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DIGITAL TECHNOLOGIES IN ASSESSING AND REDUCING CREDIT RISK IN COMMERCIAL BANKS OF UZBEKISTAN

Xamrakulov Eldar Mirkamilovich

Head of the Tashkent City Regional Banking Services Office, JSCB

“Hamkorbank”, Tashkent, Uzbekistan.

E-mail: eldar.xamrakulov.82@mail.ru

Abstract

This study examines the role of digital technologies in strengthening credit-risk assessment and reducing non-performing loans in Uzbekistan’s commercial banking sector. The analysis is based primarily on official statistics of the Central Bank of the Republic of Uzbekistan for 2024–2025 and the 2025 IMF Financial Sector Assessment Program. The results show that the banking system expanded rapidly while the aggregate non-performing loan ratio declined from 4.0% at the beginning of 2025 to 3.0% at the beginning of 2026. The paper argues that further improvements require a transition from largely document-based underwriting to integrated digital credit-risk architectures combining verified transactional data, behavioral scoring, early-warning indicators, portfolio segmentation and model governance. A practical framework is proposed for responsible use of alternative data, machine learning and automated monitoring while preserving explainability, data quality, borrower protection and supervisory compliance.

Keywords: Digital banking; credit risk; non-performing loans; machine learning; credit scoring; early-warning system; Uzbekistan; commercial banks.



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1. Introduction

Digital transformation has become a structural factor in the development of modern banking. In credit activity, its importance is especially high because the quality of lending decisions depends on the speed, completeness and reliability of information about borrowers. Traditional credit analysis is still necessary, but it is often based on periodic financial statements, collateral documents and manually verified information. Digital banking makes it possible to supplement these sources with transaction histories, account turnover, tax and payment behavior, cash-flow patterns, electronic invoices, payroll dynamics and other high-frequency indicators. This creates the potential to identify deterioration in borrower quality earlier and to differentiate credit conditions more accurately.

1. Introduction - Uzbekistan context

The relevance of the issue is reinforced by the scale of Uzbekistan's banking sector. According to the Central Bank, total banking assets increased from UZS 769.3 trillion on 1 January 2025 to UZS 924.8 trillion on 1 January 2026. Over the same period, the loan portfolio rose from UZS 533.1 trillion to UZS 604.0 trillion, while deposits increased from UZS 308.7 trillion to UZS 417.3 trillion. Thus, the system simultaneously experienced credit expansion and a stronger deposit base. At the same time, non-performing loans declined from UZS 21.2 trillion to UZS 18.1 trillion and their share in total loans fell from 4.0% to 3.0%. These changes indicate an improvement in aggregate portfolio quality, but they do not eliminate the need for stronger risk differentiation at the level of individual banks, products and borrower segments [1–4].



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2. Research objective and methods

The objective of the study is to develop practical recommendations for strengthening credit-risk assessment in Uzbek commercial banks through digital technologies. The research uses comparative analysis, structural analysis, ratio analysis and synthesis of regulatory and market evidence. Official Central Bank data are used to compare the beginning of 2025 and the beginning of 2026. IMF FSAP findings are used to interpret supervisory and systemic-risk implications. The paper does not claim causal identification; instead, it provides an evidence-based institutional framework for credit-risk digitalization.

Indicator	1 Jan 2025	1 Jan 2026	Change
Banking assets, UZS bn	769,330	924,763	+20.2%
Loan portfolio, UZS bn	533,121	604,002	+13.3%
Deposits, UZS bn	308,692	417,258	+35.2%
Capital, UZS bn	114,792	135,339	+17.9%
NPL, UZS bn	21,185	18,055	-14.8%
NPL ratio	4.0%	3.0%	-1.0 p.p.

Source: compiled by the author from Central Bank of the Republic of Uzbekistan banking statistics [1–4].

3. Why digital credit-risk assessment matters

Credit risk is not only the probability of default. For a bank, it is a multidimensional problem involving borrower selection, exposure size, pricing, collateral, concentration, maturity, currency, monitoring and recovery. Digitalization can improve each stage. At origination, automated data verification reduces information asymmetry and operational errors. During servicing, continuous monitoring makes it possible to detect early signs of stress. At portfolio level, analytics can reveal concentrations by industry, region, product



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or borrower type. During recovery, data-driven prioritization can help banks allocate collection resources more efficiently.

A digital approach is particularly useful for retail and small-business lending, where the number of applications is large and the average exposure is relatively small. Manual assessment of every case is costly and slow. Automated scoring can reduce turnaround time, but the main economic value is not simply speed. The greater value lies in consistency: similar borrowers can be evaluated using common rules, risk thresholds can be calibrated, and deviations can be audited. This creates a stronger link between risk appetite, pricing and portfolio quality. However, a bank should not equate digitalization with replacing human judgment. Poor-quality data, unstable models or opaque algorithms may produce systematic errors at scale. Therefore, digital credit-risk management must be organized as a controlled decision system in which data, models, business rules, human review and post-decision monitoring are integrated.

4. Proposed digital credit-risk architecture

Layer	Core content	Expected risk effect
Data layer	Core banking data, verified income, account turnover, payment history, tax and invoice data where legally available	Reduces information gaps
Scoring layer	Application score, behavioral score, affordability and cash-flow metrics	Improves borrower differentiation
Decision engine	Risk limits, pricing rules, collateral requirements, approval thresholds	Links risk to lending terms
Monitoring layer	Days past due, turnover decline, balance volatility, covenant and sector alerts	Earlier intervention
Portfolio layer	Vintage analysis, migration matrices, concentration indicators, stress scenarios	Improves portfolio control
Governance layer	Validation, explainability, overrides, audit trails, model-risk controls	Reduces model and conduct risk



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The proposed architecture begins with data standardization. A bank cannot obtain reliable model outputs from fragmented or inconsistent inputs. Therefore, a single borrower identifier, common definitions of income and debt obligations, standardized delinquency flags and complete historical records are prerequisites. Data lineage should allow the bank to identify the origin of each variable used in a credit decision.

The second component is risk segmentation. Retail consumers, microenterprises, SMEs and large corporate borrowers should not be evaluated with a single universal model. Their default drivers differ. For individuals, stable income, debt-service burden and repayment behavior are central. For SMEs, turnover stability, seasonality, account concentration and supplier/customer dependence are more important. For corporates, leverage, cash-flow coverage, sector outlook, foreign-currency mismatch and governance quality should play a larger role.

The third component is an early-warning system. A performing loan can become problematic long before the first missed payment. Banks should therefore monitor leading indicators such as a persistent decline in account inflows, repeated overdraft use, deterioration in deposit balances, delayed tax or supplier payments where legally observable, increasing utilization of credit limits, covenant breaches and adverse sector signals. The objective is to move from arrears-based reaction to pre-arrears intervention.

5. Empirical interpretation of NPL dynamics

The decline in the system-wide NPL ratio from 4.0% to 3.0% in 2025 is a positive development. In absolute terms, problematic loans fell by about UZS 3.13 trillion while the total credit portfolio expanded by around UZS 70.88 trillion. This combination means that the improvement was not merely the mechanical result of a shrinking loan denominator. Nevertheless, aggregate progress can conceal



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heterogeneity. At the beginning of 2025, the Central Bank reported that some institutions had materially higher NPL ratios than the system average, which confirms the importance of bank-specific underwriting quality, portfolio composition and recovery practices [3].

The data also indicate a structural funding shift. The loan-to-deposit ratio declined from 173% to 145% between 1 January 2025 and 1 January 2026. For state-owned banks it fell from 237% to 190%, while for other banks it decreased from 108% to 98% [2]. A broader deposit base can reduce funding pressure and allow banks to avoid excessive credit growth. However, stronger funding should be accompanied by equally strong underwriting standards; otherwise easier funding conditions may eventually create new asset-quality problems.

Risk metric	Interpretation	Recommended digital response
NPL ratio	Backward-looking realized credit deterioration	Combine with leading behavioral indicators
Loan-to-deposit ratio	Funding intensity of credit expansion	Integrate funding constraints into portfolio limits
Sector concentration	Exposure to common shocks	Real-time concentration dashboards
Vintage default rate	Quality of new underwriting cohorts	Recalibrate models by origination period
Stage migration / delinquency transition	Speed of deterioration	Automated watchlist triggers

6. Machine learning: useful, but only under governance

Machine-learning models may capture nonlinear relationships that are difficult to represent in traditional scorecards. For example, interaction between income volatility, account turnover, utilization and repayment behavior may contain more



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predictive information than any single variable. Yet predictive power alone is not a sufficient criterion for use in banking. Models must also be stable, explainable, legally compliant and operationally auditable.

A prudent approach is to use machine learning initially as a challenger model or as an early-warning layer rather than as an uncontrolled autonomous approval mechanism. Banks can compare its performance with existing scorecards using out-of-sample default prediction, calibration, false-positive rates and stability indices. Material model changes should require independent validation. Override decisions should be recorded and periodically analyzed to determine whether human intervention improves or weakens outcomes.

Data ethics and borrower protection are equally important. Variables that are proxies for protected characteristics or that have no economically defensible relationship with repayment capacity should be excluded. Customers should receive understandable explanations for material adverse credit decisions. This is important not only from a conduct perspective but also for model quality: explainability forces institutions to understand what the model is actually using. First, commercial banks should establish unified credit-risk data marts that combine origination, servicing, payment and recovery information. Second, model development should be separated from model validation to reduce conflicts of interest. Third, banks should use different scorecards for major borrower segments and recalibrate them regularly. Fourth, early-warning systems should be connected to specific actions: increased monitoring, covenant review, limit reduction, restructuring analysis or transfer to a watchlist. Fifth, boards and risk committees should receive concise digital dashboards focused on risk trends rather than only static balance-sheet indicators.

At supervisory level, standardized reporting on model performance, default definitions and early-warning indicators would support comparability. The IMF's



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2025 FSAP emphasized continued strengthening of systemic-risk analysis, macroprudential policy and banking supervision in Uzbekistan. Digital credit-risk systems can complement these reforms if they improve data quality and risk visibility rather than merely automate existing procedures [5].

7. Conclusion

Uzbekistan's banking system entered 2026 with larger assets, loans and deposits and a lower aggregate NPL ratio than a year earlier. This creates a favorable environment for moving from basic digital service delivery toward deeper digital risk management. The next stage should focus on verified data integration, segment-specific scoring, continuous monitoring, transparent decision engines and strong model governance. The objective is not to maximize automated approvals but to improve the risk-adjusted quality of lending. If implemented prudently, digital technologies can help banks identify deterioration earlier, price risk more accurately, reduce operating costs and support sustainable credit growth.

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