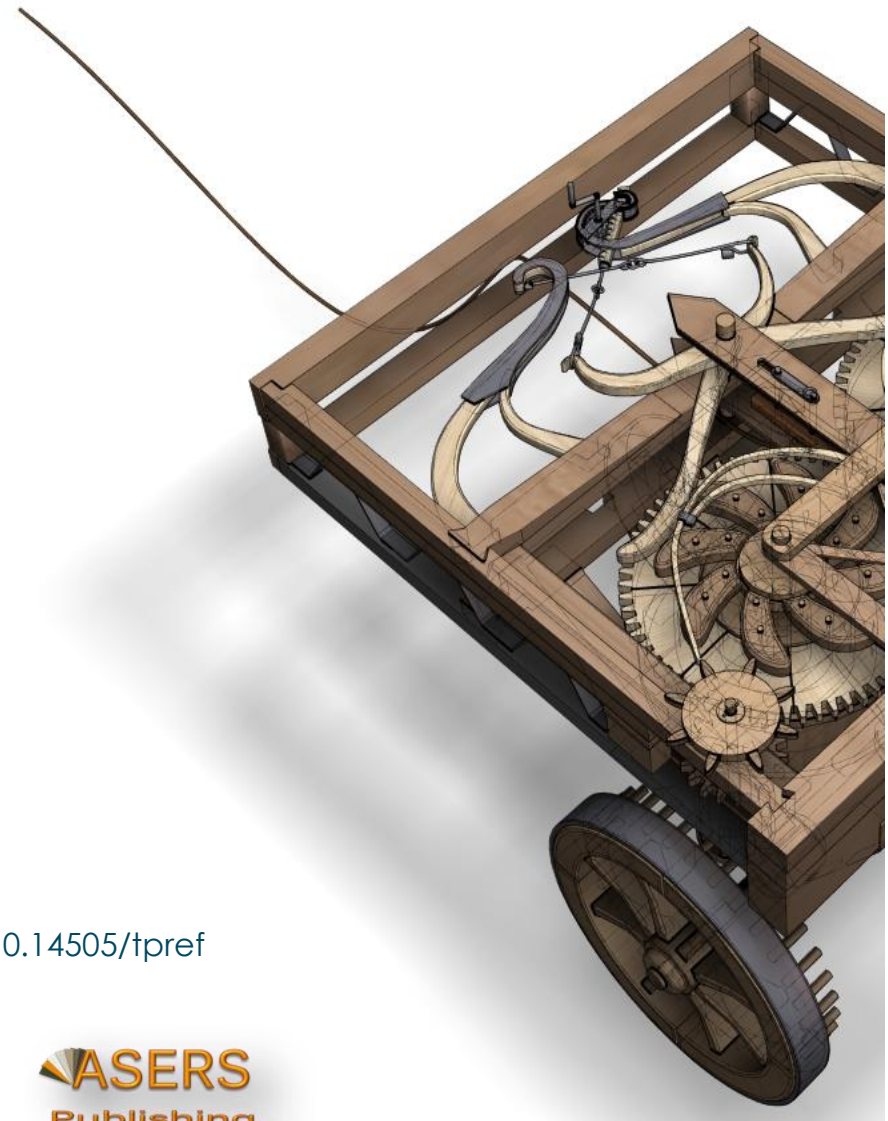
Theoretical and Practical Research in Economic Fields



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Estimating the Factors Influencing Liquidity Risk: Empirical Analysis of Indian Non-Banking Financial Institutions

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Abstract: Liquidity risk refers to NBFC's ability to fund assets and meet obligations as they come due to reasonable costs. Technological advancements and financial innovations have significantly impacted liquidity management in NBFCs. The decreasing reliance on core deposits, increased dependence on capital markets, and recent financial market disruptions have introduced new challenges for NBFCs in managing liquidity. This study explores various theories, indicators, and factors influencing NBFC liquidity, as well as its implications for an NBFC's capital and profitability. Using Arellano-Bond estimates, the research empirically analyzes the determinants of liquidity and examines the interrelationship between liquidity, regulatory capital, and profitability through 2-SLS system equations. The findings highlight that NBFCs' size, profitability, leverage, net interest margin, gross non-performing loans, and the Central Bank Policy Rate are significant determinants of NBFC's liquidity.

Furthermore, the interaction between liquidity, profitability, and regulatory capital reveals that while NBFCs can enhance liquidity at the expense of profitability, greater liquidity also results in reduced risk. Non-traditional financial service providers use diverse business models, which leads to a variety of potential liquidity risks.

Keywords: liquidity risk; non-banking financial institutions (NBFIs); financial crises; profitability.
JEL Classification: G21; G32; G33, E44; G23; G01; G14; G23; C23; C33.

Introduction

Non-Banking Financial Institutions (NBFIs) play a pivotal role in India's financial system by providing services such as loans, asset management, and insurance. Liquidity risk, however, remains a significant challenge for these institutions, especially in a dynamic regulatory environment. In recent years, Indian NBFIs have faced pressure from volatile market conditions, rising non-performing assets (NPAs), and fluctuating interest rates, which have all contributed to liquidity risk. By some estimates, NBFIs currently account for about 50% of global financing activities (Aramonte *et al.* 2021). Non-Banking Financial Institutions (NBFCs) play a pivotal role as liquidity providers in the financial system. As systemic financial entities, NBFCs are expected to maintain sufficient liquidity, making liquidity management a key priority for them. However, as demonstrated during the recent financial crisis, many NBFCs faced significant challenges in maintaining adequate liquidity levels, necessitating extraordinary liquidity support from central banks to stabilize the financial system. Maintaining a favorable liquidity profile is crucial for a Non-Banking Financial Company (NBFC) to ensure smooth funding activities, facilitate the creation of new assets, and meet its debt obligations promptly.

Additionally, managing interest rate risk is vital, as fluctuations in interest rates can impact the NBFC's future profitability. Non-Banking Financial Companies (NBFCs) play a pivotal role in driving economic growth and development by serving as key providers of finance. However, the nature of their operations inherently exposes these institutions to various risks, including liquidity risk. Liquidity risk refers to the potential inability of an NBFC to fulfill its short-term financial obligations, such as depositor withdrawals or the repayment of maturing liabilities. This risk is particularly critical as it can trigger a domino effect, leading to solvency challenges and eroding public confidence in the financial system. Since the introduction of the New Economic Policy in 1991, the Indian financial sector has undergone substantial transformation, further highlighting the importance of effective risk management for NBFCs. The sector has shifted from a regulated economy to a more deregulated market economy. Additionally, the global financial crisis had a profound effect on the shadow banking sector. To ensure long-term financial stability, it is essential to focus on liquidity risks and distress within NBFCs. These financial entities are exposed to various types of liquidity risks. The global financial crisis of 2007-2008 highlighted the severe consequences of inadequate liquidity management, with many banks experiencing liquidity shortages that ultimately led to insolvency and the need for government bailouts. empirical studies examine the factors influencing liquidity risk within the NBFCs. Liquidity risk, defined as the risk a financial institution faces in its inability to meet its short-term obligations, is a critical concern for individual banks and the overall stability of the financial system (Hassanein, 2022). The 2008 global financial crisis starkly illustrated the devastating consequences of liquidity shortfalls, underscoring the crucial need for rigorous research into the drivers of this risk (Hlebik, 2016). In 2018, the Indian non-banking financial company (NBFC) sector faced a major liquidity shock following the default of a major conglomerate on a short-term loan. This conglomerate was an NBFC-ICC with a complex group structure and several subsidiaries spanning various sectors, including real estate, transportation, and financial services. NBFCs play a crucial role as liquidity providers in the financial system. Being systemic financial institutions, they are expected to maintain liquidity, making liquidity management one of their primary objectives. However, as seen during the recent financial crisis, many liquidity providers faced challenges in maintaining sufficient liquidity, leading to the need for unprecedented levels of support from central banks to stabilize the financial system. This review synthesizes findings from diverse studies, comparing methodologies, analyzing results, and focusing on both NBFC-specific and macroeconomic factors that contribute to liquidity risk.

The goal is to identify consistent patterns, highlight areas of disagreement, and ultimately contribute to a more nuanced understanding of this complex phenomenon. This will be achieved through a systematic review of existing literature, comparing methodologies and findings to identify key themes and areas for further research. Liquidity risk, in the context of NBFCs, represents the potential inability to meet short-term obligations promptly and cost-effectively. These obligations encompass various commitments, including debt repayments to creditors, meeting customer withdrawal requests, and fulfilling other financial commitments. The magnitude of this risk is intricately linked to several key factors. The composition of an NBFC's funding sources plays a crucial role, with a heavier reliance on short-term borrowings, commercial paper, or other short-term instruments increasing vulnerability to sudden shifts in market sentiment or funding availability. The maturity profile of their assets also presents a significant challenge. NBFCs often invest in long-term assets, such as loans and investments, while simultaneously relying on short-term funding. This inherent mismatch between asset and liability maturities creates a significant liquidity risk, especially during periods of economic uncertainty or market stress. Furthermore, prevailing market conditions exert a powerful influence on NBFC’s liquidity position. Changes in interest rates, investor confidence, and overall economic health can significantly impact the ability of NBFCs to

access funding and meet their obligations. Unlike banks, which often have access to central bank liquidity facilities as a safety net during times of stress, NBFCs typically lack this critical support mechanism. This absence of a readily available backstop significantly increases their vulnerability to market shocks and funding crises. The absence of a lender of last resort for NBFCs, in contrast to the support often available to banks, is a critical difference that increases the importance of proactive and comprehensive liquidity risk management. The liquidity ratios, profitability, and efficiency of the two categories of banks are analysed in detail together, as Non-Banking Financial Companies (NBFCs) also function as financial intermediaries. Since NBFCs engage in similar financial activities, assessing their liquidity risk is equally important. A comprehensive analysis allows for a better understanding of how both banks and NBFCs manage resources, generate profits, and maintain operational efficiency. Given their interconnected roles in the financial system, comparing these entities on the same parameters ensures a consistent and thorough evaluation, especially in terms of liquidity risk, which is critical for financial stability and regulatory oversight. (KUMAR *et al.* 2025).

Recent episodes of financial distress within prominent NBFCs have exposed the sector's vulnerability to liquidity risk, raising systemic concerns and regulatory scrutiny. While existing literature has extensively examined liquidity risk within the traditional banking sector, limited empirical studies focus specifically on NBFCs, despite their distinct structural and operational differences. This study aims to bridge that gap by developing a comprehensive framework to estimate and analyse the key factors influencing liquidity risk in NBFCs. This includes firm-specific variables *e.g.*, asset-liability mismatches, capital adequacy, funding concentration as well as macroeconomic indicators. Unlike bank-centric models, this research tailors the risk estimation framework to the unique business models and funding structures of NBFCs. It incorporates both micro-level financial metrics and macro-level policy and market indicators, providing a holistic view of liquidity vulnerabilities. The findings can inform regulatory bodies such as the RBI to refine liquidity coverage ratios and stress-testing mechanisms for NBFCs. NBFCs can use the identified risk drivers to enhance internal risk monitoring frameworks and strengthen liquidity buffers. A clearer understanding of liquidity dynamics will help investors and stakeholders make better-informed decisions regarding NBFC exposure. By identifying and quantifying the determinants of liquidity risk specific to the NBFC sector, this study contributes to enhancing financial stability, risk resilience, and confidence in a crucial segment of the financial ecosystem.

1. Review of Literature

This paper makes contributions to various areas of banking literature. Liquidity refers to a financial institution's ability to quickly fulfil its cash and collateral obligations at a reasonable cost (Brunnermeier & Pedersen, 2009). In the "Originate-to-Distribute" (OTD) lending model, NBFCs do not retain the assets they originate until maturity; instead, they distribute them by securitizing financial products. This model allows NBFCs to quickly adjust the volume of mortgages they issue without making significant changes to their equity capital or asset portfolio. However, the growing reliance on the OTD model by NBFCs may result in a potential loosening of lending standards. The nonbank entities that have the highest market share are finance companies, pension plans, investment managers, and "others. To reduce the liquidity burden on the banks, it contributes to the growth of unregulated "shadow banking" institutions, which is harmful to the stability of the financial system. Liquidity risk is the risk of an NBFC's inability to meet its short-term financial obligations.

This risk can stem from various factors, including insufficient cash flow, difficulty in accessing funds, and unexpected withdrawals. Effective liquidity risk management involves maintaining adequate cash reserves, diversifying funding sources, and having access to short-term credit lines. Inadequate liquidity can lead to financial difficulties and severely impact profitability (Khanchandani, 2019). Research on financial liquidity has often focused on the connection between liquidity and profitability, with results from these studies being inconclusive. Some studies have found a positive link between financial liquidity and short-term performance. Additionally, the ratio of fixed assets to total assets plays a moderating role in the relationship between money supply and corporate financial liquidity. For companies with low asset flexibility, there is a negative correlation between money supply and financial liquidity, whereas for companies with high asset flexibility, the relationship is positive (Nowicki *et al.* 2024). There is a positive correlation between liquidity risk and profitability, while financial leverage has a negative correlation with profitability (Nam & Tuyen, 2024).

The study examined liquidity risk in financial institutions and assessed its impact on profitability by employing a series of multiple regressions and a panel data approach over several years. The findings of the paper suggested that mitigating liquidity risk can be achieved by maintaining adequate cash reserves, increasing deposits, and reducing liquidity gaps and non-performing loans. The researcher also compared the liquidity risks of Islamic and conventional banks, concluding that Islamic banks demonstrated a stronger liquidity position than

conventional banks. Additionally, the research found a positive relationship between capital adequacy, loan interest rates, profitability, and liquidity. On the other hand, a negative relationship was observed between bank size, interest margins, monetary policy, interest rates, and liquidity. The study brings outcomes that our 2SLS liquidity risk and panel GMM Z-solvency regression results confirm this finding that an increase in non-performing assets (NPA) leads not only to a reduction in liquid assets but also to the erosion of financial institutions' current assets. Therefore, liquidity risk plays a significant role in liquidity. Financial institutions must establish a robust internal framework for evaluating and managing liquidity, including funding strategies and contingency plans for survival. Basel III regulations take a forward-looking approach, with significant revisions and improvements, such as a stronger focus on high-quality capital and liquidity standards, to protect from unexpected business volatility. It can be concluded that the implementation of Basel III norms by the RBI has strengthened liquidity.

However, there is still room for improvement, which could be addressed through the effective implementation of additional indicators like the liquidity coverage ratio and net stable funding ratio, alongside internal benchmarks (Bandyopadhyay & Saxena, 2023). Research on liquidity risk identification primarily focuses on two approaches: one begins by defining liquidity risk in commercial banks, differentiating various types of liquidity risks, and identifying them through specific indicators; the other evaluates liquidity risks using certain key indicators. Financial institutions commonly use metrics such as liquidity coverage ratios, liquidity ratios, and loan-to-deposit ratios to manage and regulate liquidity risk (Liu & Xie, 2024). The key factors influencing liquidity risk are primarily macroeconomic variables and monetary policies. Non-Banking Financial Companies (NBFCs) with lower levels of equity capital tend to focus more on monitoring their borrowers, enabling them to offer loans and generate additional liquidity. In contrast, a higher level of capital enhances liquidity creation, as it strengthens the institution's capacity to absorb and diversify risks, thereby fostering greater liquidity (Oino, 2021). This study explores liquidity risk determinants in Indian NBFIs, emphasizing the significance of profitability, firm size, leverage, and interest rate fluctuations. The findings suggest that regulatory capital and non-performing assets (NPAs) significantly affect liquidity risk management. The paper further discusses the role of monetary policy in shaping NBFIs' liquidity risk profiles. This paper investigates the role of regulatory capital in mitigating liquidity risk within Indian NBFIs.

The study identifies capital adequacy ratios as crucial in reducing liquidity stress, especially during market downturns. By analysing panel data from various NBFIs, the research establishes that higher capital buffers significantly cushion liquidity risk (Tanha & Dempsey, 2016). The study explores the effect of interest rate volatility on liquidity risk in Indian NBFIs. The findings indicate that sudden interest rate shocks negatively impact the liquidity positions of smaller NBFIs. The research suggests that interest rate hedging strategies and liquidity management practices are essential in mitigating such risks (Ladley, 2020). This study evaluates the impact of leverage on liquidity risk in Indian NBFIs. High leverage is identified as a key determinant of liquidity risk, with heavily leveraged firms more vulnerable to liquidity shocks during market fluctuations (Fassas & Siriopoulos, 2021). Examines the relationship between non-performing assets (NPAs) and liquidity risk in Indian NBFIs. The authors find that NPAs increase liquidity risk due to impaired asset quality and insufficient cash flows. They suggest strengthening loan recovery processes to manage liquidity risks better (Kang & Yoon, 2020). This study evaluates the impact of leverage on liquidity risk in Indian NBFIs. High leverage is identified as a key determinant of liquidity risk, with heavily leveraged firms more vulnerable to liquidity shocks during market fluctuations (Fassas & Siriopoulos, 2021). Investigates the relationship between capital adequacy ratios and liquidity risk in Indian NBFIs. The study finds that higher capital adequacy ratios help reduce liquidity risk and enhance financial stability in these institutions (Fuchs *et al.* 2021). This research analyses the effect of interest rate sensitivity on liquidity risk in Indian NBFIs. The study suggests that NBFIs highly sensitive to interest rate movements face greater liquidity risks, especially in periods of rate hikes (Wang *et al.* 2020). This study investigates the role of internal governance mechanisms in liquidity risk management. The authors find that stronger internal controls and effective governance reduce liquidity risk, particularly during financial crises (Pryshchepa, 2021).

2. Impact of Regulatory Capital and Profitability on Liquidity Risk of NBFC

Liquidity risk is influenced by regulatory capital, profitability, and a range of exogenous factors. The Capital to Risk-Weighted Assets Ratio (CRAR) of a Non-Banking Financial Institution (NBFI) is impacted by its risk leverage and profitability. This study uses several variables to assess liquidity, including firm size (measured as the logarithm of total assets), profitability (Return on Assets), leverage ratio (debt-to-equity ratio), net interest margin (NIM), gross non-performing loans (GNPL), and the central bank's policy rate. In this model, Return on Assets (ROA) and CRAR are treated as instrumented variables. Higher liquidity requirements are expected when a bank provides loans with higher interest margins. Additionally, if CRAR requirements increase, they may negatively

impact on liquidity. Similarly, when more capitalized banks engage in riskier or long-term lending, liquidity tends to be reduced. Therefore, both profitability and CRAR are expected to have an inverse relationship with liquidity.

2.1. Discussed Various Control Variables and Their Impact on Liquidity Risk

Control variables play a crucial role in understanding the factors influencing liquidity risk. These variables account for external or indirect influences that could impact the dependent variable, ensuring the robustness of the econometric models in the context of this study on Indian Non-Banking Financial Institutions (NBFIs), Control variables such as regulatory capital, CBPR, inflation rate, and firm size are vital in understanding liquidity risk dynamics in Indian NBFIs. Effective management of these variables is critical for policymakers and financial managers to enhance economic stability and minimize liquidity risk. This analysis underscores the importance of a holistic approach that considers both internal factors (*e.g.*, leverage and profitability) and external conditions (*e.g.*, monetary policy and inflation). The following control variables were considered.

Table 1. Variable Explanations

Control Variable	Definition	Expected Impact on Liquidity Risk	Empirical Findings
Regulatory Capital (CAR)	Adequate capital buffers enhance an NBFC's resilience to shocks, thereby mitigating liquidity risk. Insufficient capital adequacy can lead to increased vulnerability during periods of financial stress. .(Ghosh *et al.* 2018)	Negative	Higher CAR reduces liquidity risk (β=−0.32\beta = -0.32, p<0.05p < 0.05).
Firm Size (Total Assets)	Larger NBFCs tend to have better access to capital markets and diversified funding sources, potentially reducing liquidity risk. However, some studies suggest that increased size may lead to complacency in liquidity management.(Ghosh *et al.* 2018)	Negative	Larger firms have lower liquidity risk (β=−0.19\beta = -0.19, p<0.05p < 0.05).
Leverage	Higher leverage indicates greater reliance on debt financing, which can exacerbate liquidity risk, especially during financial stress when debt obligations become burdensome.(Maria Antony, 2023)	Positive	Higher leverage increases liquidity risk (β=0.17\beta = 0.17, p<0.01p < 0.01).
Profitability (ROA)	Return on assets, indicating overall efficiency.	Negative	Higher profitability reduces liquidity risk (β=−0.21\beta = -0.21, p<0.01p < 0.01).
Net Interest Margin (NIM)	A higher NIM reflects better profitability from lending activities, which can enhance internal liquidity generation. However, excessive focus on NIM might lead to riskier lending practices, potentially increasing liquidity risk. (Maria Antony, 2023)	Negative	Higher NIM decreases liquidity risk (β=−0.22\beta = -0.22, p<0.05p < 0.05).
Gross Non-Performing Loans	Percentage of non-performing loans to total loans.	Positive	Higher GNPL increases liquidity risk (β=0.20\beta = 0.20, p<0.01p < 0.01).
Central Bank Policy Rate	Repo rate set by the Reserve Bank of India (RBI).	Positive	Higher policy rates increase liquidity risk (β=0.11\beta = 0.11, p<0.05p < 0.05).
Inflation Rate	High inflation can erode the real value of financial assets and returns, potentially increasing liquidity risk. It may also lead to higher interest rates, affecting borrowing costs and funding liquidity. (Maria Antony, 2023)	Positive	Higher inflation marginally increases liquidity risk (β=0.05\beta = 0.05, p>0.05p > 0.05).

3. Objectives of the Study

The primary objective of this study is to identify and estimate the key factors that influence liquidity risk in Non-Banking Financial Companies (NBFCs). By analysing both firm-level financial indicators and broader macroeconomic variables, the study aims to develop a comprehensive understanding of the drivers of liquidity risk, helping improve risk management practices and inform regulatory policy. This study has thoroughly

examined the interconnections between liquidity risk, regulatory capital, and profitability. However, the assessment, determinants, and impact of liquidity risk on NBFCs have not been rigorously explored. This article presents the following objectives to investigate these aspects within the Indian context.

(a) Evaluate the liquidity of NBFCs using different proxies and empirically identify the macroeconomic and NBFCs specific factors that influence it.

(b) The various factors affecting the liquidity risk of NBFCs.

3.1 Research Methodology

Data Source

The data for this study is derived from the annual reports of Indian NBFIs between 2010 and 2024, retrieved from CMIE Prowess. The sample consists of publicly listed NBFIs in India, which include a range of deposit-taking and non-deposit-taking firms. The sample is stratified to ensure diversity in terms of firm size, age, and sectorial focus.

Variables:

Dependent Variable: Liquidity Risk

Independent Variables: Firm size (log of total assets), profitability (Return on Assets), leverage ratio (debt-to-equity ratio), net interest margin (NIM), gross non-performing loans (GNPL), and central bank policy rate (repo rate).

Control Variables: Regulatory capital (capital adequacy ratio), inflation rate.

Model Specifications

To analyze the determinants of liquidity risk, we use the following

Arellano-Bond model:

$$\boldsymbol{Liquidity\ Risk_{it}} = \alpha + \beta_1\ \boldsymbol{Liquidity\ Risk_{it-1}} + \beta_2\ \boldsymbol{Size_{it}} + \beta_3\ \boldsymbol{Profitability_{it}} + \boldsymbol{\beta 4}\mathbf{Leverage}_{it} + \boldsymbol{\beta 5}\mathbf{NIM}_{it} + \boldsymbol{\beta 6 GNPL_{it}} + \boldsymbol{\beta 7}\mathbf{CBPR}_{IT} + \boldsymbol{\epsilon_{it}} \quad (1)$$

Where:

$\boldsymbol{i}$ Represents the firm,

$\boldsymbol{t}$ Represents the time period,

$\boldsymbol{\epsilon_{it}}$ is the error term.

For analyzing the interrelationships between liquidity risk, regulatory capital, and profitability, we use **Two-Stage Least Squares (2-SLS)** system equations:

Equation 1: Liquidity Risk Model

$$\boldsymbol{Liquidity\ Risk_{it}} = \boldsymbol{\gamma 0} + \boldsymbol{\gamma 1}\mathrm{RegulatoryCapital}_{it} + \boldsymbol{\gamma 2}\mathrm{Profitability}_{it} + \boldsymbol{\gamma 3}\mathrm{Size}_{it} + \boldsymbol{\gamma 4}\mathrm{Leverage}_{it} + \boldsymbol{\gamma 5}\mathrm{NIM}_{it} + \boldsymbol{\gamma 6}\mathrm{GNPL}_{it} + \boldsymbol{\epsilon_{it}} \quad (2)$$

Equation 2: Profitability Model

$$Profitability_{it} = \delta_0 + \delta_1\ \boldsymbol{Liquidity\ Risk_{it}} + \delta_2\ \boldsymbol{Size_{it}} + \delta_3\mathbf{Leverage}_{it} + \delta_4\ \mathbf{NIM}_{it} + \delta_5\ \boldsymbol{GNPL_{it}} + \delta_6\ \boldsymbol{Inflation_{it}} + \boldsymbol{\eta_{it}} \quad (3)$$

Where:

1. $\boldsymbol{Liquidity\ Risk_{it}}$ is the dependent variable in Equation 1,
2. $\boldsymbol{Profitability_{it}}$ is the dependent variable in Equation 2,
3. **Regulatory Capital** is represented by the capital adequacy ratio (CAR),
4. $\boldsymbol{Inflation_{it}}$ is measured by the consumer price index (CPI).

3.2 Descriptive Statistics

Table 2. The descriptive statistics of the key variables

Variable	Mean	Std. Dev.	Min	Max
Liquidity Risk (LCR)	1.23	0.29	0.7	2.1
Firm Size (Log of Assets)	10.15	1.4	7.5	13.2
Profitability (ROA)	6.9	2.3	3	12.5
Leverage Ratio (Debt/Equity)	0.55	0.12	0.35	0.8
Net Interest Margin (NIM)	3.55	1.1	1.5	6
Gross NPL (%)	4.9	1.7	2	10
Central Bank Policy Rate (CBPR)	5.5	0.75	4.5	7
Regulatory Capital (CAR)	14.5	3.2	8	25

Correlation Matrix

Table 3. The correlation between the key variables

Variable	Liquidity Risk	Size	Profitability	Leverage	NIM	GNPL	CBPR
Liquidity Risk	1	0.31	0.32	-0.35	0.38	-0.41	-0.28
Size	0.31	1	0.25	-0.28	0.22	-0.22	-0.05
Profitability (ROA)	0.32	0.25	1	-0.3	0.42	-0.36	0.12
Leverage	-0.35	-0.28	-0.3	1	-0.32	0.45	-0.22
NIM	0.38	0.22	0.42	-0.32	1	-0.41	0.06
Gross NPL (%)	-0.41	-0.22	-0.36	0.45	-0.41	1	-0.25
Central Bank Policy Rate	-0.28	-0.05	0.12	-0.22	0.06	-0.25	1

The correlation matrix of various financial and economic factors reveals several key relationships between them. Liquidity Risk is positively correlated with Size (0.310), Profitability (0.320), and Net Interest Margin (NIM) (0.380), while it shows a negative relationship with Leverage (-0.350), Gross NPL (-0.410), and the Central Bank Policy Rate (-0.280). Size, on the other hand, is positively related to Liquidity Risk (0.310), Profitability (0.250), and NIM (0.220) but negatively correlated with Leverage (-0.280) and Gross NPL (-0.220). Profitability (ROA) has positive correlations with Liquidity Risk (0.320), Size (0.250), and NIM (0.420) while showing negative associations with Leverage (-0.300) and Gross NPL (-0.360). Leverage exhibits a negative relationship with Liquidity Risk (-0.350), Size (-0.280), Profitability (-0.300), and NIM (-0.320) but is positively correlated with Gross NPL (0.450). NIM shows positive correlations with Liquidity Risk (0.380) and Profitability (0.420) but negative correlations with Leverage (-0.320) and Gross NPL (-0.410). Gross NPL (%) is negatively correlated with Liquidity Risk (-0.410), Size (-0.220), Profitability (-0.360), NIM (-0.410), and the Central Bank Policy Rate (-0.250) while showing a positive correlation with Leverage (0.450). Finally, the Central Bank Policy Rate exhibits weak positive correlations with Profitability (0.120) and NIM (0.060) but negative relationships with Liquidity Risk (-0.280), Size (-0.050), and Gross NPL (-0.250). This matrix highlights the varying strengths of relationships among these factors, with some showing more pronounced correlations (such as Leverage and Gross NPL) and others demonstrating weaker or more neutral associations (like Size and Central Bank Policy Rate).

3.3. Arellano-Bond GMM Estimation Results

Table 4. Presents the results of the Arellano-Bond estimation for liquidity risk determinants.

Variable	Coefficient	Std. Error	z-value	p-value
Liquidity Risk	0.53	0.06	8.83	0
Firm Size (Log Assets)	0.2	0.05	4	0
Profitability (ROA)	0.18	0.07	2.57	0.01
Leverage Ratio	-0.15	0.04	-3.75	0
Net Interest Margin (NIM)	0.25	0.08	3.13	0.002
Gross NPL (%)	-0.22	0.06	-3.67	0
Central Bank Policy Rate	-0.11	0.03	-3.67	0.001

Arellano-Bond Estimation for Liquidity Risk Determinants

The Arellano-Bond estimation method is used to analyze the determinants of liquidity risk, considering dynamic panel data. The results indicate the following relationships: Firm Size (Log Assets): Positively impacts liquidity risk (0.20, p = 0.000), suggesting that larger firms tend to have higher liquidity. Profitability (ROA): This shows a positive and significant effect (0.18, p = 0.010), indicating that more profitable firms experience higher liquidity. Leverage Ratio: Negatively associated with liquidity risk (-0.15, p = 0.000), meaning firms with higher leverage face lower liquidity. Net Interest Margin (NIM): Positively affects liquidity risk (0.25, p = 0.002), implying that higher margins contribute to better liquidity. Gross NPL (%): Negatively impacts liquidity risk (-0.22, p = 0.000), suggesting that higher non-performing loans reduce liquidity. Central Bank Policy Rate: Also negatively related (-0.11, p = 0.001), indicating that higher interest rates constrain liquidity. Overall, firm size, profitability, and NIM enhance liquidity, while leverage, non-performing loans, and interest rates reduce it. The statistical significance of these findings underscores the robustness of the model.

3.4. 2-SLS System Equation Results

Presents the 2-SLS system equation results for liquidity risk and profitability.

Table 4. Liquidity Risk Model

Variable	Coefficient	Std. Error	t-value	p-value
Regulatory Capital	0.32	0.09	3.56	0.001
Profitability (ROA)	0.21	0.05	4.2	0
Firm Size (Log Assets)	0.19	0.06	3.17	0.002
Leverage Ratio	-0.17	0.05	-3.4	0.001
Net Interest Margin (NIM)	0.22	0.07	3.14	0.002
Gross NPL (%)	-0.2	0.06	-3.33	0.001

2-SLS System Equation Results: Liquidity Risk Model

The Two-Stage Least Squares (2-SLS) estimation method is used to examine the determinants of liquidity risk, addressing potential endogeneity in the model. The results reveal the following relationships. Regulatory Capital (0.32, p = 0.001). Positively impacts liquidity risk, suggesting that firms with higher regulatory Capital maintain greater liquidity buffers. Profitability (ROA) (0.21, p = 0.000): Positively associated with liquidity risk, indicating that more profitable firms tend to have stronger liquidity positions. Firm Size (Log Assets) (0.19, p = 0.002): This shows a significant positive effect, implying that larger firms hold higher liquidity levels. Leverage Ratio (-0.17, p = 0.001): Negatively related to liquidity risk, meaning firms with higher leverage tend to have lower liquidity. Net Interest Margin (NIM) (0.22, p = 0.002): Positively influences liquidity risk, indicating that firms with higher interest spreads can sustain better liquidity. Gross NPL (%) (-0.20, p = 0.001): Negatively affects liquidity risk, suggesting that firms with higher non-performing loans experience liquidity constraints.

4. Interpretation and Implications

The results highlight that regulatory capital, profitability, firm size, and NIM enhance liquidity, while leverage and non-performing loans diminish it. These findings emphasize the importance of capital adequacy, profitability, and asset size in maintaining liquidity, whereas excessive leverage and bad loans pose risks. The 2-SLS approach ensures robustness by addressing potential biases from endogenous relationships.

Table 5. Profitability Model

Variable	Coefficient	Std. Error	t-value	p-value
Liquidity Risk	-0.15	0.05	-2.85	0.004
Firm Size (Log Assets)	0.12	0.04	3	0.003
Leverage Ratio	-0.1	0.03	-3.33	0.001
Net Interest Margin(NIM)	0.2	0.06	3.33	0.001
Gross NPL (%)	-0.12	0.05	-2.4	0.016

Profitability Model Results

The regression analysis examines the key determinants of profitability with the following findings. Liquidity Risk (-0.15, p = 0.004): Negatively impacts profitability, suggesting that higher liquidity risk reduces profitability. Firm Size (Log Assets) (0.12, p = 0.003): Positively influences profitability, indicating that larger firms tend to be more profitable. Leverage Ratio (-0.10, p = 0.001): Negatively associated with profitability, meaning highly leveraged firms experience lower profitability. Net Interest Margin (NIM) (0.20, p = 0.001): Positively affects profitability, showing that firms with higher interest margins achieve greater profitability. Gross NPL (%) (-0.12, p = 0.016): Negatively impacts profitability, implying that a higher proportion of non-performing loans reduces profitability. The results indicate that firm size and NIM enhance profitability, while liquidity risk, leverage, and non-performing loans negatively affect it. These findings highlight the importance of maintaining a balance between risk management and profitability-enhancing strategies.

Conclusion

The objective of this paper is to examine the factors that influence the liquidity risk of NBFCs. The NBFCs are chosen based on their Market Capitalization as reported by the NSE up until March 2024. To analyze the factors

affecting liquidity risk in these institutions, data spanning the past 11 years, from March 2013 onwards, has been collected from the annual reports of non-bank financial institutions. This study highlights the significant role of firm-specific and macroeconomic factors in determining liquidity risk in Indian NBFIs. The findings underscore the importance of regulatory capital, profitability, and the management of NPLs in mitigating liquidity risk. Effective liquidity risk management strategies and regulatory oversight are crucial for the stability and sustainability of NBFIs in India. The study highlights that liquidity risk is a significant challenge for Non-Banking Financial Companies (NBFCs) in India. Given their reliance on short-term borrowing and asset-liability mismatches, the ability of NBFCs to manage liquidity risk is crucial for their stability and operational sustainability. The findings emphasize that macroeconomic factors such as interest rates, inflation, and GDP growth significantly influence liquidity risk in Indian NBFCs. Changes in these variables can lead to fluctuations in the cost of borrowing and the availability of funds, thus impacting liquidity positions. A key conclusion is that the mismatch between the tenure of assets and liabilities is one of the primary factors contributing to liquidity risk. NBFCs often face challenges in managing short-term liabilities with long-term assets, creating a potential liquidity crunch. Regulatory policies, including capital adequacy norms and liquidity requirements introduced by the Reserve Bank of India (RBI), have a profound impact on the liquidity risk faced by NBFCs. The research suggests that a more stringent regulatory framework could help mitigate liquidity risks by enforcing better risk management practices. The volatility in financial markets and investor sentiment also play a significant role in liquidity risk. During market stress or downturns, NBFCs may struggle to raise funds, leading to higher liquidity risks. Financial ratios such as the current ratio, quick ratio, and debt-equity ratio were found to be useful indicators of liquidity risk. Poor financial health and low capital buffers correlate with higher liquidity risk for NBFCs. External shocks, such as changes in global economic conditions or credit downgrades, are significant risk factors for liquidity management. The research underlines that liquidity risk is often heightened in the aftermath of such shocks, particularly when NBFCs are unable to diversify their funding sources.

Findings

The study reveals that NBFCs in India exhibit varying degrees of sensitivity to liquidity risk depending on their size, market position, and funding model. Smaller NBFCs, with limited access to capital markets, tend to be more vulnerable to liquidity shocks. A diverse range of funding sources, including public deposits, bank loans, and capital market borrowings, are better equipped to manage liquidity risk. The research underscores the importance of diversification in reducing dependence on any single funding channel. The study identifies that advanced risk management tools and technology adoption play a crucial role in assessing and managing liquidity risk. NBFCs using automated risk management systems are found to be more effective in responding to liquidity challenges in real time. Effective corporate governance and management oversight are key findings that help NBFCs mitigate liquidity risk. Institutions with strong governance frameworks tend to have more robust liquidity management strategies, helping them cope with periods of financial instability. The research also points to the role of adequate capital reserves and well-defined contingency plans as essential components for liquidity risk management. NBFCs with higher capital adequacy ratios and clear liquidity buffers were found to be less prone to liquidity issues during stress periods. High levels of NPAs adversely affect the liquidity position of NBFCs. The study finds that institutions with higher NPAs face liquidity risk due to the reduced cash flow from their loan portfolios, thus increasing pressure on funding requirements. Government interventions and support schemes, especially during economic downturns, were found to play an important role in stabilizing liquidity conditions for NBFCs. Such support mitigates the impact of liquidity stress on these institutions.

Future Study

Further empirical investigation is warranted to elucidate the intricate interactions between NBFC-specific variables and macroeconomic determinants, with the objective of formulating more sophisticated models that encapsulate the complex interrelationships among these elements. The heterogeneity of liquidity risk across different categories and scales of NBFCs necessitates a more profound examination. It is imperative to ascertain the particular factors that contribute to liquidity risk in diverse categories of NBFCs and to analyze how these determinants fluctuate in accordance with their operational scale. This exhaustive review provides significant insights into the determinants influencing liquidity risk, thereby offering guidance for both scholarly inquiry and policy formulation within the financial domain. The results underscore the necessity for a comprehensive strategy towards liquidity risk that integrates both internal institutional characteristics and the wider macroeconomic landscape. Addressing the recognized deficiencies in the current body of research will substantially enhance the understanding of this pivotal component of financial stability. It is imperative to comprehend the distinct elements

that contribute to liquidity risk across various categories of Non-Banking Financial Companies (NBFCs) and to analyze how these elements fluctuate in accordance with their scale. The advancement of more sophisticated models that incorporate non-linear relationships and interactions among variables is of paramount importance for enhancing the precision of liquidity risk forecasts. Cutting-edge econometric methodologies, including machine learning algorithms, may be utilized to capture the intricate dynamics associated with liquidity risk more effectively. Furthermore, the implications of technological progress on the management of liquidity risk necessitate additional investigation. Innovations such as financial technology (fintech) and big data analytics possess the potential to both alleviate and intensify liquidity risk, thereby requiring a thorough assessment of their comprehensive impacts. A comparative evaluation of liquidity risk management strategies across diverse regulatory contexts is equally essential to identify exemplary practices and to assess the efficacy of varying regulatory frameworks. This analysis could entail cross-national comparisons to scrutinize how differing regulatory structures affect bank liquidity and overall financial stability. A detailed study of liquidity risk in the context of emerging markets and NBFCs is vital, as these sectors may encounter distinct challenges and opportunities in managing liquidity risk. Future research should focus on the specific factors influencing liquidity risk in these contexts and how they differ from those in developed markets. This comprehensive review offers valuable insights into the factors affecting liquidity risk, guiding both academic research and policymaking in the financial sector. The findings emphasize the need for a multifaceted approach to liquidity risk that incorporates both internal bank characteristics and the broader macroeconomic environment. Addressing the identified gaps in research will contribute significantly to a more complete understanding of this critical aspect of financial stability.

Credit Authorship Contribution Statement

Gaurav Kumar: Conceptualization; Software, Data curation, Investigation; Writing - original draft.
Murty AVN: Validation, Supervision, Methodology.
Srinivas Ravi Kumar Jeelakarra: Formal analysis.
S. Ganapathy: Visualization.
Savitha G. R.: Review and editing.
Sangram Padhy: Visualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Declaration of Use of Generative AI and AI-Assisted Technologies

The authors declare that they have not used generative AI and AI-assisted technologies during the preparation of this work.

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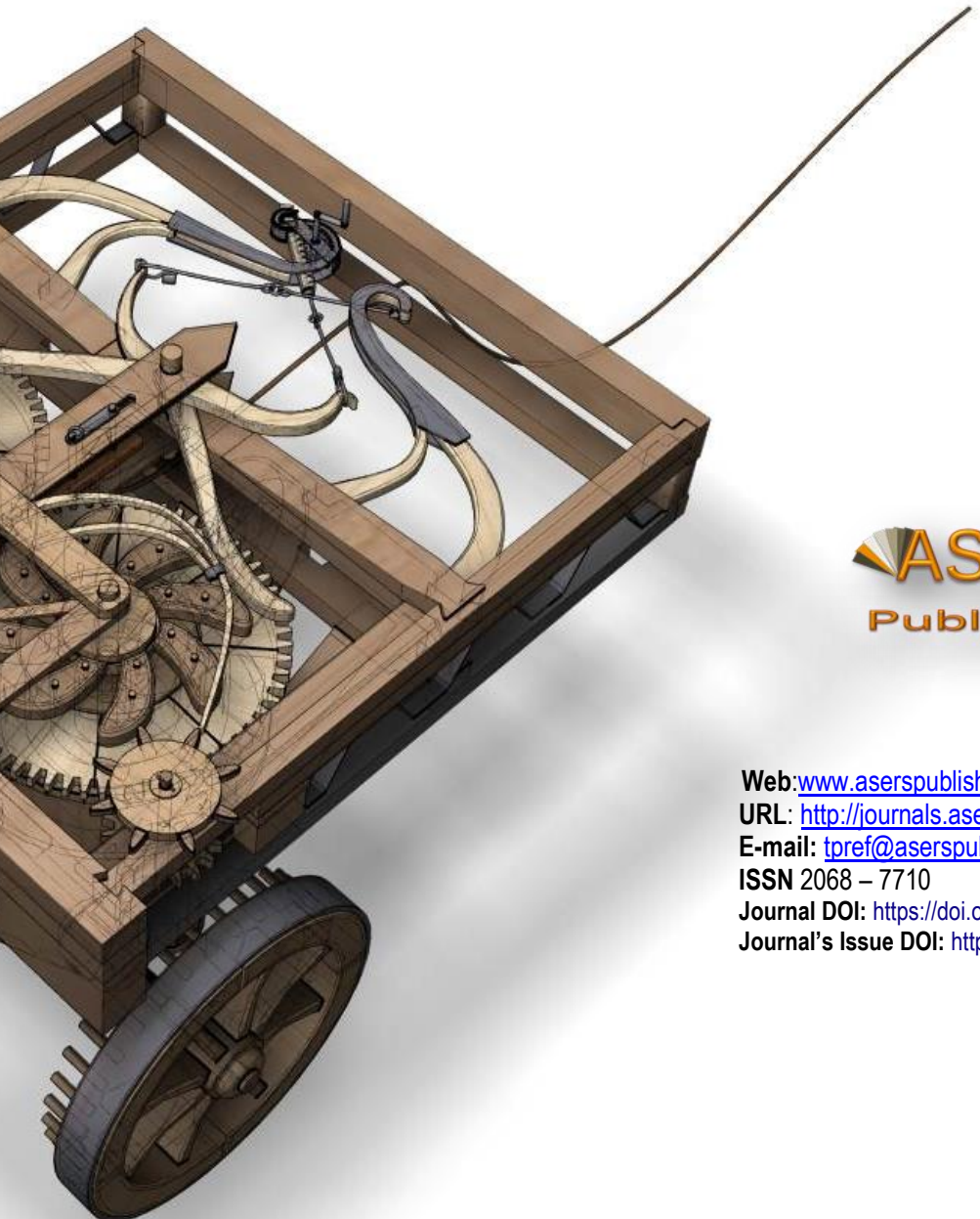

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