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- V. Literature Review
- VI. Methodology
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## TABLE OF CONTENT

1. <b>Effect of Firm Characteristics on Firm Value of Listed Deposit Money Banks in Sub-saharan Africa</b> .....	1
Mabur Zungbung Danladi, Deshi Nentawe Nengak, Maren Maram Isah and Dahel Innocent Felix	
2. <b>Effect of Forensic Interviews And Fund Tracing Techniques on Fraud Control in Public Sector Pension Administration in Kebbi State, Nigeria</b> .....	17
Ahmed Yarima Dakingari, Attahiru Ibrahim Alkali and Zainab Attahiru Alkali	
3. <b>Audit Quality as a Moderator Between Board Characteristics and Earnings Management: Evidence From Listed Banks in Nigeria</b> .....	25
Sabiu Ishaka Alfa, Lawal Faith Chidinma and Musa Adeiza Farouk	
4. <b>Effect of Non-current Assets on Value of Listed Consumer Goods Firms in Nigeria</b> .....	37
Mabur Zungbung Danladi, Deshi Nentawe Nengak, Maren Maram Isah and Dahel Innocent Felix	
5. <b>Effect of Forensic Accounting Techniques on Fraud Prevention In Ministries, Departments And Agencies (MDAs) in Plateau State</b> .....	51
Ondeku Felix Godwin, Adebisi Joseph Femi and Farouk Musa Adeiza	
6. <b>Effect of Forensic Interviews And Fund Tracing Techniques on Fraud Control in Public Sector Pension Administration in Kebbi State, Nigeria</b> .....	62
Ahmed Yarima Dakingari, Attahiru Ibrahim Alkali, Zainab Attahiru Alkali and Balkisu Ahmad Maiahu	
7. <b>Effect of Auditor Skills on Financial Accountability of Plateau State Government Ministries</b> .....	71
Umar Aishatu Adam	
8. <b>Effect of Ownership Structure on Environmental Disclosures of Listed Oil And Gas Companies in Nigeria</b> .....	80
Deshi Nentawe Nengak and Manji Eugene Nenkanma Helen	
9. <b>Moderating Effect of Audit Quality on Board Characteristics And Earnings Management of Listed Insurance Firms in Nigeria</b> .....	94
Sabiu Ishaka Alfa, Joseph Femi Adebisi, Musa Adeiza Farouk and Audu K. Buba	
10. <b>Effect of Board Characteristics on Cash Holding of Listed Commercial Banks in Nigeria</b> .....	105
Cycle Florence Kemebinkedoumene	
11. <b>Effect of Accounting Information Systems on Financial Reporting Quality of Listed Deposit Money Banks in Nigeria</b> .....	115
Adewole Adefemi Kazeem, Tamunonimim Ngerebo and Innocent Chinedu Enekwé	
12. <b>Effect of Corporate Governance Attributes and Value of Listed Insurance Companies in Nigeria</b> .....	126
Ahmed Tijjani Haruna	
13. <b>Effect of Forensic Accounting Tools on Fraud Prosecution Process in Nigeria Court System</b> .....	138
Blessing Chinelu Chukwu	

## TABLE OF CONTENT

14. <b>Effect of Sustainability Reporting on Share Price of Listed Oil and Gas Firms in Nigeria</b> .....	148
Clement Osemwengie Ekhoe-ugiagbe and Ojeifo Sidney Imevbore	
15. <b>Moderating Effect of Information Communication Technology Software on The Relationship Between Ownership Structure and Value of Listed Financial Firms in Nigeria</b> .....	160
Ejike Emeka Okongwu, Benjamin Uyagu and Farouk Musa Adeiza	
16. <b>Effect of Government Integrated Financial Management Information System Implementation on Financial Governance in Selected Ministries, Departments, and Agencies in Nigeria</b> .....	176
Emmanuel Monday Essien	
17. <b>Effect of Accounting Practices on Budget Implementation of Government-owned Research Institutes in South Eastern Nigeria</b> .....	194
Dennis Nnenna Okoro	
18. <b>Moderating Effect of Internal Audit Quality on The Relationship Between Accounting Information Systems and Financial Reporting Quality of Listed Deposit Money Banks in Nigeria</b> .....	205
Adewole Adefemi Kazeem, Tamunonimim Ngerebo and Innocent Chinedu Enekwe	
19. <b>Effect of Board Audit Committee Attributes on Assets Fraud Detection among Listed Manufacturing Companies in Nigeria</b> .....	215
Agboide Sunday Theophilus	
20. <b>An Empirical Analysis of The Relationship Between Government Transfer Payments and Economic Growth in Nigeria</b> .....	224
Inuwa Auwalu, Uyagu David Benjamin and Ganiyu A. Mustapha	
21. <b>Effect of Budget Processes on Performance of Public Funds in Plateau State Ministries, Departments and Agencies</b> .....	234
Yaks Mary Benjamin	
22. <b>The Effect of Cyber Fraud on Customer Trust in Nigerian Deposit Money Banks: A Digital Forensic Perspective</b> .....	250
Nkwonta Ifeoma Nnenna, Musa Adeiza Farouk and Benjamin Uyagu David	
23. <b>Effect of Forensic Audit on Fraud Detection in The Federal Ministry of Finance and Associate Agencies in Nigeria</b> .....	258
Musa Inuwa Fodio, Benjamin Uyagu David and Sani Chida Baba	
24. <b>Dividend Policy Determinants: Likelihood and Payout Magnitude in Nigeria's Consumer Goods Firms</b> .....	269
Ovbe Simon Akpadaka	
25. <b>Effect of Monetary Policy Instruments on Capital Adequacy of Listed Deposit Money Banks in Nigeria</b> .....	284
Jadesola Regina Adekalu, Joseph Femi Adebisi, Mbatuegwu David Christopher and Samuel Olutokunbo Adekalu	

## TABLE OF CONTENT

26. <b>Effect of Economic, Social and Governance Disclosures on Firm Value And The Moderating Effect of Leverage. A Study of Listed Non-financial Firms in Nigeria</b> .....	293
Aishat Oyiza Otori	
27. <b>Monetary Policy, Bank Size, and Capital Adequacy: A Conceptual Framework For Financial Stability in Nigeria</b> .....	301
Jadesola Regina Adekalu, Joseph Femi Adebisi, Mbatuegwu David Christopher and Samuel Olutokunbo Adekalu	
28. <b>Impact of Money Laundering Activities on The Operational Performance of Listed Commercial Banks in Nigeria</b> .....	312
Inuwa Auwalu and Ganiyu A. Mustapha	
29. <b>Effect of Computerized Forensic Investigation Techniques on Fraud Management in Lagos State Ministries, Departments and Agencies ...</b>	320
Kotun Rasheetdat Bunmi, Sunday Mlanga and Halidu Saidu	
30. <b>Moderating Effect of Bank Size on The Relationship Between Monetary Policy and Capital Adequacy of Listed Deposit Money Banks in Nigeria</b> ....	336
Jadesola Regina Adekalu, Joseph Femi Adebisi, Mbatuegwu David Christopher and Samuel Olutokunbo Adekalu	
31. <b>Legislative and Audit Oversight Institutions as Determinants of Budget Transparency in Sub-saharan Africa</b> .....	350
Emmanuel Sani	
32. <b>Do Sustainability Disclosures Matter For Market Valuation? Evidence From Consumer Goods Firms in Sub-saharan Africa</b> .....	358
Oloruntoba Adebayo Femi, Dagwon Yohanna Dang and Joseph Femi Adebisi	
33. <b>Effect of Monetary Policy on Manufacturing Outputs in Nigeria: 1980-2024</b> .....	368
S.A.S Aruwa, Benjamin Uyagu and Egbo Roseline Oruaroghene	
34. <b>Determinants of Public Participation in Public Budgeting among Sub-saharan Countries: The Influence Of Transparency and Oversight Institutions</b> .....	382
Emmanuel Sani	

## MODERATING EFFECT OF BANK SIZE ON THE RELATIONSHIP BETWEEN MONETARY POLICY AND CAPITAL ADEQUACY OF LISTED DEPOSIT MONEY BANKS IN NIGERIA.

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### ABSTRACT

*This paper investigated the effect of bank size on the relationship between monetary policy and capital adequacy of listed deposit money banks in Nigeria for the period of 2015-2024. The thirteen 13 listed Deposit Money Banks (DMBs) on the Nigerian Exchange (NGX) out of the twenty-four 24 licensed (DMBs) were used for this study. Specifically, the study adopted multiple regression techniques as a tool of analysis and data were collected from secondary source through the Central Bank of Nigeria statistical bulletins; annual reports and account of the sampled banks. Capital adequacy is proxied by the Capital Adequacy Ratio (CAR), while monetary policy is measured using the Monetary Policy Rate (MPR) and Cash Reserve Ratio (CRR). Bank size is captured as the natural logarithm of total assets, and interaction terms are employed to test the moderating effect of bank size. The findings reveal that contractionary monetary policy exerts a negative and statistically significant effect on banks' capital adequacy, indicating that higher policy rates and reserve requirements weaken banks' ability to sustain regulatory capital buffers. The findings further show that bank size has a positive and significant influence on capital adequacy, with larger banks maintaining stronger capital positions than smaller banks. In addition, the interaction results demonstrate that bank size significantly moderates the relationship between monetary policy and capital adequacy, such that the adverse effects of monetary tightening are less pronounced for larger banks. The study concludes that the impact of monetary policy on bank capital adequacy in Nigeria is heterogeneous and strongly conditioned by bank size. These findings underscore the need for size-sensitive monetary and prudential policy frameworks that balance macroeconomic stabilization objectives with banking sector resilience.*

**Keywords:** Bank size, Monetary policy, Capital adequacy, Deposit money banks; Nigeria

### INTRODUCTION

According to Basel Committee on Banking Supervision (BCBS, 2010), capital adequacy refers to “the requirement for banks to hold sufficient capital relative to their risk-weighted assets to absorb potential losses and protect depositors.” This

definition emphasizes the risk-sensitive approach to measuring capital, which ensures that banks maintain an appropriate buffer against financial shocks and insolvency risks. In a similar vein, Nnanna (2001) defines capital adequacy as “the ability of a bank to maintain a minimum level of capital to cover its credit,

market, and operational risks, ensuring that it can continue to operate safely and meet regulatory requirements.” This definition reflects the Nigerian banking regulatory perspective, where capital adequacy is a critical measure used by the Central Bank of Nigeria (CBN) to assess the soundness of deposit money banks.

Monetary policy has been widely acknowledged as a key tool for regulating economic activities and promoting financial stability. It is generally understood as the deliberate measures employed by monetary authorities to control the supply, cost, and availability of money and credit within an economy, with the primary aim of achieving macroeconomic objectives such as price stability, sustainable economic growth, and financial sector stability. Friedman (1968) defines monetary policy as the actions taken by monetary authorities to regulate the supply of money and credit in order to influence macroeconomic variables such as inflation and output. This perspective emphasizes the central role of money supply management as a determinant of economic stability, highlighting the potential consequences of poor monetary control, including inflationary pressures and economic fluctuations.

In the Nigerian context, scholars have adapted these general principles to reflect local economic conditions. Nnanna (2001) describes monetary policy as a set of measures designed to regulate the value, supply, and cost of money in consonance with the expected level of economic activity. Ajayi and Ojo (2006) similarly define it as a deliberate effort by monetary authorities to regulate money supply and credit conditions to achieve macroeconomic stability. The Central Bank of Nigeria (CBN, 2020) further clarifies that monetary policy involves actions aimed at influencing monetary aggregates and interest rates to ensure the attainment of desired macroeconomic objectives. These definitions highlight the centrality of monetary policy in creating a stable financial environment conducive to the operations of deposit money banks, particularly in ensuring capital adequacy and managing liquidity risks.

Demirgüç-Kunt and Huizinga (1999) define bank size in terms of “total assets and equity, which serve as indicators of a bank's ability to leverage resources, expand lending operations, and withstand economic shocks.” Their research highlights that size provides both operational advantages and regulatory considerations, as larger banks are often subjected to more stringent monitoring and capital requirements. In the Nigerian banking context, Nwankwo (2001) describes bank size as “the measure of a bank's total assets, deposits, and equity capital, which reflects its capacity to deliver financial services, compete in the market, and meet regulatory standards.” This perspective aligns with the operational realities of

deposit money banks in Nigeria, where size determines lending capacity, capital adequacy, and compliance with Central Bank of Nigeria regulations. Maintaining adequate capital levels remains a critical and persistent challenge for commercial banks in Nigeria, particularly in light of evolving macroeconomic dynamics, fluctuating inflationary trends, exchange rate instability, and shifting regulatory expectations. Capital adequacy, typically measured through the Capital Adequacy Ratio (CAR), plays a central role in ensuring that banks can absorb unexpected losses, maintain solvency, and support credit creation all without compromising the stability of the financial system. Following the global financial crisis of 2008 and a series of domestic banking collapses, Nigerian financial regulators, led by the Central Bank of Nigeria (CBN), intensified their efforts to safeguard the banking sector through stricter capital adequacy requirements and more conservative monetary policy tools (Sanusi, 2012).

Despite these initiatives, several Nigerian listed deposit money banks continue to report volatile and inconsistent capital adequacy ratios. This trend raises serious concerns about the effectiveness of monetary policy in promoting long-term financial soundness and regulatory compliance. The CBN, through its monetary policy instruments, particularly the Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), and Open Market Operations (OMO), attempts to control inflation, stabilize the currency, and regulate liquidity in the financial system. However, the transmission mechanism through which these tools affect banks' capital levels is complex and often indirect. For example, an increase in MPR may raise borrowing costs and reduce credit demand, which could erode banks' interest income and profitability, thereby undermining their ability to maintain capital buffers. Conversely, high CRR requirements limit banks' lending capacity by tying up a greater proportion of deposits as reserves with the CBN, which may impair capital accumulation over time (CBN, 2023).

Empirical findings on this subject have been mixed. Some studies argue that restrictive monetary policies reduce bank profitability and loan creation, thereby weakening capital adequacy (Uchenna & Ezeabasili, 2020), while others suggest that such policies enhance banks' risk management practices and asset quality, ultimately improving CAR (Okoye et al., 2017). This inconsistency underscores a major gap in both policy and scholarly understanding, especially in the Nigerian context, where bank-level heterogeneity can significantly shape responses to macroeconomic policy.

One often overlooked but theoretically significant factor in this relationship is bank size. Larger banks are typically better positioned to withstand adverse

monetary shocks due to their superior access to diversified funding sources, larger capital bases, broader market reach, and internal economies of scale. Berger and Bouwman (2013) assert that large banks are structurally more resilient and able to manage regulatory pressures without significantly compromising capital adequacy. In contrast, small and medium-sized banks often operate with thinner margins, limited capital buffers, and reduced operational flexibility, making them more sensitive to monetary tightening. Yet, most regulatory frameworks in Nigeria have historically adopted a uniform policy approach, overlooking the moderating effect of bank size in policy transmission.

This is particularly concerning in light of the CBN's 2024 recapitalization directive, which requires all international commercial banks to raise their minimum capital base to ₦500 billion, and national commercial banks to ₦200 billion (Vanguard, 2024). While this move is intended to strengthen systemic resilience and support the federal government's long-term economic goals, it places disproportionate pressure on smaller banks, many of which may struggle to meet these thresholds without resorting to mergers, acquisitions, or significant restructuring.

If bank size is not adequately factored into both monetary and prudential policy design, there is a risk of unintended consequences, including reduced competition, increased market concentration, and the possible exclusion of financially sound but smaller institutions. Therefore, understanding whether and how bank size moderates the impact of monetary policy on capital adequacy is not just an academic exercise, it has direct implications for financial sector stability, regulatory design, and the inclusive development of Nigeria's banking system.

While monetary policy is a key macroeconomic tool used to influence financial stability, its effectiveness in promoting capital adequacy in commercial banks remains underexplored in Nigeria, particularly about how firm-level characteristics like bank size shape this relationship. This study seeks to fill this gap by providing empirical evidence on the moderating effect of bank size on the relationship between monetary policy and capital adequacy of listed deposit money banks in Nigeria.

### OBJECTIVES OF THE STUDY

The specific objectives of this study are to:

- i. examine the effect of monetary policy on the capital adequacy of listed deposit money banks in Nigeria.
- ii. assess the effect of bank size on the capital adequacy of listed deposit money banks in Nigeria.
- iii. determine whether bank size moderates the

relationship between monetary policy and capital adequacy of listed deposit money banks in Nigeria.

### RESEARCH HYPOTHESES

The following null hypotheses were tested in the study:

- i.  $H_{01}$ : Monetary policy has no significant effect on the capital adequacy of Nigerian deposit money banks.
- ii.  $H_{02}$ : Bank size has no significant effect on the capital adequacy of Nigerian deposit money banks.
- iii.  $H_{03}$ : Bank size does not significantly moderate the relationship between monetary policy and the capital adequacy of Nigerian deposit money banks.

### 2. Literature Review

This section review relevant empirical studies on the relationship between monetary policy and capital adequacy of listed deposit money banks in Nigeria, with particular emphasis on the moderating role of bank size. The literature covers various subtopics, including monetary policy and capital adequacy, cash reserve ratio and capital adequacy, bank size and capital adequacy and the moderating role of bank size.

#### 2.1 Monetary Policy and Capital Adequacy

Olarewaju and Akande (2016) conducted a comprehensive empirical investigation into the determinants of capital adequacy within Nigeria's banking sector, with a particular focus on deposit money banks quoted on the Nigerian Stock Exchange. The study covered the period from 2005 to 2014, a decade that included significant banking sector reforms, recapitalization efforts, and evolving regulatory standards in Nigeria. The study also adopted a panel data methodology to assess the relationship between bank-specific financial indicators and capital adequacy. The dependent variable was the Capital Adequacy Ratio (CAR), independent variables as Equity to Total Assets (ETA), Return on Assets (ROA), Liquidity Ratio, Deposit Ratio, and Bank Size. The findings revealed that ETA, ROA, and Bank Size had significant positive relationships with capital adequacy. This implies that banks with stronger equity positions, higher profitability, and larger-scale operations tended to maintain healthier capital buffers. In contrast, Liquidity and Deposit Ratios showed a negative association with CAR, suggesting that higher liquidity or excessive reliance on customer deposits may not always translate into better capital positions, possibly due to mismatches in asset-liability management or inefficient use of available funds. The study provided valuable insights into the operational dynamics of Nigerian banks, its omission of direct monetary policy indicators limits its scope in explaining how changes

in interest rates or reserve requirements might influence capital adequacy.

Olawale (2024) examined the role of capital adequacy as a stabilizing mechanism in Nigeria's volatile macroeconomic environment, with particular emphasis on the interaction between monetary policy and banks' Capital Adequacy Ratio (CAR). The study considers CAR as the dependent variable, while independent variables include monetary policy indicators such as monetary tightening, interest rate changes, and inflationary trends, with bank-specific operational strategies (asset mix, risk management and lending structure) serving as moderating factors. The study used a mixed-method design with quantitative analysis of macro-financial data from 2015 to 2023 with qualitative assessments of policy trends and sectoral developments, including currency devaluation episodes, elevated inflation, and interest rate adjustments. The study found that CAR remains a fundamental pillar of financial stability during macroeconomic shocks. However, the effect of monetary policy on CAR is mixed and context-dependent; in some periods of monetary tightening, improved risk management supported CAR growth, while in other periods, higher interest rates reduced profitability and constrained capital accumulation. Importantly, the research highlights that the effectiveness of monetary policy depends on the robustness of banks' internal systems, rather than monetary actions alone. The study's mixed-method approach enriches the analysis, yet the absence of econometric modeling limits causal inference, and the moderating effect of bank size is not explicitly examined.

Aliyu et al. (2022) evaluated a comprehensive empirical assessment of how macroprudential regulations and monetary policy jointly influence banking sector performance in Nigeria. The dependent variables include CAR, liquidity ratios, profitability indicators, and credit growth, while independent variables are key monetary policy tools Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), and Open Market Operations (OMO) together with macroprudential regulations. Using time-series econometric techniques covering 2007Q1 to 2022Q4, the study employs long-run cointegration models and short-run dynamic analyses. Findings indicate that CAR positively influences banking sector performance over the long term, but the effect of monetary policy on CAR is not direct; it is significantly mediated by macroprudential policies. Strong regulatory enforcement allows banks to adjust smoothly to monetary shocks, whereas weak regulation can amplify capital deterioration. While the study offers an integrated perspective on monetary and regulatory influences, it does not account for firm-level heterogeneity, such as differences in bank size, limiting insights into differentiated bank responses.

Ikpesu and Oke (2022) investigated the relationship between capital adequacy, asset quality, and banking sector performance among listed commercial banks in Nigeria, using panel data from 2010 to 2019. The study's dependent variables are return on equity (ROE) and return on assets (ROA), while the independent variables include CAR and non-performing loans (NPLs), with external financial pressures serving as implicit contextual factors. Employing panel regression techniques, the study finds that both CAR and asset quality positively and significantly affect bank performance. Banks with stronger capital buffers are better positioned to absorb losses, maintain profitability, and withstand external shocks, including liquidity tightening, credit risk, and interest rate volatility. Low NPLs also correlate with improved efficiency and profitability. Although the study reinforces the importance of capital adequacy in promoting resilience, it does not explicitly examine monetary policy variables or the moderating effect of bank size, making the connection to monetary transmission indirect and inferential.

## 2.2 Cash Reserve Ratio and Capital Adequacy

Adegbite and Oladele (2020) examined the effect of liquidity requirements, including CRR, on the capital adequacy of Nigerian deposit money banks. The study treats CAR as the dependent variable and CRR, liquidity ratios, and bank size as independent variables. Using a panel data approach covering 2008–2018, the authors employ fixed-effects regression models to assess the influence of liquidity policy on capital buffers. Findings reveal that increases in CRR reduce the funds available for lending, which can compress bank profitability and, in some instances, negatively affect capital adequacy, particularly for smaller banks with limited access to alternative funding sources. The study highlights the trade-off between regulatory liquidity requirements and banks' capacity to maintain healthy capital buffers, although it does not consider interactions with other monetary instruments such as the MPR.

Ibrahim and Musa (2021) analyzed how variations in CRR affect the capital adequacy of commercial banks in Nigeria between 2010 and 2020. Using CAR as the dependent variable and CRR as the primary independent variable, the study incorporates control variables including bank size, return on assets, and liquidity ratios. Employing generalized method of moments (GMM) for dynamic panel estimation, the study finds that a higher CRR tends to reduce capital accumulation, as banks are constrained in deploying deposits for income-generating activities. However, large banks demonstrate greater resilience, suggesting that bank size moderates the relationship between CRR and CAR. The study emphasizes the importance of differentiated regulatory policies to accommodate the structural differences between large and small banks. A limitation, however, is that the study focuses

solely on the CRR and does not account for complementary macroprudential measures or interactions with broader monetary policy instruments.

Chukwuma and Eze (2019) investigated the effects of CRR on capital adequacy and lending behavior in Nigeria from 2005 to 2017. The dependent variable is CAR, while CRR and liquidity ratios serve as independent variables, with bank-specific characteristics such as size and capitalization included as controls. Using a panel regression framework, the findings indicate that increases in CRR can tighten liquidity, thereby constrain banks' earnings and slow capital growth. The study also finds that banks with larger capitalization and higher operational efficiency are better able to absorb the impact of higher reserve requirements, highlighting the moderating role of bank size. However, the study does not examine the combined effects of CRR with other monetary instruments, limiting its application to the broader monetary policy framework.

Onu and Okafor (2022) explored the short- and long-term effects of CRR adjustments on the capital adequacy of Nigerian banks. Using a sample of 15 commercial banks over the period 2012–2021, CAR is the dependent variable, while CRR, liquidity ratios, and bank size are independent variables. The study employs autoregressive distributed lag (ARDL) modeling to distinguish short-run from long-run effects. Results suggest that while CRR increases negatively impact capital adequacy in the short term due to reduced lending capacity, banks adapt in the long run through capital restructuring, risk-based lending, and diversification strategies. Again, larger banks appear less affected, confirming the moderating influence of bank size. The study, however, does not integrate the effect of the Monetary Policy Rate (MPR), limiting its analysis of comprehensive monetary policy interactions.

### 2.3 Bank Size and Capital Adequacy

Olarewaju and Akande (2016) investigated the determinants of capital adequacy among Nigerian deposit money banks listed on the Nigerian Stock Exchange from 2005 to 2014. The study considers the Capital Adequacy Ratio (CAR) as the dependent variable, while independent variables include Equity to Total Assets (ETA), Return on Assets (ROA), Liquidity Ratio, Deposit Ratio, and Bank Size. Employing a panel data regression methodology, the study finds that bank size positively and significantly affects CAR, implying that larger banks tend to maintain stronger capital buffers due to economies of scale, diversified operations, and better access to capital markets. The research, however, does not incorporate monetary policy indicators such as the Monetary Policy Rate (MPR) or Cash Reserve Ratio (CRR), limiting its applicability in understanding the

interaction between bank size and monetary policy on capital adequacy.

Ibrahim and Yusuf (2020) analyzed the effect of bank size on capital adequacy in Nigerian commercial banks from 2010 to 2018. Using CAR as the dependent variable and bank size, liquidity ratios, and profitability measures as independent variables, the study employs fixed-effects panel regression analysis. Findings indicate that larger banks are more resilient to capital shocks and maintain higher CAR levels compared to smaller banks, due to stronger financial structures and greater ability to mobilize resources. Conversely, smaller banks face challenges in maintaining adequate capital, particularly during periods of regulatory tightening or macroeconomic stress. The study highlights the moderating influence of bank size on regulatory compliance but does not consider the role of external monetary policy factors, leaving a gap for integrated analyses.

Adegbite and Ojo (2021) evaluated how bank size interacts with internal and external factors to influence capital adequacy across 20 Nigerian banks from 2012 to 2019. The study uses CAR as the dependent variable and treats bank size, liquidity, profitability, and risk-weighted assets as independent variables. Applying dynamic panel estimation techniques, the study finds that bank size enhances capital adequacy both directly and indirectly by mitigating the negative effects of liquidity constraints and operational inefficiencies. Larger banks exhibit greater capacity to maintain regulatory compliance under financial stress, while smaller banks are more vulnerable to adverse shocks. The study, however, does not explicitly account for CRR or MPR variations, which could influence the dynamics of capital buffers across different bank sizes.

Chukwu and Nwosu (2019) investigated the relationship between bank size and capital adequacy in Nigerian commercial banks over the period 2008–2018. The dependent variable is CAR, with bank size, deposit base, and profitability as independent variables. Using panel regression models, the findings reveal that larger banks maintain higher capital adequacy ratios due to diversified operations, better capitalization, and lower risk exposure, whereas smaller banks tend to struggle with capital accumulation and regulatory compliance. This study reinforces the argument that bank size acts as a buffer against financial instability, but it does not integrate the effects of monetary policy instruments, leaving a gap for research on the moderating role of bank size in monetary policy transmission.

### 2.4 Moderating Role of Bank Size

Olalekan and Adeyinka (2020) emphasized that larger banks often have better access to capital markets, enabling them to comply more easily with capital

adequacy requirements during periods of monetary tightening. Conversely, small and medium-sized banks may face liquidity pressures and capital erosion when CRR or MPR increases, given their limited financial buffers and narrower income bases. Thus, bank size can either amplify or weaken the impact of monetary policy on capital adequacy, depending on institutional capacity and risk-management frameworks.

Ibe and Nwosu (2019) found that monetary tightening through higher MPR reduces the lending capacity and capital strength of smaller Nigerian banks more significantly than larger ones, suggesting that size acts as a stabilizing factor.

Oke and Aluko (2021) reported that increases in the CRR disproportionately constrain small banks, reducing their ability to maintain adequate capital ratios, while large banks remain relatively insulated. These findings indicate that bank size plays a buffering role, mediating the extent to which monetary policy influences capital adequacy. However, existing studies rarely incorporate size as a formal moderating variable within regression models, leaving a methodological gap.

**Theoretical Foundations**

The Monetary Policy Transmission Mechanism Theory provides a primary theoretical foundation for understanding how monetary policy affects banks' balance sheets, lending behaviour, and capital positions. The theory posits that central bank actions influence economic outcomes through interest rate and credit channels, with banks playing a pivotal

intermediary role (Mishkin, 1995; Bernanke & Gertler, 1995). Empirical evidence suggests that smaller banks are more sensitive to policy tightening due to limited access to alternative funding sources (Oliner & Rudebusch, 1996).

The Capital Buffer Theory complements this framework by explaining how banks strategically manage capital above regulatory minima to absorb shocks and avoid sanctions (Calem & Rob, 1999). Larger banks are more capable of maintaining capital buffers during monetary tightening, while smaller banks often struggle due to profitability and liquidity constraints.

The reviewed literature establishes that monetary policy instruments significantly influence banks' capital adequacy, but their effects are heterogeneous across institutions. Bank size emerges as a critical factor shaping banks' responses to policy shocks. However, existing studies often examine monetary policy, bank size, and capital adequacy in isolation rather than within an integrated moderating framework.

This study addresses this gap by empirically examining bank size as a moderating variable in the relationship between monetary policy and capital adequacy among Nigerian deposit money banks. By integrating monetary policy transmission and capital buffer theories, the study contributes to a deeper understanding of bank-level heterogeneity in monetary policy effects and offers policy-relevant insights for financial regulation and stability in emerging economies.

Figure 1: Conceptual Framework



Figure 1: framework illustrates the relationship between monetary policy and capital adequacy of deposit money banks in Nigeria, with bank size introduced as a moderating variable. Monetary policy is proxied by the Monetary Policy Rate (MPR) and the Cash Reserve Ratio (CRR), which represent the key instruments through which the Central Bank of Nigeria influences banking sector liquidity, funding costs, and credit conditions. Capital adequacy, measured by the Capital Adequacy Ratio (CAR), serves as the dependent variable and reflects banks' ability to absorb losses and comply with regulatory capital requirements.

The framework further incorporates bank size, measured as the natural logarithm of total assets, as both a direct determinant of capital adequacy and a moderating factor in the monetary policy–capital adequacy relationship. The direct link between bank

size and capital adequacy captures the structural advantages of larger banks, including economies of scale, diversified income sources, and stronger access to capital markets. The moderating role of bank size is depicted through the interaction between monetary policy instruments and bank size, indicating that the effect of monetary policy on capital adequacy is conditioned by institutional size. Guided by this framework, the study empirically tests both the direct effects of monetary policy and bank size on capital adequacy, as well as the interaction effects that capture size-based heterogeneity in banks' responses to monetary policy actions.

**Methodology**

This study adopts an ex-post facto research design to examine the moderating role of bank size in the relationship between monetary policy and capital adequacy of Deposit Money Banks (DMBs) in



Nigeria. The design is appropriate because the variables investigated Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), Capital Adequacy Ratio (CAR), and bank size are historical macroeconomic and firm-level indicators that already exist and cannot be manipulated by the researcher.

The population of the study comprises 24 licensed Deposit Money Banks operating in Nigeria as at 31 December 2024 (CBN, 2024). From this population, a sample of 13 listed Deposit Money Banks was selected using a purposive sampling technique based on the availability of complete and uninterrupted audited annual financial statements covering the period 2015–2024 and continuous operation as licensed DMBs throughout the study period. This ensured the availability of consistent, reliable, and comparable data suitable for panel econometric analysis. The sampled banks include Access Bank Plc, Fidelity Bank Plc, First Bank of Nigeria Holdings Plc, First City Monument Bank, Guaranty Trust Holding Company, United Bank for Africa Plc, Zenith Bank Plc, Stanbic IBTC Bank Plc, Sterling Bank Plc, Union Bank Plc, Wema Bank Plc, Unity Bank Plc, and Ecobank Nigeria Limited.

The study relies exclusively on secondary data obtained from audited annual financial statements of the sampled banks, CBN statistical bulletins and monetary policy communiqués, and reports from regulatory institutions such as the Nigeria Deposit Insurance Corporation. The period of analysis spans 2015–2024, a decade characterized by significant monetary policy adjustments and macroeconomic shocks, including the 2015–2016 oil price collapse, the COVID-19 pandemic, and post-pandemic banking sector reforms. Data on MPR and CRR were sourced from CBN publications, while CAR and bank

size indicators were extracted from banks' annual reports. The use of multiple authoritative sources facilitated data triangulation and enhanced the validity and reliability of the dataset.

To empirically examine the moderating role of bank size, a set of panel regression models was specified following established banking literature. The baseline model examines the direct effects of monetary policy instruments on capital adequacy, expressed as  $CAR_{it} = \beta_0 + \beta_1 MPR_t + \beta_2 CRR_t + \epsilon_{it}$ . To capture the direct influence of bank size, the model was extended to include bank size measured as the natural logarithm of total assets, such that

$CAR_{it} = \beta_0 + \beta_1 MPR_t + \beta_2 CRR_t + \beta_3 Size_{it} + \epsilon_{it}$ . The moderation effect was then tested by incorporating interaction terms between bank size and monetary policy variables, yielding the full specification  $CAR_{it} = \beta_0 + \beta_1 MPR_t + \beta_2 CRR_t + \beta_3 Size_{it} + \beta_4 (MPR_t \times Size_{it}) + \beta_5 (CRR_t \times Size_{it}) + \epsilon_{it}$  Where:

- CAR<sub>it</sub>: Capital Adequacy Ratio of bank i at time t (dependent variable)
- MPR<sub>t</sub>: Monetary Policy Rate at time t
- CRR<sub>t</sub>: Cash Reserve Ratio at time t
- Size<sub>it</sub>: Size of bank i at time t (e.g., log of total assets)
- β<sub>0</sub>: Intercept
- β<sub>1</sub> to β<sub>5</sub>: Coefficients to be estimated
- ε<sub>it</sub>: Error term capturing unobserved effects.

**RESULTS AND DISCUSSION**

This section presents and interprets the empirical findings of the study in line with the stated objectives, research questions, and hypotheses. The analysis is based on balanced panel data comprising 130 bank-year observations drawn from thirteen listed deposit money banks in Nigeria over the period 2015–2024.

**Table 1: Descriptive Statistics of Study Variables (2015 –2024)**

Variable	Observations	Mean	Std. Deviation	Minimum	Maximum
Capital Adequacy Ratio (CAR, %)	130	15.72	4.81	7.12	29.40
Monetary Policy Rate (MPR, %)	130	13.94	2.13	11.00	18.75
Cash Reserve Ratio (CRR, %)	130	25.80	4.56	20.00	32.50
Bank Size (LNTA)	130	18.92	0.83	17.01	20.44
MPR × Bank Size	130	264.69	36.81	198.60	381.41
CRR × Bank Size	130	487.75	72.14	350.20	665.00

Source: Authors’ computation using EViews 12 (2025).

Table 1 presents the descriptive statistics of the study variables. The Capital Adequacy Ratio (CAR) recorded a mean value of 15.72 percent, indicating that, on average, Nigerian listed banks maintained capital buffers above the regulatory minimum during the study period. The Monetary Policy Rate (MPR) averaged 13.94 percent, reflecting a generally tight monetary stance, while the Cash Reserve Ratio (CRR) averaged 25.80 percent, underscoring the restrictive liquidity environment faced by banks. Bank size, measured as the natural logarithm of total assets, showed moderate dispersion, suggesting structural differences among the sampled banks. The interaction terms further reflect the scale-adjusted exposure of banks to monetary policy instruments.



**Table 2: Pearson Correlation Matrix**

Variables	CAR	MPR	CRR	Bank Size	MPR×Size	CRR×Size
CAR	1.000					
MPR	-0.312	1.000				
CRR	-0.228	0.461	1.000			
Bank Size	0.557	-0.093	-0.141	1.000		
MPR × Size	-0.271	0.889	0.400	0.520	1.000	
CRR × Size	-0.241	0.425	0.917	0.571	0.682	1.000

Source: Authors’ computation using EViews 12 (2025).

The Pearson correlation matrix presented in Table 2 indicates that CAR is negatively correlated with both MPR (-0.312) and CRR (-0.228), while exhibiting a positive correlation with bank size (0.557). These preliminary relationships are consistent with theoretical expectations. Although the interaction terms are strongly correlated with their respective monetary policy variables, this is expected by construction. The Variance Inflation Factor (VIF) results reported in Table 3 show that all variables have VIF values below the conventional threshold of 10, with a mean VIF of 2.87, confirming the absence of serious multicollinearity concerns.

**Table 3: Variance Inflation Factor (VIF) Test for Multicollinearity**

Variable	VIF	1/VIF
Monetary Policy Rate (MPR)	2.41	0.414
Cash Reserve Ratio (CRR)	2.98	0.335
Bank Size	1.65	0.606
MPR × Bank Size	3.42	0.292
CRR × Bank Size	3.89	0.257
<b>Mean VIF</b>	<b>2.87</b>	

Source: Authors’ computation using EViews 12 (2025).

Table 3 presents the results of the Variance Inflation Factor (VIF) test conducted to assess the presence of multicollinearity among the explanatory variables included in the regression model. The VIF values for the core monetary policy variables Monetary Policy Rate (MPR) and Cash Reserve Ratio (CRR) are 2.41 and 2.98, respectively, while Bank Size records a VIF of 1.65. These values are well below the commonly accepted threshold of 10 (and even the more conservative benchmark of 5), indicating that multicollinearity is not a serious concern among the main regressors.

With respect to the interaction terms, MPR × Bank Size and CRR × Bank Size, the VIF values of 3.42 and 3.89, respectively, are slightly higher than those of the

individual variables, which is expected due to the construction of interaction terms. However, these values remain within acceptable limits and do not suggest harmful multicollinearity. The corresponding tolerance values (1/VIF), all exceeding 0.20, further confirm the absence of multicollinearity problems in the model.

The mean VIF of 2.87 indicates a low to moderate level of correlation among the regressors, which is not sufficient to bias the estimated coefficients or inflate their standard errors. Therefore, the model satisfies the multicollinearity assumption, and the estimated regression results can be considered reliable for inference.

**Table 4: Hausman Specification Test**

Test Statistic	Value
Chi-square	14.82
Degrees of Freedom	5
Probability (p-value)	0.0119

Source: Authors’ computation using EViews 12 (2025).

Table 4 reports the results of the Hausman specification test conducted to determine the appropriate panel estimation technique between the Fixed Effects (FE) and Random Effects (RE) models. The test yields a chi-square statistic of 14.82 with 5 degrees of freedom and an associated probability (p-value) of 0.0119.

Since the p-value is statistically significant at the 5% level, the null hypothesis that the Random Effects estimator is consistent and efficient is rejected. This indicates the presence of systematic differences between the FE and RE estimators, implying that the unobserved bank-specific effects are correlated with the explanatory variables in the model.



Consequently, the Fixed Effects model is considered more appropriate for this study. The adoption of the Fixed Effects estimator ensures that time-invariant, bank-specific heterogeneity is adequately controlled

for, thereby producing unbiased and consistent parameter estimates for analyzing the impact of monetary policy variables and bank characteristics on the dependent variable.

**Table 5: Fixed Effects Regression Results: Monetary Policy and Capital Adequacy (Model 1)**

Variable	Coefficient	Std. Error	t-Statistic	p-value
Monetary Policy Rate (MPR)	-0.462	0.188	-2.46	0.015
Cash Reserve Ratio (CRR)	-0.298	0.121	-2.46	0.016
Constant	24.114	3.812	6.32	0.000
R <sup>2</sup>	0.334			
Adjusted R <sup>2</sup>	0.303			
F-statistic	10.88			0.000

Source: Authors' computation using EViews 12 (2025).

The Fixed Effects regression results for Model 1, reported in Table 5, examine the direct effect of monetary policy on capital adequacy. The results indicate that both the Monetary Policy Rate and Cash Reserve Ratio exert statistically significant negative effects on CAR. Specifically, MPR has a coefficient of -0.462 (p = 0.015), implying that increases in policy interest rates significantly reduce banks' capital adequacy. This reflects the transmission of monetary tightening through higher funding costs, constrained credit expansion, and reduced profitability. Similarly,

CRR exhibits a negative and statistically significant coefficient of -0.298 (p = 0.016), suggesting that higher reserve requirements weaken banks' capital positions by limiting liquidity and income-generating capacity.

The overall model is statistically significant (F-statistic = 10.88, p < 0.01), with an adjusted R<sup>2</sup> of 0.303, indicating that monetary policy variables explain approximately 30 percent of the variation in capital adequacy across banks and over time.

**Table 6: Fixed Effects Regression Results: Monetary Policy, Bank Size and Capital Adequacy (Model 2)**

Variable	Coefficient	Std. Error	t-Statistic	p-value
Monetary Policy Rate (MPR)	-0.381	0.174	-2.19	0.033
Cash Reserve Ratio (CRR)	-0.201	0.118	-1.71	0.090
Bank Size	1.842	0.553	3.33	0.001
Constant	-18.012	10.404	-1.73	0.087
R <sup>2</sup>	0.441			
Adjusted R <sup>2</sup>	0.406			
F-statistic	12.58			0.000

Source: Authors' computation using EViews 12 (2025).

Model 2 incorporates bank size alongside the monetary policy variables. The results, presented in Table 6, show that bank size has a positive and highly statistically significant effect on capital adequacy, with a coefficient of 1.842 (p = 0.001). This implies that larger banks maintain significantly stronger capital positions than smaller banks, reflecting economies of scale, diversified income sources, superior risk-management capacity, and better access

to capital markets.

The inclusion of bank size improves the explanatory power of the model substantially, as the adjusted R<sup>2</sup> increases from 0.303 in Model 1 to 0.406 in Model 2. The joint significance of the model is confirmed by an F-statistic of 12.58 (p < 0.01).

**Table 7: Moderation Results: Bank Size as Moderator (Model 3)**

Variable	Coefficient	Std. Error	t-Statistic	p-value
Monetary Policy Rate (MPR)	-0.201	0.142	-1.41	0.161
Cash Reserve Ratio (CRR)	-0.144	0.107	-1.34	0.182
Bank Size	1.502	0.421	3.57	0.001
MPR × Bank Size	-0.067	0.028	-2.39	0.018
CRR × Bank Size	-0.044	0.020	-2.21	0.029
Constant	-13.841	9.602	-1.44	0.153
R <sup>2</sup>	0.563			
Adjusted R <sup>2</sup>	0.517			
F-statistic	12.43			0.000

Source: Authors' computation using EViews 12 (2025).



To examine whether bank size moderates the relationship between monetary policy and capital adequacy, interaction terms between bank size and each monetary policy variable (MPR × Size and CRR × Size) were introduced in Model 3. The results reported in Table 7 reveal that both interaction terms are negative and statistically significant. Specifically, the coefficient of MPR × Size is -0.067 (p = 0.018), while that of CRR × Size is -0.044 (p = 0.029).

In Model 3, the direct effects of MPR and CRR

become statistically insignificant, while bank size remains positive and highly significant (coefficient = 1.502, p = 0.001). This pattern confirms the presence of a true moderation effect rather than a purely direct relationship. The model exhibits the highest explanatory power, with an adjusted R<sup>2</sup> of 0.517, indicating that over 50 percent of the variation in capital adequacy is explained when the moderating role of bank size is accounted for. The model is jointly significant (F-statistic = 12.43, p < 0.01).

**Table 8: Summary of Hypotheses Testing Results**

Hypothesis	Relationship Tested	Test Statistic / Evidence	Decision
-	Monetary Policy (MPR, CRR) - Capital Adequacy (CAR)	MPR: $\beta = -0.462, p = 0.015$ CRR: $\beta = -0.298, p = 0.016$	Rejected
-	Bank Size - Capital Adequacy (CAR)	Size: $\beta = 1.842, p = .001$ (Model 2)	Rejected
-	Bank Size × Monetary Policy - Capital Adequacy (CAR)	MPR × Size: $\beta = -0.067, p = .018$ ; CRR × Size: $\beta = -0.044, p = .029$ (Model 3)	Rejected

Note. CAR = capital adequacy ratio; MPR = monetary policy rate; CRR = cash reserve ratio; Size = natural logarithm of total assets.

Source: Authors' computation using EViews 12 (2025).

Table 8 provides clear evidence on the relationships between monetary policy variables, bank size, and capital adequacy ratio (CAR) among Nigerian deposit money banks.

For Hypothesis H<sub>01</sub>, which posits that monetary policy variables (Monetary Policy Rate and Cash Reserve Ratio) have no significant effect on capital adequacy, the regression results show that both MPR ( $\beta = -0.462, p = 0.015$ ) and CRR ( $\beta = -0.298, p = 0.016$ ) exert statistically significant negative effects on CAR. The rejection of H<sub>01</sub> indicates that tighter monetary policy conditions, reflected in higher policy rates and reserve requirements, significantly reduce banks' capital adequacy. This suggests that increases in MPR and CRR constrain banks' balance sheet flexibility and earnings capacity, thereby weakening their capital positions.

With respect to Hypothesis H<sub>02</sub>, which states that bank size has no significant influence on capital adequacy, the estimated coefficient for bank size is positive and highly significant ( $\beta = 1.842, p = 0.001$ ). The rejection of H<sub>02</sub> implies that larger banks tend to maintain higher capital adequacy ratios compared to smaller banks. This finding suggests that larger banks benefit from economies of scale, stronger earnings capacity, and better access to capital markets, enabling them to sustain stronger capital buffers.

Regarding Hypothesis H<sub>03</sub>, which examines the moderating role of bank size on the relationship between monetary policy and capital adequacy, the interaction terms MPR × Size ( $\beta = -0.067, p = 0.018$ ) and CRR × Size ( $\beta = -0.044, p = 0.029$ ) are both

negative and statistically significant. The rejection of H<sub>03</sub> indicates that bank size significantly moderates the impact of monetary policy on CAR. Specifically, the negative interaction effects suggest that the adverse impact of tighter monetary policy on capital adequacy becomes more pronounced as bank size increases, implying that larger banks are more sensitive to monetary tightening in terms of capital adequacy outcomes.

These findings indicate that bank size significantly conditions the impact of monetary policy on capital adequacy. Although monetary tightening generally weakens banks' capital positions, larger banks experience relatively less adverse effects compared to smaller banks. This suggests that larger banks possess stronger shock-absorption capacity, more diversified funding structures, and superior liquidity and capital management frameworks that mitigate the effects of restrictive monetary policy.

**Discussion of Findings**

This study results show that contractionary monetary policy, proxied by the Monetary Policy Rate (MPR) and the Cash Reserve Ratio (CRR), exerts a negative effect on banks' Capital Adequacy Ratio (CAR). This indicates that monetary tightening weakens banks' ability to sustain adequate capital buffers by increasing funding costs, restricting credit expansion, and compressing profitability. Higher policy rates raise the cost of funds and reduce loan demand, while elevated reserve requirements constrain banks' liquidity and limit income-generating assets. These dynamics reduce retained earnings, which constitute a primary source of internal capital accumulation for

Nigerian banks. This finding is consistent with the monetary transmission mechanism, which emphasizes the interest rate and credit channels through which monetary policy affects bank balance sheets (Bernanke & Gertler, 1995; Mishkin, 2019). Empirically, the result corroborates earlier Nigerian studies that document the adverse impact of restrictive monetary policy on bank capital strength (Uchenna & Ezeabasili, 2020; Adegbite & Oladele, 2020; Olawale, 2024).

Beyond monetary policy effects, the study finds that bank size plays a significant and positive role in determining capital adequacy. Larger banks consistently maintain higher capital adequacy ratios than smaller banks, reflecting structural advantages such as economies of scale, diversified income streams, stronger risk management frameworks, and better access to capital markets. These characteristics enhance large banks' ability to generate earnings, manage risks, and comply with prudential capital requirements, even in periods of macroeconomic stress. This result supports capital buffer theory, which posits that financially stronger banks are more capable of holding capital above regulatory minima to absorb shocks (Calem & Rob, 1999). The finding also aligns with empirical evidence from the Nigerian banking sector showing that bank size significantly enhances capital adequacy and resilience (Olawale & Akande, 2016; Ibrahim & Yusuf, 2020; Adegbite & Ojo, 2021).

A key contribution of this study is the evidence that bank size significantly moderates the relationship between monetary policy and capital adequacy. The significant interaction effects between bank size and both monetary policy instruments indicate that the impact of monetary tightening on capital adequacy is heterogeneous across banks. Specifically, while increases in MPR and CRR generally weaken capital adequacy, larger banks experience relatively less severe reductions in CAR compared to smaller banks. This suggests that large banks possess greater shock-absorption capacity, more stable deposit structures, diversified asset portfolios, and enhanced liquidity management capabilities that mitigate the adverse effects of restrictive monetary policy. This finding is consistent with Berger and Udell (2014), who argue that bank size conditions the extent to which monetary policy affects banks' capital formation and resilience.

Similarly, the moderating effect of bank size on the CRR–capital adequacy relationship indicates that liquidity-absorbing regulatory measures disproportionately affect smaller banks. While higher reserve requirements reduce capital adequacy across the banking sector, larger banks are better positioned to absorb liquidity shocks due to stronger balance sheets and broader funding options. Smaller banks, by

contrast, face tighter liquidity constraints and limited access to alternative funding sources, making them more vulnerable to capital erosion during periods of monetary tightening. This result is in line with previous studies that emphasize the size-dependent effects of reserve requirements on bank performance and stability (Ibrahim & Musa, 2021; Onu & Okafor, 2022; Adegbite & Oladele, 2020).

The findings underscore that the effect of monetary policy on bank capital adequacy in Nigeria is neither uniform nor linear but is significantly conditioned by bank size. This has important implications for monetary and regulatory policy design, suggesting that uniform policy tightening may unintentionally exacerbate vulnerabilities among smaller banks while larger institutions remain relatively resilient. Recognizing bank-level heterogeneity is therefore essential for designing balanced monetary and macroprudential policies that promote both price stability and financial system resilience in emerging economies such as Nigeria.

## CONCLUSION AND RECOMMENDATIONS

This study examined the effect of monetary policy on the capital adequacy of listed deposit money banks in Nigeria, with particular emphasis on the role of bank size and its moderating influence on the monetary policy–capital adequacy relationship. Using balanced panel data from thirteen listed banks over the period 2015–2024 and applying fixed effects estimation, the study provides robust empirical evidence on how macroeconomic policy instruments and bank-specific characteristics jointly shape banking sector resilience in a developing economy.

The findings reveal that contractionary monetary policy, proxied by the Monetary Policy Rate and the Cash Reserve Ratio, exerts a negative influence on banks' capital adequacy. Monetary tightening increases funding costs, constrains liquidity, and reduces profitability, thereby weakening banks' capacity to accumulate and sustain regulatory capital buffers. This confirms that monetary policy actions, while aimed at macroeconomic stabilization, can generate adverse balance-sheet effects for banks if applied persistently without complementary safeguards.

The study further establishes that bank size is a significant and positive determinant of capital adequacy. Larger banks are consistently better capitalized than smaller banks, reflecting advantages such as economies of scale, diversified income structures, superior risk management capabilities, and stronger access to capital markets. These structural strengths enhance the resilience of large banks and enable them to comply more effectively with prudential capital requirements, even under challenging macroeconomic conditions.

Most importantly, the study demonstrates that bank size significantly moderates the relationship between monetary policy and capital adequacy. The interaction effects show that the adverse impact of monetary tightening on capital adequacy is less pronounced for larger banks, while smaller banks experience disproportionately greater capital erosion. This confirms that the transmission of monetary policy to bank capital is heterogeneous and strongly conditioned by institutional size.

The study concludes that the effect of monetary policy on capital adequacy in Nigeria is not uniform across banks. Bank size plays a critical buffering role that shapes banks' ability to withstand monetary and regulatory shocks. These findings underscore the importance of incorporating bank-level heterogeneity into monetary and macroprudential policy frameworks. A one-size-fits-all approach to policy tightening may unintentionally undermine the capital strength of smaller banks and pose risks to financial stability. Consequently, policymakers should adopt more nuanced and size-sensitive policy measures that balance macroeconomic stabilization objectives with the need to maintain a resilient and inclusive banking sector.

### Recommendations

Based on the findings of this study, the following policy and managerial recommendations are proposed to enhance the effectiveness of monetary policy and strengthen capital adequacy in the Nigerian banking sector.

1. The Central Bank of Nigeria (CBN) should incorporate bank size considerations into the design and implementation of monetary and macroprudential policies. The findings show that monetary tightening disproportionately weakens the capital adequacy of smaller banks compared to larger banks. Consequently, a uniform application of restrictive monetary instruments such as high Monetary Policy Rate (MPR) and Cash Reserve Ratio (CRR) may unintentionally exacerbate vulnerabilities among small and medium-sized banks. The CBN should therefore consider differentiated or phased policy adjustments, especially during periods of aggressive tightening, to reduce adverse capital erosion among smaller institutions while preserving overall financial stability.
2. Given the negative impact of contractionary monetary policy on banks' capital adequacy, monetary tightening should be complemented with targeted macroprudential measures. For instance, the CBN may introduce countercyclical capital buffers, temporary regulatory forbearance, or liquidity support facilities during periods of sustained tightening. Such measures would help banks maintain adequate capital buffers without undermining the effectiveness of monetary policy in controlling inflation and stabilizing the macroeconomy.
3. Deposit money banks, particularly smaller institutions, should strengthen their internal capital planning, liquidity management, and risk management frameworks. Since smaller banks are more vulnerable to monetary tightening, management should prioritize the accumulation of capital buffers during expansionary periods and adopt conservative dividend and payout policies. Enhanced stress testing and scenario analysis should also be institutionalized to assess the potential impact of policy shocks on capital adequacy and liquidity positions.
4. Banks should be encouraged to diversify their sources of capital and funding beyond traditional deposit-based structures. Increased reliance on retained earnings, long-term debt instruments, and equity market financing can enhance banks' ability to withstand liquidity and interest-rate shocks induced by monetary policy tightening. For smaller banks, improved access to capital markets supported by regulatory incentives and improved disclosure standards would reduce excessive dependence on short-term funding and strengthen capital resilience.
5. Given the strong positive relationship between bank size and capital adequacy, policymakers should view strategic consolidation as a potential tool for enhancing banking sector resilience. While forced consolidation may not be desirable, voluntary mergers and acquisitions among smaller banks could improve economies of scale, capital strength, and shock-absorption capacity. In addition, capacity-building initiatives focused on governance, risk management, and capital optimization should be promoted across the banking sector.
6. Effective coordination between monetary policy and banking regulation is essential to avoid conflicting policy outcomes. The CBN should ensure that monetary policy decisions are aligned with prudential objectives related to capital adequacy and financial stability. Improved coordination would help mitigate situations where monetary tightening aimed at inflation control inadvertently weakens bank capital and increases systemic risk.
7. Future studies should extend the scope of analysis by incorporating additional monetary

policy instruments such as liquidity ratios, open market operations, and macroprudential indicators. Further research could also explore non-linear and threshold effects of monetary policy on capital adequacy, as well as comparative analysis between listed and non-listed banks or across different African economies to enhance the generalizability of findings.

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