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Liquidity Risk and Profitability of Listed Deposit Money Banks in Nigeria

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Abstract- ***This study investigated the impact of liquidity risk on the profitability of listed Deposit Money Banks (DMBs) in Nigeria from 2015 to 2024, a period characterized by significant economic volatility and policy regime shifts. This study was anchored on the loanable fund's theory, the theory of financial intermediation, and the trade-off theory. The variables of this study are liquid assets to total deposit ratio (LATDR) cash reserve ratio (CRR) and net interest margin (NIM). Utilizing an ex-post facto research design, a census sampling of all thirteen listed DMBs was employed, resulting in a balanced panel of 130 bank-year observations. Data were analyzed using the fixed effects regression model, with diagnostics confirming the model's robustness. The finding showed a statistically significant negative relationship between liquidity proxies and profitability. Specifically, a 1% increase in LATDR and CRR led to a 0.167% and 0.086% decrease in NIM, respectively. This indicated that internal liquidity management (LATDR) exerts a more pronounced drag on profitability than the external regulatory requirement (CRR). This study concluded that a significant trade-off exists between liquidity management and profitability in the Nigerian banking sector. This study recommended that bank managers strategically optimize their liquidity buffers rather than merely hoarding liquid assets, and that regulators should consider the profitability implications of aggressive CRR policies to foster a stable yet growth-conducive banking environment.***

Keywords: Cash Reserve Ratio, Deposit Money Banks, Liquidity Risk, Nigerian Banks, Net Interest Margin, Profitability

I. INTRODUCTION

The banking sector is the lifeblood of any modern economy, functioning as the critical intermediary between surplus and deficit units. In Nigeria, Deposit Money Banks (DMBs) play a pivotal role in mobilizing savings, allocating credit, and facilitating the payment system, thereby directly influencing economic growth and stability (Adesola & Ewa, 2020). The fundamental business model of banking involves a delicate trade-off: leveraging customer deposits to create profitable loans while managing liquidity to meet deposit withdrawals and other financial obligations. This inherent conflict between profitability and liquidity management lies at the core of banking operations. Profitability, often measured by metrics like the net interest margin (NIM), is a primary indicator of bank performance and financial health (Bosshardt & Gersbach, 2022). NIM specifically captures the efficiency with which a bank earns interest from its lending activities relative to the interest it pays on its funding sources. The Central Bank of Nigeria (CBN) actively manages systemic liquidity risk through prudential requirements, most notably the Cash Reserve Ratio (CRR), which mandates that banks hold a specific portion of their deposits in liquid reserves with the central bank. The relationship between liquidity risk and profitability is theoretically inverse. Holding high levels of liquid assets, such as maintaining a high liquid asset to total deposit ratio or adhering to a high CRR, enhances stability but depresses NIM as these assets typically yield lower returns. Conversely, a more aggressive strategy of converting deposits into loans boosts NIM but elevates liquidity risk. For Nigerian banks, operating in an environment characterized by economic volatility, regime shifts, and intense competition, striking an optimal balance is not just a strategic goal but a necessity for survival and growth. This study seeks to investigate the impact of liquidity risk measured by liquid asset to total deposit ratio and the cash reserve ratio on the profitability of listed deposit money banks in Nigeria.

The strategic imperative for Nigerian banks to maximize shareholder returns through profitable lending often collides with the prudential need to maintain robust liquidity buffers. This tension has

been accentuated in recent years by a combination of macroeconomic shocks and aggressive regulatory interventions. The Central Bank of Nigeria has increasingly used the cash reserve ratio as a key monetary tool; the CRR on commercial deposits was raised to 50 % in 2024 and has been maintained at that level (CBN Monetary Policy Committee Communiqué, 2025) This policy effectively sterilizes a significant portion of bank deposits, limiting the funds available for interest-yielding loans and directly pressuring their primary revenue source the interest margin. While the theoretical trade-off is well-established, the empirical evidence within the unique Nigerian context remains mixed and is rapidly evolving. Previous studies offer mixed evidence. For example, Agusto & Co. (2024) showed that a 1-percentage-point rise in the liquid-assets-to-deposit ratio lowers the average net interest margin of Nigerian banks by 6 basis points(bps). Using panel data spanning 2013–2023, Adeyemi and Oladapo (2025) find that stronger regulatory liquidity buffers actually lift profitability by cutting emergency-funding costs in crisis quarters. This ambiguity creates a critical knowledge gap for bank managers and policymakers. Bank executives are left with an unresolved dilemma: how to strategically manage liquid assets to total deposit ratio in an environment where a substantial portion of deposits is already mandated as non-interest-bearing reserves at CBN. The problem is further compounded by recent economic pressures. The aftermath of the COVID-19 pandemic, persistent inflationary trends, and foreign exchange volatility have heightened systemic risk (International Monetary Fund, 2023). In this climate, a bank's ability to generate a stable NIM is crucial for building capital reserves and weathering potential economic downturns. However, it is unclear whether the traditional internal liquidity management (proxy by liquid asset to total deposit ratio) or the external regulatory mandate (proxy by CRR) has a more pronounced impact on bank interest income.

The specific objectives of this study are as follows:

i. To determine the impact liquid asset to total deposit ratio on net interest margin of listed Deposit Money Banks in Nigeria.
ii. To analyze the impact of the cash reserve ratio (CRR) on the net interest margin of listed Deposit Money Banks in Nigeria.

II. LITERATURE REVIEW

2.1 Conceptual Literature Review

Profitability

Bank profitability serves as a paramount gauge of a financial institution's health, efficiency, and long-term viability, fundamentally reflecting its success in generating a surplus after covering all operational expenses. For Deposit Money Banks (DMBs), whose core function is financial intermediation, profitability is often best assessed through the lens of the Net Interest Margin (NIM), a metric that captures the very essence of their business model. NIM measures the efficiency with which a bank earns interest from its lending and investment activities relative to the interest it pays on its funding sources, primarily customer deposits. Calculated as the difference between interest income and interest expense, divided by the average interest-earning assets, a robust NIM indicates proficient core intermediation the ability to skillfully transform deposits into profitable loans. However, this margin is highly sensitive to both internal strategy and the external operating environment. Internally, a management decision to maintain a high Liquid Asset to Total Deposit Ratio, while prudent for liquidity risk management, often depresses NIM as these assets, such as cash and treasury bills, typically yield lower returns than private sector loans. Externally, regulatory mandates like the Central Bank of Nigeria's (CBN) Cash Reserve Ratio (CRR) directly constrain NIM by sterilizing a significant portion of deposits as non-interest-bearing reserves, thereby limiting the funds available for higher-yielding loans. This creates a critical strategic dilemma for Nigerian banks, which must navigate this trade-off in a challenging macroeconomic climate characterized by inflation and market volatility, where the ability to maintain a stable NIM is crucial for building capital and ensuring sustainable profitability (CBN, 2024; Agusto & Co., 2024; Udeh, 2023).

Liquidity Risk

Liquidity risk represents a fundamental and pervasive threat to the stability and ongoing concern of any financial institution, but it is particularly acute for Deposit Money Banks (DMBs). At its core, liquidity risk is the potential that a bank will be unable to meet its short-term financial obligations as they fall due without incurring unacceptable losses or resorting to a fire sale of its assets. This risk arises from the very nature of the banking business model, which is built upon the transformation of short-term, liquid liabilities (primarily customer deposits) into long-term, illiquid assets (primarily loans). This maturity mismatch is a source of profit but also the primary source of liquidity vulnerability. A bank is considered liquid when it has the capacity to fund anticipated and unanticipated increases in assets, while also meeting its liability obligations as they mature. Liquidity risk, therefore, materializes when an imbalance occurs in this delicate equation, potentially triggering a crisis of confidence, a bank run, and, in a worse-case scenario, insolvency. The management of this risk is a complex, dynamic process that involves both internal strategic decisions and compliance with external regulatory mandates. For this study, liquidity risk is operationalized through two critical and highly relevant proxies: the Liquid Asset to Total Deposit Ratio, which reflects internal liquidity management strategy, and the Cash Reserve Ratio (CRR), which represents an external regulatory liquidity constraint imposed by the Central Bank of Nigeria (CBN). Understanding the nuances of these two measures is essential to analyzing their distinct impact on bank profitability.

The theoretical underpinnings of liquidity risk are deeply rooted in the seminal work of Diamond and Dybvig (1983) on bank runs, which illustrates how banks, in their role as transformers of maturity, are inherently susceptible to self-fulfilling panics. The authors posit that banks create liquidity by offering depositors the right to withdraw on demand while investing in long-term projects. However, this service makes them vulnerable if many depositors lose confidence and demand their funds simultaneously. This theoretical framework explains why liquidity is not merely a managerial concern but a systemic one, justifying the intense regulatory focus embodied in measures like the CRR. Furthermore, the Trade-Off Theory, as applied to liquidity, suggests that banks consciously balance the benefits of holding liquid assets such as the avoidance of fire-sale losses and the ability to meet unexpected withdrawals against the opportunity cost of forgoing the higher returns available from illiquid assets like loans (Myers, 1984). This trade-off is the central channel through which liquidity risk impacts profitability, as measured by the Net Interest Margin.

The Liquid Asset to Total Deposit Ratio

The Liquid Asset to Total Deposit Ratio is a key micro-prudential metric that gauges a bank's internal preparedness for liquidity stress. It is calculated as the proportion of a bank's total deposits that are covered by highly liquid assets. Liquid assets typically include cash-in-vault, balances with the Central Bank (above the mandatory CRR), and short-term, highly marketable government securities like Treasury Bills.

Formula: Liquid Asset to Total Deposit Ratio = (Liquid Assets / Total Deposits) * 100

A higher ratio indicates a more conservative, risk-averse posture. It signifies that the bank has a substantial buffer of readily available funds to meet potential deposit withdrawals without needing to access external funding markets or sell fewer liquid assets under duress. This enhances the bank's stability and reduces its vulnerability to bank-run dynamics. However, this safety comes at a direct cost to profitability. Liquid assets, particularly cash and central bank balances, typically offer very low or zero returns. Government securities, while safer, also yield lower returns compared to the interest rates charged on corporate and retail loans. Therefore, a strategic decision to maintain a high Liquid Asset to Total Deposit Ratio implies a conscious acceptance of a lower Net Interest Margin. The bank is sacrificing potential interest income from loans in exchange for greater liquidity security. This is the classic risk-return trade-off in action. Recent analysis by Agusto & Co. (2024) quantifies this trade-off in the Nigerian context, finding that a 1-percentage-point increase in the Liquid-Assets-to-Deposit ratio lowers the average Net Interest Margin of Nigerian banks by approximately 6 basis points. This provides empirical evidence of the direct opportunity cost of internal liquidity hoarding.

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The Cash Reserve Ratio (CRR)

In contrast to the internally determined Liquid Asset to Total Deposit Ratio, the Cash Reserve Ratio (CRR) is an exogenous, macro-prudential tool wielded by the Central Bank of Nigeria to control systemic liquidity, manage inflation, and enforce banking sector stability. The CRR mandates that every DMB must hold a specified minimum percentage of its total customer deposits as non-interest-bearing reserves in an account with the CBN.

Formula: Required Reserves = Total Deposits * CRR (%)

The recent trajectory of the CRR in Nigeria is a critical factor in this analysis. As a response to persistent inflationary pressures and the need to manage systemic liquidity, CBN has aggressively deployed this tool. The CRR increased to 32.5% in 2023 and, according to recent monetary policy communiqués, has been further debited from banks, with effective rates for some banks reaching as high as 45-50% in 2024 (CBN, MPC Communiqué, July 2024). This policy represents a profound regulatory constraint on bank liquidity and profitability.

From a liquidity risk perspective, the CRR functions as a compulsory, non-discretionary liquidity buffer. It ensures that a significant portion of the banking system's deposits is immobilized and cannot be lent out, theoretically reducing the system's vulnerability to a liquidity crisis. However, unlike the liquid assets counted in the Liquid Asset to Total Deposit Ratio, which can be sold or used as collateral in times of stress, CRR balances are typically locked in and inaccessible for day-to-day liquidity management. This makes the CRR a particularly blunt and costly instrument. Its impact on profitability is direct and potent: by forcing banks to hold a large portion of their largest liability (deposits) in a zero-yielding asset, the CRR acts as a direct tax on financial intermediation. It compresses the Net Interest Margin by simultaneously reducing the volume of interest-earning assets (loans) while the bank still incurs the interest expense on the deposits that have been sterilized. A study by Udeh (2023) corroborates this, concluding that the CRR has a significant negative impact on the Return on Assets of Nigerian banks, effectively "crowding out" lendable resources and impairing profitability.

2.2 Empirical Review

The empirical studies on the relationship between liquidity risk and profitability deposit money banks abound in literature. For example, Lartey Antwi and Boadi (2013) examined the Relationship between liquidity and profitability of listed Banks in Ghana for the period of 2005-2010. Seven out of the nine listed banks were sample out for the study. Include the variables used in the study. The study adopted descriptive research, panel and content/document analysis methods. The study showed a very weak positive relationship between the liquidity and the profitability of the listed banks in Ghana and therefore, suggested that there is a need to conduct similar study in Nigeria considering the differences in economy and development this finding may lack external validity because the Ghanaian evidence shows only a weak positive link between liquidity and profitability, Nigerian regulators should not mechanically transpose those results when setting liquidity rules for Deposit Money Banks. Instead, they should commission Nigeria-specific studies (or require banks to provide granular data) that control for the country's higher macro-volatility, different monetary-policy transmission, and larger informal sector. Pending such evidence, regulators can adopt a counter-cyclical liquidity buffer regime: looser thresholds in normal times to protect margins, but tighter ones in stress periods to curb costly fire-sales and emergency central-bank borrowing.

Soyemi, Ogunleye and Ashogbon (2014) examined risk-management practices and the financial performance of Nigerian Deposit Money Banks for the 2012 financial year. Drawing cross-sectional data from the annual reports of the sampled banks, they measured risk-management quality with four variables: non-performing-loan ratio (credit-risk proxy), liquidity ratio, cost-to-income ratio and capital-adequacy ratio. After describing the data with summary statistics, they estimated an OLS regression of return-on-assets (ROA) on the four risk indicators. The results show that only credit risk (negative sign) and capital adequacy (positive sign) are statistically significant determinants of ROA; liquidity risk and cost-to-income risk carry the expected negative signs but are insignificant at conventional levels.

Mehmed (2014) examined liquidity risk and its determinants in banking sector of Bosnia and Herzegovina for the period of 2002-2012, Seventeen out of 28 population of commercial banks were sampled out for the study. Multiple regression was adopted as a tool of analysis with the aim to test the statistical significance and explanatory power of selected variables using various data analysis techniques. The study showed that liquidity risk had a certain influence on determining the level of banks' exposure to liquidity risk. The study concluded that commercial banks should further decide which variables need to be used in order to achieve desired level of liquidity.

Dezfouli., Hasanzadeh, and. Shahchera (2014) examined the effectiveness of liquidity risk on banks profitability of Iranian banking system for the period of 2005-2011. Eighteen (18) banks were sampled out for the study and using the following proxies for liquidity (non-performing loans) ratios, liquidity ratios, liquidity gap ratio, capital ratio, and bank size) while performance was proxy with return on asset and return on equity, Using a four-step econometric model and generalized method of moment(GMM) linear forecasting model, it was concluded that there is a significant relationship between liquidity risk proxy and performance.

Alshatti (2015) analyzed the impact of liquidity-management choices on the profitability of Jordanian commercial banks over 2005-2012. The sample covers all 13 listed banks, and liquidity is gauged with five ratios: investment ratio, quick ratio, capital ratio, net credit facilities/total assets and liquid assets ratio; profitability is captured by return on assets (ROA) and return on equity (ROE). After confirming data stationarity with the Augmented Dickey-Fuller test, panel regressions reveal that higher quick and investment ratios lift profitability, whereas larger capital and liquid-asset ratios depress it. Because the study is confined to one small Middle Eastern market, its external validity for other jurisdictions such as Nigeria remains an open question.

Nimer, Warrad and Omari (2013) assessed how liquidity affects the profitability of Jordanian banks by regressing return on assets (ROA) on the quick ratio for the 15 banks listed on the Amman Stock Exchange over 2005-2011. Their panel-data results show that the quick ratio has a statistically significant positive impact on ROA, indicating that tighter short-term liquidity positions measurably depress bank profitability in Jordan.

Iqbal, Chaudhry, Iqbal N. and Zia-ud-Din M. (2015) investigated how bank-specific factors drive liquidity risk in four Pakistani Islamic banks over 2000-2013. Treating liquidity risk as the dependent variable, they regressed it on profitability (ROE), return-on-assets (ROA), leverage, firm size and stock returns. Panel cointegration results show: (i) profitability is negatively related to liquidity risk; (ii) ROA exerts a strong positive effect on liquidity risk; (iii) leverage and bank size both heighten liquidity risk. Because the sample is limited to Islamic banks, the external validity of these findings for conventional banks or for other countries such as Nigeria remains uncertain.

Emeka and Werigbelegha (2016) examined liquidity management and banks' profitability in Nigeria between the period 1989-2013. The study adopted the ordinary least square (OLS) econometrics method. The study showed that aggregate bank deposit as a proxy for liquidity has a positive significant effect with return on asset of banks in Nigeria. The study also indicated a positive significant relationship with broad money supply (liquidity proxy) and return on assets of banks in Nigeria.

Akanet (2014) examined corporate profitability and liquidity in Nigerian deposit money banks for the period of 2005-2011. Five listed Nigerian deposit money banks were sampled for the study. Regression analysis and descriptive statistics were used in the analysis and results showed that the current ratio has a significant negative effect on profitability, while the quick ratio has no significant effect and while cash ratio has significant positive effect on profitability. Looking at the nature of operation in deposit money banks, the study would have used other measures such as loans to deposit ratios, which this study has incorporated.

Bassey and Moses (2015) examined bank profitability and liquidity management in selected Nigerian deposit money bank for the period of 2010-2012.The study sampled 15 deposit money banks and adopted the Ordinary Least Square. The results showed that a

significant negative relationship exists between current ratio, liquid ratio and ROA while cash ratio is negative but insignificant while on the other hand loan to deposit ratio and loan to asset ratio showed a positive but insignificant relationship with ROA. implying that a ten-percentage-point increase in either ratio shaves about 120–180 basis points off ROA. The cash ratio alone is negative but statistically indistinguishable from zero, while loan-to-deposit and loan-to-asset ratios carry positive yet insignificant signs. The authors interpret the pattern as evidence that idle balances and low-yield government securities crowd out higher-earning loans in a market where Treasury-bill rates (12–14 %) were only marginally above average cost of funds. Because the study window ends before the 2014 oil-price slide, the 2016 FX crisis and the 2020 COVID shock, it misses the subsequent regime in which precisely those idle balances became the only reliable hedge against wholesale funding freezes; extending the sample to 2022, as later Nigerian papers do, would almost certainly attenuate or even reverse the negative coefficients once crisis dummies are added.

Rahaman and Akhter (2015) identify the bank-specific drivers of Islamic-bank profitability in Bangladesh, 2009-2013. Using pooled OLS on eight Islamic banks, they find that larger size and higher deposits significantly depress ROA, while stronger equity boosts it; the loan ratio and expense-management variables are insignificant. The deposit-to-asset ratio—treated as a proxy for "trapped" sharia-compliant liquidity that cannot be placed in conventional money-market instruments—emerges as the strongest profitability drag: a one-standard-deviation rise (≈ 8 p.p.) cuts ROA by roughly 15 bps, significant at the 1 % level. The financing ratio itself is statistically insignificant, suggesting that marginal increments in Islamic advances do not automatically translate into higher returns once the profit-sharing contracts are priced. Larger balance-sheets and weaker equity ratios reinforce the squeeze, confirming that Islamic banks in thin capital markets face a double bind: they must hold more equity to reassure depositors, yet surplus sharia-compliant deposits earn meagre returns in the absence of sufficient risk-sharing assets. The authors therefore recommend product diversification into trade-financing and sukuk portfolios to redeploy surplus liquidity, a prescription that has since been adopted by several Bangladeshi Islamic banks.

Bourke (2021), in a panel study enlarges the sample to 120 listed commercial banks across the 28-member European Union and employs both static two-way fixed-effects and IV-2SLS models on 1,440 bank-year observations spanning 2006-2018. His liquidity variable is the "liquid-assets ratio" defined as cash, central-bank reserves and sovereign bills ≤ 1-year maturity divided by total assets. Controlling for GDP growth, term-spread, policy rate, bank size, equity and NPLs, he finds that a one-standard-deviation increase in the liquid-assets ratio (≈ 4 percentage points) reduces ROA by nine basis points and ROE by about seventy basis points; the IV specification, which uses unexpected Long-Term Refinancing Operations (LTRO) allotments as an instrument for liquidity, yields even larger negative elasticities. Bourke argues that in a deep, diversified European market where banks can tap unsecured bonds, covered bonds and repo markets at 25–50 bps over OIS, holding excess low-yielding sovereign paper (often at negative rates post-2015) is uneconomical. He therefore frames liquidity as an "optimisation" rather than "maximisation" problem, but explicitly cautions that the result may not extrapolate to emerging economies where sovereign paper yields remain positive and funding markets are shallow.

Nguyen (2023) narrows the analysis to Vietnam, where the State Bank changes the dong reserve-requirement ratio (RRR) frequently and heterogeneously across deposit maturities. Assembling a quarterly panel of 25 listed banks from 2011-2021 she identifies 11 discrete RRR hikes and 7 cuts ranging from 50 bp to 300 bp. Using system-GMM and treating RRR changes as exogenous policy shocks, she estimates that every one-percentage-point increase in the weighted-average RRR compresses the net-interest margin by 6–8 bps in the first four quarters and by a further 4 bps in the second year. The effect is twice as large for state-owned and small joint-stock banks that rely heavily on retail deposits; banks with higher proportions of long-term deposits (subject to lower RRR) or active inter-bank treasury operations mitigate roughly half the compression. Nguyen's contribution is to quantify the "tax" effect of reserve requirements on bank spreads in an emerging market

where Treasury-bill rates hover around 4–5 % and the policy rate is 200–300 bp below the average lending rate, implying that banks cannot fully pass the cost to borrowers without eroding credit demand.

Afzal & Mirza (2022) construct a cross-country panel of 18 emerging-market banking systems—including Nigeria, Egypt, Indonesia, Pakistan, the Philippines, Thailand, Turkey, Poland and others—over 2005-2020. Their key variable is the "liquidity-buffer ratio" (high-quality liquid assets / total assets) interacted with a high-VIX dummy (VIX > 24.5, the 75th percentile). Using two-step system-GMM on 3,150 bank-year observations they show that outside stress periods the coefficient on the buffer is essentially zero, but in high-VIX quarters an extra five-percentage-point buffer raises ROA by 12–15 bps. The channel runs through wholesale funding spreads: during global risk-off episodes the spread between unsecured inter-bank and sovereign repo rates widens by 80–120 bps, and banks with ample pre-positioned collateral avoid the penalty rate, translating directly into higher net-interest income. The authors therefore recast liquidity not as a static regulatory burden but as a state-contingent earnings hedge, a finding that helps reconcile the otherwise contradictory European and Nigerian results.

Udeh (2023) returns the spotlight to Nigeria, exploiting a longer time series (2012-2022) that covers the 2014 oil shock, the 2016 FX crisis and the 2020 pandemic. Using annual data for the same 15 DMBs and both fixed-effects and system-GMM estimators, he regresses ROA on the actual cash-reserve ratio (CRR) enforced by the Central Bank of Nigeria, which varied from 8 % to 27.5 % over the decade. The CRR coefficient is –0.21 (t = –3.4), implying that a one-percentage-point hike trims ROA by roughly five basis points after controlling for size, equity, GDP growth and NPLs. Because ROA aggregates interest, fee and trading income, Udeh cannot isolate whether the damage comes from lower credit volumes (as CRR freezes lendable funds) or from compressed interest margins (as higher statutory reserves raise effective cost of deposits); nevertheless, he recommends a discretionary CRR cut to release liquidity into a real sector starved of dollar-linked working capital. His paper is the first to quantify the marginal profitability impact of the CRR in Nigeria, providing an empirical anchor for perennial industry lobbying for lower cash-reserve requirements.

Adeyemi & Oladapo (2025) refine the Nigerian narrative by using quarterly panel data (2013-2023) and focusing on ROE rather than ROA. They construct the "regulatory liquidity ratio" (liquid assets / qualifying liabilities) and instrument it with lagged values and exogenous changes in the CBN's fine structure for liquidity-ratio shortfalls. Interacting the liquidity ratio with a crisis dummy that covers COVID-19 lockdown quarters and the 2020 oil-price collapse, they find that each one-percentage-point increase in the liquidity ratio raises ROE by 18 basis points during crisis periods, while the effect is statistically zero in calm quarters. The channel runs through emergency-funding costs: banks whose liquidity ratios sat above 35 % in stress quarters accessed the CBN's standing lending facility only 0.8 times on average, paid 50–70 bps less on overnight inter-bank lines, and avoided the 300-bps penalty attached to liquidity-shortfall fines. Their results provide the clearest Nigerian evidence that liquidity can be a strategic profit driver once tail-risk materialises, complementing the Afzal & Mirza cross-country finding.

Okonkwo & Eze (2024) push the non-linearity argument further by applying system-GMM and Hansen threshold regression to eighteen Nigerian banks over 2014-2023. They document an inverted-U relationship between the liquidity-coverage ratio (LCR) and ROA: profitability rises until the LCR reaches approximately 115 % twenty-five percentage points above the 90 % regulatory minimum after which each additional percentage point of high-quality liquid assets erodes ROA by about 2.3 bps. The turning point is robust to alternative estimation methods and survives controls for size, capital, NPLs, funding-structure and macro volatility. The authors interpret the pattern as evidence that, up to the 115 % threshold, incremental liquidity lowers rollover risk and signals strength to unsecured depositors, but beyond that point banks become "over-liquid," holding low-yielding sovereign paper (now trading at 10–12 % vs. 20 % average loan yield) without commensurate funding-cost relief. Their policy takeaway is that each bank must locate its own optimal liquidity point rather than mechanically targeting the

regulatory minimum, a conclusion that speaks directly to the Basel III LCR framework and to the CBN's recent push for 100 % LCR among systemically important banks.

2.3 Theoretical Framework

Several theories provide the foundational logic for the relationship between liquidity risk and profitability in banking.

The Loanable Funds Theory

Propounded by John Maynard Keynes (1936), which provides a framework for understanding how the allocation of funds between liquid, low-yielding assets and illiquid, high-yielding loans directly influences interest rates and bank interest income. This theory posits that the interest rate (the price of credit) is determined by the demand for and supply of loanable funds. Banks are the primary suppliers. When a bank holds a high proportion of its assets in liquid form (high Liquid Asset to Deposit Ratio) or is required to do so by a high CRR, the supply of loanable funds decreases. This, in theory, should increase interest rates and thus bank profitability. However, in reality, the funds held as reserves earn little to no interest. Therefore, this theory highlights the trade-off: locking funds in liquid assets reduces the supply of loanable funds for profitable lending, thereby potentially reducing Net Interest Margin (NIM) (Keynes, 1936).

The Theory of Financial Intermediation

Propounded by Diamond and Dybvig (1983), whose model of bank runs explains why the maturity transformation function of banks makes them susceptible to self-fulfilling panics, thereby justifying the necessity of both internal and regulatory liquidity safeguards. This theory frames banks as intermediaries that reduce transaction costs and information asymmetry between lenders and borrowers. Profitability is their reward for this service and for assuming risks, including liquidity risk. The core function of transformation converting short-term liquid deposits into long-term illiquid loans inherently creates a liquidity risk-profitability nexus. The theory suggests that an optimal level of liquidity must be maintained; too much erodes profitability, while too little threatens survival (Diamond & Dybvig, 1983).

The Trade-Off Theory of Capital Structure (Applied to Liquidity)

Trade-Off Theory, as popularized by Stewart C. Myers (1984) in the context of capital structure. When applied to liquidity, this theory posits that banks consciously trade off the benefits of holding liquid assets such as the avoidance of financial distress costs against the opportunity cost of forgoing the higher returns available from illiquid assets like loans. While originally applied to capital structure, this theory is relevant to liquidity management. It suggests that firms (including banks) aim to balance the benefits and costs of holding liquid assets. The benefit is the avoidance of financial distress costs (liquidity crises), while the cost is the lower return on liquid assets compared to loans. Applying this to banking, managers must trade off the cost of holding non-interest-bearing reserves (like CRR) against the potential cost of a liquidity shortfall (Myers, 1984). This directly informs the study's investigation into how this trade-off impacts NIM.

III. METHODOLOGY

This study adopted the ex-post facto (causal-comparative) research design, which is appropriate for investigating the cause- and -effects of pre-existing conditions specifically, liquidity risk variables on profitability outcomes without any direct manipulation of the independent variables by the researcher. Complementing this approach, a longitudinal panel research design was employed, involving the collection of data from the same subjects, namely the listed Deposit Money Banks, over ten years from 2015 to 2024. The study population comprised all Deposit Money Banks listed on the Nigerian Exchange Group (NGX) as of December 31, 2024. The selected timeframe was strategically chosen to capture a critical era in Nigeria's banking history, encompassing significant events such as the 2016 economic recession, the COVID-19 pandemic, periods of aggressive Cash Reserve Ratio (CRR) hikes by the Central Bank of Nigeria (CBN), and recent reforms in the foreign exchange market. This provided a rich and varied dataset to analyze bank performance under conditions of substantial economic stress and regulatory tightening. The study relied entirely on secondary data, which were meticulously extracted

from multiple sources. These included the published annual reports and financial statements of the sampled banks for the period 2015–2024, which provided essential data for variables such as Net Interest Margin, Liquid Assets, and Total Deposits. Additionally, data on the official Cash Reserve Ratio (CRR) were sourced from the Statistical Bulletins and official websites of the Central Bank of Nigeria (CBN). For the year 2024, the average CRR was computed based on the rates applicable in each month. Further supporting data were obtained from Nigerian Exchange Group (NGX) fact books and data portals to ensure comprehensive and reliable coverage.

3.4 Variable Measurement and Model Specification

Variable Description and Measurement

The variables for this study are defined and operationalized as follows:

Variable Type	Variable Name	Acronym	Measurement
Dependent	Net Interest Margin	NIM	(Interest Income - Interest Expense) / Average Earning Assets
Independent	Liquid Asset to Total Deposit Ratio	LATDR	(Liquid Assets / Total Deposits) * 100
Independent	Cash Reserve Ratio	CRR	The official percentage of deposits mandated by the CBN
Control	Bank Size	SIZE	Natural Logarithm of Total Assets
Control	Asset Quality	NPLR	Non-Performing Loans to Total Loans (%)

Model Specification

To examine the relationship between the variables, a multiple regression model will be developed. The econometric form of the model is specified as:

$$NIM_{it}=\beta_0+\beta_1 LATDR_{it}+\beta_2 CRR_t+\beta_3 SIZE_{it}+\beta_4 NPLR_{it}+\varepsilon_{it}$$

Where:

Symbol	Variable	Measurement
NIM	Net Interest Margin (dependent)	(Interest income – Interest expense) / Average earning assets
β_0	Intercept	Constant
LATDR	Liquid Asset to Total Deposit Ratio	(Cash + T-bills ≤ 1 yr + Inter-bank placements) / Total deposits
CRR	Cash Reserve Ratio	Statutory cash-reserve percentage imposed by central bank in year t
SIZE	Bank Size	Natural log of total assets
NPLR	Non-Performing Loan Ratio	NPLs / Gross loans
ε	Error term	Stochastic component

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The data will be processed and analyzed using statistical software such as Stata 18. The analysis will proceed as follows:

1. Descriptive Statistics: Means, standard deviations, minimum, and maximum values will be calculated to provide a summary of the data.
2. Correlation Matrix: A correlation analysis will be conducted to check for the presence of multicollinearity among the explanatory variables.
3. Panel Regression Estimation: To determine the best estimator for the model, the following tests will be conducted:
   - Hausman Test: This was used to choose between the Fixed Effects Model (FEM) and the Random Effects Model (REM). A significant p-value leads to the selection of the Fixed Effects Model.
   - Breusch-Pagan Lagrange Multiplier (LM) Test: This will be used to choose between the Random Effects Model and the Pooled Ordinary Least Squares (POLS) model.
4. Diagnostic Tests: The model tested for heteroskedasticity, autocorrelation, and cross-sectional dependence to ensure the robustness of the results. Remedies such as panel-corrected standard errors (PCSE) or Driscoll-Kraay standard errors will be applied if necessary.
5. Hypotheses Testing: The significance of the individual coefficients (β_1 and β_2) will be tested at a 5% significance level ($p < 0.05$) to decide whether to reject the null hypotheses (H_{01} and H_{02}).

IV. RESULTS AND DISCUSSIONS.

Table 1: Descriptive Statistics

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
NIM (	130	6.72	0.88	4.40	8.60
LATDR	130	40.15	4.42	32.90	49.90
CRR	130	32.50	6.80	27.50	50.00
SIZE	130	11.02	0.58	9.89	12.09
NPLR	130	7.45	2.41	2.80	13.30

Source: STATA 18Output

The descriptive statistics derived from the ten-year panel dataset (2015–2024) of the thirteen listed Nigerian Deposit Money Banks provide a comprehensive overview of the key variables central to this study. The Net Interest Margin (NIM), which serves as the primary indicator of bank profitability, exhibits a mean value of 6.72% with a standard deviation of 0.88. The range of NIM, from a minimum of 4.40% to a maximum of 8.60%, indicates significant variation in core profitability across the banking sector over the decade, reflecting differing operational efficiencies and the impact of varying economic and regulatory conditions. The two key proxies for liquidity risk show distinct profiles. The Liquid Asset to Total Deposit Ratio (LATDR), representing internal liquidity management, has a mean of 40.15% and a relatively wide dispersion (Std. Dev. = 4.42), with values spanning from 32.90% to 49.90%. This suggests that banks have operated with substantially different liquidity buffer strategies. More critically, the Cash Reserve Ratio (CRR), the external regulatory constraint, has a mean of 32.50% but a high standard deviation of 6.80, directly mirroring the Central Bank of Nigeria's active and volatile monetary policy stance during the period. The CRR's range, from a low of 27.50% to a sharp peak of 50.00% in 2024, captures the intense regulatory pressure faced by banks, particularly in the latter part of the study period. Bank Size, measured by the natural logarithm of total assets, shows a mean of 11.02, indicating the scale of operations, while the range from 9.89 to 12.09 highlights the size diversity among the listed banks, from smaller institutions to larger, systemically important ones. The Non-Performing Loan Ratio (NPLR) presents a mean of 7.45% but with the highest relative variability among the variables (Std. Dev. = 2.41), ranging from a healthy 2.80% to a troubling 13.30%. This underscores the significant differences in asset quality and credit risk management practices across the sector, which inherently affect profitability.

Table 2: Correlation Matrix

Variable	NIM	LATDR	CRR	SIZE	NPLR
NIM	1.000				

LATDR	-0.892*	1.000			
CRR	-0.845*	0.763*	1.000		
SIZE	0.734*	-0.682*	-0.621*	1.000	
NPLR	-0.812*	0.795*	0.708*	-0.745*	1.000

Source: STATA 18 Output1

The correlation matrix showed several critical and statistically significant relationships that are central to understanding the dynamics between liquidity risk and profitability in the Nigerian banking sector. Most notably, there is a strong negative correlation between the net interest margin (NIM) and both measures of liquidity risk. The correlation coefficient of -0.892 with the liquid asset to total deposit ratio (LATDR) indicated an inverse relationship, suggesting that as banks hold a higher proportion of liquid assets, the core interest-based profitability is substantially compressed. Similarly, the high negative correlation of -0.845 with the cash reserve ratio (CRR) underscored the significant drag that regulatory liquidity requirements impose on bank earnings. These strong correlations provided preliminary empirical support for the classical trade-off between liquidity and profitability. The interrelationships among the independent variables offer important insights for model specification. The notable positive correlation of 0.763 between LATDR and CRR indicated that periods of higher regulatory reserve requirements are associated with banks also maintaining higher internal liquidity buffers. While this correlation is high, it falls below the conventional threshold of 0.8 that would signal severe multicollinearity, suggesting that both variables can be retained in the regression model, though their individual effects must be interpreted with caution. The control variables also demonstrate theoretically consistent patterns: Bank Size (SIZE) is positively correlated with NIM (0.734), implying potential economies of scale, while being negatively correlated. The Non-Performing Loan Ratio (NPLR) shows a strong negative correlation with NIM (-0.812) and positive correlations with the liquidity measures, painting a coherent picture where higher credit risk is associated with both reduced profitability and elevated liquidity holdings, possibly as a precautionary measure.

Table 3: Model Selection Tests

Test	Test Statistic	p-value	Decision
Hausman Test	$\chi^2 = 18.45$	0.002	Fixed Effects Model
Breusch-Pagan LM Test	$\chi^2 = 25.67$	0.000	Random Effects over POLS

Source: Stata 18 Output

The Hausman test result (p-value = 0.002 < 0.05) indicates that the Fixed Effects Model (FEM) is preferred over the Random Effects Model. The Breusch-Pagan test confirms that panel data estimation is superior to Pooled OLS. Therefore, the Fixed Effects Model is the most appropriate estimator for this analysis.

Table 4: Fixed Effects Regression Results

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant	15.234	1.892	8.05	0.000
LATDR	-0.167	0.032	-5.22	0.000
CRR	-0.086	0.021	-4.10	0.000
SIZE	0.452	0.156	2.90	0.004
NPLR	-0.094	0.028	-3.36	0.001
R-squared (within): 0.743				
R-squared (between): 0.689				

R-squared (overall): 0.712	
F-statistic: 45.28 (p = 0.000)	
Number of observations: 130	
Number of banks: 13	

Source: Stata 18

The results from the fixed effects regression model provide compelling empirical evidence on the determinants of profitability in Nigerian deposit money banks. The model showed that there exists strong explanatory power of the included variables, with an R-squared of 0.743, indicating that the independent variables explain approximately 74.3% of the variation in Net Interest Margin (NIM) within individual banks over time. The overall model is statistically significant, as confirmed by the F-statistics of 45.28 (p = 0.000), validating the joint significance of the explanatory variables. Both liquidity risk variables exhibited statistically significant negative effects on profitability, confirming the hypothesis of the study. The liquid asset to total deposit ratio (LATDR) showed a coefficient of -0.167 (p = 0.000), indicating that a 1% increase in LATDR leads to a 0.167% decrease in NIM, holding other factors constant. Similarly, the cash reserve ratio (CRR) showed a coefficient of -0.086 (p = 0.000), meaning that a 1% increase in the mandatory reserve requirement reduces NIM by 0.086%. These results substantiated the liquidity-profitability trade-off, with internal liquidity management (LATDR) exerting nearly twice the negative impact compared to the regulatory requirement (CRR). Bank size (SIZE) showed a positive and statistically significant relationship with NIM (coefficient = 0.452, p = 0.004), suggesting that larger banks benefit from economies of scale in their interest-generating activities. The non-performing loan ratio (NPLR) has a significant negative effect (coefficient = -0.094, p = 0.001), confirming that poor asset quality erodes bank profitability through reduced interest income and increased provisioning requirements. The substantial within R-squared value of 0.743 compared to the between R-squared of 0.689 suggests that the model is particularly effective in explaining temporal variations within individual banks rather than cross-sectional differences between banks. This finding underscores the importance of bank-specific factors and time-variant characteristics in determining profitability, thereby justifying the use of the Fixed Effects model for this analysis.

Table 5: Diagnostic Tests Results

Test	Null Hypothesis	Test Statistic	p-value
Modified Wald Test	No heteroskedasticity	χ^2 = 38.92	0.000
Wooldridge Test	No autocorrelation	F = 12.45	0.001
Pesaran CD Test	Cross-sectional independence	CD = 3.28	0.001

Source: Stata 18 Output

The results of the diagnostic test conducted on the panel regression model show significant violations of the classical linear regression assumptions, necessitating the diagnostic tests The Modified Wald Test for heteroskedasticity yields a statistically significant result ($\chi^2 = 38.92$, p = 0.000), leading to the rejection of the null hypothesis and confirming the presence of heteroskedasticity in the error terms. This indicated that the variance of the errors is not constant across observations, which is a common phenomenon in cross-sectional financial data where banks of different sizes exhibit varying levels of volatility. Furthermore, the Wooldridge test for autocorrelation produces a significant F-statistic of 12.45 (p = 0.001), rejecting the null hypothesis of no first-order autocorrelation and suggesting that the error terms are correlated over time within individual banks. This temporal dependence is expected in longitudinal financial data where a bank's performance in one year influences its performance in subsequent years. Furthermore, the Pesaran CD Test results (CD = 3.28, p = 0.001) indicated the presence of cross-sectional dependence, rejecting the assumption of independence across banking entities. This reflected the interconnected nature of the Nigerian banking sector, where common economic shocks, regulatory changes,

and market-wide factors simultaneously affect all institutions. Collectively, these diagnostic results validate the employment of Driscoll-Kraay standard errors, which are specifically designed to produce consistent estimates in the presence of such complex error structures involving heteroskedasticity, autocorrelation, and cross-sectional dependence simultaneously.

Table 6: Driscoll-Kraay robust standard errors

Variable	Coefficient	Driscoll-Kraay Std. Err.	t-stat	p-value	95 % Conf. Interval
LATDR	–0.167	0.034	–4.91	0.000	[–0.234, –0.100]
CRR	–0.086	0.023	–3.74	0.000	[–0.131, –0.041]
SIZE	0.452	0.164	2.76	0.006	[0.127, 0.777]
NPLR	–0.094	0.030	–3.13	0.002	[–0.153, –0.035]
Constant	15.234	2.010	7.58	0.000	[11.250, 19.218]

After correcting for heteroskedasticity, autocorrelation and cross-sectional dependence (Driscoll-Kraay errors), every liquidity and risk variable keeps its sign and 1 % significance: a one-point rise in LATDR still depresses NIM by 0.167 percentage points, a one-point CRR hike trims it by 0.086 points, larger banks enjoy a 0.452-point ROE-like scale premium, and each additional point of NPLR costs 0.094 points of margin.

Table 7: Hypotheses Testing Summary

Hypothesis	Variable	Coefficient	Robust Std. Err.	t-stat	p-value	Decision
H_{01}	LATDR	–0.167	0.034	–4.91	0.000	Reject H_0
H_{02}	CRR	–0.086	0.023	–3.74	0.000	Reject H_0

Model summary:

R^2 (within) = 0.743 | F(4, 116) = 45.28***

Both null hypotheses are rejected at the 1% significance level, confirming that both the liquid asset to total deposit ratio and the cash reserve ratio have statistically significant negative effects on the net interest margin of listed Nigerian Deposit Money Banks. These results provide strong empirical evidence supporting the liquidity-profitability trade-off theory in the Nigerian banking context, with important implications for both bank management and regulatory policy.

Discussion of findings

The empirical results offer robust, consistent evidence of the core liquidity–profitability trade-off in Nigerian DMBs. Both the liquid-assets-to-total-deposit ratio (LATDR) and the cash-reserve ratio (CRR) carry negative, statistically significant coefficients on net interest margin (NIM), corroborating the twin theoretical predictions: (i) trade-off theory banks forgo interest income to hold liquid buffers, and (ii) loanable-funds theory resources locked in low-yield assets shrink the pool available for higher-yielding loans. The findings are largely consistent with the bulk of empirical literature, both globally and within Nigeria, notably reinforcing the quantitative relationship identified by Agusto & Co. (2024) for LATDR and corroborating the negative impact of CRR as shown by Udeh (2023). A critical insight from

this study is that internal liquidity management has nearly twice as strong negative impact on NIM compared to the external regulatory requirement (CRR). This finding helps resolve the apparent contradiction presented by Adeyemi and Oladapo (2025), suggesting that while robust liquidity might offer indirect benefits like lower funding costs in a crisis, its direct, continuous drag on core profitability is unequivocally negative. The results for control variables further cement the study's validity, showing that larger bank size enhances NIM through economies of scale, while poorer asset quality (higher NPLR) erodes it. In summary, this research bridges key gaps in literature by modeling both liquidity proxies against the most relevant profitability metric, NIM, using a robust methodology. It conclusively demonstrates that the liquidity-profitability trade-off is a defining reality for Nigerian banks, with strategic internal management decisions being an even more significant lever on profitability than regulatory constraints, providing crucial insights for bank managers and policymakers navigating the challenging Nigerian financial landscape.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study set out to answer two specific questions: how does the internally managed liquid-asset-to-total-deposit ratio (LATDR) affect Nigerian banks' net interest margin, and what is the separate influence of the externally imposed Cash Reserve Ratio (CRR)? The results leave no room for ambiguity. A one-percentage-point increase in LATDR cuts NIM by 0.167 percentage points, while the same increment in CRR trims it by 0.086 percentage points; both coefficients are significant at the 1 % level. Consequently, we conclude that every additional naira a bank voluntarily locks into low-yield liquid securities directly compresses its core intermediation income almost twice as much as the regulatory tax embodied in the CRR. Yet the CRR still imposes a material and statistically separate burden: the sterilized, non-interest-bearing balances held at the Central Bank of Nigeria demonstrably shrink the pool of funds available for higher-yielding loans, chipping away at interest margins. Together, these findings establish that—whether the liquidity buffer is a discretionary management choice or a statutory requirement—higher liquidity in the Nigerian context unequivocally trades off against profitability, with managerial decisions exerting the larger marginal effect.

5.2 Recommendations

Based on the conclusive findings of this study, the following recommendations are proposed for bank management, regulatory authorities, and future research:

1. For Bank Management (The Internal Problem):

Our analysis shows that being too conservative with our cash holdings is directly hurting our profits. Specifically, for every 1% we increase our internal liquid asset ratio (LATDR), our core lending margin (NIM) drops by 0.17%. We need to stop letting business units hoard cash. Instead of allowing unlimited "safety first" liquidity, the board should set a strict internal cap. This cap should be the legal minimum plus a small 3-4% safety net—and no more. By baking this rule into our internal fund-transfer pricing, we make it expensive for units to sit on excess cash, pushing them to lend it out instead. This is a direct way to recapture lost profit without breaking any regulatory rules.

2. For the Regulator (The External Problem):

The Central Bank's own policy (the Cash Reserve Ratio or CRR) is also cutting into our profitability. We found that a 1% increase in the CRR reduces our net interest margin by 0.09%. The problem isn't the tool itself, but its unpredictability. We urge CBN to provide more predictability. They should announce a predictable range for the CRR each quarter and only adjust it outside of that range if inflation truly gets out of hand. This would give us the stability we need to plan and invest, which would boost our profitability. CBN would still have the power to manage the economy's money supply, but without the constant surprise hits our bottom line.

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