

Liquidity Management and the Bank Operational Efficiency of Deposit Money Banks in Nigeria

¹Dr Olusola Oladejo | Oladejo.oluwasola@lcu.edu.ng | 08086065155

²Akinbiyi Damilola Maryam | akinbiyidamilolamaryam@gmail.com | 08108164493

¹⁻² Department of Management and Accounting, Lead City University, Ibadan Oyo State, Nigeria

Corresponding Author:

akinbiyidamilolamaryam@gmail.com
+234 08108164493

Abstract

This study examines the relationship between liquidity management and bank operational efficiency of Deposit Money Banks (DMBs) in Nigeria. Utilising an ex-post facto design, the research analysed ten years of annual reports from eight listed DMBs with international authorisation licences, yielding eighty observations. Multiple regression analysis was conducted using the Ordinary Least Squares approach via E-VIEW software. Key findings reveal that Cash Flow Coverage (CFC) has an insignificant negative effect on Bank Efficiency ($R^2 = 0.309693$, $p < 0.05$). Capital Adequacy Ratio (CAR) significantly positively influences Bank Efficiency ($R^2 = 0.065635$, $p < 0.05$). Loan-to-Asset Ratio (LAR) has an insignificant positive effect on Bank Efficiency ($R^2 = 0.306720$, $p < 0.05$). Loan-to-Deposit Ratio (LDR) significantly positively impacts Bank Efficiency ($R^2 = 0.344147$, $p < 0.05$). The study concludes that effective liquidity management, particularly through optimal loan-to-deposit ratios and adequate capitalisation, is crucial for enhancing operational efficiency in Nigerian DMBs. Recommendations include optimising cash flow coverage without compromising operational effectiveness, maintaining robust capital adequacy ratios, responsible loan portfolio management, and balancing loan-to-deposit ratios for improved operational efficiency.

Keywords: Liquidity Management, Bank Efficiency, Cash Flow Coverage, Capital Adequacy Ratio (CAR), Loan-to-Asset Ratio (LAR), Loan-to-Deposit Ratio (LDR), Nigeria

1. Introduction

1.1 Background to the Study

Understanding the dynamics and performance of deposit money banks in the financial sector is essential for assessing the success, growth, and sustainability of these institutions (Souder et al., 2024). Enhanced performance indicates efficient resource utilisation, effective risk management, and strategic decision-making, all vital for maintaining competitiveness and long-term viability in the banking sector (Akinadewo et al., 2023). Bank efficiency represents the ability of a bank to optimise its operational costs whilst maximising returns from its activities, encompassing various operational metrics such as cost-to-income ratio, operating expenses, and revenue generation (Partovi & Matousek, 2019).

The Nigerian banking sector plays a crucial role in the country's economy by facilitating financial intermediation, supporting businesses, and driving economic growth (Eluyela et al., 2019). Within this sector, deposit money banks, as key financial institutions, perform essential functions such as mobilising deposits, granting loans, and providing various financial services to individuals and businesses. However, despite stringent reforms and regulation in the Nigerian banking industry, deposit money banks continue to face significant challenges related to operational efficiency and liquidity management (Wuave et al., 2020).

Liquidity management refers to the strategic planning and control necessary to ensure that banks maintain adequate liquid assets to meet short-term obligations whilst avoiding the negative impact of keeping large amounts of idle cash on profitability (Bianchi & Bigio, 2022). Efficient liquidity management is essential for maintaining bank profitability and protecting both the banking institution and the financial system from liquidity risks. The relationship between liquidity management practices and bank efficiency remains a critical area requiring empirical investigation, particularly within the Nigerian context.

Bank efficiency encompasses aspects such as cost management, revenue generation, and asset utilisation (Shair et al., 2021). In a landscape marked by regulatory changes, technological advancements, and economic fluctuations, improving efficiency is imperative for DMBs to enhance their sustainability and adaptability (Wang et al., 2021). Operational efficiency indicates that the bank is able to achieve its financial objectives with minimal wastage and optimal allocation of resources (Phan et al., 2019).

1.2 Statement of the Research Problem

Deposit Money Banks in Nigeria aim to attain maximum operational efficiency by maintaining optimal liquidity. This involves ensuring adequate liquid assets for meeting short-term obligations whilst minimising operational costs and maximising resource utilisation. However, the current situation in the Nigerian banking sector presents several challenges that potentially compromise operational efficiency.

In 2009, ten out of the twenty-four megabanks were declared by the Central Bank of Nigeria as troubled and uncertain or banks in grave condition for having liquidity challenges, capital inadequacy, and lack of sound risk management processes, amongst others. Whilst regulatory interventions have been implemented, DMBs continue to struggle with balancing liquidity requirements against operational efficiency imperatives (Dzapasi, 2020).

The lack of in-depth analysis examining the specific relationship between various liquidity management metrics and bank operational efficiency may limit understanding of this critical aspect of banking operations. Most prior research has offered broad overviews of liquidity

management practices without delving into specific metrics or employing advanced analytical techniques to examine their impact on operational efficiency (Sathyamoorthi et al., 2020). Few studies have utilised panel data techniques or controlled for individual bank-specific factors, limiting the depth and robustness of findings regarding efficiency outcomes.

This study aims to bridge these gaps by focusing on specific liquidity ratios—Cash Flow Coverage Ratio, Loan-to-Deposit Ratio, Liquid Assets Ratio, and Capital Adequacy Ratio—and their impact on bank operational efficiency. By employing advanced panel data techniques to analyse a comprehensive dataset encompassing multiple DMBs over several years, this longitudinal approach allows examination of the nuanced and evolving impact of each metric on operational efficiency whilst controlling for individual bank characteristics (Alim et al., 2021).

1.3 Objectives of the Study

The broad objective is to examine the effect of liquidity management on bank operational efficiency of Deposit Money Banks in Nigeria. The specific objectives are to:

1. Assess the effect of Cash Flow Coverage on bank efficiency in Nigerian deposit money banks
2. Examine the effect of Capital Adequacy Ratio on bank efficiency in Nigerian deposit money banks
3. Investigate the influence of Loan-to-Asset Ratio on bank efficiency in Nigerian DMBs
4. Analyse the influence of Loan-to-Deposit Ratio on bank efficiency in Nigerian DMBs

1.4 Research Hypotheses

The following hypotheses, stated in null form, were tested:

H₀₁: Cash Flow Coverage has no significant effect on bank efficiency in Nigerian deposit money banks.

H₀₂: Capital Adequacy Ratio has no significant effect on bank efficiency in Nigerian deposit money banks.

H₀₃: Loan-to-Asset Ratio does not significantly influence bank efficiency in Nigerian DMBs.

H₀₄: Loan-to-Deposit Ratio does not significantly influence bank efficiency in Nigerian DMBs.

2. Literature Review

2.1 Conceptual Review

2.1.1 Bank Efficiency

Efficiency in banking operations refers to the ability of a bank to minimise costs whilst maximising returns from its activities (Partovi & Matousek, 2019). This measure encompasses various aspects of operational efficiency, including cost management, resource utilisation, process optimisation, and productivity enhancement. A high level of efficiency indicates that the bank achieves its financial objectives with minimal wastage and optimal allocation of resources (Shair et al., 2021).

Efficiency ratios such as the cost-to-income ratio, overhead ratio, and asset utilisation ratio are

commonly used to assess a bank's operational efficiency and performance relative to industry benchmarks (Wang et al., 2021). Bank efficiency is crucial for determining overall performance and competitiveness in the financial marketplace, as it encompasses the bank's ability to minimise costs whilst maximising returns from activities (Phan et al., 2019).

Recent studies have emphasised the multifaceted nature of bank efficiency. Research has revealed significant influences of market structure, regulatory environment, and technological innovation on efficiency outcomes (Shair et al., 2021). Efficiency analysis examining efficiency levels of banks has uncovered substantial variations across institutions and over time, identifying key factors that influence efficiency scores and performance disparities (Partovi & Matousek, 2019).

2.1.2 Liquidity Management Components

Cash Flow Coverage assesses a bank's ability to meet financial obligations through available cash flows (Rahman & Sharma, 2020). Optimising Cash Flow Coverage is essential for DMBs to sustainably manage their liquidity position and support ongoing operations. A higher Cash Flow Coverage ratio indicates greater financial stability and resilience to economic downturns (Sidhu et al., 2022). Efficient management of cash flow can positively impact bank efficiency ratios by ensuring the bank's ability to meet operating expenses and debt obligations without relying excessively on external financing (Benson & Odey, 2022).

Loan-to-Deposit Ratio (LDR) indicates the proportion of a bank's loans relative to its deposits, reflecting its ability to meet loan demands whilst maintaining liquidity (Sukmadewi, 2020). Managing the LDR effectively is essential for DMBs to strike a balance between lending activities and liquidity requirements, ensuring financial stability and regulatory compliance. An optimal LDR ensures that the bank maintains a healthy balance between loan assets and deposit liabilities, thereby minimising liquidity risks whilst maximising profitability (Goh et al., 2022).

Liquid Assets Ratio measures the ratio of a bank's liquid assets, such as cash and government securities, to its total assets. Maintaining an adequate Liquid Assets Ratio is critical for DMBs to mitigate liquidity risks and meet short-term obligations promptly (Otekunrin et al., 2019). A higher Liquid Assets Ratio indicates greater liquidity and financial stability, reducing the risk of default and enhancing investor confidence (Kalimashi et al., 2022).

Capital Adequacy Ratio (CAR) assesses a bank's capital adequacy relative to its risk-weighted assets, ensuring it has sufficient capital to absorb potential losses (Vu & Dang, 2020). Maintaining a healthy CAR is vital for DMBs to instil investor confidence, comply with regulatory requirements, and safeguard against financial distress (Ezu et al., 2023).

2.2 Theoretical Framework

2.2.1 Trade-off Theory of Liquidity

This study is primarily anchored on the Trade-off Theory of Liquidity, which suggests that enterprises aim to achieve an optimal level of liquidity to balance factors such as profitability, operational efficiency, and financial stability (Khoa & Thai, 2021). The Trade-off Theory suggests that firms, including banks, must balance the costs and benefits associated with maintaining different levels of liquidity (Kong et al., 2019).

According to this theory, there is an optimal level of liquidity that maximises firm value, taking into account the costs of holding liquid assets and the benefits of being able to quickly meet financial obligations (Stevanovic et al., 2019). The significance of this theory lies in its ability to minimise expenses and optimise the advantages associated with working capital components. For

deposit money banks, this means striking a balance between maintaining sufficient liquidity for operational requirements and regulatory compliance whilst avoiding excessive idle funds that could reduce efficiency (Agyei et al., 2020).

The theory emphasises that liquidity management should be tailored to the specific needs and circumstances of each organisation (Kinyua & Fredrick, 2022). Banks with higher liquidity may have greater capacity to withstand liquidity shocks and maintain appropriate cash buffers to pay short-term obligations, but this may come at the expense of operational efficiency if resources are not optimally deployed (Kong et al., 2019).

2.3 Empirical Review

2.3.1 Cash Flow Coverage and Bank Efficiency

Research examining the relationship between cash flow coverage and bank efficiency has produced mixed findings. Studies have highlighted the crucial function of intelligent liquidity management in assuaging financial risks and preserving seamless corporate operations even amidst poor economic situations (Rahman & Sharma, 2020). However, the specific impact on operational efficiency metrics remains contested.

Investigations into cash flow management have demonstrated that maintaining appropriate cash reserves is essential for operational stability, but excessive cash holdings may reduce efficiency (Olunja, 2022). Banks that prioritise liquidity over interest-generating activities often experience challenges in optimising operational performance, as resources may be diverted from efficiency-enhancing activities (Kiplagat, 2021). Research by Abuga et al. (2023) confirmed that liquidity capacity affects financial performance, though the relationship with operational efficiency specifically requires further examination.

2.3.2 Capital Adequacy Ratio and Bank Efficiency

Studies on Capital Adequacy Ratio have consistently demonstrated its importance for bank stability and operational performance (Korankye et al., 2022). Higher capital adequacy not only improves financial stability but also enhances operational efficiency by reducing the cost of capital and enabling better resource allocation (Syafrizal et al., 2023).

Research in various emerging markets has shown that well-capitalised banks tend to operate more efficiently (Pham, 2022). Banks with robust capital positions can manage their operating expenses more effectively, leading to improved overall performance and enabling investment in efficiency-enhancing initiatives (Vu & Dang, 2020). This relationship appears particularly strong in developing economies where capital buffers provide crucial resilience against economic volatility (Ezu et al., 2023).

Muchuku (2022) examined bank-specific factors affecting capital adequacy in Kenyan commercial banks and found significant relationships between operational performance and capital strength. Similarly, research by Korankye et al. (2022) in Ghana demonstrated that adequate capitalisation positively influenced operational metrics including efficiency ratios.

2.3.3 Loan-to-Asset Ratio and Bank Efficiency

Empirical evidence on the Loan-to-Asset Ratio suggests that whilst higher ratios might contribute to increasing revenues through lending activities, the relationship with operational efficiency is not straightforward (Suroso, 2022). Studies have indicated that external factors such as loan quality and credit risk may influence whether increased loan portfolios translate into efficiency

gains (Nugraha et al., 2021).

Research in the Western Balkans demonstrated that banks maintaining balanced loan-to-asset ratios were better positioned to optimise resource allocation (Kalimashi et al., 2022). Effective liquidity management, including optimising the loan-to-asset ratio, positively impacts operational efficiency when loans are well-managed and aligned with market demand (Ajayi & Lawal, 2021).

Ngumo et al. (2020) investigated determinants of financial performance in microfinance banks and found that loan portfolio management significantly affected operational outcomes. The study emphasised the importance of balancing asset growth with operational capacity to maintain efficiency.

2.3.4 Loan-to-Deposit Ratio and Bank Efficiency

Studies on Loan-to-Deposit Ratio have consistently found significant positive effects on bank efficiency, suggesting that effective deposit-to-loan conversion enables banks to streamline operations and reduce overhead costs (Sukmadewi, 2020). Research in Indonesia highlighted that banks with optimal LDR demonstrated superior operational performance through better resource utilisation (Liyana & Indrayani, 2020).

However, scholars emphasise the importance of balance (Awaluddin et al., 2023). Whilst LDR impacts operational performance, its real value lies in the bank's ability to balance liquidity with profitability, which in turn drives efficiency gains (Sochib et al., 2023). Excessive lending relative to deposits may create liquidity pressures that ultimately compromise operational efficiency (Goh et al., 2022).

Research by Rajindra et al. (2021) examined the relationship between LDR and Return on Assets in Indonesian banks, finding that operational efficiency served as a mediating factor. The study concluded that optimal LDR management enhanced both profitability and operational performance through improved resource utilisation.

3. Methodology

3.1 Research Design

The research utilised an ex-post facto design, examining past data to analyse relationships between variables. This quasi-experimental approach was appropriate as the study examined relationships between variables that had already occurred and could not be manipulated. The design aligned with previous studies in banking and finance research, allowing for robust analysis of historical financial data (Wabwoba, 2022).

3.2 Population and Sample

The population consisted of Deposit Money Banks listed on the Nigerian Stock Exchange as of 31st December 2014. From the twenty-four listed DMBs, eight banks with international authorisation licences were selected, representing institutions with comprehensive financial activities and robust liquidity management practices. The sample size comprised ten years of annual reports (2014-2023) from these eight banks, yielding eighty observations.

3.3 Data Collection and Variables

Secondary data were collected from audited annual financial statements of the selected banks. The dependent variable was Bank Efficiency, measured by the cost-to-income ratio (non-interest expenses divided by total revenue). Independent variables included:

Cash Flow Coverage (CFC): Net Operating Cash Flow divided by current interest expense plus short-term debt

Capital Adequacy Ratio (CAR): Total capital divided by risk-weighted assets

Loan-to-Asset Ratio (LAR): Total loans divided by total assets

Loan-to-Deposit Ratio (LDR): Total loans divided by total deposits

3.4 Model Specification

The functional relationship was specified as:

$$\text{Bank Efficiency} = f(\text{CFC}, \text{CAR}, \text{LAR}, \text{LDR}) + \varepsilon$$

The regression equation:

$$\text{BE} = \beta_0 + \beta_1\text{CFC} + \beta_2\text{CAR} + \beta_3\text{LAR} + \beta_4\text{LDR} + \varepsilon$$

Where BE represents Bank Efficiency, β_0 is the constant term, β_1 - β_4 are coefficients, and ε is the error term.

3.5 Method of Data Analysis

Data analysis employed descriptive statistics and multiple regression analysis using the Ordinary Least Squares (OLS) method via E-VIEW software. Diagnostic tests including the Levin, Lin & Chu unit root test, Variance Inflation Factor for multicollinearity, and Breusch-Pagan test for heteroscedasticity were conducted. The Hausman test determined the appropriate model (Fixed Effects or Random Effects) for panel data analysis.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1: Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Observations
EFFICIENCY	0.224	0.215	0.450	0.030	0.093	0.306	2.867	80
CFC	0.426	0.420	0.660	0.220	0.127	0.175	1.795	80
CAR	0.144	0.140	0.210	0.070	0.030	-0.040	2.623	80
LAR	0.298	0.290	0.470	0.110	0.076	0.028	3.046	80
LDR	0.637	0.645	0.870	0.340	0.160	-0.281	1.847	80

Descriptive analysis revealed that Bank Efficiency averaged 22.4% with moderate variability (standard deviation of 0.093) across Nigerian DMBs. The distribution showed slight positive skewness (0.306), indicating that a few banks operated at higher efficiency levels than most. Cash Flow Coverage averaged 42.6%, Capital Adequacy Ratio 14.4%, Loan-to-Asset Ratio 29.8%, and Loan-to-Deposit Ratio 63.7%. The CAR showed slight negative skewness (-0.040), suggesting most banks-maintained capital levels above the mean. All variables demonstrated kurtosis values near 3, indicating approximately normal distributions suitable for parametric analysis.

4.2 Diagnostic Tests

Table 2: Unit Root Test Results (Levin, Lin & Chu t)*

Variable	Statistic	Probability	Decision
EFFICIENCY	6.22008	0.0000	Stationary
CFC	11.15711	0.0000	Stationary
CAR	5.201009	0.0000	Stationary
LAR	3.41147	0.0316	Stationary
LDR	3.66126	0.0000	Stationary

The Levin, Lin & Chu unit root test confirmed stationarity for all variables ($p < 0.05$), ensuring reliability for panel data analysis. All test statistics were highly significant, with efficiency showing the strongest evidence of stationarity (statistic = 6.22008, $p < 0.0001$). This confirms that all variables are suitable for regression analysis without risk of spurious correlations.

Table 3: Variance Inflation Factor (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
CFC	0.24970	9.07038	2.672992
CAR	0.37919	3.11702	1.989234
LAR	0.16427	3.21395	1.267561
LDR	0.19900	29.2308	2.269927

Variance Inflation Factor values remained below 3 for all centered VIF values, indicating absence of problematic multicollinearity. CFC showed the highest centered VIF (2.673), followed by LDR (2.270), both well below the threshold of concern ($VIF > 5$). This confirms that independent variables are sufficiently distinct, allowing for reliable coefficient estimates.

Table 4: Heteroscedasticity Test (Breusch-Pagan-Godfrey)

Test	Statistic	Probability	Decision
F-statistic	0.567710	0.369	Homoscedastic
Obs*R-squared	3.622100	0.285	Homoscedastic
Scaled explained SS	16.43311	0.034	Potential Heteroscedasticity

The Breusch-Pagan test suggested homoscedasticity based on F-statistic ($p = 0.369 > 0.05$) and Obs*R-squared ($p = 0.285 > 0.05$). However, the Scaled explained SS statistic ($p = 0.034 < 0.05$) indicated potential mild heteroscedasticity. Given two of three measures supported homoscedasticity, we proceeded with analysis whilst considering robust standard errors.

4.3 Correlation Analysis

Table 5: Correlation Matrix

	EFFICIENCY	CFC	CAR	LAR	LDR
EFFICIENCY	1.000				
CFC	-0.116 (0.306)	1.000			
CAR	0.288** (0.010)	-0.184 (0.103)	1.000		
LAR	0.134 (0.235)	-0.182 (0.105)	0.326** (0.003)	1.000	
LDR	0.133 (0.239)	-0.051 (0.654)	0.048 (0.675)	-0.057 (0.614)	1.000

Note: Probabilities in parentheses. ** Significant at 5% level.

Correlation analysis revealed that Cash Flow Coverage had a weak negative correlation with Bank Efficiency (-0.116, $p = 0.306$), indicating minimal impact. Capital Adequacy Ratio demonstrated a significant positive correlation with Bank Efficiency (0.288, $p = 0.010$), suggesting that better-capitalised banks achieve higher operational efficiency. Loan-to-Asset Ratio showed weak positive correlation (0.134, $p = 0.235$), whilst Loan-to-Deposit Ratio exhibited weak positive correlation (0.133, $p = 0.239$). Notably, CAR and LAR showed significant positive correlation (0.326, $p = 0.003$), suggesting well-capitalised banks maintain larger loan portfolios relative to assets.

4.4 Hypothesis Testing Results

Hypothesis One: Cash Flow Coverage and Bank Efficiency

Table 6: Hausman Test for Hypothesis One

Statistic	Chi-Sq.	Probability	Selected Model
Cross-section random	2.649	0.088	Random Effects

Table 7: Effect of Cash Flow Coverage on Bank Efficiency (Random Effects Model)

Variable	Coefficient	Std. Error	t-Statistic	Probability
CFC	-0.053863	0.073148	-0.736366	0.4637
C (Constant)	0.246591	0.035813	6.885436	0.0000
Model Statistics				
R-squared	0.006795			
Adjusted R-squared	-0.005939			
F-statistic	0.533618			0.467278
Durbin-Watson stat	1.787881			

The Hausman test ($\chi^2 = 2.649$, Prob = 0.088) indicated the Random Effects model was appropriate. Results showed CFC had a negative effect on Bank Efficiency ($\beta = -0.05386$, $p = 0.4637$). The overall model had $R^2 = 0.006795$ with $p\text{-value} = 0.467278$, indicating the effect was not statistically significant. Therefore, the null hypothesis was not rejected. The negative coefficient suggests that higher cash flow coverage creates slight operational inefficiencies, possibly through idle cash holdings, though this relationship is not statistically meaningful. The low R-squared (0.68%) indicates CFC explains minimal variation in bank efficiency.

Hypothesis Two: Capital Adequacy Ratio and Bank Efficiency

Table 8: Hausman Test for Hypothesis Two

Statistic	Chi-Sq.	Probability	Selected Model
Cross-section random	2.92	0.551	Random Effects

Table 9: Effect of Capital Adequacy Ratio on Bank Efficiency (Random Effects Model)

Variable	Coefficient	Std. Error	t-Statistic	Probability
CAR	0.764206	0.314217	2.432155	0.0147
C (Constant)	0.113914	0.047176	2.414557	0.0140
Model Statistics				
R-squared	0.065635			
Adjusted R-squared	0.053656			
F-statistic	5.479163			0.021800
Durbin-Watson stat	1.740445			

The Hausman test ($\chi^2 = 2.92$, Prob = 0.551) supported the Random Effects model. CAR demonstrated a positive significant effect on Bank Efficiency ($\beta = 0.764206$, $p = 0.0147$). The model achieved $R^2 = 0.065635$ with overall significance ($p = 0.021800$). The null hypothesis was rejected, confirming CAR significantly positively influences Bank Efficiency. A one-unit increase in CAR leads to a 0.764 increase in bank efficiency, indicating well-capitalised banks operate substantially more efficiently. The model explains 6.56% of variation in efficiency, with the F-statistic confirming overall model significance.

Hypothesis Three: Loan-to-Asset Ratio and Bank Efficiency

Table 10: Hausman Test for Hypothesis Three

Statistic	Chi-Sq.	Probability	Selected Model
Cross-section random	3.32	0.001	Fixed Effects

Table 11: Effect of Loan-to-Asset Ratio on Bank Efficiency (Fixed Effects Model)

Variable	Coefficient	Std. Error	t-Statistic	Probability
LAR	0.022393	0.153521	0.145855	0.8845
C (Constant)	0.216949	0.049041	4.423781	0.0000
Model Statistics				
R-squared	0.306720			
Adjusted R-squared	0.228604			
F-statistic	3.926468			0.000690
Durbin-Watson stat	2.005832			

The Hausman test ($\text{Chi}^2 = 3.32$, Prob = 0.001) indicated the Fixed Effects model was appropriate. LAR showed a positive effect ($\beta = 0.022393$, $p = 0.8845$). With $R^2 = 0.306720$ and overall model significance ($p = 0.000690$), the specific effect of LAR was not statistically significant. The null hypothesis was not rejected. Whilst the coefficient is positive, suggesting potential efficiency benefits from larger loan portfolios, the high p-value (0.885) indicates this relationship is not reliable. The model's relatively high R-squared (30.67%) is primarily attributed to fixed effects rather than LAR's contribution.

Hypothesis Four: Loan-to-Deposit Ratio and Bank Efficiency

Table 12: Hausman Test for Hypothesis Four

Statistic	Chi-Sq.	Probability	Selected Model
Cross-section random	3.32	0.001	Fixed Effects

Table 13: Effect of Loan-to-Deposit Ratio on Bank Efficiency (Fixed Effects Model)

Variable	Coefficient	Std. Error	t-Statistic	Probability
LDR	0.114941	0.056946	2.018446	0.0473
C (Constant)	0.150465	0.037322	4.031569	0.0001
Model Statistics				
R-squared	0.344147			
Adjusted R-squared	0.270248			
F-statistic	4.656993			0.000132
Durbin-Watson stat	1.990733			

The Hausman test ($\text{Chi}^2 = 3.32$, Prob = 0.001) supported the Fixed Effects model. LDR demonstrated a positive significant effect ($\beta = 0.114941$, $p = 0.0473$). The model achieved $R^2 = 0.344147$ with strong overall significance ($p = 0.000132$). The null hypothesis was rejected, confirming LDR significantly positively influences Bank Efficiency. A one-unit increase in LDR

leads to a 0.115 increase in bank efficiency, indicating banks that effectively convert deposits into loans achieve superior operational performance. The model explains 34.41% of variation in efficiency, the highest among all hypotheses tested, with excellent model fit indicated by the F-statistic.

4.5 Discussion of Findings

The empirical findings reveal a nuanced relationship between liquidity management components and bank operational efficiency in Nigeria. Capital Adequacy Ratio and Loan-to-Deposit Ratio emerged as significant positive determinants, whilst Cash Flow Coverage and Loan-to-Asset Ratio showed insignificant effects.

The significant positive impact of CAR on efficiency ($\beta = 0.764$, $p = 0.015$) underscores the importance of strong capitalisation for operational excellence, supporting findings by Korankye et al. (2022) and Ezu et al. (2023). Well-capitalised banks possess greater capacity to invest in efficiency-enhancing initiatives, manage risks effectively, and optimise resource allocation. This finding has particular relevance for Nigerian banking regulators and policymakers seeking to enhance sector efficiency through capital requirements (Vu & Dang, 2020).

The significant positive effect of LDR ($\beta = 0.115$, $p = 0.047$) highlights the efficiency benefits of optimal deposit-to-loan conversion, consistent with research by Sukmadewi (2020) and Rajindra et al. (2021). Banks that effectively mobilise deposits and channel them into productive lending activities achieve operational efficiencies through improved asset utilisation and reduced idle resources. However, this must be balanced against liquidity management imperatives to avoid excessive lending that could compromise financial stability (Goh et al., 2022).

The insignificant effects of CFC ($\beta = -0.054$, $p = 0.464$) and LAR ($\beta = 0.022$, $p = 0.885$) suggest these liquidity metrics, whilst important for financial stability, do not directly drive operational efficiency improvements. This indicates that liquidity management's contribution to efficiency may be more indirect, operating through risk mitigation and financial stability rather than direct operational optimisation, aligning with findings from Abuga et al. (2023) and Kalimashi et al. (2022). The Trade-off Theory of Liquidity finds empirical support in these results, demonstrating that banks must carefully balance liquidity requirements with operational efficiency objectives (Khoa & Thai, 2021; Kong et al., 2019).

5. Conclusion and Recommendations

5.1 Conclusion

This study examined the relationship between liquidity management and bank operational efficiency in Nigerian Deposit Money Banks from 2014 to 2023. The findings demonstrate that effective liquidity management significantly influences operational efficiency, though the relationship varies across different liquidity metrics.

Capital Adequacy Ratio and Loan-to-Deposit Ratio emerged as significant positive determinants of bank efficiency. Well-capitalised banks with optimal loan-to-deposit ratios achieve superior operational performance through better resource allocation, risk management, and asset utilisation. Conversely, Cash Flow Coverage and Loan-to-Asset Ratio showed insignificant effects, suggesting their contribution to efficiency operates through indirect channels rather than direct operational improvements.

The study contributes empirical evidence on the multifaceted relationship between liquidity management and operational efficiency in emerging market banking systems. Findings underscore

the importance of balanced liquidity management that maintains financial stability whilst optimising operational performance. Nigerian DMBs must strategically manage capital adequacy and loan-deposit ratios to enhance efficiency without compromising liquidity requirements.

5.2 Recommendations

Based on the findings, the following recommendations are proposed:

For Bank Management:

- **Optimise Capital Adequacy Ratios:** DMBs should maintain CAR levels exceeding regulatory minimums, as higher capitalisation significantly enhances operational efficiency (coefficient = 0.764, $p < 0.05$). Management should view capital not merely as regulatory requirement but as strategic resource enabling operational excellence through investments in technology, processes, and capabilities.
- **Balance Loan-to-Deposit Ratios:** Banks should strategically optimise LDR to maximise operational efficiency (coefficient = 0.115, $p < 0.05$) whilst maintaining adequate liquidity buffers. This requires sophisticated analytics to dynamically adjust lending activities based on deposit mobilisation trends, market conditions, and liquidity requirements.
- **Implement Integrated Liquidity Management:** Develop comprehensive liquidity management frameworks that consider interrelationships between different liquidity metrics and their collective impact on operational efficiency. This holistic approach should balance cash flow coverage, capital adequacy, and lending activities to optimise both stability and efficiency.
- **Invest in Efficiency-Enhancing Initiatives:** Well-capitalised banks should leverage their financial strength to invest in operational improvements including process automation, digital transformation, staff development, and risk management systems that drive long-term efficiency gains.

For Regulators:

- **Strengthen Capital Requirements:** The Central Bank of Nigeria should maintain robust capital adequacy requirements whilst providing incentives for banks exceeding minimum thresholds, recognising capital's positive contribution to operational efficiency ($R^2 = 6.6\%$, $p = 0.022$) and systemic stability.
- **Monitor Efficiency Metrics:** Regulators should incorporate operational efficiency indicators into supervisory frameworks, enabling early identification of banks with deteriorating efficiency that may signal underlying operational or governance challenges.
- **Promote Best Practices:** Facilitate knowledge sharing and benchmarking amongst DMBs regarding liquidity management practices that enhance operational efficiency whilst maintaining financial stability.

For Future Research:

- Investigate the mechanisms through which capital adequacy influences operational efficiency, examining specific channels such as technology investments, risk management capabilities, and organisational development.
- Explore optimal ranges for loan-to-deposit ratios that maximise efficiency ($R^2 = 34.4\%$, $p < 0.001$) without compromising liquidity, considering bank-specific characteristics and market conditions.

- Examine the moderating effects of bank size, ownership structure, and market positioning on relationships between liquidity management and operational efficiency.
- Conduct comparative studies across African banking markets to identify regional patterns and best practices in balancing liquidity management with operational efficiency objectives.

5.3 Contribution to Knowledge

This study contributes to banking and finance literature by providing empirical evidence on the specific relationships between liquidity management components and operational efficiency in an emerging market context. It demonstrates that different liquidity metrics have varying impacts on efficiency, highlighting the complexity of balancing financial stability with operational performance. The application of Trade-off Theory of Liquidity to Nigerian banking operations extends theoretical frameworks for understanding liquidity-efficiency relationships in developing economies. Findings offer practical insights for bank managers and regulators seeking to enhance operational efficiency through effective liquidity management strategies.

References

- Abuga, K., Wamugo, L., & Makori, D. (2023). Liquidity capacity and financial performance of commercial banks in Kenya. *International Journal of Finance and Accounting*, 8(1), 76-96.
- Agyei, J., Sun, S., & Abrokwah, E. (2020). Trade-off theory versus pecking order theory: Ghanaian evidence. *Sage Open*, 10(3), 2158244020940987.
- Ajayi, J. A., & Lawal, Q. A. (2021). Effect of liquidity management on bank performance. *Izvestiya Journal of Varna University of Economics*, 65(2), 220-237.
- Akinadewo, I. S., Ogundele, O. S., Odewole, P. O., & Akinadewo, J. O. (2023). Empirical investigation of financial performance determinants: Evidence from deposit money banks in Nigeria. *Res Militaris*, 13(2), 6926-6936.
- Alim, W., Ali, A., & Metla, M. R. (2021). *The effect of liquidity risk management on financial performance of commercial banks in Pakistan*.
- Awaluddin, M. R., Haliah, H., & Kusumawati, A. (2023). The effects of non-performing loan and loan to deposit ratio toward return on asset. *International Journal of Humanities Education and Social Sciences*, 2(6).
- Benson, E., & Odey, J. O. (2022). Net cash flow from operating activities and liquidity of First Bank Nigeria Plc. *World Scientific News*, 168, 1-15.
- Bianchi, J., & Bigio, S. (2022). Banks, liquidity management and monetary policy. *Econometrica*, 90(1), 391-454.
- Dzapasi, F. D. (2020). The impact of liquidity management on bank financial performance in a subdued economic environment: A case of the Zimbabwean banking industry. *PM World Journal*, 9(1), 1-20.
- Eluyela, D. F., Adetula, D. T., Obasaju, O. B., Ozordi, E., Akintimehin, O., & Popoola, O. (2019). Foreign directors, indigenous directors and dividend payout structure in Nigerian deposit money banks. *Banks and Bank System*, 14(2), 1-14, 16.
- Ezu, G., Nwanna, I. O., & Eke-Jeff, O. M. (2023). Effect of capital adequacy on the performance of deposit money banks in Nigeria. *International Journal of Novel Research in Marketing Management and Economics*, 10(1), 53-63.
- Goh, T. S., Erika, E., Henry, H., & Syawaluddin, S. (2022). The effect of capital adequacy ratio and loan to deposit ratio on return on asset with non-performing loan as moderating variable in banking companies listed in BEI. *JPPI (Jurnal Penelitian Pendidikan Indonesia)*, 8(3), 710-718.
- Kalimashi, A., Ahmeti, S., & Aliu, M. (2022). The relationship between liquidity risk management and commercial bank performance: Evidence from the Western Balkans. *International Journal of Applied Economics, Finance and Accounting*, 14(2), 129-136.
- Khoa, B. T., & Thai, D. T. (2021). Capital structure and trade-off theory: Evidence from Vietnam. *The Journal of Asian Finance, Economics and Business*, 8(1), 45-52.
- Kinyua, F. W., & Fredrick, W. (2022). Liquidity risk and financial performance of manufacturing firms listed at Nairobi Securities Exchange. *International Academic Journal of Economics and Finance*, 3(8), 1-24.

- Kiplagat, N. K. (2021). *Selected factors determining the corporate cash holdings of commercial banks in Kenya* [Doctoral dissertation, Kabarak University].
- Kong, Y., Musah, M., & Antwi, S. K. (2019). Liquidity-profitability trade-off: A panel study of listed non-financial firms in Ghana. *International Journal of Trend in Scientific Research and Development*, 3(4), 1086-1099.
- Korankye, M., Bright, D., & Donyoh, M. (2022). Effect of non-performing loans on the profitability of universal banks: A time series analysis of the Ghanaian banking industry. *Research Journal of Finance and Accounting*, 13(2), 33-46.
- Liyana, L., & Indrayani, E. (2020). The effect of non-performing loan (NPL), loan to deposit ratio (LDR) and net interest margin (NIM) on financial performance (ROA) with CAR as intervening variables on go public commercial banks in Indonesia and listed on BEI period 2014-2018. *Asian Journal of Social Science and Management Technology*, 2(2), 61-75.
- Muchuku, S. (2022). *Effect of bank specific factors on capital adequacy of commercial banks in Kenya* [Doctoral dissertation, University of Nairobi].
- Ngumo, K. O. S., Collins, K. W., & David, S. H. (2020). Determinants of financial performance of microfinance banks in Kenya. arXiv preprint arXiv:2010.12569.
- Nugraha, N. M., Yahya, A., Nariswari, T. N., Salsabila, F., & Octaviantika, I. Y. (2021). Impact of non-performing loans, loan to deposit ratio and education diversity on firm performance of Indonesia banking sectors. *Review of International Geographical Education Online*, 11(3).
- Olunja, A. O. (2022). *Effects of management of cash flow on profitability of commercial banks in Kenya* [Doctoral dissertation, University of Nairobi].
- Otekunrin, A. O., Fagboro, G. D., Nwanji, T. I., Asamu, F. F., Ajiboye, B. O., & Falaye, A. J. (2019). *Performance of deposit money banks and liquidity management in Nigeria*.
- Partovi, E., & Matousek, R. (2019). Bank efficiency and non-performing loans: Evidence from Turkey. *Research in International Business and Finance*, 48, 287-309.
- Pham, H. L. (2022). *Impact of risk management on financial performance of Vietnamese commercial banks: Implementation of Basel III regulatory perspective*.
- Phan, H. T., Anwar, S., Alexander, W. R. J., & Phan, H. T. M. (2019). Competition, efficiency and stability: An empirical study of East Asian commercial banks. *The North American Journal of Economics and Finance*, 50, 100990.
- Rahman, A., & Sharma, R. B. (2020). Cash flows and financial performance in the industrial sector of Saudi Arabia: With special reference to insurance and manufacturing sectors. *Investment Management & Financial Innovations*, 17(4), 76.
- Rajindra, R., Guasmin, G., Burhanuddin, B., & Anggraeni, R. N. (2021). Costs and operational revenue, loan to deposit ratio against return on assets: A case study in Indonesia. *The Journal of Asian Finance, Economics and Business*, 8(5), 109-115.
- Sathyamoorthi, C. R., Mapharing, M., & Dzimiri, M. (2020). Liquidity management and financial performance: Evidence from commercial banks in Botswana. *International Journal of Financial Research*, 11(5), 399-413.
- Shair, F., Shaorong, S., Kamran, H. W., Hussain, M. S., Nawaz, M. A., & Nguyen, V. C. (2021). Assessing the efficiency and total factor productivity growth of the banking industry: Do

environmental concerns matters? *Environmental Science and Pollution Research*, 28, 20822-20838.

- Sidhu, A. V., Rastogi, S., Gupte, R., & Bhimavarapu, V. M. (2022). Impact of liquidity coverage ratio on performance of select Indian banks. *Journal of Risk and Financial Management*, 15(5), 226.
- Sochib, S., Indrianasari, N. T., & Sholihin, M. R. (2023). The influence of loan to deposit ratio and non-performing loan on the performance of conventional national private banks. *Assets: Jurnal Ilmiah Ilmu Akuntansi, Keuangan dan Pajak*, 7(1), 35-44.
- Souder, D., Shaver, J. M., Harris, J. D., & Alrashdan, A. (2024). Performance metrics in strategy research: A new metric and method for assessing dynamic value. *Strategic Management Journal*, 45(1), 144-167.
- Stevanovic, S., Minovic, J., & Ljumovic, I. (2019). Liquidity profitability trade-off: Evidence from medium enterprises. *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, 24(3), 71-81.
- Sukmadewi, R. (2020). The effect of capital adequacy ratio, loan to deposit ratio, operating-income ratio, non performing loans, net interest margin on banking financial performance. *eCo-Buss*, 2(2), 1-10.
- Suroso, S. (2022). Analysis of the effect of capital adequacy ratio (CAR) and loan to deposit ratio (LDR) on the profits of go public banks in the Indonesia Stock Exchange (IDX) period 2016–2021. *Economit Journal: Scientific Journal of Accountancy, Management and Finance*, 2(1), 45-53.
- Syafrizal, A., Ilham, R. N., & Muchtar, D. (2023). Effect of capital adequacy ratio, non performing financing, financing to deposit ratio, operating expenses, and operational income on profitability at PT. Bank Aceh Syariah. *Journal of Accounting Research, Utility Finance and Digital Assets*, 1(4), 312-322.
- Vu, H., & Dang, N. (2020). Determinants influencing capital adequacy ratio of Vietnamese commercial banks. *Accounting*, 6(5), 871-878.
- Wabwoba, O. (2022). *Effect of capital structure on financial performance of agricultural firms listed at the Nairobi Securities Exchange* [Doctoral dissertation, University of Nairobi].
- Wang, Y., Xiuping, S., & Zhang, Q. (2021). Can Fintech improve the efficiency of commercial banks?—An analysis based on big data. *Research in International Business and Finance*, 55, 101338.
- Wuave, T., Yua, H., & Yua, P. M. (2020). Effect of liquidity management on the financial performance of banks in Nigeria. *European Journal of Business and Innovation Research*, 8(4), 30-44.