

BANK STABILIZATION TOOLS, RISK AND PERFORMANCE OF DEPOSIT MONEY BANKS (DMBS) IN NIGERIA

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Abstract: *The study examined the impact of liquidity, bank capital, loan-to-deposit ratio on risk and performance of banks in Nigeria. Data for this study was sourced from the financial statement of thirteen (13) quoted banks in Nigeria from 2012 to 2023 and employed descriptive statistic, fixed effect and system GMM method of estimation. The empirical result shows Higher capital and loan-to-deposit ratio promote DMBS performance while higher liquidity worsens the DMBS performance. Higher capital and liquidity expose the DMBS to greater risk while higher loan-to-deposit ratio reduces the risk of DMBS. Additionally, higher capital promotes the big DMBS performance while higher liquidity and loan-to-deposit ratio worsen the performance of the big DMBS. However, the small DMBS capital, liquidity and loan-to-deposit ratio promote the performance of the small DMBS. Higher capital and liquidity expose both big and small DMBS to greater risk while loan-to-deposit ratio minimizes the risk exposure of DMBS in Nigeria. The study therefore, recommends that the big DMBS should engage more in traditional banking activities as it has contributed immensely to the performance and reduce the risk of the small DMBS in Nigeria financial system. The CBN should also continue the periodic review of its policies on the DMBS into to increase the volume of credit extended to the small and medium enterprises, increasing the level of employment, protection of the customers, shareholders and other stakeholders' interest in Nigerian financial system*

Keywords: *Bank Capital, Liquidity, Loan-to-Deposit Ratio, DMBS, Risk.*

JEL Classification: *G21, C26, G28, E51, E58.*

1. Introduction

The global banking has experienced significant reform via regulation and restructuring which has imposed various changes in the regulatory instruments, stiff competition and stability in the economy. The variation in the stabilization instruments, namely; bank capital, liquidity ratio, the loan-to-deposit ratio among others have promoted stability in the financial system and reduced the occurrence of bank failure in the economy. While the stabilisation tools have been perceived to attract benefit to the Deposit Money Banks (DMBS) performance and the financial system, it also poses financial instability on the economy through unhealthy competition, lack of risk management mechanism which adversely influence the prosperity of the banking system and increase the volatility in the banking environment. DMBS, however, play an indispensable role in an economy which makes it imperative to ascertain whether the variation in the stabilization tools has promoted the DMBS performance and reduce the risk or not.

In this study, an attempt is made to examine the complementarity roles of bank capital, liquidity ratio and loan-to-deposit ratio on bank performance in Nigeria. It is established in prior works of (Abbas et al, 2019; Majumder and Li, 2018; Obim et al, 2020; Hapsari, 2018; Fajinmi, et al., 2023; Ugorji, et al., 2025) that bank performance is not independent of bank capital, liquidity ratio and loan-to-deposit ratio which has dominated discourse at the level of Basel Committee for Banking Supervision (BCBS) and Central Bank of Nigeria (CBN) which were tailored towards enhancement of bank performance and prevention of bank crisis in the financial system. Persistency in the performance of banks is a function of bank capitalisation which serves as a shock absorber to Deposit Money Banks (DMBS) in event of internal and external crises and boost the confidence of the public in the banking sector; liquidity which is the ability of banks to meet up with their customers' requirements by maintaining adequate

reserve (Khalid et al, 2019; Oudat, et al., 2024) and used by the monetary authority as a tool to either expand or tighten the economic activities; loan-to-deposit ratio serves as an avenue through which the banks execute their core intermediation function by making the surplus sectors fund available to the deficit sectors for a reward called the interest income (Saleh and Abu Afifa, 2020) which equally promote economic output, increase employment opportunities and citizens welfare etc. The positive performance of banks is however essential for promoting the wealth of the shareholders, increasing the value of the bank and strengthening the investors' confidence in the banking sector.

Theoretically, higher liquidity ratio reduces the bank profit while lower liquidity ratio increases the bank profit (Smaoui, et al., 2020; Alqsass, et al., 2022) which could also be linked to the theory of risk, the higher the risk, the higher the expected return and vice versa. This means for banks to make a higher profit; more credit must be given to the deficit unit which exposes the bank to more risk. Similar to Khalid, et al's assertion, also postulated that an increase in capital is expected to increase bank profitability. Contrarily, holding on to excess capital without creating credit is expected not to attract any profit but equally reduces the bank risk exposure. Liquidity is however not independent of loan-to-deposit ratio, the higher the proportion of deposit given out as a loan, the lower the liquidity ratio and vice versa. An adequate level of capital therefore helps to cushion the adverse effect in the situation of low liquidity which could lead to bank run if not well managed. The endogeneity between these three tools (bank capital, liquidity and loan-to-deposit ratio) makes it imperative to investigate the complementarity role of these three variables on bank performance in Nigeria. It is also surprising to ascertain that studies on the complementarity role of these phenomena are scarce. Management of these variables with the profitability of banks is therefore viewed to be very essential to maximize the shareholders' wealth (Trans et al, 2016).

Only a few studies (Afrogha, et al., 2023; Adediran, et al., 2025; Olufemi and Sunmisola, 2022; Opuene and Amadiwo, 2025) have towed this line of discourse. Prior studies have examined the individual effect of these variables on the performance of banks which is not sufficient enough because of the endogeneity of the three regressors (bank capital, liquidity ratio and loan-to-deposit ratio). It is however important to also note that adequate bank capital reduces the bank exposure to risk and bank runs in the period of a financial crisis. Adequate liquidity also assists banks in meeting up with their customers' requirements; inability to meet up with their customers need could lead to discontinuous patronage by some of the customers which could be detrimental to the bank customers retention rate while a high level of loan as a percentage of deposit channeled to the public is expected to increase the economic output, employment and increase the interest income of the bank. More so, the level of divestment by the investors experienced in the global equity market and Nigerian Stock Exchange (NSE) (Fadun, O. S., & Silwimba, 2023) recently is likely going to affect the bank capital due to the reduction in the banking stock, the magnitude of impact on Nigerian banks is what is unknown.

More so, growth of performance of bank differs which is attributable to the level of bank capital (Koroleva, et al., (2021; Abdelaziz, et al., 2022), level of participation in core intermediation activities (Roger, 1998), the amount of asset acquired by the bank (Al-Matari, 2023) operating expenses management, foreign ownership and market share (Athanasoglou et al, 2005; Tibebe and Gujral 2022) the level of engagement in non-traditional activities, stock

market development, liquidity (Obim et al, 2020) and any other factors inducing the performance of the bank.

One of the factors that determine economic output, level of employment and bank performance in Nigeria is the loan-to-deposit ratio which prior studies have excluded from their investigation. Apart from (Hapsari, 2018); who investigated the role of loan-to-deposit ratio, no country-specific study has investigated the role of loan-to-deposit ratio on bank performance in Nigeria. This study seeks to unleash the role of loan-to-deposit ratio on bank performance and the economy at large due to its significant contribution which forced the CBN to increase the loan-to-deposit ratio of DMBs from 60% to 65% in the third quarter of 2019 which is planned to be increased to 70% in 2020 (Adesina, 2019). This sudden increase was targeted towards increasing lending to the real sector which contribute massively to the level of employment and growth in the economy.

This study proxied performance using the risk-adjusted return on asset (RAROA) and risk-adjusted return on equity (RAROE) because they take into consideration the risk attached to the bank return in their computation which makes them different from the measure of performance used by the previous studies reviewed (see Baek et al, 2018 for extensive explanation). This investigation is considered important as a result of the recent review of regulatory tools used by the CBN in regulating the banking industry. The findings of this study will be useful to the policymakers, DMBs, the bank customers, the investors and other stakeholders in making decisions. The rest of this paper is structured as follows; Section 2 is the literature review, Section 3 deals with the methodology. Section 4 deals with the results and discussions and the last section deals with the conclusion.

2. Literature review

The level of performance of DMBs is very paramount in maximizing the stakeholder's wealth. Previous literatures reviewed proxied performance with return on asset (Hapsari, 2018; Majumder and Li, 2018; Gupta and Sikarwar, 2020, Munangi and Sibindi, 2020; Serwadda, 2018, Al-Rdaydeh et al, 2017; Kwashie et al., 2022; Al Zaidanin and Al Zaidanin, 2021), return on equity (Alqsass et al., 2022, Oudat et al., 2024, Olalekan et al., 2018) and net interest margin (Baek et al, 2018; Al Zaidanin and Al Zaidanin, 2021; Munangi and Sibindi, 2020) proxied performance using the risk-adjusted return on asset (RAROA) and risk-adjusted return on equity (RAROE) which is believed to take into consideration the volatility attached to the bank return. Previous studies proxied that risk exposure of bank by the Z-Score (Majumder and Li, 2018; Rahman et al., 2018; Hunjra et al., 2022; Saleh and Abu (2020), Abel et al., 2023). The Z-Score helps to determine the relationship between the bank risk exposure and the independent variables (capital, liquidity and loan-to-deposit).

Capital regulation was viewed to be the most imperative of all the tools used by the monetary authority in achieving stability in the economy (Zheng and Cronje. 2019, Smaoui et al 2020). Davydiv et al., (2021) opines that the liquidity risk exposure of banks with high capital is minimal because of the buffer capital the bank possesses. Bank capital is proxied by previous literature as total equity to the total asset which has been used by previous studies (Dutra et al., 2023, Dias 2021, Salime and Surtipto, 2023, Abbas et al, 2019). The higher the ratio, the more protected the depositor's fund. A positive effect of this ratio is expected on performance while a negative impact is expected on bank risk.

Liquidity is the ability of an institution to meet up with their customer's requirement. The inability of DMBs to meet up with their customer request could be a signal of liquidity

problem. Liquidity was conceptualized as a dual concept by (Fecht et al., 2024) which implies that DMBs could either fulfil their obligation or not. Liquidity problem could however be risky to the DMBs and financial system at large because it could make the DMBs to be insolvent. To combat this liquidity problem, banks are therefore implored to be proactive by maintaining an adequate level of liquidity (Huynh, 2024) which would help to prevent the threat to the regulators, DMBs and economy at large (Khan et al, 2017). Prior literature reviewed measure liquidity by total equity to the total asset (Abbas et al, 2019; Majumder and Li, 2018; Hu, 2025; Fecht et al., 2024) proxied liquidity ratio by loan to total asset ratio. This measurement is therefore preferred by this study because the higher the amount of credit advanced to the customers, the larger the interest income and risk expected. A negative relationship is expected between liquidity ratio and performance while a positive relationship is expected between liquidity ratio and risk. However, the study of (Hunjra, et al., 2022; Dutra, et al., (2023) reported a positive impact of liquidity on profitability which implies that the higher the credit advanced to bank customers, the higher the expected profit.

The customer deposit serves as a liability in the bank statement of financial position which is transformed into loan and advances. The loan and advances represent an asset to the DMBs; this is simply referred to as liability transformation. Banks are compelled by the monetary authority to give out a reasonable percentage of their deposit as a loan to enhance the productive capacity of the SMEs and increase employment in the economy which is the loan-to-deposit ratio. Loan-to-deposit ratio is expected to increase the performance of banks which means a positive effect on profitability is expected. Hapsari, (2018) and Oudat, et al., (2024) asserted a positive impact of loan-to-deposit ratio on the profitability of banks. The loan-to-deposit ratio helps to determine the level of credit extended to the small and medium enterprises (SMEs) in the economy from the deposit with the DMBs. A higher loan-to-deposit ratio indicates that the DMBs are carrying out their core intermediation function in the economy.

Odigie and Adim (2024) investigated into the relationship between risk management and performance of deposit money banks in Nigeria. The qualitative approach was employed where twenty four banks was employed and one hundred twenty senior level managers was sourced based on the information collected for the resource base theory and performance was captured from the construct of profitability, service quality and market share. The findings suggests that risk management effect of profitability. Oluwaseun et al (2025) examines into the influence of risk management on the financial sustainability deposit money banks in Nigeria. The study was able to check the influencing impact of liquidity risk, credit risk, and market risk on return on asset, with control variables of firm size and leverage. The findings shows that credit and capital adequacy risk has positive significant effect on financial sustainability. Ogbuji and Adekunle (2024) examines into the impact of growth on the economic dexterity on Nigerian economy. The subject matter was to determine how the intermediative role of bank improves the economy, with proxies of loan-to-deposit ratio, credit to private sector, liquidity ratio, cash reserve ratio, inflation rate, interest rate, monetary policy rate and economic growth. The theory was anchored on financial intermediation theory, while the findings shows that loan-to-deposit has positive significant effect on economic growth. Diarua (2025) examines into the relationship between liquidity management and financial performance of quoted deposit money banks. The subject matter was to determine how current ratio, loan-to-deposit ratio and cash reserve ratio affect, return of asset of five deposit money banks from 2019 to 2023. The inquiry was anchored on the trade off theory. The panel

regression analysis showed that current ratio and cash reserve has positive significant effect on return on asset. The measures of performance using the return on asset aligns with the works of Oluwaseun et al (2025) and the insignificant effect of loan-to-deposit ratio on bank performance, but otherwise when the measures are used in determining the intermediate performance of banks in the economy (Ogbuyi and Adekunle 2024). Opuene and Amadiwo (2025) examines into the effect of financial risk management on the financial performance of deposit money bank in Nigeria. The subject matter determines how credit risk management, operational risk management and risk committee size, influence earnings per share and return on asset of selected deposit money banks. The study employing panel ARDL technique for a micro data and not inter-country data may not be statistically correct. The findings shows from the long-run effect depicts that credit risk management and operational risk management has significant effect on return on asset. Fajinmi et al (2023) investigated into effect of portfolio management and performance of deposit money banks in Nigeria. The subject matter was to determine the portfolio components of bank which include cash and cash equivalent, financial assets, bank foreign asset, deposit mix, private sector concentration and absolute profit before tax. The theory was anchored on the Markowitz portfolio theory. The findings reveals from employing the ARDL technique depicts that all constructs of portfolio management has significant effect on profit after tax, return on investment, asset quality, capital adequacy of selected deposit money banks. Afrogha et al (2023) in their inquiry examines into the effect of monetary policy on the performance of listed deposit money banks. The subject matter was to investigate how indicators of monetary policy like monetary policy rate, reserve requirements, broad money supply and exchange rate affect the performance of measure of return on assets, return on equity, liquidity coverage, current ratio, credit growth, non-performing loans, capital adequacy ratio and total deposit. The findings depicts that money supply, monetary policy rate, has significant effect on total deposits. Adediran et al (2025) in their study investigated into the influence of risk management strategies and financial performance of quoted deposit money banks in Nigeria. The subject matter was to capture earnings volatility, interest coverage ratio, debt-to-equity ratio on return on assets, anchoring the inquiry on agency theory, pecking order theory and trade off theory. The findings shows that earnings volatility and debt-to-equity has positive and negative significant effect on return on assets. Olufemin and Sunmisola (2022) examines into the impact of financial risk and financial performance of deposit money in Nigeria. The subject matter was to capture how liquidity and credit risk as a measure of financial risk influences return on equity. The findings reveals that liquidity risk and credit risk have substantial effect on return on equity. Wisdom et al (2018) in their inquiry investigated into the relationship between financial risk management and financial performance. The subject matter was to determine how market risk management and liquidity risk management influences return on average. The multiple regression shows that market risk management and liquidity risk management has significant relationship with return on average. Ehiedu (2022) examines into the relational impact of monetary jeopardy and Nigeria's deposit bank. The subject matter is to capture monetary jeopardy with credit risk, liquidity risks, operational risks, market risks and return on equity. The findings shows that credit risk and market risk has positive and negative significant effect on return on equity. Ugorji et al (2025) investigated into the effect of credit risk management and stability of deposit money banks in Nigeria. The subject matter is to determine how interest rate, loan and advances and non-performing loan affect bank stability of deposit money banks. The study was anchored on the

credit market theory and anticipated income theory. The findings from the pooled regression results shows that loan and advances, interest rate and non-performing loan has negative significant effect on banks stability.

3. Methodology

The study employs descriptive and inferential statistics in estimating the relationship between capital, liquidity, loan-to-deposit, DMBs performance and risk in Nigeria. The descriptive statistics describe the traits of each variable employed while the causal relationship between the dependent and independent variables was ascertained using the inferential statistics. The study mainly used secondary data sourced from the annual reports and accounts of the selected thirteen (13) DMBs quoted on the Nigerian Stock Exchange as at 31st December 2023 which covers the period of 2012-2023.

3.1 Model, Estimation Technique and Variables Specification

This study uses the risk-adjusted return on asset (RAROA) and risk-adjusted return on equity (RAROE) as a proxy for DMBs performance while risk exposure was proxied using the Z-Score. RAROA is measured by return on asset divided by the standard deviation of the return of asset while RAROE is measured by return on equity divided by the standard deviation of the return on equity. RAROA and RAROE further helped to ascertain whether DMBs capital, liquidity and loan-to-deposit expose bank returns to higher volatility. The risk-adjusted return was used in the previous studies of (Baek, Lee, Lee & Mohanty, 2018).

$$RAROA_{it} = \frac{ROA_{it}}{SDROA_{it}} \quad \text{Equation (1)}$$

$$RAROE_{it} = \frac{ROE_{it}}{SDROE_{it}} \quad \text{Equation (2)}$$

Z-Score measures the exposure of DMBs to insolvency (Ha and Quyen, 2018; Majumder and Li, 2018). The higher the Z-Score, the lower the risk exposure of a bank which means that a bank with higher Z-Score has a lower risk of being insolvent while banks with lower Z-Score has a higher tendency of insolvency. The Z-Score is calculated using the formula below:

$$Z - Score_{it} = \frac{ROA_{it} + CAR_{it}}{SDROA_{it}} \quad \text{Equation (3)}$$

Where:

ROA is the return on asset of bank *i* at period *t*

CAR is the capital adequacy ratio of bank *i* at period *t* measured by equity to asset ratio?

SDROA is the standard deviation of return on asset of bank *i* at period *t*.

This study employed the panel estimation technique to estimate the impact of the independent variables on the dependent variable. It is to be noted that it is imperative to carry out unit root test to ascertain the order of integration of these variables. This study estimated the dynamic panel system generalised method of moment (GMM) (Arellano and Bover, 1995; Blundell and Bond 1998) which was based on the prior model developed by (Arellano and Bond 1991) where differencing of all the regressors was introduced and called difference GMM. The model of Arellano and Bond was based on the following assumptions; that the observation is greater than the time ($N > T$), linearity in the relationship, inclusion of the lagged value of the dependent variable, regressors are not strictly exogenous, fixed individual effects and problem of autocorrelation & heteroskedasticity within a variable (Roodman, 2009). Imposing the strict exogeneity assumption leading to violations and discrepancy in our

fixed-effect model which leads to the generation of a single equation dynamic GMM estimators by using a common factor representation (Blundell and Bond, 1998). The dynamic panel output model is expressed as:

$$y_{it} = \rho + \omega y_{it-1} + \theta_1 Cap_{it} + \theta_2 K_{it} + \theta_3 L_{it} + \theta_4 Exc_{it} + \mu_{it} \quad (4)$$

$$i = 1 \dots n, t = 1 \dots T$$

ρ is the constant parameter, ω and θ are the output elasticities

The violation of the assumption of strict orthogonality led to the introduction of varying parameters by taking the semi-derivatives of the variables to account for variances in units and measurements.

$$\varepsilon_{i,t} = \mu_{i,t} + v_{i,t} \quad (5)$$

The disturbance term $\varepsilon_{i,t}$ comprise of two orthogonal components; the fixed effects that is time-invariant which is $\mu_{i,t}$ and the idiosyncratic shocks which is represented by $v_{i,t}$ which is assumed to be independent and normally distributed with zero (0) mean and constant variance.

Adjustment of the bank performance is expected to be affected by factors such as the capital, liquidity, loan-to-deposit ratio, asset growth and size. Bank performance adjustment to changes in these factors is dependent on two basic conditions, first is the passage of time which give rise to the introduction of the lagged values of the factors as independent variables, and second is on the difference between the equilibrium of bank performance and the previous year actual performance which led to the introduction of the dynamic GMM in which lag of the dependent variable is also included as an independent variable in the model.

Application of OLS in our estimation could lead to “dynamic panel bias” which usually occur due to correlation between the lagged value of the dependent variable and the fixed effects in the error term which leads to the violation OLS assumption which is necessary for attaining an unbiased estimate, leading to endogeneity problem. Introduction of lagged variable as an instrument in the strict orthogonal assumption helps in solving this problem which is incorporated in the system GMM (Blundell and Bond, 1998; Roodman, 2009).

This study, therefore, estimated the impact of capital, liquidity, the loan-to-deposit ratio on bank performance and risk in Nigeria using the System GMM based on the satisfaction of some assumptions; that the observation is greater than the time ($N > T$), ability to solve endogeneity, heteroscedasticity and serial correlation problem and produce an estimate which reduces the correlation between the instrument and the disturbance term to zero. The dynamic GMM model is expressed as:

$$y_{i,t} = \alpha + \beta_3 Y_{i,t-1} + \beta_1 X_{i,t} + \beta_2 Z_{i,t} + \varepsilon \quad (6)$$

The model for this study is based on the previous work of (Abbas, Iqbal and Aziz, 2019; Alqsass, et al., 2022) which is expressed in order to suit the objective of this study as:

$$RAROA_{i,t} = \alpha + \beta_7 RAROA_{i,t-1} + \beta_1 CAP_{i,t} + \beta_2 LIQ_{i,t} + \beta_3 LDR_{i,t} + \beta_4 ASG_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (7)$$

$$RAROE_{i,t} = \alpha + \beta_7 RAROE_{i,t-1} + \beta_1 CAP_{i,t} + \beta_2 LIQ_{i,t} + \beta_3 LDR_{i,t} + \beta_4 ASG_{i,t} + \beta_5 SIZE_{i,t} + \varepsilon_{i,t} \quad (8)$$

The independent variables used in this study include capital, liquidity ratio and loan-to-deposit ratio while the control variables are asset growth and size. Koroleva, et al., (2021).

opines that the asset growth of the bank determines the level of risk assumed by a bank. A bank with a rapid growth rate in the asset has a high tolerance for risk while the banks with low growth rate have a low-risk tolerance. Bank size is viewed to induce bank performance (Abbas et al, 2019)

Table 1 below shows the description and justification for each variable in the model.

Table 1. Variables description and measurement

	Acronyms	Description	Measurement/Justification
Dependent	RAROA	Risk Adjusted Return on Asset	RAROA is measured by return on asset divided by the standard deviation of the return of asset (Baek, et al, 2018)
	RAROE	Risk Adjusted Return on Equity	while RAROE is measured by return on equity divided by the standard deviation of the return on equity ((Baek et al, 2018)
	Z-Score	Z-Score	Z-Score measures the exposure of DMBs to insolvency. It is measured by return on asset plus capital adequacy ratio divided by standard deviation of return on asset (Ha and Quyen, 2018; Munangi, and Sibindi (2020).
Independent	CAP	Capital	Capital is measured using total equity divided by total asset (Abbas et al, 2019;
	LIQ	Liquidity Ratio	Liquidity is measured by loan to total asset as used in the prior studies of (Obim et al, 2020; Ha and Quyen, 2018)
	LDR	Loan-to-Deposit Ratio	Loan-to-deposit is measure using customers loan divided by customers deposit (Hapsari, 2018; Saleh and Abu Afifa 2020).
	ASG	Asset Growth	Asset growth is measured using current year asset minus previous year asset divided by the previous year asset (Isshaq et al, 2019).
	SIZE	Bank Size	Bank size is measured using the natural logarithm of bank asset as used by past researchers (Abbas et al, 2019; Ugorji, et al., 2025).

4. Empirical results and discussions

The section presents the descriptive statistics, correlation matrix and regression estimation techniques. The descriptive statistics of the financial data are shown in table 1 covering 2012 to 2023.

Table 2: Descriptive Statistics

Variable	Mean	Std.Dev.	Maximum	Minimum	Observations
RAROE	0.192044	1.000001	0.756401	-9.46093	156
RAROA	0.178173	0.20967	0.652422	-1.04539	156
Z – Score	6.502241	13.14976	41.80355	-85.9302	156
LIQ	0.427625	0.096847	0.571904	0.057238	156
CAP	0.153376	0.292371	0.973031	-1.5475	156
LDR	0.66432	0.173744	1.063525	0.035504	156
SIZE	12.14124	0.395403	12.91508	11.19453	156
ASG	0.062002	0.257028	0.590438	-0.927191	156

Source: Authors Computation

Table 2 shows the descriptive statistics of the data used in this study. The Risk-Adjusted Return on Equity (RAROE) has an average value of 19.2% with a standard deviation of 100% which implies that the average risk-adjusted return on equity of DMBs is lower than the standard deviation, this means there is a decrease in the return of the bank. The Risk-Adjusted Return on Asset (RAROA) has an average value of 17.8 with a standard

deviation of 21% which implies that the average risk-adjusted return on asset of DMBs is lower than the standard deviation. Z-Score has an average value of 6.502241. The maximum and minimum values of Z-Score are 41.80355 and -85.9302.

Liquidity has an average of 42.76% with a standard deviation of 9.7% which implies that the banks have a greater ability to meet up with their customers' requirements. Capital adequacy ratio has an average value of 15.34% which is higher than the minimum requirement set by the Central Bank of Nigeria which was 15% for banks with international subsidiaries and 10% for banks without international subsidiaries. This implies that the depositor's funds are protected and the Nigerian banking system is stable.

Loan to deposit ratio has an average value of 66.43% which means that average bank in Nigeria gives out N64.43 out of every N100 deposit of the bank which is higher than the minimum of 65% set by the CBN in the third quarter of 2019. The maximum and minimum of the loan to deposit ratio are 1.06 and 0.035504. Asset growth has an average rate of 6.2% which means that average bank asset in Nigeria grows at the rate of 6.2% annually. Bank size has an average value of 12.14124 which implies that the average assets of banks in Nigeria are N1,384,331,177,311. The minimum and maximum values of bank asset are 11.19453 and 12.91508 which means that the minimum and maximum value of assets of banks in Nigeria are N156,505,642,576 and N8,223,941,265,916 respectively.

Table 2 shows the relationship that exists among the variables which are used to determine the variables to be included in the model to resent multicollinearity and biased results.

Table 3. Correlation Matrix

<i>Variables</i>	<i>RAROE</i>	<i>RAROA</i>	<i>Z – Score</i>	<i>LIQ</i>	<i>CAP</i>	<i>LDR</i>	<i>SIZE</i>	<i>ASG</i>
<i>RAROE</i>	1.0000							
<i>RAROA</i>	0.3079	1.0000						
<i>Z – Score</i>	0.0410	0.4067	1.0000					
<i>LIQ</i>	0.0850	-0.1775	0.3276	1.0000				
<i>CAP</i>	0.0619	0.5544	0.7907	-0.1340	1.0000			
<i>LDR</i>	0.1172	-0.0993	0.3661	0.9031	-0.0422	1.0000		
<i>SIZE</i>	0.2866	0.1487	0.3426	0.3443	0.0453	0.3399	1.0000	
<i>ASG</i>	0.0770	0.1018	0.1879	0.3140	-0.1097	0.3120	0.3086	1.0000

Source: Authors Computation

Table 3 shows that there is no likelihood of occurrence of multicollinearity among the variables used in this study as shown by the correlation coefficients.

The effect of capital, liquidity and loan-to-deposit on performance is estimated using the system GMM estimation technique as shown in table 3. The performance measurement used in the model is the risk-adjusted return on asset and risk-adjusted return on equity.

Table 4. Impact of Capital, Liquidity and Loan-to-deposit on DMBs Performance
Dependent Variables: RAROA and RAROE

Variable	One-Step Result		Two-Step Result	
	RAROA	RAROE	RAROA	RAROE
<i>RAROA(-1)</i>	-0.157295 (0.1606735)		0.5481888 * (0.1250879)	
<i>RAROE(-1)</i>		-0.0652636 * (0.0263512)		0.0577879 (0.0497958)
<i>CAP</i>	2.012238 * (0.2555644)	0.01058 (0.0772131)	1.409697 * (0.140459)	0.01058 (0.0772131)
<i>LIQ</i>	-2.898321 ** (1.37163)	-1.326572 * (0.4490248)	-1.6964 * (0.6490649)	-0.8397739* (0.2834281)
<i>LDR</i>	0.6027793 (0.8018286)	0.5374542 ** (0.2612218)	0.100044 (0.3207841)	0.3324423 *** (0.192697)
<i>SIZE</i>	0.3455775 (0.5223389)	0.5416466 * (0.1717786)	0.0255463 (0.4054007)	0.3356357 ** (0.1765255)
<i>ASG</i>	1.440469 * (0.4992888)	0.1028859 (0.1510043)	1.250034 * (0.1658983)	0.0557114 (0.1055146)
<i>α_{it}</i>	-2.996395 (6.102326)	-6.085176 (2.014201)	0.3759947 (4.719796)	-3.663629 (2.09973)
<i>Observation</i>	91	91	91	91
<i>Number of Countries</i>	13	13	13	13
<i>Number of instruments</i>	53	55	80	80
<i>F/Wald chi2 Prob</i>	0.000	0.000	0.000	0.000
<i>AR (1)</i>	0.740	0.359	0.086	0.118
<i>AR (2)</i>	0.015	0.449	0.704	0.178
<i>Sargan test Chi (2)</i>	0.000	0.796	0.123	0.070

Source: Authors Computation

Level of significance was reported as *, ** and *** representing 1, 5 and 10 percent respectively. The parenthesis represents the standard errors

Table 4 reveals the empirical finding of the impact of capital, liquidity and loan-to-deposit on DMBs performance. The empirical result shows that the lag dependent variables were negative to DMBs performance based on the one-step result but positively related to performance-based on two-step result. Capital is positive and significantly related to the performance of DMBs under the model but positive and insignificantly related to the model which implies that an increase in capital leads to a higher performance of DMBs. This result is in line with the empirical findings of (Oluwaseun et al., 2025; Fajinmi et al 2023; but contrary to the findings of (Ogbuji and Adekunle, 2024; Opuene and Amadiwo, 2025, Afrogha et al 2023). The result is also in line with the apriori expectation and theory. Liquidity has a negative and statistically significant influence on the performance of DMBs across the model, this implies that an increase in liquidity leads to a decline in DMBs performance. This result is in line with the previous studies of (Olufemi and Sunmisola 2022; Wisdom et al 2018) opines that liquidity negatively influences bank performance but contrary to the findings of (Ehiedu 2022; Ugorji et al 2025). where they asserted that liquidity positively influences performance in their various studies. Loan-to-deposit has a positive and statistically significant on the performance of DMBs (RAROA) but positive but insignificant impact on DMBs performance (RAROE), this implies that increase in loan-to-deposit leads to an increase in DMBs performance. This finding is in line with the result of (Ugorji et al 2025; Diarua 2025) and the apriori expectation.

The findings also revealed that bank size has a positive and insignificant impact on RAROA but a positive and significant impact on RAROE which implies that increase in bank size leads to higher performance. the apriori expectation. Lastly, asset growth has a positive and significant impact on performance (RAROA) but positive and insignificant impact on performance (RAROE). This means that increasing growth in the bank asset promotes the performance of DMBs in Nigeria.

Table 5. Impact of Capital, Liquidity and Loan-to-deposit on DMBs Risk
Dependent Variable: Z-Score

	One-Step Result	One-Step Result
<i>Variable</i>	<i>Z – Score</i>	<i>Z – Score</i>
<i>Z – Score(–1)</i>	0.0318946* (0.0417287)	0.1842759 * (0.0515193)
<i>CAP</i>	22.33474 * (0.8528187)	20.14425 * (3.416323)
<i>LIQ</i>	21.3168 * (4.070062)	24.50808 ** (12.26871)
<i>LDR</i>	-1.509484 (2.373096)	-3.39221 (6.142332)
<i>SIZE</i>	7.80403 * (1.618222)	4.705 (3.051964)
<i>ASG</i>	4.520721 * (1.613625)	5.465766 (3.557305)
<i>α_{it}</i>	-107.1712 (19.09286)	-69.41867 (37.62992)
<i>Observation</i>	91	91
<i>Number of Countries</i>	13	13
<i>Number of instruments</i>	55	91
<i>F/Wald chi2 Prob</i>	0.0000	0.0000
<i>AR (1)</i>	0.304	0.002
<i>AR (2)</i>	0.069	0.319
<i>Sargan test Chi (2)</i>	0.000	0.054

Source: Authors Computation

Level of significance was reported as *, ** and *** representing 1, 5 and 10 percent respectively. The parenthesis represents the standard errors

Table 5 shows the empirical finding of the impact of capital, liquidity and loan-to-deposit on DMBs performance. The empirical result shows that one-period lag of Z-Scores have a positive and statistically significant influence on DMBs risk which implies that the risk is persistence. Capital has a positive and statistically significant influence on the risk of DMBs which implies that increase in bank capital leads to higher volatility which is in line with the empirical findings of (Andrés and Ingmar, 2017; Nguyen et al, 2019) but contrary to the findings of (Majumder and Li, 2018; Ugorji et al 2025).

Liquidity has a positive and statistically significant impact on the risk of DMBs which implies that an increase in liquidity leads to higher volatility. This result is in line with the findings of) but contrary to the result of (Ha and Quyen, 2018; Fajinmi et al 2023). Loan-to-deposit has a negative and statistically insignificant impact on the risk of DMBs which implies that an increase in loan-to-deposit leads to lower volatility. Bank size and asset growth are positively related to bank risk which implies that an increase in bank size and asset growth leads to higher volatility.

The effect of the bank capital, liquidity and loan-to-deposit on big and small DMBs performance and risk exposure

The effect of the bank capital, liquidity and loan-to-deposit on DMBs performance and risk exposure was analysed by separating the DMBs into big and small DMBs to ascertain whether our variable of choice affects the big DMBs differently from small DMBs. The DMBs were separated into big and small based on the estimated mean of bank size. The

DMBs with average annual size greater than the estimated mean were referred to as the big DMBs while DMBs with an average annual size lower than the estimated mean were taken to be smaller DMBs. Table 5 shows the bank capital, liquidity and loan-to-deposit on performance and risk of big DMBs.

Table 6. Impact of Capital on Big DMBs Performance

Variable	BIG BANK		
	RAROA	RAROE	Z – Score
CAP	7.637724 * (2.793107)	0.0725502 (1.584332)	3.083286 * (0.3008936)
LIQ	-0.3442845 (1.985614)	-0.5953937 (1.126298)	0.160003 (0.2139046)
LDR	-0.4356999 (0.9826549)	-0.5060366 (0.5573906)	-0.0472058 (0.1058586)
SIZE	0.6078849 (0.4353938)	0.3709091 (0.2469681)	0.0177051 (0.0469037)
ASG	-0.4823992 (0.4144784)	-0.3979423 (0.2351043)	-0.100281 (0.0446506)
α_{it}	-7.178376 (5.706276)	-4.091327 (3.236767)	0.1046102 (0.614721)
R – squared	0.8695	0.2862	0.9684
Adjusted R – squared	0.6765	0.0478	0.9429
F – statistic	3.48	1.32	48.52
Prob(F – statistic)	0.0133	0.2836	0.0000
Durbin – Watson stat	2.163326	2.052133	2.224195

Source: Authors Computation

Level of significance was reported as *, ** and *** representing 1, 5 and 10 percent respectively. The parenthesis represents the standard errors

The empirical result in table5 shows that capital is positively related to performance and risk of big DMBs. Liquidity is negatively related to DMBs performance but positively related to big DMBs risk. Loan-to-deposit ratio is negatively related to big DMBs performance and risk. Bank size is positively related to DMBs performance and risk. Asset growth is negatively related to big banks performance and risk.

Table 7. Impact of Liquidity on Small DMBs Performance

Variable	SMALL BANK		
	RAROA	RAROE	Z – Score
CAP	1.232708 * (0.4825117)	0.0093063 (0.7139537)	26.30977 * (1.724996)
LIQ	1.996807 (2.863263)	1.123902 (4.236659)	24.95413 ** (10.23627)
LDR	1.236271 (1.596081)	-0.0366794 (2.361659)	-9.070874 (5.706046)
SIZE	-1.223716 (1.00273)	-0.1927686 (1.4837)	13.03528 * (3.584794)
ASG	2.301951* (0.6627247)	0.4252443 (0.9806079)	1.801599 (2.369264)
C	14.8124 (11.43978)	-2.698015 (16.92699)	-164.8248 (40.8976)
R – squared	0.0292	0.0310	0.8894
Adjusted R – squared	0.2706	0.0001	0.7787
F – statistic	6.18	0.33	82.03
Prob(F – statistic)	0.0002	0.8947	0.0000
Durbin – Watson stat	2.166684	2.058625	2.229051

Source: Authors Computation

Level of significance was reported as *, ** and *** representing 1, 5 and 10 percent respectively. The parenthesis represents the standard errors

The empirical result in table 7 shows that capital is positively related to performance and risk of big DMBs. Liquidity is positively related to big DMBs performance risk. Loan-to-deposit ratio is positively related to RAROA but negatively related to RAROE of big DMBs

performance and risk. Bank size is negatively related to big DMBs performance but positively related to risk. Asset growth is positively related to big banks performance and risk.

Discussion

Our research findings are centered on the influence of bank capital, liquidity and loan-to-deposit ratio on DMBs performance and risk in Nigeria. Discussion of our empirical findings is based on the two-step GMM result based on its superiority over the one-step result. The empirical result revealed that there is a positive influence of capital on DMBs performance in Nigeria which implies that higher capitalization promotes DMBs performance in Nigeria. Liquidity inversely influences DMBs performance implying that excess liquidity reduces the bank performance which could be likely because Nigerian banks keep excessive cash in their vault and give less loan to their customers. Loan-to-deposit ratio directly influences DMBs performance implying that giving a higher proportion of bank deposit as loan improve the DMBs performance in Nigeria.

Bank capital and liquidity increase the risk of the bank which means that the higher the capital and level of liquidity maintained by the banks, the higher the risk exposure of the bank. Loan-to-deposit ratio is inversely related to DMBs risk which implies that the higher the loan disbursed to the bank customers, the lower the risk exposure of the bank.

Big DMBs capital is positively related to DMBs performance while liquidity and the loan-to-deposit ratio is inversely related to big DMBs performance. Big DMBs capital and liquidity are directly related to Big DMBs risk while the loan-to-deposit ratio is inversely related to big DMBs risk. The small DMBs capital, liquidity and loan-to-deposit ratio are positively related to DMBs performance while higher capital and liquidity exposes small DMBs to risk but higher loan-to-deposit ratio reduces the small DMBs risk.

5. Conclusion

The study examined the impact of capital, liquidity and loan-to-deposit ratio on Deposit Money Banks (DMBs) performance and risk in Nigerian banking industry using panel data from 2012 to 2023 which were obtained from the financial statements of DMBs in Nigeria using two-steps GMM estimation technique. The study further separated the DMBs into big and small using the fixed effect estimation technique to ascertain the ban with better performance between the big DMBs and small DMBs in Nigeria.

The empirical result shows that the performance of DMBs is persistence. Higher capital and loan-to-deposit ratio promote DMBs performance while higher liquidity worsens the DMBs performance. This indicate that higher capitalization enables the DMBs to carry out their intermediation function efficiently while excess liquidity prevents the bank from giving out a loan which generates the interest income; this has a spill-over effect of a lower DMBs profit. Higher capital and liquidity expose DMBs to greater risk while an increase in loan-to-deposit ratio reduces the risk of DMBs. This implies that excessive liquidity prevents credit creation which forms part of the DMBs revenue while disbursement of a higher proportion of the deposit to the deficit sector as loan reduces the risk of the bank and generate higher interest income. Additionally, the findings show that higher capital promotes the big DMBs performance while higher liquidity and loan-to-deposit ratio worsen the performance of the big DMBs. However, the small DMBs capital, liquidity and loan-to-deposit ratio promote the performance of the small DMBs. This means the small DMBs engage in more traditional banking activities than the big DMBs in Nigeria. Higher capital and liquidity

expose both big and small DMBs to greater risk while loan-to-deposit ratio minimizes the risk exposure of DMBs in Nigeria.

The study, therefore, recommends that the CBN should continue with the periodic review of its policies on the DMBs which forced the DMBs to key into the new policy review which were aimed at increasing the volume of credit extended to the small and medium enterprises, increasing the level of employment, protection of the customers, shareholders and other stakeholders interest. The big DMBs should also engage more in financial intermediation as it has promoted the performance and reduce the risk of the small DMBs in Nigeria financial system.

DATA AVAILABILITY STATEMENT. *The data that support the findings of this study are sourced from the annual reports and accounts of the selected DMBs quoted on the Nigerian Stock Exchange as at 31st December 2019. The data are available from the corresponding author upon request.*

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