

PRUDENTIAL SUPERVISION PRACTICES IN COMMERCIAL BANKS OF UZBEKISTAN: CURRENT STATE, CHALLENGES AND SOLUTIONS

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Abstract

This article examines the current state of prudential supervision in commercial banks of Uzbekistan, the challenges arising in the implementation of prudential requirements, and the main approaches to addressing them. Particular attention is paid to the supervision of bank capital, liquidity, asset quality, and credit risk. The study substantiates the need to transform traditional prudential monitoring into a risk-based and forward-looking supervisory framework. The research proposes an Early Warning System (EWS) model incorporating artificial intelligence elements to support the early identification of non-performing loans, liquidity shortages, and capital risks. It also proposes a macroprudential monitoring mechanism that takes into account the impact of monetary policy factors on the financial stability of commercial banks.

Keywords: Prudential supervision, commercial banks, capital adequacy, liquidity, asset quality, credit risk, non-performing loans, risk-based supervision, artificial intelligence, Early Warning System, EWS, macroprudential monitoring, financial stability, monetary policy.

ПРАКТИКА ПРУДЕНЦИАЛЬНОГО НАДЗОРА В КОММЕРЧЕСКИХ БАНКАХ УЗБЕКИСТАНА: СОСТОЯНИЕ, ПРОБЛЕМЫ И РЕШЕНИЕ

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Аннотация

В статье исследованы современное состояние пруденциального надзора в коммерческих банках Узбекистана, проблемы, возникающие в процессе выполнения пруденциальных требований, а также направления их решения. Рассмотрены особенности надзора за капиталом, ликвидностью, качеством активов и кредитными рисками банков. Обоснована необходимость трансформации традиционного пруденциального мониторинга в риск-ориентированный и перспективный надзор. В результате исследования предложена модель Early Warning System (EWS) с использованием элементов искусственного интеллекта, направленная на раннее выявление проблемных

кредитов, дефицита ликвидности и рисков капитала. Кроме того, предложен механизм макропруденциального мониторинга, учитывающий влияние факторов денежно-кредитной политики на финансовую устойчивость коммерческих банков.

Ключевые слова: пруденциальный надзор, коммерческие банки, достаточность капитала, ликвидность, качество активов, кредитный риск, проблемные кредиты, риск-ориентированный надзор, искусственный интеллект, Early Warning System, EWS, макропруденциальный мониторинг, финансовая устойчивость, денежно-кредитная политика.

Introduction

The acceleration of digitalization in the global banking system, the increasing complexity of banking operations, and the growing interdependence of credit, liquidity, and operational risks are strengthening the need to improve the substance and methods of prudential supervision. Under modern conditions, prudential supervision should not be limited to verifying compliance with prescribed economic ratios. It should also be aimed at the early identification of risks, assessment of their development trends, and implementation of appropriate supervisory measures before adverse consequences materialize. The Core Principles for Effective Banking Supervision, updated by the Basel Committee in 2024, likewise identify forward-looking and risk-based supervision, early intervention, and timely supervisory action as key features of effective prudential supervision [1].

Emerging risks in banking require supervisory authorities not only to record banks' current conditions but also to develop the capacity to assess their future risk profiles in advance. In particular, the Basel Committee's current approach provides that the nature, frequency, and intensity of supervision should be tailored to a bank's risk profile and systemic importance, while forward-looking assessments and stress testing should be incorporated into the supervisory process [2]. This creates a need for broader integration of modern digital technologies capable of rapidly processing large volumes of data, identifying adverse trends, and generating risk signals within the prudential supervision framework.

Mechanisms for prudential supervision and financial stability are also being consistently developed in Uzbekistan's banking system. The Central Bank's Financial Stability Report for 2025 noted that banks' capital and liquidity indicators remained above regulatory requirements, the quality of the loan portfolio improved, and macroprudential instruments aimed at preventing systemic risks were further enhanced [3]. At the same time, credit risks associated with microloans, cyber risks, changes in global financial conditions, and other emerging risk factors are increasing the importance of continuous monitoring and preventive supervision in safeguarding banking-system stability.

The effectiveness of prudential supervision is associated not only with identifying microprudential risks at the level of individual banks, but also with assessing systemic risks that may affect the banking system as a whole. The Macroprudential Policy Framework of the Central Bank of the Republic of Uzbekistan identifies the detection of systemic risks, limitation of their adverse impact on the financial system, and maintenance of financial stability as key objectives of macroprudential policy [4].

This issue is particularly important under an inflation-targeting regime. Since 2020, monetary policy in Uzbekistan has been conducted within an inflation-targeting framework, with the Central Bank's policy rate serving as the principal monetary policy instrument [4]. Changes in monetary conditions may affect banks' risk profiles through the cost of funding, lending activity, liquidity, and financial performance. Therefore, linking the results of microprudential supervision with macroeconomic and monetary policy factors can strengthen the forward-looking nature of prudential supervision.

An analysis of prudential supervision practices in commercial banks of Uzbekistan shows that, alongside existing mechanisms for monitoring capital adequacy, liquidity, asset quality, and credit risk, there is a need to expand the capacity for earlier risk detection and for incorporating systemic factors. In particular, identifying adverse changes in prudential indicators before they reach critical levels, providing supervisors with early-warning signals, and monitoring the interaction between micro- and macro-level risks are important directions for modern prudential supervision.

Accordingly, in order to improve the effectiveness of risk-based prudential supervision of commercial banks under digitalization, this study proposes the use of an Early Warning System (EWS) model incorporating artificial intelligence elements to support the early detection of non-performing loans, liquidity shortages, and capital risks. This approach is intended to expand the transition of prudential supervision from a reactive mechanism responding to already materialized problems into a preventive mechanism focused on identifying risks in advance.

The study also proposes the introduction of a macroprudential monitoring mechanism that takes into account the effects of the Central Bank's inflation-targeting regime and modern monetary policy instruments on the financial stability of banks. This mechanism envisages regular assessment of the relationship between individual banks' prudential indicators and macroeconomic and monetary factors in order to identify emerging trends in systemic risk.

Against this background, the purpose of the article is to analyze the current state of prudential supervision in commercial banks of Uzbekistan, identify the practical challenges in its implementation, and develop scientific and practical solutions aimed at improving supervisory effectiveness through the use of digital technologies and macroprudential approaches.

Research methodology

The study applies systemic, comparative, and statistical analysis, grouping, time-series analysis, and scientific generalization to assess the current state and existing challenges

of prudential supervision in commercial banks of Uzbekistan. The effectiveness of prudential supervision is examined using indicators characterizing capital adequacy, liquidity, asset quality, and credit risk [1], [3]. The principles of risk-based supervision are adopted as the methodological basis for forward-looking risk assessment [2]. Based on the identified challenges, the study develops directions for applying an Early Warning System model supported by artificial intelligence elements and a macroprudential monitoring mechanism that incorporates monetary policy factors.

Literature review

The organization of prudential supervision in commercial banks and the improvement of its effectiveness have been widely examined in the studies of international financial institutions and economists. In the Basel Committee's contemporary approach, prudential supervision is not limited to checking banks' compliance with established ratios; it also includes forward-looking assessment of their risk profiles, early identification of risks, and determination of supervisory intensity in proportion to the level of risk [1], [2]. This approach reflects the transformation of prudential supervision from a reactive model into a preventive and risk-based framework.

P.S. Rose and S.C. Hudgins identify the interrelationship among capital adequacy, liquidity, asset quality, credit risk, and profitability as an important dimension of assessing the financial condition of commercial banks [6]. T.W. Koch and S.S. MacDonald place particular emphasis on the need to analyze capital, assets and liabilities, liquidity, and various financial risks in an integrated manner when managing banking activities [7]. These views substantiate the need to monitor not only individual indicators but also the bank's overall risk profile within prudential supervision.

Recent studies on the digitalization of banking supervision devote particular attention to the potential of SupTech technologies. Research by the Financial Stability Institute demonstrates the possibilities of using artificial intelligence and machine-learning technologies to process supervisory data, identify risks, and improve supervisory activities [8]. At the same time, the use of such technologies raises issues related to data quality, model risk, explainability of results, and the preservation of human oversight. Accordingly, artificial intelligence should be viewed not as a substitute for expert supervisory judgment, but as an analytical tool that supports it.

Research on macroprudential supervision emphasizes the relationship between the financial stability of individual banks and systemic risks arising across the financial system as a whole. C. Borio explains that the central feature of the macroprudential approach is the need to assess the financial system not as a collection of separate institutions, but as an interconnected system [9]. D. Galati and R. Moessner, analyzing the development, objectives, and instruments of macroprudential policy, stress that limiting systemic risk is a critical condition for ensuring financial stability [10].

In the context of Uzbekistan, the importance of this issue is also reflected in the Central Bank's approaches to financial stability and macroprudential policy [3], [4]. The implementation of monetary policy under an inflation-targeting regime further

increases the need to account, within prudential analysis, for the effects of changes in the policy rate and other monetary instruments on banks' lending activity, liquidity, funding costs, and financial stability [5].

A comparative analysis of the literature indicates that the theoretical and methodological foundations of prudential supervision, artificial-intelligence-based supervisory technologies, and macroprudential policy have been studied relatively extensively. However, in the context of commercial banks in Uzbekistan, the issue of linking an AI-supported mechanism for the early identification of non-performing loans, liquidity shortages, and capital risks with macroprudential monitoring that incorporates monetary policy factors requires separate investigation.

Based on this research gap, the study proposes an Early Warning System (EWS) model that uses artificial intelligence elements to support the early detection of NPL, liquidity, and capital risks, together with a macroprudential monitoring mechanism that takes into account the impact of the inflation-targeting regime and monetary policy instruments on banks' financial stability.

Analysis and results

Capital adequacy, liquidity, asset quality, and financial stability indicators are particularly important when assessing the current state of prudential supervision in Uzbekistan's banking system. At the end of 2024, the banking system's total regulatory capital adequacy ratio stood at 17.0 percent, the Liquidity Coverage Ratio (LCR) at 194 percent, and the Net Stable Funding Ratio (NSFR) at 115 percent [11]. By the end of the first half of 2025, total regulatory capital adequacy had increased to 17.4 percent, LCR to 195 percent, and NSFR to 117 percent, while the share of non-performing loans in total loans was 3.8 percent [12].

Table 1. Key prudential indicators of the banking system of Uzbekistan

Indicator	End-2024	First half of 2025	Change
Total regulatory capital adequacy, %	17.0	17.4	+0.4 p.p.
LCR, %	194	195	+1 p.p.
NSFR, %	115	117	+2 p.p.
NPL, %	—	3.8	—
ROA, %	—	2.0	—
ROE, %	—	10.8	—

Source: compiled by the author based on data from the Central Bank of the Republic of Uzbekistan.

The data in Table 1 indicate that the banking system's aggregate capital and liquidity positions remained stable. In particular, from the end of 2024 to the first half of 2025, capital adequacy increased by 0.4 percentage points, LCR by 1 percentage point, and NSFR by 2 percentage points. In its subsequent assessment for the end of 2025, the

Central Bank likewise noted that capital and liquidity indicators remained above regulatory requirements and that non-performing loans had declined [3].

However, the stability of prudential indicators at the system level does not mean that risks are equally distributed across all banks. Banks differ in the composition of their loan portfolios, customer bases, funding sources, and quality of risk management. Moreover, in 2025 the Central Bank identified credit risks associated with microloans, cyber risks, and changes in external financial conditions as factors requiring attention from a financial-stability perspective [3].

Therefore, prudential supervision should not be limited to monitoring whether indicators remain above regulatory thresholds. Early identification of their dynamics, interrelationships, and adverse trends is an important direction for improving supervisory effectiveness.

Traditional prudential monitoring is often based on the analysis of indicators formed at the end of a reporting period. Such an approach makes it possible to assess a bank's existing condition, but rapidly changing circumstances require additional analytical capabilities to identify the process of risk formation in advance. Digital supervisory technologies, or SupTech tools, can help identify anomalies and risk signals more quickly in large data sets; however, data quality and model governance remain critical [8]. Contemporary BIS materials also note that SupTech can enable supervisory authorities to detect risk patterns earlier and focus attention on the most significant risks [13].

On this basis, the study proposes the introduction of an Early Warning System (EWS) model using artificial intelligence elements to improve the effectiveness of risk-based prudential supervision of commercial banks under digitalization and to facilitate the early detection of non-performing loans, liquidity shortages, and capital risks.

The purpose of the proposed EWS is not to replace the supervisory authority's expert judgment with artificial intelligence, but to generate early-warning signals through rapid processing of prudential data and to direct specialists' attention toward areas in which risks are intensifying.

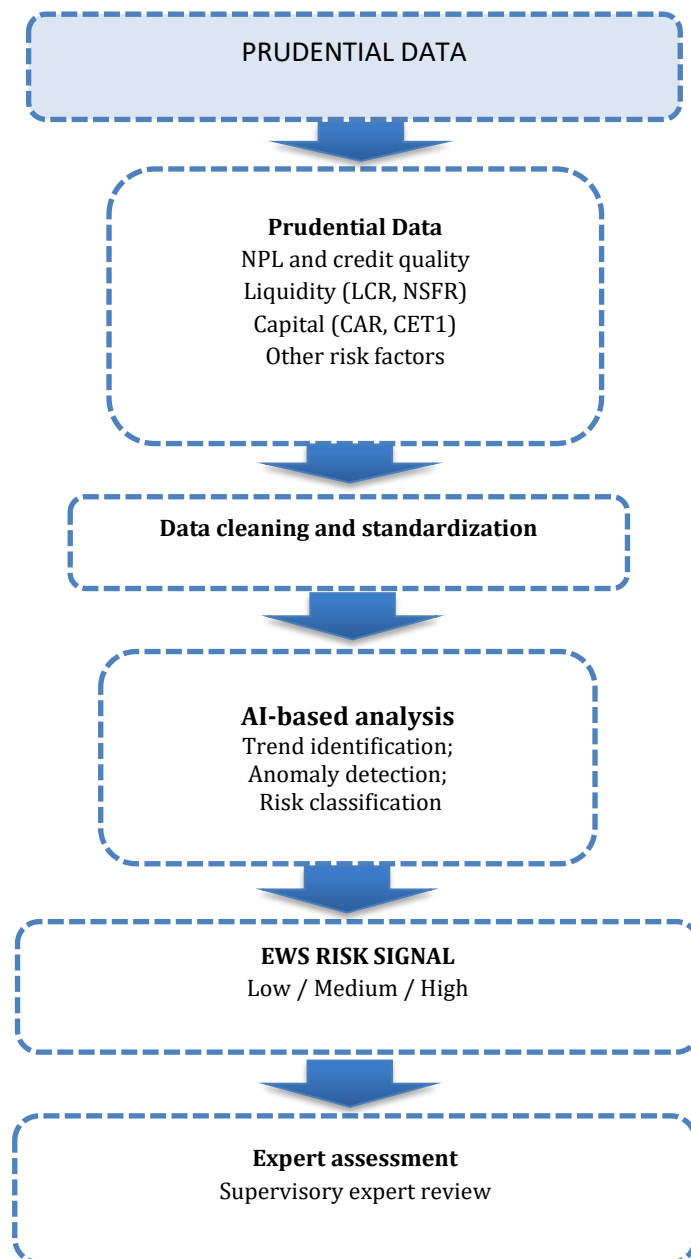


Figure 1. Operating mechanism of the EWS model based on artificial intelligence elements

Source: developed by the author.

It is important to preserve human oversight within this mechanism. A high-risk signal generated by the AI model should not automatically result in a supervisory sanction. The signal should first be subject to additional analysis by a supervisory specialist and compared with the individual circumstances of the bank before an appropriate preventive measure is determined. This reduces the risk of unfounded decisions caused by model errors or false-positive signals.

Assessing the effectiveness of prudential supervision solely through an individual bank's internal indicators is also insufficient. Banks' financial conditions are affected by inflation, interest rates, credit growth, economic activity, and other macro-financial factors. Since 2020, monetary policy in Uzbekistan has been conducted under an inflation-targeting regime, with the Central Bank's policy rate serving as the principal monetary policy instrument [5].

The Central Bank's Macroprudential Policy Framework identifies the detection of systemic risks, limitation of their adverse consequences, and maintenance of financial-system stability as key directions of macroprudential policy [4]. In practice, the framework provides for the use of capital buffers and borrower-based instruments such as LTV, DSTI, and DTI [14].

Table 2. Proposed directions for integrating prudential supervision and macroprudential monitoring

Monitoring block	Key indicators	Risk identified	Supervisory function
Capital	CAR, CET1, capital buffers	Solvency risk	Identify weakening of capital
Liquidity	LCR, NSFR	Liquidity and funding risk	Early identification of liquidity pressure
Credit quality	NPL, credit growth	Credit risk	Monitor deterioration in asset quality
Monetary conditions	Policy rate, inflation	Interest-rate and macro-financial risk	Assess external effects on the bank risk profile
Systemic risk	Credit cycle, capital buffers, LTV/DSTI/DTI	Systemic risk	Determine macroprudential measures
EWS	Dynamic combination of the above indicators	Early intensification of risks	Generate preventive signals

Source: developed by the author based on the research findings.

As a result of the study, a macroprudential monitoring mechanism is proposed that takes into account the impact of the Central Bank's inflation-targeting regime and modern monetary policy instruments on the financial stability of commercial banks. The mechanism is intended to expand the capacity for early identification of emerging systemic risks by monitoring banks' capital, liquidity, and asset-quality indicators in conjunction with macro-financial factors.

Certain institutional foundations for this approach already exist in Uzbekistan. The functions of the Central Bank's Financial Stability Department include the development of early-warning indicators for cyclical, structural, and climate-related systemic risks; the calculation of risk maps, financial conditions indices, and financial stress indices;

and the development of econometric models for identifying systemic risks [15].

Accordingly, the proposed scientific approach should be viewed not as a replacement for the existing macroprudential framework, but as a means of strengthening the analytical linkage among microprudential data, EWS signals, and macro-financial indicators.

Overall, the analysis shows that although the capital and liquidity indicators of Uzbekistan's banking system remain stable, there is scope to make prudential supervision more forward-looking. In this regard, the two main findings of the study form an integrated mechanism:

Prudential data → AI-based EWS → individual bank risk signal → expert assessment → macroprudential monitoring → systemic risk assessment → preventive supervisory action.

Thus, the first scientific contribution is aimed at strengthening early risk identification at the microprudential level, while the second is aimed at enhancing the assessment of those risks in connection with macro-financial conditions and systemic risks. Their integration provides a methodological basis for shifting prudential supervision from a reactive approach toward a model focused on anticipating risks and taking preventive action.

Conclusions and Recommendations

The analysis demonstrates that although the prudential supervision system in commercial banks of Uzbekistan continues to develop, there remains a need to strengthen early risk identification, the use of digital technologies, and the link between microprudential and macroprudential supervision. Based on the research findings, the following conclusions and recommendations are formulated:

First, it is advisable to consistently transform prudential supervision from an approach focused mainly on compliance with prescribed ratios into a risk-based and forward-looking supervisory system aimed at identifying emerging risk trends in advance.

Second, an Early Warning System (EWS) model based on the use of artificial intelligence elements in processing prudential data is proposed for the early detection of non-performing loans, liquidity shortages, and capital risks. EWS signals should be combined with the expert judgment of the supervisory authority.

Third, it is proposed to further develop a macroprudential monitoring mechanism that takes into account the impact of the inflation-targeting regime and monetary policy instruments on the financial stability of commercial banks. This would expand the capacity to assess banks' capital, liquidity, and asset-quality indicators in relation to macro-financial factors.

Fourth, in order to improve the effectiveness of prudential supervision, it is advisable to implement step by step the following mechanism: prudential data → AI-based EWS → individual risk signal → expert assessment → macroprudential monitoring → systemic risk assessment → preventive supervisory action. This approach can strengthen the integration of microprudential and macroprudential supervision.

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