The Effect of Capital Adequacy Regulations on the Financial Performance of Deposit Money Banks in Nigeria.

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ABSTRACT

The ongoing distress in the Nigerian banking sector raises the question of whether the current regulatory framework is effective in both ensuring financial system stability and enabling banks to earn profits for their shareholders. Among the requirements, the capital adequacy regulations are of particular concern: do they strengthen the stability of the financial sector or constrain banks' ability to deliver returns to shareholders? This study examines the effect of capital adequacy regulations on the performance of deposit money banks in Nigeria. The survey period is from Q1 2015 to Q1 2025. The study used return on equity as the measure of bank performance (dependent variable) and capital adequacy ratio as the independent variable. Asset quality and liquidity were considered as control variables. The inflation rate was included to account for external shocks. Appropriate econometric analysis was conducted using the Autoregressive Distributed Lag (ARDL) bounds testing approach. The major finding is that capital adequacy regulations have a significant adverse effect on bank performance in both the short and long run. Asset quality has a considerable influence, while liquidity and inflation do not. Other tests for model selection, stability, serial correlation, heteroskedasticity, and normality confirm the model's suitability. The study concludes that while capital adequacy regulations are necessary for systemic stability, their strict enforcement at high levels can constrain bank profitability. Policymakers need to strike a balance by adopting a risk-sensitive approach to capital regulation, enhancing asset quality management, applying countercyclical capital buffers, and introducing discretionary flexibility during economic shocks. These recommendations align the goals of prudential supervision with banks' dynamic performance objectives, thereby improving outcomes for the macroeconomic environment in which these banks operate. Overall, policymakers, regulators, and capital bank managers can benefit from the study's findings by ensuring that banks operate with adequate capital levels that support, rather than hinder, performance in Nigeria's banking sector.

Keywords: Capital Adequacy Ratio, Financial Performance, Return on Equity, Asset Quality, Liquidity, External Shocks, ARDL, Nigeria. **JEL Codes:** G21, G28, C32, E44, E52.

INTRODUCTION

The banking sector serves as an essential vehicle for mobilising savings and investments worldwide. To fulfil this role, it is vital that banks can pool funds from economic agents in a sound and stable manner. As a result, regulation intervenes in the financial intermediation process, with capital adequacy regulation serving as the linchpin. On a conceptual level, capital is deemed the last line of defence for a bank and, hence, essential to financial stability (Berger & Bouwman, 2013; Athanasoglou, Brissimis, & Delis, 2008). Furthermore, adequate capitalisation is considered critical for mitigating agency problems, absorbing unexpected losses, providing an extra layer of protection for depositors, and preserving the reputation of bank executives.

Against the backdrop of the above concerns, the Central Bank of Nigeria has consistently introduced regulations aligned with international best practices to maintain the stability of the Nigerian banking sector. This

development has culminated in unintended consequences for critical bank-level performance variables, such as bank capitalisation, in Nigeria. By any objective standard, the Basel Capital Accord framework is a landmark; for the first time, the capital position of a bank was consolidated, making capital a fundamental regulatory requirement. Central to the Basel framework is the Capital Adequacy Ratio, defined as the ratio of a bank's regulatory capital to its risk-weighted assets. This ratio is critical to a bank for two reasons. First, it measures the bank's ability to absorb shocks due to its capital buffer. Second, it is a signal to investors, depositors, and other agents who are not in a position to internalise the bank's risk, which is particularly desirable when adverse selection is an issue (BIS, 2019). Capital adequacy regulation, however, has resulted in mixed perceptions among stakeholders in the banking sector, with some arguing that it has contributed to greater banking sector stability, particularly in developed economies.

In contrast, others argue that it has negatively impacted the profitability of banks in both developed and emerging economies, as higher capital requirements limit risk-taking and thereby constrain growth opportunities, particularly in the absence of deposit insurance. However, findings on this are mixed in the existing empirical literature. While some studies find a positive relationship, others see a negative one, and still others find none at all. Different variables used to measure capital and bank profitability, as well as differences in methodologies and time frames used in the analyses, may explain this difference.

Return on equity is a commonly used measure of a bank's performance, as it shows how effectively its management uses shareholders' equity to generate profit (Almazari & Alamri, 2017). A high capital adequacy ratio can lead to lower ROE because the bank is unable to lend more to customers in the short term. On the other hand, banks that hold more capital may have lower operational risk exposure, thereby improve performance and attracting more investors in the long run. Empirical evidence on the direction of this relationship is inconclusive and does not exist for the Nigerian banking industry, which warrants further investigation.

Besides the capital, other internal factors affecting a bank's performance include liquidity and asset characteristics. A bank with sufficient liquidity will not only be able to meet customer withdrawals but also cover non-interest liabilities without incurring a loss from the early sale of assets (Vodová, 2011). The quality of assets also reflects a bank's overall performance, as measured by the ratio of nonperforming loans to total loans. When the volume of nonperforming loans is high, the income accrued is neither made available to the bank nor released into the economy, resulting in a significant loss for the bank (Nkusu, 2011). Poor asset quality has long characterised the Nigerian banking industry, particularly during recessionary periods.

Macroeconomic factors also influence banks' financial performance, in addition to their internal factors. Among these factors, inflation affects banks by changing the real value of financial assets, the real cost of funds, and the real value of loan repayments. While high or rising inflation may reduce banks' profitability through rising operational costs and diminishing returns on loans, moderate inflation can increase loan demand, stimulate business activity, and thus enhance banks' profitability (Perry, 1992; Djalilov & Piesse, 2016). Nigeria has experienced double-digit inflation since the 2016 recession. Since the COVID-19 pandemic shock, inflation in Nigeria has remained in double digits. Thus, both inflation and real inflation effects are relevant external shock variables for examining characteristics of Nigerian banks' financial performance.

The effect of capital adequacy regulation on the financial performance of Nigerian banks is relatively underexplored. Existing studies have focused on the interaction of three internal bank factors – capital, liquidity, and asset quality - as well as inflation and external macroeconomic shocks, as one of the determinants of a bank's financial performance. Exhaustive studies have shown that capital adequacy regulation has been implemented to ensure the sound operation and stability of the Nigerian economy. Regulatory capital requirements were increased to empower banks to absorb losses and protect depositors. Supervisory and regulatory policies were also implemented after the repeated banking crises of 2005–2009 to maintain shareholders' loan-loss reserves at 4 per cent. Given the importance of capital adequacy regulation, along with other bank-specific determinants and a macroeconomic shock in banks' financial performance, it is critical to investigate the extent to which being capital compliant is profitable, thus beneficial for shareholders; or being capital compliant reduces the bank's risks of depositors and the banking system, but goes against the profitability of owners' funds. The investigation is vital because Nigerian banks operate in an economy characterised by relatively high inflation and other unfavourable macroeconomic conditions. Empirical investigation is also important and relevant in light of the

extreme levels of gain or loss determined by epsilon and delta. The macroeconomic shocks could also change over the years considered for the data period used in the examination. Therefore, considering both internal and external factors, as well as their combined effect, where relevant, is essential for effective regulation and management. Hence, capital adequacy regulation, liquidity, asset quality risk, and inflation, along with one external macroeconomic shock variable, were considered in a model of bank capital profitability, along with their financial performance.

Capital requirements regulations have likely affected the financial performance of deposit money banks in Nigeria from Q1 2015 to Q1 2025. Specifically, this study aims to investigate the effect of the capital adequacy ratio on return on equity, a proxy for the financial performance of deposit money banks in Nigeria, while controlling for liquidity, asset quality, and inflation. We have the prior that poor asset quality reduces profitability regardless of the capital base, that excessive liquidity adversely affects ROE, and that under liquidity increases risk. IFRS adoption necessarily increases asset quality but reduces profitability. Additionally, inflation and interest rates escalate the cost of funds, absolute returns, and loan quality. Note that macroeconomic factors, such as inflation, operate externally to the banks but still affect their performance.

According to Solomon et al (2019), capital is the collateral placed in trust to protect depositors and creditors. Capital provides the first line of defence for any shortfall expected due to surprisingly high loan losses. High leverage increases the likelihood that the bank's equity holders will not recover their investment. As leverage increases, banks' returns become more volatile and risky. In a world with deposit insurance and no risk-sensitive capital regulation, risk management is displaced: banks will choose the safest risk policy, which maximises deposit-seeking franchise value. In this model, equity could function as a buffer against loss.

In line with the objectives, the following null hypotheses are tested:

- **H₀₁:** Capital adequacy ratio has no significant effect on the return on equity of deposit money banks in Nigeria.

- **H₀₂:** Liquidity has no significant effect on the return on equity of deposit money banks in Nigeria.

- **H₀₃:** Asset quality has no significant effect on the return on equity of deposit money banks in Nigeria.

- **H₀₄:** Inflation has no significant effect on the return on equity of deposit money banks in Nigeria.

Given these objectives, the study's findings contribute to the policy debate on balancing regulation and profitability in the Nigerian banking sector, providing insights for bank managers and regulators on enhancing bank stability and performance. The remaining part of the study is structured as follows: Section 2 outlines the theoretical underpinnings, a review of related literature, and the research gap. Section 3 presents the data and the methodology used. Section 4 presents the results and discusses the findings. Section 5 concludes with policy implications.

Conceptual, Theoretical, and Review of Related Literature

Conceptual Framework

Figure 1: Conceptual Framework for the Study of CAR, LIQ, AQ, INF, and ROE of Deposit Money Banks. The conceptual framework above displays the variables examined in the empirical analysis. The Capital Adequacy Ratio (CAR) is the independent variable, which tests the effect of required capital on bank performance, as measured by Return on Equity. Liquidity and Asset Quality are the control variables that capture the specific internal banking features that either stimulate or depress profitability levels as they flow through the relationship. Inflation captures the external shock variable in the macro-shock-driven effect on profitability, reflecting the impact of macroeconomic uncertainties on the bank's performance. Return on Equity (ROE) acts as the dependent variable and proxy for performance. Unidirectional arrows indicate the hypothesised direction of relationships between the independent and dependent variables, as well as the spliced combined effect of regulatory, internal, and external macro-elements on the overall performance of deposit money banks in Nigeria.
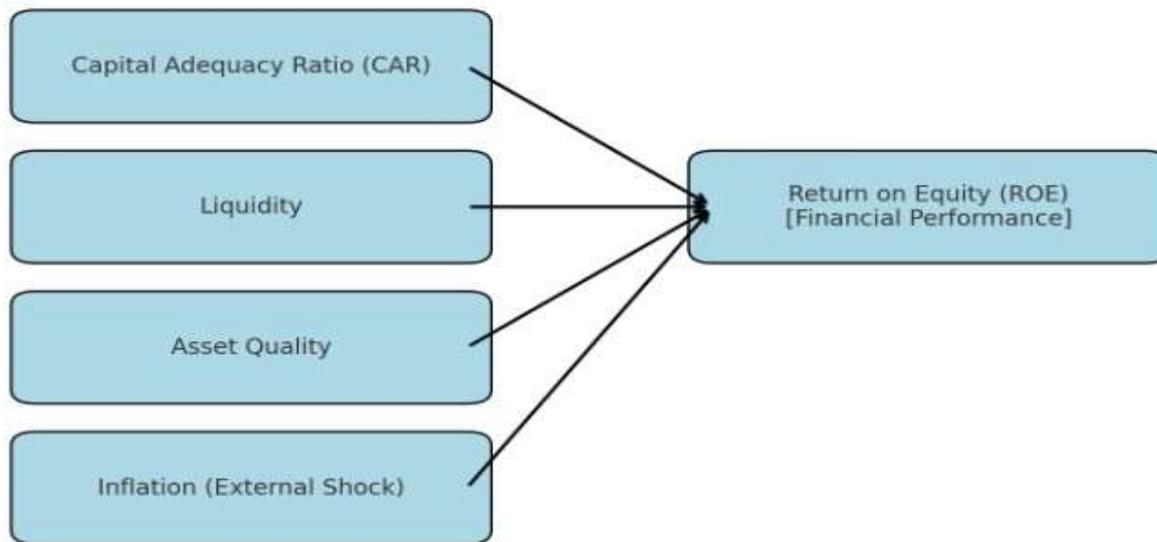
Figure 1: Conceptual Framework of the series under investigation. Source: Author Draft

THEORETICAL FRAMEWORK

This study uses the Capital Buffer Theory and the Risk-Return Trade-off Theory as its conceptual framework. The Capital Buffer Theory, as propounded within the Basel framework, posits that banks voluntarily hold capital in excess of the minimum capital requirements to minimise the likelihood of financial distress and the consequent risk of regulatory sanctions or penalties (Ayuso, Pérez, & Saurina, 2004). Capital regulation thus serves as an instrument to enhance macroeconomic stability by ensuring banks' capacity to absorb unexpected shocks. However, a higher capital ratio may restrain over-lending by banks, thereby decreasing the banks' profitability.

The Risk-Return Trade-off Theory posits that banks will earn lower returns as they constrain their risk-taking due to higher capital requirements (Markowitz, 1952). The implementation of a higher capital requirement reduces risk-taking incentives, leading shareholders to prefer loan/syndicated borrowers with smaller risk profiles. In the long term, the decrease in returns might be compensated for (through lower loan rates) by a lower expected default probability. On the other side of the fence, excessive risk-taking behaviour to boost equity returns will deteriorate the quality of the bank's assets, increasing the risk of loan defaults and affecting the bank's expected returns. The same applies to liquidity risk, where banks can either invest in liquid or illiquid, higher-yielding assets.

However, an exogenous macroeconomic shock, such as inflation, alters the constructs of both theories by affecting the overall lending environment, borrowers' indebtedness, repayment behaviour, deposit currency composition, market structure, business models, and even the real value of equity. Drawing on this theoretical background, the study examines how capital adequacy, liquidity risk, asset quality, and bank-specific capital buffers respond to exogenous macroeconomic shocks and how these responses affect the profitability of Nigerian banks.

REVIEW OF RELATED LITERATURE

The adequacy of bank capital is widely recognised as a central determinant of financial performance, particularly within the Nigerian deposit money banks (DMBs). Existing studies generally highlight that compliance with capital adequacy regulations not only stabilises banks but also enhances their operational efficiency. For instance, Ezu, Nwanna, and Eke-Jeff (2023) report that a robust capital adequacy ratio (CAR) positively correlates with financial performance, as higher capital buffers shield banks from economic shocks and strengthen investor confidence by signalling prudent management. Similarly, Abba et al. (2018) emphasise that regulatory capital requirements encourage improvements in banks' capital structures, which in turn enhance return on assets (ROA) and return on equity (ROE). In line with this, Udom and Eze (2018) find that adherence to capital adequacy requirements significantly promotes profitability by enabling banks to absorb potential losses.

The adoption of the Basel III framework has reinforced these dynamics. Abdul (2017) notes that Nigerian banks have adapted to the CBN's stricter capital requirements, thereby reducing systemic risk and aligning with international best practices. However, contrary evidence exists. Ogunode, Awoniyi, and Ajibade (2022) argue that while capital adequacy improves performance, it may constrain liquidity, which is vital for daily operations. Likewise, Nwankwo (2019) cautions that smaller banks face significant challenges in meeting regulatory requirements, often leading to a reduced market share and profitability—a concern also raised by Amahalu et al. (2017).

Beyond stability, adequate capital also enhances banks' operational capacity. Ruggah et al. (2024) highlight that well-capitalised banks are better positioned to expand into diverse services, boosting income streams and competitiveness. Soomiyol, Bwuese, and Yua (2023) note that stringent CBN directives indirectly promote improved risk management practices, thereby enhancing overall financial health. Olawale (2024) similarly emphasises that resilience in volatile economies is closely tied to higher capital reserves, which help banks sustain profitability during downturns. Complementing these findings, Aliyu, Abdullyhi, and Bakare (2020) provide empirical evidence linking robust CARs to effective risk management, creditor confidence, and improved global performance. Expanding the focus, Nyanyuki, Nyanga'u, and Onwonga (2022) demonstrate that capital adequacy influences bank performance not only in Nigeria but across multiple markets, underscoring its global relevance. Emmanuel, Musa, and Udi Polycarp (2022) further recommend sustained collaboration between regulators and banks to refine prudential directives that strike a balance between stability and profitability.

International evidence broadly mirrors these trends. Berger and Bouwman (2013) show that well-capitalised banks in the U.S. were more resilient and profitable during financial crises, while Bitar, Pukthuanthong, and Walker (2018) confirm that Basel III capital standards strengthened stability and profitability in well-regulated markets. Nonetheless, dissenting views exist: Barth, Caprio, and Levine (2013) argue that stringent capital requirements may restrict credit expansion, thereby limiting profitability. Similarly, Almazari and Alamri (2017), studying Saudi banks, report that higher CARs reduced returns on equity, highlighting the trade-off between stability and profitability.

Beyond capital adequacy, bank-specific characteristics also play a role. Liquidity plays a critical role: Vodová (2011) notes that while adequate liquidity underpins stability, excessive liquidity can reduce profitability by limiting lending opportunities. Asset quality, commonly measured by nonperforming loans (NPLs), has a consistently negative impact on returns (Nkusu, 2011; Athanasoglou, Brissimis, & Delis, 2008). At the macroeconomic level, inflation exerts mixed effects: Perry (1992) suggests moderate inflation can spur lending and boost profitability, whereas excessive inflation undermines loan quality. Djalilov and Piesse (2016) find that inflation hurts profitability in transition economies, reflecting macroeconomic fragility.

In the Nigerian context, earlier research has mainly focused on specific reform eras or crisis periods. Adegbaju and Olokoyo (2008) find that post-consolidation capitalisation improved stability but had mixed effects on profitability. More recent evidence (Onoh & Nwachukwu, 2017) indicates that persistent asset-quality issues, exceptionally high NPLs, have eroded performance despite regulatory capital buffers. Yet, comprehensive studies that integrate capital adequacy, liquidity, asset quality, and inflation over an extended recent period remain limited.

The Nigerian banking sector during the study period (2015Q1–2025Q1) experienced significant regulatory reforms and macroeconomic disruptions that shape the interpretation of the results. First, the post-2009 banking crisis reforms led to strengthened prudential supervision, stricter capital requirements, and enhanced risk-based supervision by the Central Bank of Nigeria (CBN). The implementation of Basel II/III-inspired capital frameworks, higher minimum capital thresholds for internationally licensed banks, and intensified stress testing requirements increased compliance pressure on deposit money banks. Second, the 2016 economic recession—triggered by oil price collapse and foreign exchange shortages—significantly deteriorated asset quality, as reflected in rising nonperforming loans. This period exposed structural weaknesses in credit risk management and heightened the importance of capital buffers. Third, the COVID-19 pandemic (2020–2021) introduced unprecedented liquidity interventions, regulatory forbearance measures, loan restructuring programs, and temporary capital relief measures. These interventions may have moderated the short-run profitability effects of

capital regulation.

Fourth, Nigeria's persistent double-digit inflation, exchange rate volatility, and monetary tightening cycles during 2022–2024 created an environment of macro-financial uncertainty. Inflationary pressures eroded real returns and increased credit risk, although the ARDL results show that inflation did not exert a statistically significant direct effect on ROE. These structural reforms and macroeconomic shocks provide important context for interpreting the negative long-run relationship between capital adequacy and profitability. The results suggest that in a volatile emerging-market environment, the cost of maintaining high regulatory capital may outweigh short-term profitability gains, particularly when asset quality challenges persist.

Conclusively, the literature reveals a multifaceted relationship between capital adequacy regulations and the performance of Nigerian banks. While robust CARs generally enhance stability and profitability, they may also constrain liquidity and disproportionately burden smaller banks. A balanced approach that considers capital requirements alongside liquidity management, asset quality, and macroeconomic conditions is, therefore, essential to ensure both resilience and sustainable profitability in the Nigerian banking sector.

Research Gap

Two primary gaps arise from the reviewed literature. First, while international studies highlight the dampening influence of capital adequacy, the findings are often specific to particular jurisdictions and do not fully capture the intricacies of Nigeria's banking landscape, which is characterised by regulatory shifts, oil price volatility, and entrenched inflation. Second, Nigerian-centric investigations often focus solely on capital adequacy, failing to adequately address how interactions between liquidity, asset quality, and external shocks, such as inflation, coalesce to influence bank performance.

To address these issues, the study examines the impact of capital adequacy regulation on the financial performance of deposit money banks in Nigeria, utilising quarterly data from 2015Q1 to 2025Q1. By introducing liquidity, asset quality, and inflation as additional explanatory variables alongside capital adequacy, the analysis provides a more comprehensive understanding of the multifaceted determinants of bank performance in Nigeria's dynamic macroeconomic environment. Consequently, the research deepens the existing empirical discourse on bank regulation and informs policy discussions regarding the dichotomy of regulatory adherence and profitability in Nigeria's banking framework.

DATA AND METHODOLOGY

Methodology

This study employs the Autoregressive Distributed Lag (ARDL) bounds testing procedure proposed by Pesaran, Shin, and Smith (2001) to empirically investigate the relationship between capital adequacy regulation and financial performance. The reasons for leveraging the ARDL method are threefold. First, it allows for the inclusion of I(0) and I(1) variables, meaning that not all time series need to be integrated to the same order. Second, the ARDL approach is robust to smaller sample sizes, a feature particularly useful in the context of this study, given its limited quarterly time-series data. Most importantly, the ARDL approach accommodates an estimation methodology that simultaneously captures short-run and long-run interactions among the variables.

The ARDL model for this study is specified as follows in equations () and (2):

$$ROE = f(CAR, AQ, LIQ, INF) \tag{1}$$

$$\Delta ROE_t = \alpha_0 + \sum_{i=1}^{p} \beta_i \, \Delta ROE_{t-i} + \sum_{j=0}^{q1} \gamma_j \, \Delta CAR_{t-j} + \sum_{k=0}^{q2} d_k \, \Delta LIQ_{t-k} + \sum_{l=0}^{q3} \varnothing_l \, \Delta AQ_{t-l} + \sum_{m=0}^{q4} \theta_m \, \Delta INF_{t-m}$$

$$+ \pi_1 ROE_{t-1} + \pi_2 CAR_{t-1} + \pi_3 LIQ_{t-1} + \pi_4 AQ_{t-1} + \pi_5 INF_{t-1} + \mu_t \tag{2}$$

Where: ROE_t is the return on equity at time t (financial performance), CAR_t is the capital adequacy ratio, LIQ_t is the liquidity ratio, AQ_t denotes asset quality, INF_t is the Inflation, Δ represents the first difference operator, and μ_t is the error term.

The analysis begins with the bounds test to identify any long-run relationships between the variables. Upon confirming cointegration, the long-run coefficients of the model are estimated, followed by the estimation of the short-run dynamics using an error-correction model (ECM). Finally, several diagnostic tests are conducted, including checks for serial correlation, heteroskedasticity, functional form issues, and stability using CUSUM and CUSUMSQ tests, to validate the credibility of the modelled results.

Data

This study covers quarterly data from 2015Q1 to 2025Q1. This period is chosen to capture the bank capital regulatory reforms in Nigeria's banking sector, as well as critical macroeconomic events, including the 2016 economic recession, the COVID-19 pandemic, and rising inflation rates. The data source is the CBN Statistical Bulletin, the only source of uniform, regular data reporting on the Nigerian banking capital sector and macroeconomic indicators.

The dependent variable, ROE, measures the bank's financial performance. The primary explanatory variable is the CAR, which measures deposit money banks' ability to meet their regulatory capital requirements relative to their risk-weighted assets. LIQ and AQ are two other bank-specific control variables. LIQ is a measure of a bank's liquidity, defined as total liquid assets divided by total assets. Similarly, AQ, used to capture the quality of banks' assets, is the ratio of nonperforming loans to total loans. INF, which captures the effect of macroeconomic shocks on banks' performance, is included. Other variables are also capitalized on.

All series were subjected to log transformations to stabilise variances and facilitate comparisons across data with varying scales. Descriptive statistics and correlation matrices for all variables were obtained before performing the main econometric estimation as preliminary checks to analyse the dataset, provide initial insights into variable behaviour, and detect multicollinearity.

Table 1 provides summary statistics for the explanatory variables used in this study. The mean LNROE is 2.98, with a maximum of 3.91 and a minimum of 2.19; this indicates that the profitability of Nigerian deposit money banks is moderately diverse over the study period. The standard deviation is reasonably low at 0.418, further suggesting moderate variability in the distribution of profitability data within the scope of the study. The series distribution is positively skewed, with more values falling above the mean; however, the Jarque-Bera probability of 0.273 indicates that the series is approximately normally distributed.

Table 1: Descriptive Statistics

	LNROE	LNCAR	LNLIQ	LNASQ	INF
Mean	2.984	2.675	3.038	1.991	17.527
Median	2.883	2.702	3.059	1.857	15.979
Maximum	3.917	3.028	3.200	2.787	34.800
Minimum	2.191	2.349	2.803	1.282	8.493
Std. Dev.	0.418	0.160	0.084	0.475	7.177
Skewness	0.593	0.017	-0.425	0.526	1.058
Kurtosis	2.670	3.093	3.165	1.760	3.276
Jarque-Bera	2.592	0.016	1.284	4.521	7.785
Probability	0.273	0.991	0.526	0.104	0.020
Sum	122.348	109.677	124.598	81.652	718.630
Sum Sq. Dev.	6.989	1.033	0.284	9.025	2060.942
Observations	41	41	41	41	41

The cross-sectional mean of capital (CAR) is 2.68. This result confirms the findings of other bank-specific studies with CAR above 1, indicating compliance with CBN's capital requirements. Additionally, the crosssectional standard deviation of capital (0.165) suggests that CAR values are closely clustered around the mean, revealing slight variation among the loan-specific and bank-specific determinants of bank performance. LNLIQ shows the least cross-sectional variation with a standard deviation of 0.084. The result indicates that Nigerian banks are liquid on a scale similar to the CARPQ variable, and their liquidity remained relatively unchanged over the study period.

The cross-sectional mean of LNLIQ is 0.159, with a standard deviation of 0.084, indicating stable liquidity. LNASQ averaged 1.99 with a standard deviation of 0.475, higher than extreme levels that might be expected. This interpretation shows a more extreme variation in the bank-specific determinant over the study period. The data also show that the variable INF has the highest degree of skewness, with a mean of 17.53, a minimum of 8.49, and a maximum of 34.80. Furthermore, the standard deviation of INF is the largest at 7.177, and the J-B value of INF is 7.680 with a P-value of 0.020. Compared with the other variables in the table, the result indicates the least variability in that variable's value over time.

The data are not normally distributed. The high deviation from all explanatory variables is due to macroeconomic shocks the Nigerian economy experienced, as well as the drastic changes in aggregate price levels over the study period. The table confirms that variables such as CARPQ, LIQ, and ASQ have low standard deviations relative to their means, consistent with general expectations for those variables over the study period. However, since LIQ has a mean of 0.159, and the values of LNASQ fall into nonperformance categories for the banks included in the panel study, the final model to estimate the bank performances of Nigerian commercial banks will include LIQ, ASQ, and INF because there is a chance of variability in the determinants of bank-specific performance.

The unit root test results for the variables used in the study for cross-sectional comparisons are presented in Table 2, using models specified with constant, constant and trend, and no intercept and trend, according to the procedure of Dickey and Fuller (1979). The results show that all variables are nonstationary at the level and stationary at the first difference. Overall, we have a mixture of I(0) and I(1) processes. Only LIQ shows a trendstationary process at the 5% level with a constant in model 1. Additionally, we can observe that the variables CARPQ, ROE, ASQ, and INF do not exhibit mean-reverting properties at the level.

Table 2: Unit Root Test Results

	At Level					
		ROE	LIQ	INF	CAR	ASQ
With Constant	t-Statistic	-1.688	-3.083	-0.903	-2.369	-1.258
	Prob.	**0.429**	**0.035**	**0.774**	**0.156**	**0.639**
		n0	**	n0	n0	n0
With Constant & Trend	t-Statistic	-2.586	-3.421	-1.909	-1.866	-2.642
	Prob.	**0.288**	**0.062**	**0.627**	**0.653**	**0.264**
		n0	*	n0	n0	n0
Without Constant & Trend	t-Statistic	-0.903	-0.242	0.405	-0.898	-0.318
	Prob.	**0.318**	**0.592**	**0.794**	**0.320**	**0.564**
		n0	n0	n0	n0	n0

At First Difference						
		d(ROE)	d(LIQ)	d(INF)	d(CAR)	d(ASQ)
With Constant	t-Statistic	-4.944	-6.210	-2.638	-5.979	-5.426
	Prob.	**0.000**	**0.000**	**0.095**	**0.000**	**0.000**
		***	***	*	***	***
With Constant & Trend	t-Statistic	-4.870	-6.157	-2.477	-6.369	-5.514
	Prob.	**0.001**	**0.000**	**0.336**	**0.000**	**0.000**
		***	***	n0	***	***
Without Constant & Trend	t-Statistic	-5.010	-6.295	-2.707	-5.991	-2.394
	Prob.	**0.000**	**0.000**	**0.008**	**0.000**	**0.017**
		***	***	***	***	**

Notes: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%. And (no) Not Significant and *MacKinnon (1996) one-sided p-values.

Table 2 presents the results of the ADF unit root test. First-difference stationarity is observed at the 1% or 5% significance level, depending on the specifications, for all variables except inflation, using the test regression with a constant and trend. However, strong evidence of first-difference stationarity for inflation is provided under the other test specifications, implying that the series is nonstationary and a first-difference integrated series (I(1)).

Following the testing procedures, none of the variables is integrated of order two, I(2), which is a necessary condition for the application of the ARDL bounds testing approach to cointegration by Pesaran et al. (2001). The mixed orders of integration I(0) and I(1) justify the application of ARDL, which estimates the short-run dynamics and long-run relationships simultaneously with the use of a single reduced-form equation, even in the presence of endogenous and exogenous variables with mixed integration orders.

Table 3 presents the correlation matrix for the study variables, which reveals that LNROE is significantly and negatively correlated with LNLIQ and LNASQ, with coefficients of –0.497 and –0.574, respectively, both significant at the 1% probability level. These findings suggest that higher liquidity (LNLIQ) and poor asset quality, as proxied by the nonperforming loans to total loans ratio (LNASK), are negatively associated with the performance of deposit money banks in Nigeria. The results are consistent with the business theory of banking, which highlights the lock-in effects of excessive liquidity on banks' profitability potential, the high agency costs of holding excess liquidity, and the largely capital-dilutive nature of asset quality.

Table 3: Correlation Coefficient Results

Correlation	LNROE	LNCAR	LNLIQ	LNASQ	INF
LNROE	1.000				

LNCAR	-0.045	1.000			
t-stat	-0.281	-----			

p-value	0.779	-----			
LNLIQ	-0.497	0.249	1.000		
t-stat	-3.580	1.609	-----		
p-value	0.000	0.115	-----		
LNASQ	-0.574	-0.288	0.195	1.000	
t-stat	-4.380	-1.884	1.242	-----	
p-value	0.000	0.067	0.221	-----	
INF	0.545	-0.423	-0.585	-0.377	1.000
t-stat	4.068	-2.917	-4.513	-2.547	-----
p-value	0.000	0.005	0.000	0.014	-----

Table 3 shows the results of the correlation analysis. The table shows that the correlation between LNCAR and ROE is very low (–0.045, p = 0.779). This finding suggests that there is very weak bivariate evidence supporting the claim that capital adequacy regulations are associated with bank performance. Therefore, the evidence indicates the need for further econometric analysis using the ARDL model to establish both short-term and longterm relationships between capital adequacy regulations and bank performance. This is because correlation does not always capture dynamic relationships.

In terms of macroeconomic and other indicators, INF shows a significant and fairly strong positive correlation with ROE (r = 0.545, p < 0.000), suggesting that capital returns were typically higher during inflationary periods. A strong and significant negative correlation exists between inflation and liquidity (–0.585, p < 0.001), with a similarly strong negative correlation observed with asset quality (–0.377, p < 0.001). This negative association indicates that as inflation rises, bank asset quality tends to deteriorate. The correlation results suggest that these three macroeconomic and bank-specific control variables – liquidity, asset quality, and inflation – may be relevant in explaining variation in bank performance in Nigeria. The long-run impact of capital adequacy regulations, however, only comes to the fore within the dynamic context of the ARDL model.

Empirical Results

Table 4 presents the ARDL bounds testing results examining the relationship between capital adequacy, liquidity, asset quality, and return on equity (ROE), excluding the role of external shocks such as inflation.

Table 4: ARDL Bound Testing Results (without external shock, inflation)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Short run				
Constant	3.130**	1.380	2.268	0.030
LNROE (-1)	-0.235**	0.094	-2.493	0.018
LNCAR	-0.667***	0.212	-3.145	0.003
LNLIQ	-0.104	0.426	-0.244	0.809
LNASQ	-0.170**	0.076	-2.239	0.032

ECM	-0.234***	0.050	-4.631	0.000
Long-run				
LNCAR	-2.837*	1.562	-1.816	0.078
LNLIQ	-0.443	1.739	-0.255	0.801
LNASQ	-0.724**	0.320	-2.266	0.030
Constant	13.323**	4.879	2.731	0.010
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	3.849***	10%	2.37	3.2
k	*3*	*5%*	*2.79*	*3.67*
		2.5%	3.15	4.08
		1%	3.65	4.66

Note: Variables are significant at *, **, and *** (i.e., at 0.10, 0.05, and 0.01 per cent, respectively)—selected Model: ARDL (1, 0, 0, 0, 0).

In the short-run estimates, we find that both capital and asset quality have a significant negative impact on bank performance. Specifically, LNCAR has a negative and highly significant coefficient of –0.667 (p < 0.01), indicating that higher bank capital requirements reduce profitability in the short term, possibly due to increased loan growth and risk-taking. Similar to the findings of Molyneux et al. (2015), asset quality has a statistically significant coefficient of –0.170 (p < 0.05). The coefficient on LNLIQ is not substantial in the short-run regression, indicating that liquidity does not have an immediate impact on bank performance. The statistically significant, negative coefficient on LNROE (-1) suggests that bank profitability exhibits earnings persistence over time. In addition, the error correction term ECM = –0.234 (p < 0.01) is negative and significant, with a quarter-on-quarter adjustment coefficient of approximately 23 per cent, indicating a moderate speed of adjustment for correcting the deviation of bank performance from its long-run equilibrium.

In the long run, there is clear evidence that both capital adequacy and asset quality are important determinants of financial performance. Capital adequacy has a negative coefficient (–2.837, p < 0.10), indicating that higher capital reserves are detrimental to banks' long-term profitability. This finding supports the argument that regulatory capital strengthens a bank's resilience against crises but, over the long run, reduces shareholder value when set above a certain level. Asset quality has a negative coefficient in the long-run equation (–0.724, p < 0.05), confirming the idea that nonperforming loans harm bank profitability in the long run for Nigeria's banking sector. On the other hand, liquidity has no long-term effect on profitability, implying that being extremely liquid does not generate long-term profits.

The bounds test results, displayed in Table 4, show that the F-statistic of 3.849 exceeds the upper bound at the 5% significance level; thus, confirming the presence of a long-run relationship among the variables and validating the ARDL procedure for estimating both short- and long-run relationships. This implies that the capital adequacy regulation, liquidity risk, and asset quality are the core bank-specific determinants of financial performance in Nigeria, at least in the absence of any external shocks. The lack of a long-run unintended positive effect of liquidity risk on banks' financial performance further demonstrates that the impact of capital adequacy regulation and exposure to credit risk on profitability dominates; hence, capital risk regulation and exposure to credit risk significantly shape the profitability of Nigerian banks.

Table 5 treats INF as an external shock and incorporates it into the ARDL framework. By and large, the results did not significantly alter the dynamics of the long-run relationship, as banks' capital risk regulation remains a

significant long-run determinant of banks' financial performance in Nigeria. Bank capital adequacy regulation and asset quality continue to negatively impact bank profitability in the long term. Both LNCAR and LNASQ coefficients have adverse signs. The LNCAR coefficient remains significant at the 5% level (−0.620, p = 0.018), as in the model excluding the inflation shock, implying that stronger capital risk regulation depresses banks' financial performance in the long run. The long-run coefficient of LNASQ is also negative (−0.619) and significant at the 1% level, indicating that nonperforming assets hurt banks' profitability in the long run, as shown in the model without the inflation shock. As in the model excluding the inflation shock, bank liquidity risk and inflation did not play any long-run role in influencing banks' financial performance in Nigeria. The average longrun and cointegration relationships among the variables are captured by the relationships between the dependent and independent variables, with LNLIQ and INF remaining exogenous. The dependent variable coefficient is shown to be the coefficient on the error correction term (ECM): ECM = −0.245, p < 0.01. About 25% of the short-run deviations from the long-run equilibrium are corrected each quarter. This result is also similar to that of the model that excludes inflation.

Long-run estimates include short-run coefficients—results at the 5% significance level. Robust standard errors are in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively. Longrun coefficients: Significant error-correction terms were found in both the asset quality and capital adequacy equations, indicating the presence of cointegration. Furthermore, the demand-following nature of the relationship between the aforementioned economic variables and bank profitability in Nigeria was established based on these estimates.

For overall profitability, the long-run estimates align with the earlier findings. Asset quality (–0.638, p < 0.10) remains a significant negative determinant, indicating continuing overhang from past bad debts and nonperforming assets/persistent credit risks on bank performance. Capital adequacy remains negative (–2.531); however, it is now not statistically significant at conventional levels. In essence, the capital requirements may have a positive impact but be economically insignificant, particularly in the long run and in the presence of macroeconomic shocks. That is expected due to the macroeconomic environment. As in the short run, liquidity and inflation remain statistically insignificant. Thus, external funding shocks, at least partly driven by changes in the inflation rate, may not be the critical determinants of the long-run profitability of banks in Nigeria.

Table 5: ARDL Bound Testing Results (with external shock, inflation)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Short run				
Constant	2.748	1.754	1.567	0.126
LNROE (-1)	-0.245**	0.099	-2.464	0.019
LNCAR	-0.620**	0.250	-2.476	0.018
LNLIQ	-0.033	0.474	-0.070	0.944
LNASQ	-0.156*	0.086	-1.814	0.079
INF	0.003	0.007	0.360	0.721
ECM	-0.245***	0.053	-4.656	0.000
Long run				
LNCAR	-2.531	1.638	-1.545	0.132
LNLIQ	-0.136	1.919	-0.071	0.944
LNASQ	-0.638*	0.376	-1.696	0.099
INF	0.010	0.028	0.372	0.712

Constant	11.217	7.203	1.557	0.129
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	*3.150*	*10%*	*2.2*	*3.09*
K	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Note: Variables are significant at *, **, and *** (i.e., at 0.10, 0.05, and 0.01 per cent, respectively)—selected Model: ARDL (1, 0, 0, 0, 0).

In the inflation-adjusted baseline model, the bounds test statistic (F = 3.150) is only slightly below the upper bound critical value at the 10% level and well below the lower bound critical value at the 5% significance level. These results suggest that including inflation as an additional variable in the model may weaken the evidence supporting a long-run relationship between the selected series. Thus, external shocks could push the long-run equilibrium further from its baseline without inflation.

In general, although inflation is a crucial macroeconomic variable in the overall Nigerian economy, it does not have a statistically significant direct effect on bank profitability in this model. However, the significance of capital adequacy and asset quality as crucial central bank-specific variables affecting bank profitability remains confirmed, both in the absence and presence of external shocks.

Comparative Synthesis

The short-run coefficient estimates across specifications in Table 4, Model 1, as well as Table 5, Model 2, show a significant adverse effect of CAR on ROE (Table 4 short-run: –0.667, $p < 0.01$; Table 5 short-run: –0.620, $p < 0.05$). This confirms the risk–return trade-off and capital-buffer hypotheses, as discussed in the literature, where a higher regulatory capital in the short term creates a greater buffer against adverse outcomes but also reduces short-run returns to shareholders by reducing leverage and profitable risk-taking (i.e. loans with risk premiums above the cost of capital) (Berger & Bouwman, 2013; Ayuso, Pérez, & Saurina, 2004). The consequences of stricter capital requirements for short-run profitability have also been highlighted in the empirical literature by Almazari and Alamri (2017) and Barth, Caprio, and Levine (2013).

ASQ remains robust as a negative short-run determinant across both specifications considered, with the shortrun estimates being significant, but the effect also carries through in the long-run equilibria (Table 4 long-run: –0.724, $p < 0.05$; Table 5 long-run: –0.638, $p < 0.10$). The results confirm that high credit risk and nonperforming loans lead to lower earnings and higher provisioning for bad debts, and are a well-known and studied effect in the literature (Nkusu, 2011; Athanasoglou, Brissimis, & Delis, 2008). The coefficient on ASQ carries through to the long-run equilibrium, suggesting that banks need to achieve proper 'mixing' in their loan book composition and quality to protect not only the short-term viability of ROE but also its long-run sustainability.

LIQ remains insignificant as a short-run and/or long-run determinant across both sets of results. The direction(s) of the relationship may not be well captured by either the levels or the first-differenced marketing efforts aimed at maintaining high levels of liquid assets. The results here suggest that variance in net liquid assets, holding all else constant, did not have a systematic impact on ROE for the sampled period and geographic region. Previous literature has found that liquidity effects are mixed, and, like capital, liquidity can be a trade-off (less risk versus opportunity costs) that banks manage for varying reasons and outcomes. Additionally, the measurement of liquidity's effect depends on the method used (Vodová, 2011).

Introducing INF into the model, as per the above specification changes, alters the results somewhat, primarily in the long-run equations of the bounds test. As discussed in detail in the previous section, the ARDL bounds test

suggests cointegration in Model 1, estimated separately without inflation, with the Null hypothesis rejected at all conventional significance levels with robust bounds for the critical values (F = 3.849). Whereas the same test in Model 2, estimated with a lagged variable for inflation, results in an F-statistic of 3.150, which is right on the cutoff for the 10% and only significant at the more relaxed unadjusted bootstrap level. This suggests that, controlling for macroeconomic risk, adding inflation and price volatility to the ROE calculation reduces the strength of the long-term relationship among CAR, LIQ, ASQ, and ROE. The lagged inflation term is statistically insignificant in both the short- and long-run equations in Model 2, Table 5. However, as noted in the descriptive analysis, inflation had a high unconditional correlation with ROE. Therefore, we can interpret this as confirming that inflation does not impact returns on equity banks directly but rather potentially through indirect channels such as those driven by its real effect on loan portfolio terms or other macroeconomic – rather than banking industry – driven factors, an interpretation consistent with previous empirical work and findings on the impact of inflation on banking (Perry, 1992; Djalilov & Piesse, 2016).

The ECM, or error correction term lagged one period, is negative, highly significant, and relatively close in magnitude across both models, estimated at approximately –0.230 to –0.250 (p < 0.01). Estimated systems will experience up to 23–25% of the short-run deviation back to the respective long-run equilibria each quarter. As such, if an exogenous, short-run shock impacts ROE, for example, through an external shift in the regulatory landscape or internal stressors on bank performance, the system will, on average and all other things being equal, recover to the long-run equilibrium point in 4 to 5 quarters.

Short-run underperformance costs of capital increases, which should guide supervisors against sudden and overaggressive hikes in capital targets, without other easing measures, such as time to implement or other incentives for capital increases. Additionally, the long-run persistence of poor ASQ should drive home the messages of supervisors and other decision-makers regarding expectations of provisioning returns and possible realignments of loan terms before discounting short-run trade-offs between macro-prudential and capital target returns. As such, it is imperative to stay on top of pre-emptive loan-loss provisioning and otherwise manage down credit risk – not only for individual return-based bank profits but for the system trade-off that persists between stability and returns on equity (Nkusu, 2011; Berger & Bouwman, 2013).

Table 6 presents the results of the post- **Diagnostic Test Results**

estimation diagnostic tests for the ARDL model. The serial correlation

LM test yields an F-statistic of 0.085 with a p-value of 0.918, which is well above the 5% significance threshold.

This indicates that the residuals are free from serial correlation, confirming that the model is not subject to misspecification due to autocorrelation.

Table 6: Diagnostic Test Results

Serial Correlation LM Test:			
F-statistic	0.085	Prob. F(2,32)	0.918
Heteroskedasticity Test: ARCH			
F-statistic	0.140	Prob. F(1,37)	0.7103
Normality			
F-statistic	0.409	Prob. F(1,37)	0.815

These outcomes indicate a good overall fit of the ARDL model, as argued by Murtaza et al. (2019). The BreuschGodfrey serial correlation test F-statistic of 1.569 with a p-value of 0.2199 indicates the absence of first-order serial correlation, thereby supporting an assumption crucial for valid inference. The lack of serial correlation often indicates a well-specified model, in which past errors do not predict current mistakes. Furthermore, the results of the heteroskedasticity test (ARCH) indicate no evidence of heteroskedasticity, as noted in the F-statistic of 0.140 and the probability of 0.7103. Thus, our ARDL estimates are also efficient, given that there is no heteroskedasticity problem or constant variance of shocks across periods. The diagnostic test for

normality indicates that the errors are normally distributed with an F-statistic of 0.409 and a corresponding probability of 0.815. Since the likelihood exceeds the standard thresholds of 0.10, 0.05, and 0.01, we fail to reject the null hypothesis of normally distributed residuals. Therefore, based on the diagnostic test results, we conclude that our ARDL model is adequately specified, has characteristics for valid inference, and is robust. Significant lagged dependent variable coefficients, the absence of serial correlation, non-heteroskedasticity, and normal residuals lead to accurate and efficient estimators, reinforcing confidence in the ARDL estimates made for both the short and long run.

Stability Test Results

In Figure 2, we present plots of the CUSUM and CUSUM of Squares statistics, which test the stability of the estimated ARDL model coefficients over the study period (2015Q1–2025Q1). As shown in the CUSUM plot, the cumulative sum of recursive residuals falls within the 5% significance critical bounds throughout the entire sample period. This finding suggests that the estimated coefficients are stable, indicating that the model is not structurally unstable.
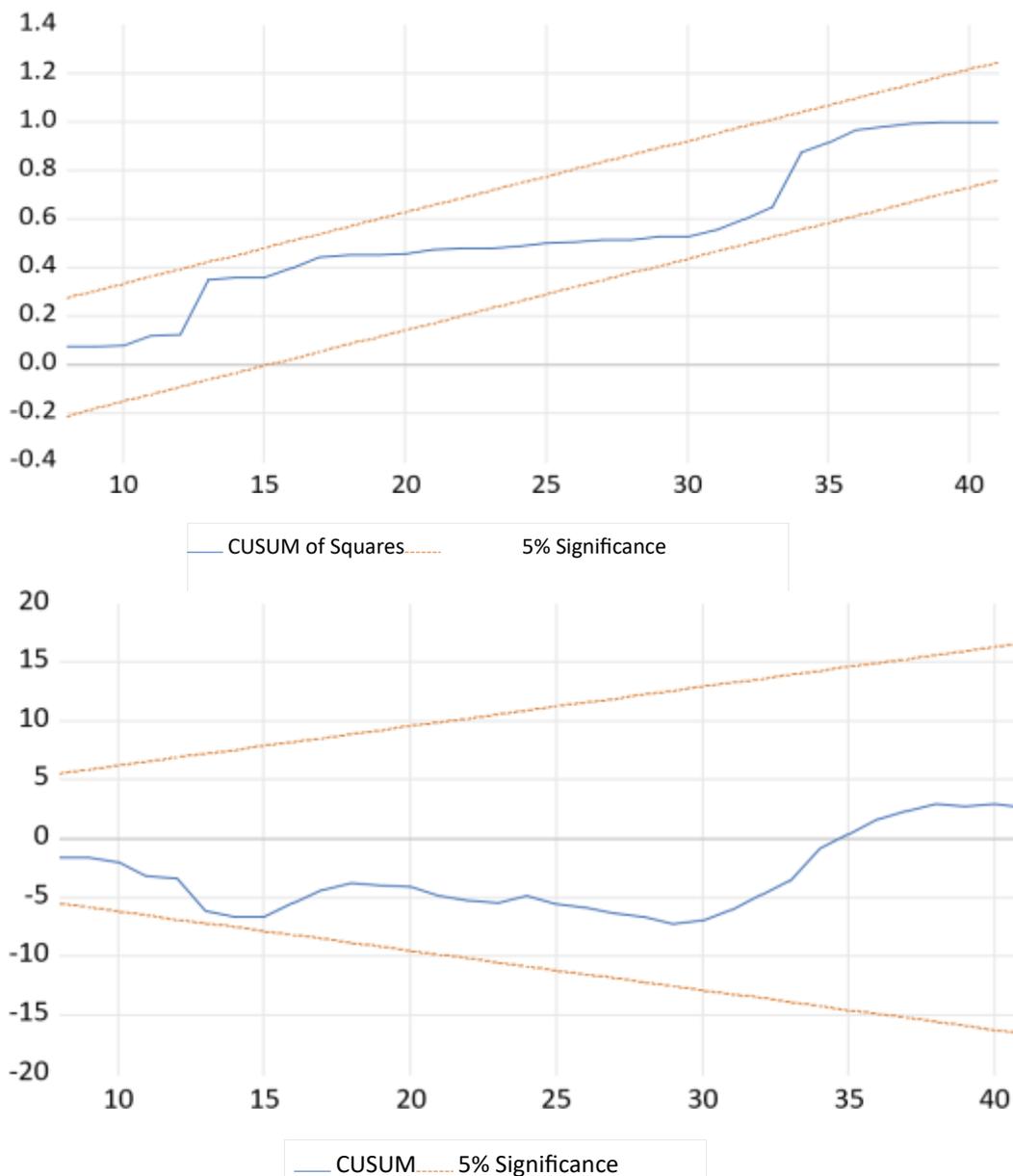
Figure 2: Stability Plots (CUSUM & CUSUM-Square).

Similarly, the results for the CUSUM of Squares test confirm the absence of parameter instability. As depicted in the graph, the CUSUM statistic remains between the 5% critical bounds. Hence, it affirms that there are no substantial structural breaks in the relationship encompassing capital adequacy regulations, control variables, and bank performance. This points towards the stability of the ARDL model. In conjunction with the above

results, the ARDL model is deemed stable and valid for deriving both long-run and short-run conclusions. The stability test results reinforce the robustness of the results, corroborating Pesaran and Pesaran (1997), who underscore the importance of parameter stability for the estimates obtained using the ARDL approach.

CONCLUSION AND POLICY RECOMMENDATIONS

Conclusion

Using data from 2015Q1 to 2025Q1, this study empirically analyses the effect of capital adequacy regulations on the financial performance of deposit money banks in Nigeria, using the ARDL bounds testing approach. The study uses return on equity as a measure of bank performance, with the capital adequacy ratio as the primary regressor. Liquidity and asset quality represent the other independent/predictor/control variables. Inflation is included as a control variable to account for external shocks.

The key finding is that capital adequacy regulations have a significantly negative impact on financial performance, both in the short term and the long term. This suggests that higher bank capital requirements, while enhancing resilience, may dampen profitability by increasing risk through leverage. Among the control variables, asset quality is the only significant predictor of bank performance: Bad loans are negatively related to ROE. Liquidity coefficients are largely insignificant. Although inflation has a negative coefficient, it is not statistically significant, suggesting that internal bank factors have a greater impact on financial performance than external shocks or macroeconomic factors during the study period. Stability and diagnostic tests indicate that the model is correctly specified and structurally stable.

Policy Recommendations

The findings carry important implications for regulatory calibration in Nigeria and other emerging economies. First, the consistently negative short-run and long-run effects of capital adequacy on ROE suggest that overly stringent capital requirements may suppress shareholder returns, particularly in environments characterised by weak asset quality and macroeconomic instability. This does not imply that capital regulation should be relaxed indiscriminately; rather, it highlights the need for optimal calibration. Second, regulators should adopt a more risk-sensitive and countercyclical capital framework. During economic expansions, higher buffers may be accumulated; during downturns, temporary flexibility or phased compliance could prevent excessive contraction in lending and profitability. Third, differentiated capital requirements based on bank size, systemic importance, and risk profile may reduce the disproportionate burden on smaller banks while preserving systemic stability.

Fourth, since asset quality emerged as a persistent and significant determinant of profitability, supervisory focus should shift from purely capital quantity toward credit risk governance, early warning systems, loan restructuring frameworks, and strengthened provisioning standards. In essence, regulatory authorities face a fundamental trade-off: Higher capital → greater systemic resilience but lower ROE. Lower capital → higher profitability but increased systemic vulnerability.

An optimal policy framework should therefore balance microprudential stability (bank-level safety), macroprudential resilience (system-level stability) and sustainable profitability (shareholder incentives and financial intermediation efficiency) The evidence from Nigeria suggests that stability and profitability objectives are not perfectly aligned and must be dynamically managed rather than statically imposed.

Limitations and Areas for Future Study

Despite its contributions, this study has several limitations. First, the analysis is conducted at the aggregate industry level, which may mask heterogeneity in responses across individual banks. Large, internationally active banks may respond differently to capital regulations compared to smaller domestic institutions. Second, potential endogeneity between capital adequacy and profitability cannot be fully ruled out. While the ARDL framework captures dynamic adjustments, it does not fully resolve reverse causality concerns. Third, the study relies on inflation as the primary external shock variable. Other macroeconomic factors—such as exchange rate volatility, interest rate movements, oil price shocks, and fiscal policy uncertainty—may also significantly influence bank performance. Fourth, profitability is measured solely by return on equity. Alternative indicators such as return on assets, cost-to-income ratio, or risk-adjusted profitability measures could provide additional insight.

Future research may: Employ bank-level panel data with GMM or instrumental variable techniques, explore nonlinear or asymmetric effects using NARDL models, conduct cross-country comparisons within Sub-Saharan Africa, investigate the interaction between capital adequacy and corporate governance mechanisms, and examine how digital transformation and non-interest income moderate the capital–profitability relationship. Addressing these areas would deepen understanding of how prudential regulation interacts with profitability dynamics in emerging financial systems.

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