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Abstract

This study investigates the effect of liquidity on the stability of the banking sector in Bangladesh based on sample of 35 banks listed in the capital market between 2011 and 2024. Using insights from liquidity preference theory and financial intermediation theory, cash to deposit ratio and loan to deposit ratio have been determined as independent variables (liquidity factors) in model 1 and model 2 respectively. Risk adjusted Z-score is used as an indicator of bank stability while capital adequacy ratio is employed to check the robustness. In addition, return on equity, non-performing loans, bank size, board size, and growth rates of gross domestic production have been incorporated as control variables. For data analysis, ordinary least squares regression is employed in this panel data set due to having the presence of heterokasdascitiy problem .The findings indicate that the cash-to-deposit ratio strengthens banking stability in model 1, while the loan-to-deposit ratio weakens it in model 2. Furthermore, the non-performing loan ratio displays a negative coefficient in both specifications. Our outcome remains robust in robustness test. These findings have vital insight to policymakers of the banking sector with respect to how liquidity of bank influences the banking stability. Many banks, being overexposed to the stock

market, met liquidity crisis by the end of 2010. When the capital market crashed, devaluation of bank investment led to a shortage of liquid assets causing liquidity crisis. It is not unlikely that such shortage of liquidity affects the stability of banks. However, this issue has not been adequately addressed by the existing studies and accordingly, the present study is an attempt in this aspect.

Keywords: Bank Sector Stability, Capital Market, Liquidity, Return on Equity and risk adjusted Z-score

Introduction

The financial intermediation role of banks involves with channeling financial resources among savers, lenders and borrowers as well as driving economic development (Le and Nguyen, 2025). Since the 1980s, bank-dominant financial systems have been instrumental in boosting the economic growth of developing countries like Bangladesh (Aziz et al., 2017). Consequently, the stability of the banks is synonymous with the sustained economic advancement (Fulford, 2015; Shahriar et al., 2023). This stability ensures an affordability of banks to maintain steady and safe operations even during severe economic downturns (Gwachha, 2023). Bank liquidity has been acknowledged as a pillar of financial system stability (Akber et al., 2025) and exerts extensive predictive power for forecasting financial turmoil (Guo et al., 2026). Sound bank liquidity is indispensable for safeguarding macroeconomic stability. Similar views are emphasized in scholarly works of Asian markets, exhibiting that liquidity impacts stability and credit disbursement of banks (Huynh, 2024). Banks with poor level of liquidity may encounter hard time in case they fail to convert their holdings into cash (Ahmad et al., 2022).

Liquidity refers to a bank's ability to fulfill both its expected and unexpected obligations, such as deposit withdrawals. Fundamentally, it involves managing cash inflows and outflows to maintain a stable, consistent balance within a financial intermediary (Anh and Sang, 2024). While containing a robust pool of liquid assets serves as a key cushion during financial shocks, holding excessively high levels can inadvertently change a bank's risk-taking behavior (Chen et al., 2020). Conversely, lack of liquidity can happen individual bank failures and trigger wider systemic instability. Strong liquidity enhances a bank's overall stability and performance by mitigating operational risks and lowering financing expenses. This ultimate protective layer boosts profitability while significantly diminishing the bank's vulnerability to insolvency (Tran et al., 2025).

Liquidity is synonymous with a bank's continuous development and stability (Habib et al., 2022). Despite its critical importance, the relationship between liquidity and banking stability remains a facet seldom explored in empirical literature. While numerous cross-country studies examine multi-dimensional factors influencing banking stability, the specific impact of liquidity shocks—such as those originating from capital market crashes—requires deeper investigation. The historical context of Bangladesh highlights this critical research gap. By the end of December 2010, excessive exposure of commercial banks to the capital market inflated the Dhaka Stock

Exchange General Index, creating an unsustainable asset bubble (Bangladesh Bank, 2011). Some banks had unsafely deployed up to 75% of their funds into the stock market, heavily violating the regulatory cap of 10% (Hossain, 2018). When the bubble burst on December 19, 2010, it triggered severe liquidity stress across the financial sector, driving call money market rates to a record high of 33.5% (Bangladesh Bank, 2011). Because capital market collapses can induce severe liquidity shortages that compromise overall banking stability, this issue demands rigorous academic scrutiny. Accordingly, the present study addresses this gap by analyzing the direct effects of liquidity dynamics on banking stability.

Guided by Keynes (1936) liquidity preference theory and Diamond and Dybvig's (1983) financial intermediation theory, this study identifies the specific liquidity factors that impact banking stability. The liquidity preference theory explains how interest rates and money demand are driven by transaction, precautionary, and speculative motives (Keynes, 1936). In banking, this framework highlights how sudden shifts toward cash holdings directly impact institutional stability. When panic triggers a sudden rush for liquid money, bank deposits drain rapidly, causing liquidity crises that threaten the broader financial system (Anh and Sang, 2024). Drawing from these liquidity preference principles, this study utilizes the cash-to-deposit ratio (CDR) as a key indicator of liquidity. Ultimately, a high CDR protects banks from liquidity shocks (Guo et al., 2026).

This study uses financial intermediation theory which posits that a bank's stability and performance heavily depend on its ability to effectively mobilize deposits and extend credit (Gwachha, 2019). Because the loan-to-deposit ratio (LDR) directly reflects how efficiently a bank executes this core intermediation process, it serves as a critical indicator of liquidity and banking stability (Le and Nguyen, 2025). However, managing this balance is vital; aggressive or high-risk lending can lead to severe cash shortages and instability if those loans default (Giolongo et al., 2019).

Prior studies measure banking stability using Z-score (Shahriar et al.,2023; Hossain and Imam,2017; Gwachha 2023), capital adequacy ratio (Mkadmi et al,2021), and CAMELS framework (Afroj, 2022) as well as identify factors affecting bank stability such as return on equity (Mkadmi et al. 2021), bank size (Ahmad et al. 2022), board size (Babic et al. 2020) and gross domestic production (Gwachha, 2023). However, following Li et al. (2016), this study employs the risk-adjusted Z-score—rather than the traditional Z-score—to measure banking stability, thereby introducing a novel analytical dimension. We test our predictions using a sample of 35 listed banks in Bangladesh spanning the period from 2011 to 2024. To evaluate liquidity dynamics, we develop two distinct empirical models, incorporating the CDR in Model 1 and LDR in Model 2 respectively.

Our empirical results show that CDR is positively associated with banking stability, whereas LDR exhibits an inverse relationship. These findings support our theoretical frameworks stating that stable banks maintain higher cash reserves and liquid assets to satisfy sudden shifts in liquidity preference, protecting themselves against market shocks and maintaining bank stability. With regard to endogenity tests, the Durbin–Wu–Hausman (DWH) procedure has been applied which provide no statistical evidence that CDR or LDR suffers from an endogeneity problem within the specified models.

We make several distinct contributions to the literature in several key ways. First, this study expands the limited literature on the effect of liquidity on banking stability (Habib et al.,2022), impact of liquidity risk on the financial performance (Yeasin, 2023), nexus between liquid asset holdings and bank profitability (Mohammad et al.,2024 and Islam et al., 2022), as well as significance of liquidity creation for financial stability (guo et al.,2026). However, to the best of our knowledge, the connection between bank stability and liquidity has been largely overlooked during 2010–2011 stock market scandal**.** Thus, our study advances the existing body of literature by testing financial theories such as liquidity preference theory and financial intermediation theory in the context of a developing country like Bangladesh.

Second, this study adds a novel viewpoint in bank stability measurement. Prior studies measure the bank stability using traditional Z-score such as (Shahria et al.,2023 and Mkadmi et al.,2021). Using the risk-adjusted Z-score as an improved measure of bank stability, we follow the approach of Li et al. (2016).

Third, to identify key liquidity factors, this study utilizes insights from both liquidity preference theory and financial intermediation theory, which serve as highly relevant frameworks for the analysis. Existing literature rarely provides a clear link between banking stability—as measured by Z-score variations—and overall bank liquidity.

Finally, we utilize an extensive data set comprising 476 bank-year observations from banks in Bangladesh for the time frame of 2011-2024. This extensive timeframe highlights the connection between liquidity and bank stability over a longer period. A strong foundation for our outcomes is provided by the robustness and currency of the data, ensuring conclusions highly pertinent to the present context of banking stability.

The remainder of our paper is organized as follows. Section 2 presents the theoretical framework and develops the hypotheses. Section 3 discusses the data sources, sample, and methodology. Section 4 presents and discusses our main results, while Sect. 5 presents additional analysis. Sect. 6 shows the endogeneity test . Finally Sect. 7 concludes the paper.

Theoretical Frameworks, Empirical Evidences and Hypotheses Development

Theoretical Frameworks: Liquidity Preference Theory (Keynes, 1936)

Liquidity mirrors the stability of a commercial bank (Islam & Jahan, 2018). Mohammad and Khan (2024) highlight that every bank must balance holding cash with investing in income-generating assets. Doing so requires a deep understanding of what ties down liquid assets and how it alters profitability and liquidity management as well. So, liquidity preference theory is instrumental in comprehending the liquidity management for the survival of financial institutions

(Anh and sang, 2024). The nexus between liquidity preference theory and banking stability lies in the trade-off between holding liquid cash and investing in less liquid assets (Keynes, 1936). CDR supports the perceptions of liquidity preference theory, which, states that individuals and businesses prefer to hold their wealth in cash rather than less liquid assets due to transaction, precautionary, and speculative motives. When people prefer holding cash, they maintain fewer deposits in banks which reduce the CDR of banks. So, in the context of banking, by maintaining an optimal level of liquid assets, banks can ensure they have enough cash to meet short-term obligations while also taking advantage of investment opportunities to maximize their returns. This balance is essential for maintaining financial stability and achieving long-term success (Keynes, 1936).

Theoretical Frameworks: Financial Intermediation Theory (Diamond and Dybvig's (1983)

Financial intermediation theory finds that banks perform the role of financial intermediary, which accept deposits and make loans or investments to ensure flow of funds in the economy (Diamond Dybvig, 1983). Financial intermediation theory clarifies how banks exist to link the gap between those with surplus funds and those with funding needs (Le and Nguyen, 2025). By providing highly liquid deposits to savers while investing those funds in illiquid, long-term loan, bank may create instability, as sudden demands of funds by the depositors cash can trigger bank runs (Guo et al., 2026) . This theory further reveals that there is an affiliation between loans and deposits or liquidity and credit risks where risky assets can be the reason of the instability of banks. Credit risk of a bank is inherently linked to financial intermediation theory (Allen and Santomero (1998). Furthermore, in an efficient, ideal world without information gaps or transaction costs, savers would lend straight to borrowers; however, real-world inefficiencies force banks to act as intermediaries. Banking operations are always subject to credit risk (Dei Ofosu-Hene & Amoh, 2016). Credit risk typically rises as credit expands. Credit risk measured by the non-performing loans has negative and statistically significant impact on the stability of commercial banks (Yeasin, 2023). Bank size and financial intermediation theory are closely connected because a bank's scale directly shapes how efficiently it performs core intermediation functions like risk-sharing, liquidity creation, and information processing (Le and Nguyen, 2025). Larger banks lower the transaction and operational costs of gathering deposits and issuing loans. Financial intermediation theory highlights that intermediaries exist to reduce transaction costs, and scale makes this process more efficient (Khosim and Masman, 2026). Intermediaries absorb and shift risk. Efficient risk management reduces unexpected loan losses, protecting net income and sustaining a stable ROE over economic cycles (Scholtens and Wensveen, 2003). Financial intermediary theory argues that intermediaries exist to minimize transaction costs**,** mitigate asymmetric information **(**adverse selection and moral hazard), and act as delegated monitors of borrowers. Executing these tasks creates direct demands on the board (Scholtens and Wensveen, 2003). In corporate finance, financial intermediary theory connects directly to board size through the unique roles that banks, insurance companies, and other financial firms play in managing risk

and asymmetric information. Unlike standard non-financial corporations, financial intermediaries face distinct operational, regulatory, and monitoring complexities that fundamentally reshape the optimal structure and size of their board of directors (Carretta et al.,2006). Macroeconomic factors are deeply connected to financial intermediation theory because broader economic conditions directly shape how banks and financial institutions manage risk, set interest rates, and allocate credit between savers and borrowers (Kariuki and Mereipie, 2023).

Empirical Evidences

The liquidity ratio exerts mixed effects on banking stability. However, specific evidence from Malaysia's top five listed commercial banks between 2011 and 2020 reveals that the current ratio yields a significant, positive impact on financial soundness (Awulo et al., 2019; Zaharum et al., 2022). Conversely, empirical evidence from the 2006–2016 periods indicates that higher liquidity ratios compromised the profitability of commercial banks listed on the Iraq Stock Exchange (Ali and Jameel, 2019). Greater bank liquidity generally diminishes NPLs, while high NPLs subsequently drain a bank's available liquidity.NPL has negative and significant relationship with financial performance of banks in Bangladesh (Yeasin, 2023). LDR has a significant positive effect on the stability of Tunisian banks (Zaghdoudi, 2019). In contrast, banks exhibit a negative relation between LDR and bank stability in Jordan and Tunisia (Kharabsheh & Gharaibeh, 2022). While higher liquidity can initially reinforce stability, it may eventually incentivize excessive risk-taking behavior; conversely, well-liquidated institutions play a vital role in injecting liquidity back into the financial system during economic crises (Cornett et al., 2011). Amid varying liquidity risk management frameworks, the CDR has been identified as a highly efficient strategy for bolstering banking stability (Ajao & Iyekekpolor, 2022). This structural benefit is particularly applicable to emerging economies like Bangladesh, where empirical evidence suggests that escalating the CDR significantly strengthens overall banking sector stability (Islam et al., 2022).The impact of ROE on banking stability is complex: high ROE is a sign of profitability, but it can mask systemic vulnerabilities. When banks artificially boost ROE using high debt or thin capital, they become highly fragile. True, long-term stability is achieved when strong earnings are backed by adequate, high-quality capital reserves rather than excessive leverage (Moussu, 2018). However, ROE impacts negatively the bank stability in Tunisia as the most profitable banks are inclined to take excessive risks. These risks negatively influence bank performance and lead to a decrease in bank stability (Mkadmi et al. 2021).Bank size (SIZE) has a positive impact on bank stability (Ahmad et al., 2022). Yet, larger banks frequently diversify their types of business, which puts them at risk for agency issues and bad corporate governance, both of which increase systemic risks and diminish the bank's stability as well (Dei Ofosu-Hene & Amoh, 2016). While SIZE affects banking stability positively in Nepal, Morocco ,Ghana and African coutnries (Gwachha, 2023; and Adusei, 2015), it has a significant negative impact in the European Union banks implying that larger banks are less stable than smaller banks (Kohler, 2015). In Bangladesh, SIZE affects positively the financial strength of banks indicating that banks with greater assets are more able to tackle

unfavorable situations than banks with lesser assets (Afroj, 2022).Large corporate boards are less effective due to the problems of coordination, control, and decision-making and give excessive control to CEOs (Jensen, 1993). Firms with small boards have a better financial performance (Yermack, 1996). Board size (BS) influences the bank stability of Serbia negatively (Babic et al., 2020). In contrast, Board size (BS) is positively and significantly related to the performance of the banks (Adams and Mehran, 2005). In the context of macroeconomic factors, GDP growth and inflation are key macroeconomic factors that influence the stability and performance of the banking sector. Research shows that both GDP and inflation positively affect banking stability in nations like Jordan, Nepal, the UK, Romania, and Oman (Gwachha, 2023). However, the impacts vary by region; for instance, in Bangladesh**,** while GDP growth significantly boosts banking performance, inflation has been found to have no significant effect (Islam et al., 2022).

Hypotheses Development

Based on the preceding theoretical arguments and empirical evidences, we test the following hypothesis:

Hypothesis 1 (H1*)* *CDR impacts positively the banking stability.*
Hypothesis 1 (H1*)* *LDR has a negative relation with banking stability.*

Data and Model

Data

We collect bank-specific data from the annual reports and macroeconomic data from World Bank. Following Li et al., (2016), risk adjusted Z-score has been determined as dependent variable to measure the stability of banks while the greater value of Z-score means greater bank stability and lower bankruptcy risks (Gwaccha, 2023). Also following Mkedmi et al. (2021), capital adequacy ratio is utilized as an alternative of bank stability to check the robustness of the findings as greater capital enhances stability through providing the adequate financial support during unexpected situation. CDR and LDR driven by liquidity preference theory and financial intermediation theory have been determined as key liquidity factors affecting bank stability. Data on other variables performing as control variables such as non-performing loans return on equity, bank size, board size and growth rates of gross domestic production have also been obtained to make a comprehensive data set containing 476 observations. These observations include listed 29 banks in the year 2011 and 2012, listed 34 banks in the year 2013 and 2014 and listed 35 banks from the year 2015 through 2024. Details description of the dependent, independent and control variables used for the study have been shown in appendix-1.

Empirical Model

We estimate the following regression equation and run the Ordinary least squares (OLS) regression to test the effects of liquidity on bank stability.

Model 1

$$Z_{RORWA_{it}} = \beta_0 + \beta_1 CDR_{it} + \beta_2 Controls_{it} + \varepsilon_{it}$$

Model 2

$$Z_{RORWA_{it}} = \beta_0 + \beta_1 LDR_{it} + \beta_2 Controls_{it} + \varepsilon_{it}$$

Z_RORWA is risk adjusted Z-score, CDR for Cash to deposit ratio (model 1) and LDR for loan to deposit ratio (model 2). Following extant literature (Ahmad et al. 2022; Mkadim et al.2021; Yeasin, 2023; Babic et al. 2020 and Gwachha, 2023), we include control variables such as SIZE, the natural log of total assets; ROE, ratio of return to equity; NPL, ratio of non-performing loans to gross loans; BS, number of directors; and GGDP, annual growth rates of gross domestic production.

Descriptive Statistics

Table 1 reports the descriptive statistics for our sample. The average value of Z_RORWA is 28.84, with a relatively high standard deviation of 15.32, indicating considerable variation in bank stability across observations. The average CDR is .10 while the mean LDR is 83.8%. The average NPL ratio is 5.10%, suggesting moderate credit risk among the sampled banks. Banks have an average board size of approximately 14 members, whereas the average firm size is 12.20. GGDP averages 6.40% during the study period.

Table 1 Descriptive Statistics of the Variables Used in the Study

Variables	Observation	Mean	Standard dev.	Min	Max
Z_RORWA	476	28.84	15.32	2.33	139.93
CDR	476	0.10	0.09	0.01	0.84
LDR	476	0.83	0.11	0.24	1.75
ROE	476	0.11	0.07	-0.70	0.86
NPL	476	0.05	0.04	0.0	0.33
SIZE	476	12.20	0.80	8.69	14.42
BS	476	14.31	4.17	6.0	22.0
GGDP	476	0.06	0.01	0.03	0.07

Multicollinearity Test: Correlation Matrix

Correlation Matrix of model 1 and model 2 (Appendix Table 2) find that the strongest relationship is observed between SIZE and NPL (r = 0.338), which is considered moderate. However, the tolerance limit is set according to the Pearson coefficient, which is equal to 0.60 (Mkadmi et al.,2021).Therefore, the correlation matrix alone does not indicate serious multicollinearity. So, the above mentioned correlation metrics do not find any of the correlation

between independent variables greater than 0.60, indicating that the explanatory variables are correlated with each other at a relatively low level. These suggest that the concern of multicollinearity in the model is not a serious matter in this study.

Multicollienarity Test: Variance Inflation Factor (VIF)

All remaining explanatory variables record VIF values below the commonly accepted threshold of 10 (Appendix Table 3). The VIF is considered to be a concerning issue if its value is greater than 10 (Shrestha, 2020). As the VIF values are less than 10, the multicollinearity is not a problem in the model. These results indicate that multicollinearity is no longer a concern, suggesting that the explanatory variables provide independent information and that the estimated regression coefficients are stable and reliable.

Normality Test

The normality of the regression residuals is assessed using the Shapiro–Wilk test (Appendix Table 4). This test rejects the null hypothesis of both models indicating that the residuals deviate significantly from normality. However, because the sample consists of 476 observations, the violation of residual normality is not considered a major concern as the shape of the distribution becomes more normal as the sample size increases (Islam, 2018). Furthermore, according to the Central Limit Theorem, OLS estimators remain consistent and asymptotically normal in large samples, allowing valid statistical inference when robust standard errors are employed (Woodridge, 2010). So it is concluded that our simulation results are consistent with the central limit theorem.

Autocorrelation Test

The presence of autocorrelation is examined using the Durbin–Watson statistic (Appendix Table 5). Since the Durbin–Watson statistic is reasonably close to the benchmark value of 2, there is no evidence of severe first-order autocorrelation in the residuals. The result suggests that only mild positive serial correlation may be present and that autocorrelation is unlikely to substantially affect the regression estimates. Overall, based on the Durbin–Watson statistic, autocorrelation does not appear to be a major concern in the current model specification.

Heteroskedasticity Test

To assess heteroskedasticity , Breusch–Pagan test and the White test have been conducted in model 1 and model 2 (Appendix Table 6).Since the p-values obtained from both tests are below the 5% significance level in model 1 and 2, the null hypothesis of constant error variance is rejected. These findings indicate that the residuals exhibit heteroskedasticity, implying that the variance of the error terms is not constant across observations. Heteroskedasticity does not bias

the estimated regression coefficients; however, it results in inefficient standard errors and unreliable hypothesis tests if left uncorrected (Woolridge, 2019). To obtain valid statistical inference, the regression model should therefore be estimated using heteroskedasticity-robust standard errors (HC3 or White robust standard errors), which provide consistent standard errors even when the homoskedasticity assumption is violated (White, 1980).

Empirical Results

Baseline regression

Model 1

Our baseline estimation results for the effect of liquidity on bank stability are presented in Table 2. In column 2 and 4, we find that at 1% significance level, CDR has a positive and statistically significant relationship with Z_RORWA ($\beta = 20.317$, $p < 0.001$). This suggests that, holding other variables constant, an increase in CDR is associated with an increase in bank stability confirming the hypothesis 1 as well as consistent with our theoretical framework, which is based on the insights from liquidity preference theory. Similarly, NPL as a control variable exhibits a negative and statistically significant effect on Z_RORWA in column 2 and 4 ($\beta = -58.199$, $p = 0.026$), implying that higher levels of non-performing loans reduce bank stability similar with existing literature (Yeasin, 2023). Consistent with, these results demonstrate that the CDR positively impacts banking stability**.** The overall regression model remained statistically significant ($F = 3.355$, $p = 0.0031$), indicating that the explanatory variables jointly explain a significant proportion of the variation in bank stability (Z_RORWA). The model explained approximately 24% of the variation in the dependent variable ($R^2 = 0.24$).

Table 2 OLS Regression Output of Model 1

Variable	**Coefficient**	**Robust SE(HC3)**	**p-value**
Constant	45.829	22.656	0.043
CDR	20.317	5.531	0.001*
ROE	-23.240	15.861	0.143
NPL	-58.199	21.154	0.026**
SIZE	-0.245	1.803	0.892
BS	-0.313	0.206	0.128
GGDP	-29.649	59.347	0.617
F= 3.355 P=0.0031 R^2=.24			

This table reports the results of OLS regression following the detection of heteroskedasticity and model 1 is estimated using heteroskadasticity-robust(HC3) standard errors. *, **, and *** denotes to the significance levels of 1%, 5% and 10% respectively. CDR is used as liquidity factor with RORWA as measurement of bank stability.

Model 2

Table 3 shows the baseline regression findings of model 2 using LDR as independent variable.

Table 3 OLS Regression Output of Model 2

Variable	**Coefficient**	**Robust SE (HC3)**	**p-value**
Constant	60.424	24.486	0.0136
LDR	-19.938	8.486	0.0188**
ROE	-20.870	12.700	0.1003
NPL	-55.140	19.282	0.0042*
SIZE	-0.315	1.765	0.8582
BS	-0.299	0.202	0.1383
GGDP	-25.586	60.121	0.6704
F=2.137		P=0.0483	R^2=0.26

This table reports the results of OLS regression following the detection of heteroskedasticity and model 1 is estimated using heteroskadasticity-robust(HC3) standard errors. LDR is used a liquidity factor with RORWA as measurement of bank stability. *, **, and *** denotes to the significance levels of 1%, 5% and 10% respectively.

In column 2 and 4, LDR exhibits a negative and statistically significant relationship with bank stability ($\beta = -19.938$, $p = 0.0188$) complying the hypothesis 2, indicating that higher loan-to-deposit ratios are associated with lower values of Z_RORWA, holding other factors constant. Similarly, NPL has a negative and statistically significant effect ($\beta = -55.140$, $p = 0.0042$), implying that increases in non-performing loans significantly reduce bank stability. These findings also confirm the empirical literature and theoretical frameworks, which is based on the insights from the financial intermediation theory (Diamond and Dybvig's ,1983).

Additional Analysis

Table 4 and Table 5 display the Model 1 and Model 2 regression results, employing CAR as an alternative banking stability measure for robustness checks.

Table 4 OLS Regression Output of Model 1

Variable	Coefficient	Robust SE (HC3)	p-value
Constant	0.8131	0.2979	0.0064
CDR	0.6443	0.0332	0.0461**
ROE	-0.2564	0.1763	0.1458
NPL	-0.3551	0.1657	0.0322**
SIZE	-0.0546	0.0239	0.0222**
BS	0.0017	0.0008	0.0278**
GDP	0.2490	0.2152	0.2473
F=3.265	P=0.0398	R^2=0.21	

This table reports the results of OLS regression following the detection of heteroskedasticity and model 1 is estimated using heteroskadasticity-robust(HC3) standard errors. *, **, and *** denotes to the significance levels of 1%, 5% and 10% respectively. CDR is used as liquidity variables with CAR as alternative measurement of bank stability.

In column 2 and 4, coefficient and p-value of CDR shows a statistically significant effect confirming the finding of baseline regression of model 1. NPL has a negative and statistically significant effect on the dependent variable (β = -0.3551, p = 0.0322), suggesting that an increase in credit risk is associated with a reduction in the dependent variable measured by CAR, holding all other factors constant. This finding supports the outcome of model 1 .SIZE exhibits a negative and statistically significant relationship (β = -0.0546, p = 0.0222) while BS demonstrates a positive and statistically significant effect (β = 0.0017, p = 0.0278), implying that larger boards are associated with a slight increase in the dependent variable. Though SIZE and BS exhibits as significant factors, these findings do not support the findings of baseline regression of model 1.

Table 5: OLS Regression Output of Model 2

Variable	Coefficient	Robust SE (HC3)	p-value
Constant	0.7211	0.1977	0.0054
LDR	-0.0701	0.0422	0.0498**
ROE	-0.4544	0.2673	0.1152
NPL	-0.2181	0.1791	0.0219**
SIZE	-0.0576	0.0381	0.0372**

BS	0.0019	0.0006	0.0383**
GGDP	0.1990	0.3732	0.3379
F=2.913		P=0.0256	R^2=0.29

This table reports the results of OLS regression following the detection of heteroskedasticity and model 1 is estimated using heteroskadasticity-robust(HC3) standard errors. *, **, and *** denotes to the significance levels of 1%, 5% and 10% respectively. LDR is used as liquidity variables with CAR as alternative measurement of bank stability.

So, the statistically significant liquidity factors affecting the banking stability are LDR, NPL, SIZE and BS while the coefficients of ROE and GGDP have been found as insignificant ones at the 5% significant level. Similar to the finding of baseline regression of model 2, LDR shows a negative relation with banking stability. Besides, NPL exhibits a negative relation which confirms the baseline regression outcomes of model 2.Overall, the results of the robustness checks are similar with our main results establishing the reliability of the research findings.

Endogeneity Test

In this section, we address potential endogeneity concerns using the Durbin–Wu–Hausman (DWH) procedure. The Durbin-Wu-Hausman (DWH) test is a statistical hypothesis test used in econometrics to detect whether a regressor in a regression model is endogenous and correlates with the error term. This test verifies whether standard OLS results are reliable or require an instrumental approach (Baum et al. 2002).

Table 6: Findings of Endogeneity Test

Model	**Test**	**Test Statistic**	**P-value**	**Decision @ 5%**	**Conclusion**
Model 1 : CDR	Durbin Test	0.82	0.365	Fail to reject H_0	No evidence of endogeneity
Model 1 :CDR	Wu–Hausman Test	0.81	0.369	Fail to reject H_0	No evidence of endogeneity
Model 2: LDR	Durbin Test	0.67	0.412	Fail to reject H_0	No evidence of endogeneity
Model 2 :LDR	Wu–Hausman Test	0.66	0.416	Fail to reject H_0	No evidence of endogeneity

This table highlights the Durbin-Wu-Hausman test of model 1 and model 2 to examine whether explanatory variables, CDR in Model 1 and LDR in Model 2, are correlated with the regression error term .

For Model 1, the Durbin test produced a statistic of 0.82 with a p-value of 0.365, while the Wu–Hausman test produced a statistic of 0.81 with a p-value of 0.369. Similarly, for Model 2, the Durbin and Wu–Hausman tests generate statistics of 0.67 and 0.66, with corresponding p-values of 0.412 and 0.416. Since all p-values are greater than the conventional 5% significance level, the null hypothesis of exogeneity is not rejected for either model. Therefore, there is no sufficient evidence to conclude that explanatory variables face endogeneity problem within the specified models. So, the OLS regression results after addressing for heterogeneity is a sound, robust and highly credible.

Conclusion and Policy Implications

This study investigates whether the liquidity of banks impacts significantly the banking stability. While financial intermediation theory predicts a negative relationship between liquidity and bank stability, liquidity preference theory conversely suggests a significant positive relationship between the two. Using a sample of 35 listed banks in the capital market of Bangladesh, we find robust evidence supporting our hypotheses. Our baseline and robustness analyses confirm that banking stability is boosted by a higher cash-to-deposit ratio, which provides the liquidity needed to prevent sudden bank runs, but is negatively impacted by a high loan-to-deposit ratio that leaves banks vulnerable to rapid withdrawals due to declining liquid assets. Our analysis further suggests that higher volumes of non-performing loans can create a risk to bank stability. Our results have significant theoretical implications; we are the first to determine the liquidity factors using insights from liquidity preference theory and financial intermediation theory altogether as well develop an improved measure of bank stability called risk adjusted Z-score. Our findings have important implications for policy makers and corporate decision makers. First, banks should employ cash in assets have the highest potential of achieving returns with less credit risk as greater non-performing loans may lower the stability of banks. Second, having higher capital level may increase liquidity risk leading to the occurrence of cash-deficit. So, banks should maintain liquidity tailored to the demands of the customer which necessitate having effective strategic plan for maturity intermediation of loans and deposits. Third, banks need to improve stringent risk management strategies to lessen default risk as well as safeguard better asset quality which can give liquidity relaxation. Consequently, our framework emphasizes the importance of maintaining a balanced trade-off among cash deposit ratio, loan to deposit ratio, non-performing loans to ensure bank stability.

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Appendix

See Table 1 to Table 6 and Figure 1.

Table 1: Variable Description

CDR	The ratio of cash to total deposits
LDR	The ratio of loan to total deposits
RORWA	Risk adjusted Z-score developed by Li et al. (2016)
CAR	Ratio of the sum of Tier-1 and Tier-2 capital to risk weighted assets
ROE	Ratio of net income to total equity
SIZE	log value of bank assets
NPL	Ratio of non-performing loans to total loans
BS	Number of directors on the corporate board
GGDP	Growth rates of gross domestic production

Table 2 Correlation Matrix of Model 1

	Z_RORWA	CDR	ROE	NPL	SIZE	BS	GDP
Z_RORWA	1	-0.118	-0.068	-0.099	-0.058	-0.033	-0.031
CDR	-0.118	1	-0.035	-0.046	0.066	-0.029	-0.006
ROE	-0.068	-0.035	1	-0.24	0.034	0.005	-0.123
NPL	-0.099	-0.046	-0.24	1	0.338	-0.307	0.126
SIZE	-0.058	0.066	0.034	0.338	1	-0.247	0.122
BS	-0.033	-0.029	0.005	-0.307	-0.247	1	0.02
GGDP	-0.031	-0.006	-0.123	0.126	0.122	0.02	1

Table 3 Correlation Matrix of Model 2

Variable	Z_RORWA	LDR	ROE	NPL	SIZE	BS	GDP
Z_RORWA	1.000	-0.145	-0.068	-0.099	-0.058	-0.033	-0.031
LDR	-0.145	1.000	0.030	-0.020	0.051	-0.009	0.011
ROE	-0.068	0.030	1.000	-0.240	0.034	0.005	-0.123
NPL	-0.099	-0.020	-0.240	1.000	0.338	-0.307	0.126

SIZE	-0.058	0.051	0.034	0.338	1.000	-0.247	0.122
BS	-0.033	-0.009	0.005	-0.307	-0.247	1.000	0.020
GGDP	-0.031	0.011	-0.123	0.126	0.122	0.020	1.000

Table 4 Shaprio-Wilk test statitic

Model	Shapiro–Wilk test statistic	P- value
1	0.852	<0.0001
2	0.7932	<0.0001

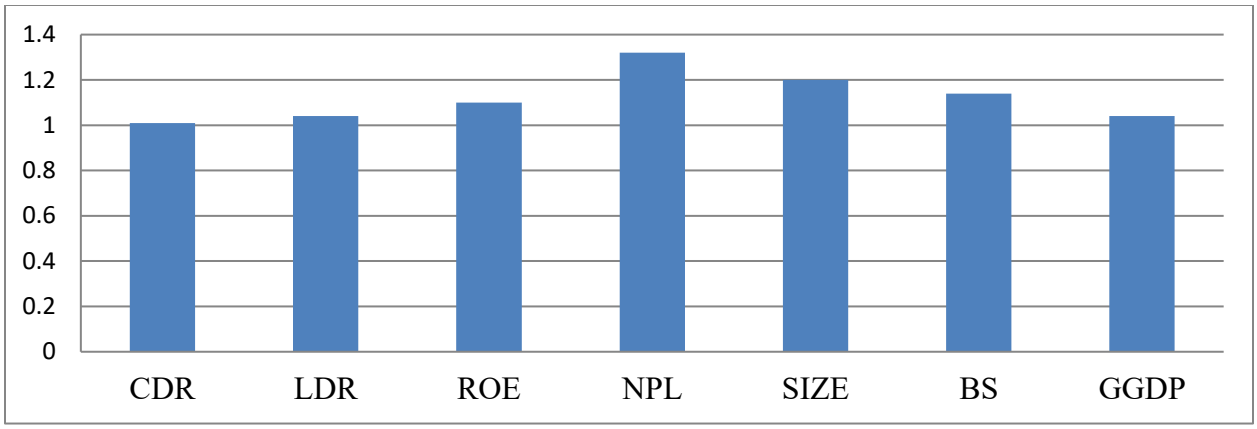
Table 5 Durbin-Watson Statistic

Model	Durbin–Watson statistic
1	1.670
2	1.711

Table 6 Bresuch-Pagan and White test statistic

Model	Breusch–Pagan test		White test statistic	
	Test Statistic	P value	Test Statistic	P value
1	22.03	0.0012	88.19	<.0001
2	25.245	0.0031	91.518	<.0001

Figure 1 VIF values of the Variables Used in the Study


1.4
1.2
1
0.8
0.6
0.4
0.2
0
CDR
LDR
ROE
NPL
SIZE
BS
GGDP