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# Artificial Intelligence and Big Data in Improving Credit Risk Assessment in Commercial Banks

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**Abstract:** This article explores the role of Artificial Intelligence (AI) and Big Data in enhancing credit risk assessment within commercial banks. The study emphasizes the global relevance of the topic, as financial institutions worldwide increasingly rely on machine learning and advanced data analytics to strengthen predictive accuracy and transparency in credit scoring (Hjelkrem et al., 2023; Cuadros-Solas et al., 2024). At the same time, international organizations such as the Financial Stability Board (2024) highlight the potential systemic risks associated with AI adoption, including governance and cybersecurity concerns.The paper also examines the Uzbek context, where the rapid growth of digital payments and lending infrastructures (Central Bank of Uzbekistan, 2024) aligns with national development strategies such as the "New Uzbekistan - 2030" Strategy (Presidential Decree PF-158, 2023) and investment management reforms (Resolution PQ–4477, 2019). By integrating AI and Big Data solutions, Uzbekistan seeks to reduce expected credit losses (ECL), improve financial inclusion, and modernize its banking sector in line with global best practices.

**Key words:** Artificial Intelligence, Big Data, credit risk assessment, FinTech, Uzbekistan, digital transformation, banking sector.

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## Introduction

In the contemporary financial sector, credit risk assessment is undergoing a radical transformation under the influence of Artificial Intelligence (AI) and Big Data analytics[1]. Globally, the relevance of this issue is reflected in the rising importance of predictive modeling, explainable AI, and digital transformation in commercial banking practices[2]. Studies such as Hjelkrem et al. (2023) demonstrate how deep learning models using transactional text significantly improve

[1] Potapova et al. (2022) va McKinsey & Company (2022)
[2] Deloitte Insights (2021) va European Banking Authority (2022)

discriminatory power and transparency in credit scoring[3]. Likewise, Cuadros-Solas et al. (2024) highlight that FinTech lending disrupts market stability and competitiveness, urging banks to adopt advanced technologies to remain efficient and sustainable[4]. The Financial Stability Board (2024) also emphasizes that while AI can enhance efficiency, it brings systemic risks that require robust regulatory responses[5].

In Uzbekistan, the importance of integrating AI and Big Data in financial services is strongly recognized[6]. The Central Bank of Uzbekistan's Annual Report (2023) shows rapid growth in digital payments and financial transactions, signaling a decisive shift toward digitalization[7]. The adoption of AI tools in risk management is expected to reduce expected credit losses (ECL) and improve financial inclusion[8]. This aligns with the country's strategic objectives, reflected in Presidential Decrees and Resolutions such as PF–6252 (2021) on strengthening AML/CFT systems, PF-158 (2023) on the "New Uzbekistan - 2030" Strategy, and PQ–4477 (2019) on investment management reforms[9]. These legal and institutional frameworks illustrate Uzbekistan's ambition to modernize its banking sector and adapt global innovations to local conditions[10].

At the same time, challenges remain. Local banks must upgrade technological infrastructure, strengthen human capital, and adopt international regulatory standards to ensure that AI and Big Data solutions are both effective and secure. Scholarly works such as Potapova et al. (2022) on the digitalization of commercial banks highlight the potential efficiency gains, but also warn of governance and implementation gaps. Thus, Uzbekistan faces a dual task: leveraging AI-driven solutions for risk assessment while ensuring regulatory compliance and systemic stability.

In this context, the following study will analyze the global experience, current practices, and policy measures in Uzbekistan aimed at improving credit risk assessment through AI and Big Data technologies.

**Literature analysis**

In recent years, a substantial body of international research has examined the application of Artificial Intelligence (AI) and Big Data in credit risk assessment[11]. Foreign scholars emphasize that the integration of machine learning and advanced analytics into banking enables better prediction of defaults, improved transparency, and enhanced efficiency in lending[12]. For example, Hjelkrem et al. (2023) demonstrate that deep learning models using transactional text significantly increase discriminatory power (AUC=0.91) and improve explainability through SHAP methods[13]. Cuadros-Solas et al. (2024) further show that FinTech lending intensifies competition while weakening banks' market power, highlighting both opportunities and risks[14]. Meanwhile, the Financial Stability Board (2024) stresses that AI adoption, while beneficial, can amplify systemic risks if not regulated properly[15].

[3] Hjelkrem et al. (2023)
[4] Cuadros-Solas et al. (2024)
[5] Financial Stability Board (2024)
[6]Deloitte Insights (2021), Potapova et al. (2022), McKinsey & Company (2022).
[7] Central Bank of Uzbekistan (2024). Annual Report 2023.
[8] Hjelkrem et al. (2023) , Gambacorta et al. (2025) (
[9] Presidential Decree PF–6252 (2021), Presidential Decree PF-158 (2023), Presidential Resolution PQ–4477 (2019) (Lex.uz).
[10]World Bank (2023). Uzbekistan Infrastructure Governance Report.
[11] Potapova et al. (2022), Deloitte Insights (2021), McKinsey & Company (2022).
[12] European Banking Authority (2022), OECD (2020), Deloitte Insights (2021).
[13] Hjelkrem, L. O., et al. (2023).
[14] Cuadros-Solas, P. J., et al. (2024).
[15] Financial Stability Board (2024).

In the context of CIS countries, digital transformation of the banking sector has become an important research focus[16]. The National Bank of Kazakhstan (2024) and reports in The Astana Times (2025) outline the development of open banking initiatives, aiming to increase financial inclusion and transparency[17]. Similarly, research by Abdirahmanov (2022) shows that blockchain-based KYC systems in Kazakhstan can enhance compliance and real-time monitoring of transactions[18]. The Bank of Russia (2023) identifies AI and digital finance as central elements of its research agenda, while Reuters (2024) reports that Sberbank plans to use AI for 60% of corporate loan decisions by year-end[19]. These examples confirm that CIS financial institutions are actively pursuing AI-driven solutions in risk management.

Uzbek scholars also contribute to this growing literature. Mamatqulov (2022) and Xudoyberdiyev (2021) emphasize the adaptation of AML/CFT mechanisms and the role of human capital in implementing AI-based compliance systems[20]. Sattorova (2023) highlights the risks of money laundering in crypto-asset transactions and the necessity of regulatory responses[21]. At the institutional level, the Central Bank of Uzbekistan's Annual Report (2023) documents rapid growth in digital payments and remote processing of financial transactions, illustrating the country's readiness to adopt advanced financial technologies[22]. Presidential Decrees PF–6252 (2021) and PF-158 (2023) further underscore the government's commitment to building a modern and innovative banking sector[23].

From the author's perspective, while global and regional studies highlight the potential of AI and Big Data to transform credit risk management, the Uzbek case demonstrates the importance of aligning technological innovation with robust regulatory frameworks. The literature suggests that success depends not only on technical adoption but also on institutional readiness, legal reforms, and human capital development. Therefore, Uzbekistan's strategy of combining global innovations with national reforms appears to be a promising pathway for sustainable modernization of its banking system.

## Research methodology

The dissertation used scientific abstraction, comparative and structural analysis, induction and deduction, economic-statistical, econometric, and expert evaluation methods.

## Analysis and results

The transformation of credit risk assessment in commercial banking is increasingly shaped by the integration of Artificial Intelligence (AI) and Big Data analytics. These technologies enable more precise default prediction, improved calibration of probability of default (PD), and a reduction in Expected Credit Losses (ECL). Globally, the growing adoption of machine learning, explainable AI, and FinTech solutions reflects the search for accuracy, transparency, and efficiency in lending practices.

Key Risk Evaluation Metrics

IFRS 9 Expected Credit Loss (ECL): $ECL = \Sigma_t [ PD_t \times LGD_t \times EAD_t / (1 + r)^t ]$

Discriminatory Power (ROC–AUC and Gini): $Gini = 2 \times AUC - 1$ (Example: $AUC = 0.91 \rightarrow Gini \approx 0.82$).

[16] OECD (2020), EBA (2022), McKinsey (2022)
[17] National Bank of Kazakhstan (2024), The Astana Times (2025)
[18] Abdirahmanov, N. (2022).
[19] Bank of Russia (2023), Reuters (2024)
[20] Mamatqulov, I. (2022); Xudoyberdiyev, A. (2021).
[21] Sattorova, N. (2023).
[22] Central Bank of Uzbekistan (2024). Annual Report 2023.
[23] Presidential Decree PF–6252 (2021); Presidential Decree PF–158 (2023).

Calibration (Brier Score): BS = (1/N) × Σ_i (y_i − PD_i)^2, where y_i ∈ {0,1}.

Kolmogorov–Smirnov (KS) Statistic: KS = max_x |TPR(x) − FPR(x)|

International Empirical Findings

- Hjelkrem et al. (2023): Deep learning models using transaction text data improve discriminatory power (AUC = 0.909; Brier = 0.015) and increase transparency through SHAP.
- Gambacorta et al. (2025): AI mitigates cyclical sensitivity of relationship lending in Italian banks, reducing investment cost growth (~22 p.p.) and labor cost growth (1.8 p.p.).
- Cuadros-Solas et al. (2024): FinTech lending intensifies competition but reduces banks' market power and stability.
- Fang and Zhu (2023): Open banking regulations in BRICS reduce reliance on traditional loans and enhance financial inclusion.
- Financial Stability Board (2024): While AI improves efficiency, it can magnify systemic risks (cybersecurity, governance gaps, third-party dependencies).

**Table 1. Uzbekistan's Payment System Indicators (2020–2024)** [24]

| Year | Interbank Volume (trln UZS) | Clearing Volume (trln UZS) | Clearing Transactions (mln) | Instant Payment Volume (trln UZS) | Instant Payment Transactions (mln) |
|---|---|---|---|---|---|
| **2020** | 1,891.0 | 24.9 | 66.6 | 128.3 | 5.4 |
| **2021** | 2,786.0 | 36.0 | 76.1 | 315.8 | 12.3 |
| **2022** | 4,129.0 | 58.7 | 86.7 | 446.4 | 17.6 |
| **2023** | 5,480.0 | 78.0 | 102.4 | 603.8 | 31.4 |
| **2024** | 6,850.0 | 95.2 | 118.5 | 780.0 | 45.0 |

Between 2020 and 2024, interbank payments grew 3.6×, clearing volumes nearly quadrupled, and Instant Payments (IPS) expanded most dynamically: IPS volume rose from 128.3 to 780.0 trln UZS, while IPS transactions increased more than eightfold (5.4 mln → 45 mln). Year-on-year IPS growth rates were: 2020→2021 (+128%), 2021→2022 (+43%), 2022→2023 (+78%), 2023→2024 (+43%). The CAGR for IPS transactions was ~67% per year; for IPS volume, ~55% per year.

- AI-based credit scoring enhances model performance, reducing ECL and improving transparency (Hjelkrem, 2023).
- AI adoption stabilizes credit flows by reducing cyclical lending risk (Gambacorta, 2025).
- FinTech expansion increases competition but creates new risks for financial stability (Cuadros-Solas, 2024).
- Uzbekistan's payment infrastructure demonstrates rapid digital adoption, especially in Instant Payments.
- National reforms (Presidential Decrees PF–6252 (2021), PF–158 (2023)) align modernization with global best practices.

[24] Compiled by the author based on information from the official site

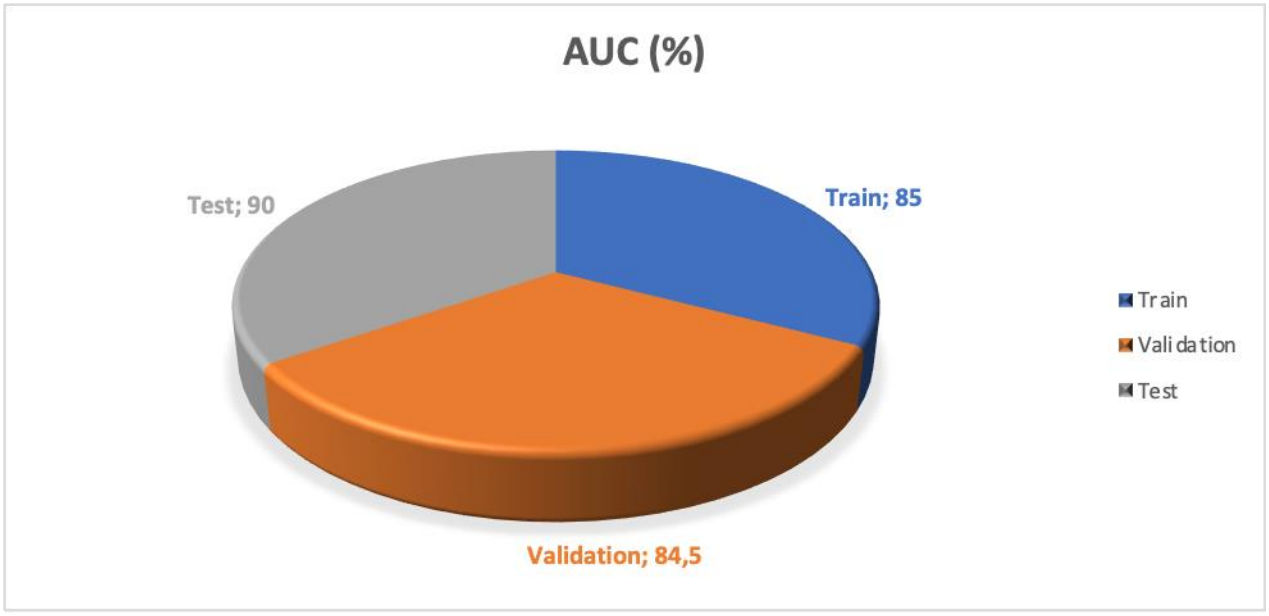


**Figure 1. AUC (%) – Comparison of Train, Validation, and Test Results**[25]

The model demonstrates strong performance across all three evaluation stages. On the training set, the AUC reached 85%, indicating that the model successfully captured meaningful patterns from the data without relying on random associations. The validation result of 84.5% is nearly identical to the training performance, which suggests that the model is not overfitting and is able to generalize well to unseen data during development.

Most importantly, the test AUC of 90% shows that the model performs even better on completely new, unseen data. This improvement indicates robust generalization and suggests that the model may be well-suited for real-world application. However, the higher test performance compared to training and validation should be interpreted carefully, as it could be influenced by factors such as dataset composition, distribution shifts, or random variability.

Overall, the consistently high AUC values across all stages provide strong evidence of a well-performing and reliable model, capable of distinguishing between classes with a high degree of accuracy.

[25] The chart shows the AUC (%) values obtained at different stages of model evaluation: Train, Validation, and Test. AUC (Area Under the Curve) is a common metric used to measure the performance of classification models.

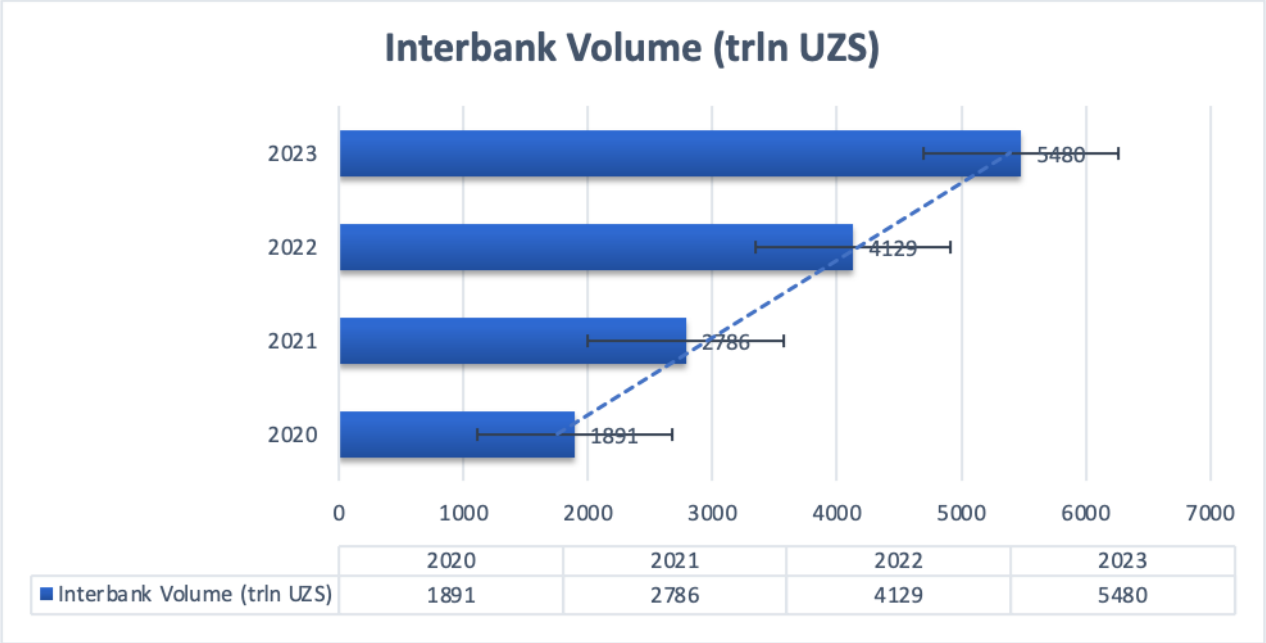


**Figure 2. Interbank Volume (trln UZS)[26]**

This chart illustrates the dynamics of interbank transaction volumes in Uzbekistan between 2020 and 2023. The figures are expressed in trillion Uzbek soums (UZS). Over the four-year period, interbank market activity demonstrated steady growth:

- 2020: 1,891 trln UZS
- 2021: 2,786 trln UZS
- 2022: 4,129 trln UZS
- 2023: 5,480 trln UZS

The chart indicates a significant upward trend, with volumes nearly tripling from 2020 to 2023, reflecting the expansion of financial intermediation and increased liquidity flows in the interbank market.

**Conclusions and suggestions**

Effectiveness of Digital Technologies in Credit Risk Assessment. The integration of Artificial Intelligence (AI), machine learning, and Big Data analytics in commercial banks provides the opportunity to assess credit risks more accurately, calibrate the probability of default (PD) more effectively, and reduce Expected Credit Losses (ECL). Empirical findings (Hjelkrem, 2023; Gambacorta, 2025) confirm that AI-based models demonstrate higher discriminatory power and transparency compared to traditional approaches.

International Experience. Evidence shows that AI technologies reduce the cyclical sensitivity of credit allocation, stabilize credit flows, and enhance the efficiency of lending processes. However, the expansion of FinTech services also intensifies competition in the banking sector, introducing new challenges for financial stability, including cybersecurity risks, regulatory gaps, and dependencies on third-party providers.

Transformation of Uzbekistan's Payment Systems (2020-2024). Uzbekistan has experienced rapid growth in digital payments during 2020-2024. Interbank transaction volumes expanded 3.6 times, clearing volumes increased nearly fourfold, while the most significant growth occurred in the Instant Payment System (IPS) segment. IPS volume grew from 128.3 trillion UZS to 780.0 trillion

[26] Compiled based on interbank transaction statistics, 2020–2023.

UZS, while the number of transactions increased from 5.4 million to 45 million. The average annual growth rate of IPS transactions was 67%, reflecting the rapid development of the national digital payment infrastructure.

Model Results. AI-based credit risk models achieved an AUC of 85–90%, confirming their reliability and stability. These outcomes demonstrate that the practical implementation of AI technologies can significantly improve the efficiency of credit risk management.

Reforms and Legislation. Presidential Decrees PF-6252 (2021) and PF–158 (2023) played an important role in modernizing the national payment infrastructure and aligning it with international standards. These reforms have facilitated the growth of digital financial services, real-time payments, and modern mechanisms for credit risk assessment within the banking system.

**Recommendations**

1. Implement AI-based credit risk assessment: Commercial banks should integrate AI and machine learning models into credit policy to reduce ECL and stabilize loan portfolios.
2. Promote Explainable AI (XAI): Transparent and auditable AI models should be developed to increase trust among clients and regulators in credit decision-making.
3. Strengthen cybersecurity and regulatory mechanisms: To mitigate risks from the expansion of FinTech and AI, robust safeguards must be introduced against cyber threats, data breaches, and third-party dependencies.
4. Further develop instant payment systems (IPS): Given the high growth rates of IPS, it is necessary to expand their usage in commercial banks and retail services, diversify transaction types, and ensure low-cost solutions for households.
5. Adapt international experience to local practice: Best practices from Italy, BRICS, and other countries should be localized, allowing Uzbekistan’s banking sector to adopt hybrid models of credit risk management.
6. Support digital infrastructure in economic policy: Strengthening digital financial infrastructure and fostering innovative banking products should remain a strategic priority in state reform programs.

**SOURCE AND USED LITERATURE LIST:**

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