

Article

Assessing the Impact of Liquidity Risks on the Efficiency of Commercial Banks

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Abstract: This article studies the assessment of bank efficiency and the liquidity risk and its components affecting it. The relationship between bank efficiency indicators (ROA, ROE, NIM) and liquidity risk is analyzed using correlation and empirical methods, and the main conclusions are drawn. The article develops scientific and practical proposals for improving liquidity management mechanisms, effective management of assets and liabilities, as well as ensuring stability in the banking system in order to increase the efficiency of commercial banks.

Keywords: Bank efficiency, financial risks, ROA, ROE, liquidity risk, credit risk, bank assets, current liquidity, management strategies.

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Introduction. Studying the impact of liquidity risks on the efficiency of commercial banks is one of the crucial issues in modern banking management. Liquidity risk refers to the risk of a commercial bank not having sufficient liquid assets to fully and timely meet its short-term obligations. This risk significantly affects the bank's operations, especially concerning efficiency. For banks to manage their resources effectively and utilize them optimally, it is essential to assess and manage liquidity risks. Conducting economic analysis of these risks and utilizing the results to enhance efficiency is of great importance for commercial banks.

Literature review. Cornett, McNutt, Strahan, and Tehranian identified a sharp decline in the efficiency of banks with low liquidity during the financial crisis [1]. They emphasized that liquidity management plays a crucial role in maintaining the stability of banks.

Similarly, Vázquez and Federico analyzed the evolution of bank funding structures and their impact on financial stability prior to the global financial crisis using a dataset covering nearly 11,000 banks in the US and Europe between 2001

and 2009. Their findings indicate [2] that banks with weaker structural liquidity and higher leverage during the pre-crisis period were more likely to fail subsequently. Smaller banks were found to be more vulnerable to liquidity risks, while large cross-border banks were more prone to insolvency risks due to excessive leverage. These results support the proposed Basel III regulations on structural liquidity and leverage.

Empirical evidence on liquidity has shown largely inconsistent results. For instance, in his study in Pakistan, Ahmed Naveed found that ROA (Return on Assets) had a statistically insignificant relationship with liquidity. In contrast, Hakim and Neaime studied the structural differences in the banking systems of Egypt and Lebanon and the monetary fluctuations, analyzing the impact of liquidity, credit, and capital on bank profitability in each country's banking sector. They concluded that capital, liquidity, and investments are key determinants of profitability in the banking and insurance sectors.

Flamini, McDonald, and Schumacher, in their research on Sub-Saharan African countries, found a significant negative relationship between bank profitability and liquidity [3, 4].

Methodology. The study utilized various methods, including scientific abstraction, comparative and structural analysis, induction and deduction, economic-statistical analysis, econometric modeling, mathematical modeling, expert evaluation, and others.

Panel regression models are often used to assess the impact of liquidity risk on the efficiency of banks across an entire country. To evaluate its effect on the efficiency of a specific bank, linear regression models are applied.

The dependent variables are financial efficiency indicators representing the proxied activities of commercial banks, which are used to measure the profitability of the bank's operations.

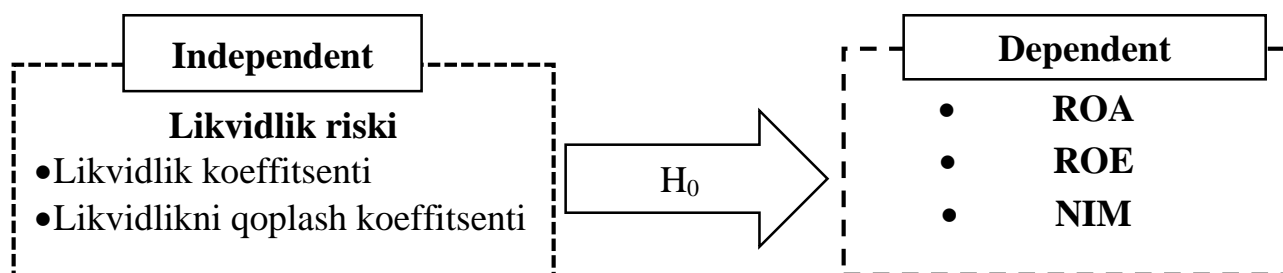


Figure 1. Dependent and independent variables relationship

This study sets the following null hypothesis (H_0):

H_0 : There is no statistically significant relationship between liquidity risk and the efficiency of commercial banks in Uzbekistan.

Results and Discussion

A high level of liquidity typically enhances security for banks; however, it can also limit opportunities to generate income from these assets. Therefore, banks must strike an optimal balance between liquid and income-generating assets. To achieve this, commercial banks need to update their liquidity strategies and ensure effective

use of their capital. As a result, reducing liquidity risk positively impacts the long-term stability and profitability of a bank.

Analysis results may indicate that when banks focus on robust liquidity management, they become more resilient to economic fluctuations. However, excessive liquidity often reduces resource efficiency, as banks may rely on low-yield assets to maintain high levels of liquid assets. This can ultimately lower the profitability and income of banks.

Key Metrics for Measuring Liquidity Risk:

Loan-to-Deposit Ratio (LR1): Reflects the balance between a bank's assets and liabilities.

Liquid Assets-to-Total Assets Ratio (LR2): Indicates the proportion of total assets that are liquid.

For instance, if the liquidity coefficient negatively impacts a bank's efficiency, it suggests that the bank is unable to use its liquid assets effectively. Similarly, if an increase in the debt-to-assets ratio correlates with reduced efficiency, it indicates that the bank has a high level of liabilities.

A thorough analysis of the impact of liquidity risks on the efficiency of commercial banks is not only essential for improving financial performance but also serves as a key tool for ensuring the sustainable development of the entire economic system. Such analysis helps make banks more reliable and competitive, enabling them to manage financial resources prudently and strengthen their position with clients.

When assessing the economic efficiency of banks, various factors must be considered, including liquidity risk indicators, which play a crucial role. These indicators, in turn, reflect the financial capacity of banks and their resilience to adverse economic conditions.

This study examines the relationship between liquidity risk indicators and efficiency in the case of “Turonbank” ATB. Based on the regression results, we analyze the factors influencing bank efficiency (ROA, ROE, NIM) and test the null hypothesis (H_0) in this context.

Table-1

LnROA	Coef.	St.Err.	t-value	p-value	[95% Conf Interval]	Sig
LnLR1	.656	.198	3.32	.001	.264 1.048	***
LnLR2	-.916	.172	-5.33	0	-1.257 -.575	***
Constant	1.487	1.041	1.43	.157	-.581 3.556	
Mean dependent var	-0.543		SD dependent var		0.703	
R-squared	0.355		Number of obs		94	
F-test	25.033		Prob > F		0.000	
Akaike crit. (AIC)	164.361		Bayesian crit. (BIC)		171.991	

*** p<.01, ** p<.05, * p<.1

Table 1. Regression result of Turonbank ROA and Liquidity risk indicators

In the regression model, two main variables are included: LnLR1 (the natural logarithm of the ratio of high-liquid assets to total assets) and LnLR2 (the natural logarithm of the ratio of high-liquid assets to total deposits). These indicators are used to measure the level of liquidity risk in banks. The primary objective of the

model is to determine which variables influence bank efficiency (ROA). The first variable, LnLR1 (liquid assets/total assets), has a coefficient of 0.656, indicating a positive effect. This means that as the ratio of high-liquid assets to total assets increases, the bank's efficiency (ROA) also improves. This result is supported by a high t-statistic (3.32) and a low p-value (0.001), indicating that this variable has a statistically significant impact on bank efficiency.

The second variable, LnLR2 (liquid assets/total deposits), has a coefficient of -0.916, showing a negative relationship. This implies that as the ratio of high-liquid assets to total deposits increases, the bank's efficiency decreases. This variable is also statistically significant, with a t-statistic of -5.33 and a p-value of 0.000, confirming the negative impact of liquidity risk on efficiency.

The model's R-squared value is 0.355, which means the model explains 35.5% of the variation in bank efficiency. This indicates a moderate level of fit. The F-test value (25.033) and Prob > F (0.000) confirm the overall significance of the regression model, suggesting that at least one variable significantly affects bank efficiency.

Based on the regression results, the regression equation can be formulated as follows:

$$\text{LnROA} = \beta_0 + \beta_1 \cdot \text{LnLR1} + \beta_2 \cdot \text{LnLR2} + \varepsilon$$

Here:

LnROA – Natural logarithm of Return on Assets;

LnLR1 – the natural logarithm of the ratio of high-liquid assets to total assets;

LnLR2 – the natural logarithm of the ratio of high-liquid assets to total deposits;

β_0 – constant;

β_1 and β_2 – regression coefficients;

ε – standard error.

Final regression equation looks like:

$$\text{LnROA} = 1.487 + 0.656 \cdot \text{LnLR1} - 0.916 \cdot \text{LnLR2}$$

This equation predicts the bank's performance using the variables LnLR1 and LnLR2. Additionally, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) values also indicate the good fit of the model. Lower AIC and BIC values suggest a better model fit.

Based on the regression results from Turonbank's ROA (Return on Assets) and liquidity risk indicators, several recommendations can be developed to improve the bank's performance and manage liquidity risks.

The analysis results show that LnLR1 (the ratio of highly liquid assets to total assets) has a positive effect, meaning an increase in this indicator improves the bank's performance. On the other hand, LnLR2 (the ratio of highly liquid assets to total deposits) has a negative effect, meaning an increase in this indicator may decrease the bank's performance.

At the same time, a high value for LnLR1 helps the bank improve liquidity and performance. However, a high value for LnLR2 may increase liquidity risk and reduce performance.

Turonbank should focus on attracting high-return assets while ensuring that this does not increase the overall liquidity risk of the bank. That is, the bank needs to allocate more resources to high-liquid assets and related investments in liquidity management. The bank could increase short-term securities and government bonds.

Taking into account the negative impact of the LnLR2 indicator, Turonbank should consider further diversifying the volume of deposits. Utilizing long-term deposits and borrowing sources would help reduce dependence on short-term deposits.

For LnLR1, the p-value is 0.001, which is less than 0.01, so the null hypothesis (H0) is rejected. This means that the liquidity risk indicator has a significant effect on the bank's performance.

For LnLR2, the p-value is 0.000, which also indicates the rejection of the null hypothesis (H0). This means that the liquidity risk indicator has a negative effect on the bank's performance. Thus, the null hypothesis — that liquidity risk does not affect the performance of banks — is rejected, and liquidity risk does affect the profitability of bank assets.

Table-2

LnROE	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnLR1	.281	.218	1.29	.2	-.152	.713	
LnLR2	-.661	.189	-3.49	.001	-1.037	-.285	***
Constant	3.253	1.147	2.84	.006	.974	5.532	***

Table 2. Turonbank's ROE and Liquidity Risk Indicators Regression Results

The regression results for Turonbank's Return on Equity (ROE) and liquidity risk indicators are presented as follows:

$$LnROE = 3.253 + 0.281 \cdot LnLR1 - 0.661 \cdot LnLR2$$

The LnLR1 indicator has a positive effect on ROE, but this effect is not statistically significant (p-value: 0.2, $p > 0.05$, meaning the result is not statistically significant). In other words, an increase in the ratio of highly liquid assets to total assets may increase the bank's ROE, but the strength of this relationship is weak, and its statistical reliability is low.

The LnLR2 indicator has a negative effect on ROE. This means that as the ratio of highly liquid assets to total deposits increases, the bank's ROE decreases. This result is statistically significant ($p < 0.01$) and shows no positive relationship.

The LnLR1 indicator does not have a negative effect on the bank's ROE, but its statistical significance is low. This result suggests that changes related to the ratio of highly liquid assets to total assets do not significantly affect the bank's ROE. This may be related to the effectiveness of the bank's liquidity management policy.

Turonbank should continue its liquidity management strategy and optimal resource allocation, but it should not focus too much on this indicator.

The LnLR2 indicator has a negative effect on ROE. This means that as the ratio of highly liquid assets to total deposits increases, the bank's return on equity decreases. In efforts to increase liquidity, a higher proportion of highly liquid assets to deposits could reduce the bank's ROE.

Turonbank needs to strengthen caution in managing the LnLR2 indicator. These changes may negatively affect the bank's profitability, so it is essential to maintain a balance between deposits and assets.

The model's R-squared value is low (0.156), indicating that many other factors, in addition to liquidity risk, affect the bank's ROE. To improve this indicator,

additional variables could be included in the regression.

The H_0 hypothesis ("Liquidity risk does not affect the bank's performance") is rejected based on this analysis. The LnLR2 indicator has a negative effect on ROE, thus the H_0 hypothesis is rejected. In other words, liquidity risk significantly affects the bank's performance.

Table-3

LnNIM	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
LnLR1	.851	.142	6.01	0	.57	1.133	***
LnLR2	-1.119	.123	-9.09	0	-1.364	-.874	***
Constant	2.663	.747	3.57	.001	1.18	4.146	***

Table 3. Net Interest Margin and liquidity risk indicator regression results

The following regression equation represents the variables related to LnNIM (Net Interest Margin):

$$\text{LnNIM} = 2.663 + 0.851 \cdot \text{LnLR1} - 1.119 \cdot \text{LnLR2}, \quad \text{here:}$$

LnNIM - Natural logarithm of Net Interest Margin.

The LnLR1 (0.85) indicator has a positive effect on NIM. This means that as the ratio of highly liquid assets to total assets increases, the bank's net interest margin also increases. These changes are statistically significant.

The LnLR2 indicator has a negative effect on NIM. This means that as the ratio of highly liquid assets to total deposits increases, the bank's net interest margin decreases. This effect is statistically significant.

The explanatory power of the model is moderately high, meaning the regression explains 62.4% of the variation in NIM (R-squared: 0.624). This indicates that the model is quite effective in explaining NIM.

The overall significance of the model is high with $p < 0.01$, indicating the overall relevance of the model. In other words, the regression equation is significant with all variables considered together.

To better understand the results of the regression, the following graph can be created.

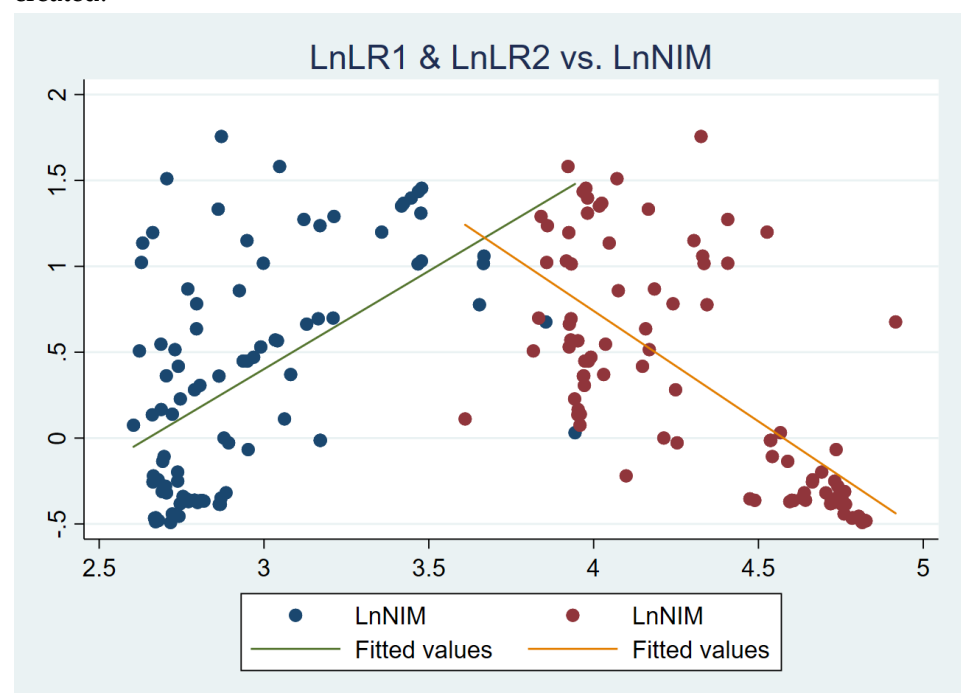


Figure 2. Liquidity risk and net interest margins relationship

The graph shows a positive and strong correlation between the ratio of highly liquid assets to total assets (LR1) and NIM. This confirms the idea that as liquidity increases, the bank's financial performance improves.

There is a negative relationship between the other liquidity indicator (LR2), i.e., the ratio of highly liquid assets to total deposits, and NIM. This suggests that a higher level of liquidity could lead to a decrease in the bank's profitability.

As LnLR2 increases, NIM decreases, meaning that as the ratio of highly liquid assets to total deposits increases, the bank's net interest margin decreases. This likely indicates that although deposits are increasing to boost liquidity, these resources are being used inefficiently.

Turonbank needs to manage the LnLR2 indicator carefully. While the ratio of deposits may increase when boosting liquidity, the bank must maintain its profitable operations by managing this indicator effectively.

The relationship between LnLR1 and LnLR2 and their impact on NIM is statistically significant according to the regression results. The p-value of 0.000 confirms that these indicators affect the bank's performance, while the high t-value further affirms the significance of the indicators, leading to the rejection of the H_0 hypothesis (i.e., liquidity risk does not affect the bank's performance).

Conclusion.

The research findings confirmed the complex interrelationship between the efficiency of commercial banks and liquidity risks. The following key conclusions were drawn:

The ratio of highly liquid assets to total assets (LnLR1) has a positive impact on bank efficiency. This suggests that when a bank's liquidity is stable, its income-generating activities are more effective.

The ratio of highly liquid assets to total deposits (LnLR2), however, negatively impacts bank efficiency. As this indicator increases, the ability to use resources effectively decreases, leading to lower profitability.

The results based on ROA (Return on Assets) indicate that a balance between liquid assets and total assets enhances efficiency. However, when the balance between liquid assets and total deposits is disrupted, profitability decreases.

Regarding ROE (Return on Equity), a higher level of liquidity was found to have a statistically insignificant but negative impact on profitability relative to equity. This could indicate that the bank's resources are being allocated inefficiently.

Practical Recommendations:

Banks should diversify the composition of liquid assets and maintain a balance between short-term and long-term resources.

Diversifying deposits, reducing dependence on short-term liabilities, and developing strategies to attract long-term resources are necessary.

To improve operational efficiency, it is essential to reconsider strategies focused on transitioning to high-return, but less liquid assets.

The hypothesis (H_0) proposed in the study was rejected, confirming that liquidity risk significantly impacts the efficiency of commercial banks. This necessitates a reevaluation of liquidity management and financial strategies.

Based on these conclusions, it is crucial to implement integrated and advanced approaches to managing liquidity risk to ensure the stability and efficiency of banks. This will not only enhance the stability of individual banks but also contribute to the overall stability of the financial system.

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