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COMMERCIAL BANKS' OPTIMAL LIQUIDITY MANAGEMENT MODELS: THEORY AND PRACTICE

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ABSTRACT

The article analyzes the problem of optimal liquidity management in commercial banks based on the integration of Basel III regulatory indicators such as the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), asset–liability management (ALM), internal funds transfer pricing (FTP), and liquidity stress testing. The proposed model envisages optimizing the portfolio of liquid assets and the funding structure under constraints while maintaining the balance between bank profitability and safety. Publicly available data on Uzbekistan's banking system indicate that LCR and NSFR exceed the minimum requirement (100%), which implies the presence of liquidity buffers; however, optimization is necessary because excess liquidity entails an "opportunity cost" (foregone profit).

KEYWORDS

Liquidity, ALM, LCR, NSFR, HQLA, stress testing, optimization, transfer pricing.

Introduction

In recent years, Uzbekistan's banking system has entered a phase of rapid transformation driven by economic reforms: the efficient allocation of resources through banks, the expansion of financing for the private sector, the modernization of payment infrastructure, and the strengthening of risk management in line with international standards have intensified. In this process, the Central Bank's prudential supervision and macroprudential policy serve as key pillars for ensuring banking sector stability, and liquidity risk management approaches have been significantly strengthened: liquidity assessment indicators such as LCR and NSFR are monitored against a minimum 100% requirement, and these requirements are being implemented not only in aggregate terms but also by domestic and foreign currency segments, alongside the development of continuous monitoring of banks' liquidity positions. At the same time, the ongoing updating of monetary policy instruments and prudential parameters (particularly approaches to required reserves) has pushed banks' "free liquidity resources" management mechanisms toward a more calculation- and model-based framework: according to the Central Bank's requirements, required reserves are formed by commercial banks in a special account at the Central Bank, and reserves are required to be maintained in the national currency regardless of the currency denomination of liabilities. Under such conditions, liquidity is no longer merely an "operational" issue; it becomes a strategic management task directly linked to the structure of liabilities, the price of funding, the pace of lending, and currency cash flows.

Public statistical data published by the Central Bank show the presence of a liquidity "buffer" in the banking system: as of January 1, 2026, high-quality liquid assets (HQLA) amounted to UZS 189,082 billion, HQLA-to-assets stood at 21.1%, and LCR and NSFR were recorded at 207.5% and 119.9%, respectively—well above minimum benchmarks. Official communications on financial stability also emphasize that system-wide indicators are high (for example, for 2024, LCR of 194% and NSFR of 115% were reported), indicating that banks have resilience to liquidity shocks in the short and medium term. However, precisely this "high level" intensifies another pressing question from a management perspective: if a bank maintains liquidity too conservatively, it typically increases the share of low-yield assets and puts pressure on the net interest margin and overall profitability; conversely, excessive "saving" on the liquidity buffer can threaten solvency during periods of accelerated deposit outflows, tightened market funding, or heightened foreign-exchange liquidity stress. Therefore, in Uzbekistan's context, finding an "optimal liquidity" level—one that preserves stability under stress without violating regulatory constraints and without exerting excessive pressure on profitability—has become a relevant issue both practically and academically.

One factor that amplifies this relevance is intensifying competition in interbank and customer markets and the growing struggle for funding resources: competition for deposit rates, concentration of large depositors, rapid changes in payment flows, and the need to sustain lending growth push liquidity management beyond the "treasury-only" domain and link it to ALM-level decisions. In this context, the practical value of liquidity management lies in interconnected questions such as: at what maturity, in which currency, and with what degree of stability should a bank attract funding; how should it maintain the HQLA portfolio composition so that regulatory requirements and stress resilience are preserved while profitability is not lost; and how should "free" liquidity be planned under required reserve conditions. At this point, the Central Bank's prudential indicators are not merely "reporting metrics" but also serve as constraints and signals that directly affect banks' internal management mechanisms; for example, decisions on reserve requirements (such as lowering the reserve ratio for foreign-currency deposits) have practical effects on the cost of liquidity and the structure of funding resources.

For these reasons, an optimal liquidity management model for Uzbekistan's banking practice is relevant as an approach that integrates, within a single framework, the forecasting of cash flows by tenor and currency, the linkage of LCR/NSFR constraints to strategic and daily decisions, the correct reflection of the required reserve factor in "free liquidity" calculations, the justification of buffer size through stress tests, and the transmission of the true "price" of liquidity to business units via internal funds transfer pricing (FTP). Such an integrated approach, on the one hand, translates the apparent stability reflected in high system indicators into a structure that "works" under real stress conditions, and on the other hand, reduces the profitability pressure caused by excess liquidity, thereby enhancing banks' competitiveness; moreover, the emphasis placed on stress-test results in financial stability materials reinforces the need to manage liquidity not merely as a "reporting" topic but as "resilience."

Methods

The methodological basis of the article adopts an integration of macro- and micro-level approaches. First, a regulatory-statistical analysis is conducted to assess the overall situation by examining the dynamics of key publicly disclosed liquidity indicators for the banking system—HQLA, LCR, NSFR, and immediate liquidity.

At the micro level, considering that optimal liquidity management is typically implemented within banks through ALM/treasury functions, the proposed model relies on five modules that combine internal management into a unified framework. In this framework, cash flows such as deposit inflows/outflows, loan repayments, interest payments, currency conversion, payment discipline of major clients, and repo or market funding opportunities are forecast by maturities, and in Uzbekistan's context particular attention is given to managing liquidity in the national currency and foreign currency separately. In the model, prudential requirements operate as "hard constraints," meaning that the conditions LCR $\geq$ 100% and NSFR $\geq$ 100% are introduced as regulatory thresholds that must be continuously satisfied. In addition, the factor of required reserves and Central Bank instruments is explicitly taken into account, because this mechanism directly affects the volume of a bank's "free liquidity resources" and the treasury's daily liquidity plan. The stability component of the model is strengthened through liquidity stress tests: under scenarios such as abrupt deposit outflows, closure of market funding, tightening of foreign-exchange liquidity, or changes in collateral valuation (haircuts), the bank's "survival horizon" and cash-flow resilience are tested. The profitability component is ensured through internal funds transfer pricing (FTP), which transmits liquidity costs to business units by signaling that short-term and unstable resources are "more expensive," while long-term and stable resources are "cheaper."

The conceptual optimization logic is that, while seeking to maximize profit, a bank must not violate LCR/NSFR constraints and internal risk limits; therefore, the model jointly considers decision variables such as the composition and share of the HQLA portfolio, the structure of deposits (by maturity and segment), the growth rate of the loan portfolio and refinancing plan, the volume of repo and interbank funding, and the liquidity position by currency. As a result, the methodology forms an integrated approach that enables the simultaneous management of regulatory compliance, stress resilience, and profitability.

Results

The conclusions obtained in the Results section indicate that liquidity indicators in Uzbekistan's banking system have been formed above the minimum prudential requirements, making it possible to maintain a "liquidity buffer"; however, from a practical management perspective, the key issue is no longer "more liquidity," but rather determining an optimal buffer level that preserves regulatory requirements without compressing profitability. Specifically, the overall indicators as of January 1, 2026 (HQLA of UZS 189,082 billion, HQLA/assets of 21.1%, LCR of 207.5%, NSFR of 119.9%, and an immediate liquidity ratio of 134.7%) suggest that the banking system is resilient to short- and medium-term stress; nevertheless, such high LCR/NSFR levels are often achieved through a higher HQLA share, which can exert pressure on profitability via the "opportunity cost" channel, prompting banks to strengthen layered buffer approaches, maturity- and currency-gap limits, and stress-test-based "survival horizon" management.

Table 1. Layered structure of the liquidity buffer (practical approach)

Layer	Main components	What need it covers	Management content
Layer 1 (operational)	Cash, accounts at the Central Bank, overnight placements	Intraday and 1–7 day payments	Daily treasury planning, payment continuity
Layer 2 (regulatory HQLA)	High-quality liquid assets (HQLA): quickly realizable instruments	30-day stress horizon (LCR stability)	Maintaining LCR with a "buffer," optimizing HQLA composition
Layer 3 (contingent)	Repo/collateralized funding, backup credit lines, rapid liquidation plan	Extraordinary shocks and market closure	Contingency Funding Plan, collateral portfolio and "action playbook"

As a result of this layered approach, banks ensure daily liquidity continuity, keep regulatory indicators such as LCR/NSFR within a safe range, and maintain a contingent mechanism ready to activate rapid funding sources in emergency situations; in Uzbekistan's context, where national- and foreign-currency flows run in parallel, managing liquidity by currency further improves effectiveness. At the same time, because required reserves affect the volume of free liquidity resources, clearly distinguishing between "visible liquidity" and "usable liquidity" through cash-flow forecasting and limits provides practical benefits for bank management.

In addition, the results suggest that optimal liquidity management is not limited to monitoring ratios; it also requires early identification of rising liquidity pressure through an Early Warning Indicator (EWI) system and the rapid activation of necessary measures; for this purpose, a minimal dashboard of indicators is formed as follows.

Table 2. KPI and Early Warning Indicators (EWI) set for liquidity

Indicator	Meaning (what it shows)	EWI signal (illustrative)	Typical management actions
LCR	Coverage capacity under 30-day stress	Downward trend or breach of internal "buffer"	Strengthen HQLA composition, restrict outflows, reprice short-term funding
NSFR	Level of stable funding over 1 year	Decline in the share of stable funding	Increase long-term resources, align asset maturities
Immediate liquidity ratio	Instant payment capacity	Sharp daily fluctuations or decline	Recalibrate treasury limits, increase intraday buffer
Tenor/currency gap (7/30/90 days)	Liquidity mismatch by maturity and currency	Approaching limits	FX balancing, plan conversions and market funding
Top-10 depositors' share	Concentration (heightened run risk)	Rapid increase in share	Diversification, contingent plan for large deposits
Unencumbered HQLA share	HQLA available for real liquidation	Increase in encumbered assets share	Review collateral policy, restore "free" HQLA buffer
Deposit outflow "speed"	Speed of deposit outflows	Acceleration in 3–5 day trend	Pricing/communication measures, stabilize funding, partially activate CFP

Overall, the results show that in Uzbekistan's context an optimal liquidity management model strengthens the "stability–profitability" balance in practice by integrating the bank's daily treasury operations, ALM-level strategic decisions, prudential constraints, the impact of required reserves, foreign-exchange liquidity, and stress-test outcomes within a single management framework.

Discussion

The Discussion shows that in Uzbekistan's banking practice, liquidity management is no longer limited to "meeting" regulatory indicators such as LCR/NSFR; rather, it is becoming a strategic task linked to

the stability of the funding base, the pace of lending, currency cash flows, and profitability targets, because although indicators above requirements signal resilience, they are often achieved by increasing the share of low-yield liquid assets, which can pressure net interest margin and overall profitability; therefore, the main objective is not "maximum" but identifying an "optimal buffer" that preserves solvency under stress without violating regulatory constraints and without compressing profitability excessively.

To ensure this balance, it is important to align ALM and treasury processes under a single logic, conduct cash-flow forecasting by tenor and currency, assess the behavioral stability of deposits (segments, large depositor concentration, outflow speed) based on real data, and clearly distinguish between "visible" and "free usable" liquidity due to required reserves. In addition, managing national- and foreign-currency liquidity in separate contours, regularly testing market-funding tightening or FX shocks through stress tests, and continuously monitoring quality indicators (unencumbered HQLA, gap limits, outflow speed) and early warning signals alongside ratios improves real resilience.

As a practical solution, strengthening the layered liquidity buffer, the Contingency Funding Plan (CFP), and the internal FTP mechanism shifts a bank from "reactive" decisions during shocks to "pre-planned" management; however, since optimal parameters depend on each bank's deposit structure, access to market funding, FX risks, and risk appetite, model parameters must be continuously calibrated based on banks' historical data.

Conclusion

In conclusion, while liquidity indicators in Uzbekistan's banking system being above minimum prudential requirements demonstrates banks' resilience to short- and medium-term shocks, the primary management task is no longer holding "more" liquidity, but determining an optimal buffer level that preserves solvency under stress without violating regulatory requirements (LCR/NSFR) and internal risk limits and without exerting excessive profitability pressure through a higher share of low-yield liquid assets. Therefore, liquidity management should not be limited to monitoring ratios; it should focus on forecasting cash flows by tenor and currency, assessing the behavioral stability of deposits based on real data, clearly distinguishing between "free" and "visible" liquidity under required reserve conditions, managing national- and foreign-currency liquidity in separate contours, and continuously testing the "survival horizon" through stress tests.

As recommendations, it is advisable to integrate ALM and treasury processes into a unified management framework, treat LCR/NSFR not only as reporting metrics but also as strategic management constraints linked to decisions on lending growth, deposit structure, market funding volume, and HQLA portfolio composition, implement the layered liquidity buffer approach in practice, and maintain a workable Contingency Funding Plan (CFP) with clearly defined instruments, sequences of actions, and accountability. In addition, strengthening FTP to signal that short-term and unstable resources are more expensive while long-term and stable resources are cheaper can incentivize business units toward stable funding; continuous monitoring with early warning indicators (gap limits, large depositor concentration, outflow speed, unencumbered HQLA share) and automated triggers, and regular calibration of internal buffer ranges based on stress-test outcomes, risk appetite, and historical data will strengthen the bank's stability–profitability balance.

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