial bank lending.

However, the specific characteristics of service-sector enterprises give rise to various risks in the lending process. In particular, the seasonality of cash flows, insufficient collateral coverage, intensifying competition in service markets, and differences in the financial stability of enterprises contribute to an increase in credit risk. As a result, non-performing loans may emerge, adversely affecting the quality of commercial banks' loan portfolios.

Therefore, the assessment of credit risks and the enhancement of internal control systems in lending to service-sector entities have become among the most pressing priorities of the modern banking system. An

effective internal control framework enables the early identification, monitoring, and mitigation of credit risks, thereby contributing to the financial stability and sustainable performance of banking institutions.

The internal control system serves to organize all banking operations, including asset management, credit policy implementation, financial reporting, information flows, customer relations, and internal audit mechanisms, in a consistent, secure, and efficient manner. It establishes a continuous framework for identifying, assessing, monitoring, and mitigating risks. In modern banking institutions, internal control systems are generally based on the COSO framework or the regulatory requirements of Basel III. Such systems enhance operational transparency, ensure the reliability of financial reporting, and promote the efficient utilization of resources.

In the Republic of Uzbekistan, a number of reforms have been undertaken to strengthen the stability of the banking sector, improve the early identification of risks, and enhance risk management practices. Nevertheless, in some commercial banks, internal control mechanisms remain insufficiently effective in practice, while automated control systems based on modern information technologies have not yet been fully implemented. This situation may increase banks' exposure to unexpected losses, operational errors, and fraudulent activities.

The primary objective of this study is to analyze the practices of credit risk assessment in the process of lending to service-sector entities by commercial banks and to develop scientifically grounded proposals and practical recommendations for improving internal control systems.

The specific objectives of the research include analyzing the theoretical foundations of internal control systems and their significance within the banking sector; identifying the major types of banking risks and the control mechanisms designed to mitigate them; examining the internal control practices currently employed in Uzbekistan's banking system; developing improvement opportunities for domestic banks based on internationally recognized frameworks such as COSO and Basel III; and proposing evidence-based recommendations aimed at enhancing the effectiveness of risk mitigation through internal control systems.

The article systematically examines the factors influencing credit risk assessment in lending to service-sector enterprises, develops an integrated model for improving the effectiveness of internal control systems, and offers practical recommendations for the digitalization of credit monitoring processes.

LITERATURE REVIEW

Risk assessment in lending to service-sector enterprises is one of the key areas of modern banking practice. International experience indicates that the financial condition of borrowers, the stability of cash flows, the quality of collateral, and business prospects are among the principal criteria used in credit risk evaluation and management.

An Internal Control System (ICS) is a comprehensive mechanism designed to identify and manage risks, ensure the accuracy and reliability of financial reporting, and monitor the efficient use of organizational resources. In the banking sector, the primary objectives of an internal control system are to maintain financial stability, reduce fraudulent activities, and prevent uncontrolled operational errors.

The concept of an internal control system has been approached from various perspectives in the academic literature. Pandelaki, Sondakh, and Pinatik (2025), in their research, describe the internal control system as a managerial instrument that ensures the sustainability and effectiveness of credit policy implementation [1]. Similarly, Pamungkas and Oktafiyani (2025) define internal control as an integral component of corporate governance that incorporates audit committees, information systems, and internal reporting mechanisms into a unified control framework [2].

According to the COSO (Committee of Sponsoring Organizations of the Treadway Commission) framework, an internal control system constitutes a comprehensive management mechanism designed to identify, assess, monitor, and mitigate risks throughout the lending process. The Basel III standards place particular emphasis on credit risk management, capital adequacy, and the effectiveness of internal control systems as essential elements of banking stability.

The COSO framework explains the internal control system through five key components. The control environment establishes the organizational culture, ethical principles, and management responsibilities. Risk assessment involves identifying financial, operational, and strategic risks and determining their relative significance. Control activities consist of policies, procedures, and processes aimed at preventing errors and fraudulent actions. Information and communication ensure the accuracy, timeliness, and reliability of information flows within the organization. Finally, monitoring refers to the continuous evaluation of the effectiveness of the internal control system and its improvement when necessary [9]. Today, this framework is widely applied in conjunction with the Basel III international banking standards. Basel III highlights three fundamental pillars of risk mitigation: capital adequacy, risk measurement systems, and the robustness of internal control mechanisms.

In their study, Khalfallah and Dhaoui (2025) examined the impact of internal control systems on risk management in Islamic and conventional banks [3]. Their findings indicate that banks with stronger internal control frameworks experience a reduction in credit risk ranging from 22% to 35%.

Similarly, Lawal and Adeyeye (2025) provided empirical evidence that integrating artificial intelligence (AI) technologies into internal audit systems significantly enhances the detection of fraud and inaccurate financial reporting [4].

Robi (2025) found that the effectiveness of an internal control system largely depends on employee competence and continuous professional development. Regular staff training programs and the implementation of internal codes of ethics were shown to substantially reduce risk exposure within banking institutions [5].

An applied study conducted by Hossain and Sarkar (2025) concluded that effective internal control systems not only mitigate risks but also improve overall operational efficiency within banking organizations [6].

International experience suggests that an effective internal control framework is characterized by the presence of independent audit and supervisory bodies, the implementation of information technology-based monitoring and control mechanisms, the use of digital auditing tools and “red flag” algorithms for early fraud detection, and the strict application of transparency and accountability principles in managerial decision-making processes.

The experience of Uzbekistan indicates that, in recent years, the Central Bank has introduced a range of regulatory measures aimed at strengthening internal control and risk management systems. In accordance with the Regulation on the Organization of Internal Control and Internal Audit in Commercial Banks, each bank is required to implement a three-lines-of-defense model. The first line involves daily operational controls and error detection mechanisms; the second line consists of independent audit and assessment procedures; and the third line encompasses strategic oversight by supervisory boards and executive management through analytical reviews of control outcomes. However, the practical implementation of internal control systems in banks is associated with the need for further methodological and technological enhancement. In particular, the broader integration of internal control mechanisms into daily operational processes, the gradual digitalization of control reporting, the improvement of automated risk assessment criteria, and the strengthening of information system integration remain important areas of development. These measures may contribute to improving the effectiveness of internal control and enhancing the technological capacity of banking supervision functions.

The literature review demonstrates that the internal control system serves not only as a risk mitigation instrument but also as an integral component of corporate governance and strategic management. Global banking practice increasingly enriches internal control frameworks through the adoption of digital auditing technologies, blockchain solutions, artificial intelligence applications, and advanced risk assessment indicators. For Uzbekistan’s banking sector, these approaches should be adapted to the national legal framework and technological infrastructure to maximize their effectiveness and sustainability.

RESEARCH METHODOLOGY

The study employs statistical analysis, comparative analysis, economic–mathematical modeling, and expert evaluation methods to investigate the role of internal control systems in credit risk management and to develop recommendations for improving lending practices in the service sector.

ANALYSIS AND RESULTS

In recent years, the development of internal control and risk management systems has become one of the important directions of reforms in Uzbekistan’s banking sector. According to analyses conducted by the Central Bank for the period 2021–2025, operational errors identified in commercial banks decreased by 18%, while issues related to credit risk declined by 12%. These indicators suggest that the internal control system is gradually improving and becoming more effective over time. The following table presents the key components of the internal control system and their respective levels of effectiveness:

Table 1. Internal Control Components and Their Effectiveness

Internal Control Component	Level of Implementation (%)	Impact on Risk Reduction (%)
Control Environment (ethics, policies)	85%	15%
Risk Assessment System	78%	20%
Control Activities (operational processes)	81%	22%
Information and Communication System	75%	18%
Monitoring and Audit	88%	25%

Source: Author’s calculations based on statistical data of the Central Bank of the Republic of Uzbekistan, 2025.

These analytical results indicate that, among the components of the internal control system, monitoring and control activities demonstrate the highest effectiveness in reducing risks. However, the level of automation within information systems and risk assessment mechanisms remains insufficient, highlighting the need for further technological enhancement in these areas.

Credit risk represents one of the most critical and challenging areas of banking activity, and in Uzbekistan's commercial banks, the internal control system employs several effective mechanisms to mitigate this risk. These include conducting an in-depth analysis of borrowers' repayment capacity through scoring models, ensuring continuous internal audit oversight of credit committee operations, utilizing automated monitoring tools to detect potential irregularities within the loan portfolio at an early stage, and implementing early risk alert systems to immediately identify and address high-risk loans when payment delays occur.

According to the study by Hossain and Sarkar (2025), automated internal control systems in banks reduce credit risk by an average of 27% [6]. In Uzbekistan as well, a Basel III-compliant credit risk assessment methodology has been introduced since 2022. As a result, the share of loans classified as "doubtful" in the national credit portfolio decreased from 9.8% to 7.2% in 2023, indicating measurable progress in credit risk mitigation across the country's banking sector [12].

Operational risks refer to losses arising from employee errors, technical failures, or deficiencies within internal processes. According to the 2024 report of the Central Bank, more than 40% of operational risks in the banking sector are associated with improper documentation or the double entry of data.

According to the findings of Lawal and Adeyeye (2025), AI-based audit systems can reduce such errors by 30–35% [4]. Beginning in 2023, several commercial banks in Uzbekistan, particularly Ipoteka Bank, Kapital Bank, and Aloqabank, transitioned their internal control processes to digital platforms. As a result, the number of errors detected during internal audit procedures declined from 2.8 thousand cases in 2021 to 1.5 thousand cases in 2024, indicating a significant improvement in operational accuracy and process discipline.

Liquidity risk refers to the threat that a bank may be unable to meet its obligations in a timely manner. The internal control system mitigates this risk by monitoring financial flows in real time, overseeing the proportion of liquid assets, and employing early warning systems that provide timely alerts about potential liquidity shortages.

According to the study conducted by Kovalenko and Petruk (2025), the implementation of an early response system increases financial stability in banks by 18% and reduces losses associated with liquidity shortages [7]. This approach is also being gradually introduced in Uzbek banks. In 2024, Asaka Bank and Turonbank integrated automated liquidity-monitoring modules into their internal control systems. As a result, their short-term liquidity coverage ratio (LCR) increased from an average of 110% to 128%, demonstrating substantial improvement in liquidity resilience.

The effectiveness of the internal control system is assessed using the following key indicators:

Table 2. Key Indicators of Internal Control Effectiveness (2020–2024)

Indicator	2020	2021	2022	2023	2024	Change (%)
Credit Risk (NPL ratio, %)	9.5	9.2	8.5	7.8	7.2	–24%
Number of Operational Errors	2.8 thousand	2.4 thousand	2.0 thousand	1.8 thousand	1.5 thousand	–46%
Number of Fraud Cases	132	115	88	71	65	–50%
Deficiencies Identified in Internal Audit Reports	245	208	174	150	132	–46%
Bank Profitability (ROA, %)	1.6	1.7	1.9	2.0	2.2	+37%

Source: Author's calculations based on statistical data of the Central Bank of the Republic of Uzbekistan and commercial banks' annual reports, 2020–2024.

It is evident that the strengthening of the internal control system has not only reduced risks but has also improved the overall profitability of banks. This outcome confirms a central premise of the COSO framework: the internal control system functions not merely as a control mechanism, but as a strategic component of organizational management.

The correlation analysis conducted in the course of the study revealed a strong negative relationship of -0.78 between the Internal Control System Effectiveness Index (ICSI) and banking risk indicators. This indicates that as the level of internal control strengthens, risk metrics decline significantly. The results show that an effective internal control system can reduce fraud cases in banks by up to 50%, while automated audit systems can decrease operational errors by as much as 40%, and enhanced risk-monitoring modules can

lower credit losses by up to 25%. Collectively, these factors contribute to an average increase of 0.5 to 0.7 percentage points in bank profitability.

The findings of the study confirm that the internal control system is a critical instrument for managing credit risk in the lending activities of service-sector enterprises. The automation of credit monitoring processes, the implementation of credit scoring systems, and the utilization of Early Warning System (EWS) mechanisms contribute significantly to reducing the volume of non-performing loans and enhancing the overall quality of loan portfolios.

International banking practice demonstrates that the application of artificial intelligence (AI), Big Data analytics, and digital auditing technologies substantially improves the accuracy and effectiveness of credit risk assessment. These technologies enable financial institutions to process large volumes of data, identify risk patterns at an early stage, and make more informed lending decisions. The broader adoption of such innovative solutions by commercial banks in Uzbekistan would enhance lending efficiency, strengthen risk management capabilities, and improve the stability and competitiveness of the banking sector.

Empirical analyses conducted within the context of Uzbekistan's banking system demonstrate that the strengthening of internal control mechanisms has led to a significant reduction in credit risks, fraud incidents, and operational errors. This indicates that the internal control system functions not only as a "detective" mechanism but also performs a crucial "preventive" role in mitigating potential risks before they materialize.

Enhancing the effectiveness of the internal control system improves the quality of managerial decision-making, which in turn promotes the efficient use of resources and strengthens customer confidence. The findings of Hossain and Sarkar (2025) support this conclusion, showing that banks with well-developed internal control mechanisms exhibit profitability levels that are 15–20% higher compared to those with weaker control systems.

In international practice, internal control systems are deeply integrated into the corporate governance mechanisms of banks. The following table presents a comparative analysis of the experiences of Uzbekistan and developed countries:

Table 3. Comparison of Internal Control Practices: Uzbekistan vs. International Standards

Indicator	Uzbekistan's Banks	International Practice (Basel III, COSO, EU)
Control Environment	Partially automated, dependent on human judgment	Fully automated with integrated digital audit modules
Risk Assessment	Conducted quarterly	Continuous monitoring with real-time indicators
Internal Audit	Performed by internal audit departments	Involves independent external auditors in addition to internal teams
Technological Integration	Limited (often based on Excel tools)	AI, blockchain, and Big Data used for control and verification
Staff Qualification	Medium level	Certified risk professionals (CFA, FRM)
Effectiveness	Risks reduced by 15–25%	Risks reduced by 35–45%

This comparison indicates that banks in Uzbekistan are taking significant steps toward aligning their internal control systems with international standards; however, the processes of digital transformation have not yet been fully completed.

As highlighted in the works of scholars such as Lawal and Adeyeye (2025), the integration of artificial intelligence and blockchain technologies into audit processes elevates the internal control system to a qualitatively new level [4]. In particular, blockchain-based audit systems enable real-time monitoring of transactions, thereby facilitating the early prediction and mitigation of potential risks.

The development of internal control mechanisms in Uzbekistan's banking sector is constrained by several systemic challenges. These include the insufficient integration of information systems, which limits the automation of interdepartmental data exchange; the strong dependence on the human factor in internal audit processes, which increases the likelihood of errors and subjective assessments; the partial inconsistency of risk assessment indicators with international standards; the limited qualifications and professional competencies of personnel involved in internal control procedures; and the insufficient effectiveness of accountability mechanisms concerning the results of control activities.

Pamungkas and Oktafiyani (2025) report that similar challenges have been observed in the Indonesian banking system, and to address them, the introduction of "integrated digital audit platforms" has been recommended [2]. This approach is likewise highly relevant for Uzbekistan. If each bank consolidates its internal control functions into a unified information platform, not only will control processes become faster and more

efficient, but the capacity to monitor risks in real time will also be significantly enhanced. Based on the findings of this study, the following recommendations have been developed for commercial banks in Uzbekistan:

Table 4. Recommendations for Enhancing the Internal Control System in Commercial Banks of Uzbekistan

No	Recommendation Area	Description
1	Implementation of a Digital Internal Control System	Integrating internal audit, risk management, and operational control units through a unified digital platform; the platform should be based on AI and Big Data technologies and provide real-time monitoring of risk indicators.
2	Standardization Based on COSO and Basel III	Harmonizing banks' internal control policies into a unified regulatory model; this simplifies audit procedures and facilitates cooperation with international financial institutions.
3	Enhancing Staff Qualification and Certification	Introducing training and qualification programs based on international certifications such as FRM, CISA, and CFA for internal control personnel; this increases audit quality and improves the accuracy of risk assessment.
4	Linking Internal Control Outcomes to Financial Indicators	Developing a KPI system to measure the effectiveness of internal control: indicators such as fraud reduction, audit accuracy, and optimization of the risk portfolio should be assessed in alignment with the bank's financial performance.
5	Establishment of an Independent External Evaluation System	Creating an independent evaluation commission under the Central Bank that annually rates the effectiveness of banks' internal control systems based on international standards.

The findings of this study demonstrate a strong causal relationship between the internal control system and the reduction of banking risks, as the system's effectiveness fundamentally depends on three key factors. First, technological integration—through digital auditing, automated monitoring, and analytical platforms—enhances the accuracy and timeliness of control processes. Second, the quality of human resources—the qualifications, competencies, and accountability culture of employees—plays a decisive role in preventing risks. Third, the level of corporate governance—specifically, the management's commitment to transparency, responsibility, and a strong control culture—ensures the proper functioning of the internal control system. When these factors operate in harmony, the internal control system significantly strengthens a bank's stability, security, and competitiveness.

CONCLUSION AND SUGGESTIONS

The service sector is one of the fastest-growing segments of the national economy, and its sustainable development largely depends on the availability and effectiveness of credit resources provided by commercial banks. Therefore, accurate credit risk assessment and the enhancement of internal control systems in the lending process to service-sector entities represent key strategic priorities for banking institutions.

Based on the theoretical and empirical analyses conducted in this study, the following conclusions can be drawn:

- The findings reveal that the most significant determinants of credit risk in lending to service-sector enterprises include the borrower's financial stability, the consistency of cash flows, the quality of collateral, the seasonality of business operations, and fluctuations in market conditions. The results demonstrate that a comprehensive assessment of these factors contributes to improving loan portfolio quality and increasing loan repayment performance.

- A strong inverse relationship was identified between the effectiveness of internal control systems and the level of credit risk in lending to service-sector entities. Strengthening credit monitoring procedures, continuously supervising borrowers' activities, and ensuring the proper utilization of loan funds can significantly reduce the proportion of non-performing loans.

- Contemporary approaches to risk management and internal control based on the COSO framework and Basel III standards were examined, and the necessity of adapting these practices to the operational environment of commercial banks in Uzbekistan was substantiated. In particular, the automation of credit risk assessment processes, real-time monitoring of loan portfolios, and the implementation of risk indicator systems can substantially enhance lending efficiency.

- Several challenges currently affecting lending practices in the service sector were identified, including insufficient information regarding borrowers' activities, the continued reliance on manual credit monitoring

procedures in certain cases, the need to improve risk assessment methodologies, and the relatively low level of digitalization within internal control systems. These factors limit the ability of banks to identify and address credit risks at an early stage.

- The study confirms that the application of digital technologies, including artificial intelligence (AI), Big Data analytics, credit scoring models, and Early Warning System (EWS) mechanisms, can improve the accuracy of creditworthiness assessments, enhance credit risk forecasting, and reduce the occurrence of non-performing loans among service-sector enterprises.

Based on the research findings, the following practical recommendations are proposed for improving the lending system for service-sector entities in commercial banks:

- Implement comprehensive credit scoring models for more effective credit risk assessment;
- Fully digitalize credit monitoring processes;
- Establish integrated information platforms connecting internal control and risk management departments;
- Utilize automated early warning systems in loan portfolio management; and
- Expand the adoption of internal control mechanisms aligned with international banking standards throughout the lending process.

Overall, the effective assessment of credit risks and the continuous improvement of internal control systems in lending to service-sector enterprises can enhance the quality of commercial banks' loan portfolios, reduce the share of non-performing loans, strengthen financial stability, and support the sustainable development of the service sector. Further advancement of reforms in this area will play a crucial role in increasing the competitiveness of Uzbekistan's banking system and improving the efficiency of financing the real sector of the economy.

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