Financial Stability, Prudential Regulation, and Bank Performance: Panel Evidence from Nigeria

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ABSTRACT

Purpose
This study examines the effect of bank-specific financial soundness indicators on the performance of listed Deposit Money Banks (DMBs) in Nigeria. It investigates whether prudential regulation moderates the relationship between financial soundness and bank performance.

Methodology
The study employs panel data from ten publicly listed Nigerian DMBs during 2014–2023. Financial performance is proxied by return on equity (ROE), while financial soundness indicators include capital adequacy, liquidity management, asset quality, and management efficiency. Prudential pressure is incorporated as a moderating variable. A Generalized Least Squares random effects estimator is applied to account for unobserved bank-specific heterogeneity and potential data issues.

Findings
The results reveal that capital adequacy, liquidity management, and prudential pressure exert a positive and significant effect on bank profitability, while asset quality negatively affects ROE. Management efficiency shows no significant direct impact on performance. Furthermore, prudential regulation significantly moderates the relationship between financial soundness indicators and bank performance, strengthening the positive effects of capital adequacy and liquidity while amplifying the adverse impact of poor asset quality.

Conclusion
The study concludes that financial soundness indicators are critical determinants of bank performance in Nigeria, and that prudential regulation plays a vital moderating role in enhancing profitability. These findings underscore the importance of strong but balanced regulatory frameworks that reinforce capital and liquidity buffers, promote effective credit risk management, and allow sufficient flexibility to support sustainable bank performance in emerging markets.

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1. Introduction

Bank performance is a crucial aspect in determining the stability and resilience of the entire banking sector, particularly in emerging economies where financial institutions serve as the central intermediaries. Deposit money banks (DMBs) are the pillars of the Nigerian financial system and play an important role in the distribution of credit, the mobilization of savings, and economic development. However, recurring episodes of weak profitability, rising non-performing loans, and regulatory-induced balance sheet adjustments among Nigerian DMBs have raised renewed concerns about the sustainability of bank performance and financial stability in the post-crisis period (Maude & Dogarawa, 2021; Michael & Akpabio, 2025).

In response to post-crisis vulnerabilities, the focus on ensuring the robustness of bank-specific financial soundness indicators, including capital adequacy, liquidity, asset quality, and managerial efficiency, has been reinstated as a key determinant of bank profitability and solvency. Empirical studies document that better-capitalised banks are firmer shock absorbers and are more likely to sustain profitability, as measured by return on assets (ROA) and return on equity (ROE) (Ozili, 2017; Onyenagubom & Nongu, 2024). Capital adequacy reflects a bank's ability to withstand losses while maintaining depositor and investor confidence, whereas liquidity enables banks to meet short-term obligations, although excessive liquidity may reduce income-generating capacity (Gambo et al., 2022; Zaharum et al., 2022). Similarly, asset quality deterioration, often proxied by non-performing loans, undermines profitability by increasing provisioning requirements and weakening earnings capacity (Enekwe et al., 2022; Okine & Garr, 2025).

Management efficiency, commonly measured using the cost-to-income ratio, also plays a crucial role in shaping bank performance. Banks that optimally deploy resources and control operating costs tend to outperform less efficient counterparts (Olowokure & Abdulraheem, 2023; Akarogbe et al., 2024). While these financial soundness indicators have been widely examined as direct drivers of bank performance, emerging evidence suggests that their effectiveness may depend on the regulatory and institutional environment within which banks operate (Ben Naceur et al., 2010; Yang et al., 2019).

Recent literature increasingly emphasizes the role of prudential regulation in shaping bank behavior and performance, particularly in emerging markets. Sound regulatory frameworks can strengthen risk management, discipline managerial excesses, and enhance the performance-enhancing effects of capital adequacy and efficiency (Klomp & de Haan, 2015; Chen et al., 2022). Conversely, overly stringent or poorly designed regulations may increase compliance costs, constrain credit creation, and compress profit margins (Ben Naceur et al., 2010; Yang et al., 2019). This suggests that prudential regulation does not merely exert a direct effect on bank performance but may condition, strengthen, or weaken the relationship between financial stability indicators and performance outcomes, consistent with institutional theory (North, 1990).

In Nigeria, the Central Bank of Nigeria (CBN) has implemented Basel III capital requirements, liquidity coverage ratios, and a risk-based supervisory framework to enhance financial stability and institutional quality. Despite these reforms, empirical evidence on whether prudential regulation moderates the link between financial stability and bank performance remains limited, particularly for listed DMBs over an extended period marked by regulatory tightening and macroeconomic shocks (Michael & Akpabio, 2025). Existing Nigerian studies primarily focus on either financial soundness indicators

or regulatory effects in isolation, thereby overlooking their potential interaction effects (Maude & Dogarawa, 2021; Agu & Nwankwo, 2019).

This study addresses this gap by examining the moderating role of prudential regulation in the relationship between financial stability indicators and the financial performance of listed deposit money banks in Nigeria from 2014 to 2023. Using panel data techniques and a Generalized Least Squares (GLS) random-effects estimator, the study jointly estimates the direct effects of capital adequacy, liquidity, asset quality, and management efficiency, as well as their interaction with prudential regulation.

The study makes three key contributions to the literature. First, it extends existing bank performance models by explicitly incorporating prudential regulation as a moderating variable rather than treating it solely as an exogenous control. Second, it provides long-horizon evidence from an emerging market banking system characterized by intensive regulatory reforms. Third, it offers policy-relevant insights for regulators and bank managers on how to design supervisory frameworks that simultaneously promote financial stability and sustainable profitability.

2. Literature and Hypotheses

2.1. Theoretical Review

The insight into the linkage between bank-specific financial soundness variables and financial performance is grounded in several economic and financial theories that explain firm behaviour, risk management, and regulatory dynamics. The Risk–Return Theory, Agency Theory, Signaling Theory, and the Theory of Regulatory Compliance provide complementary explanations of how internal bank characteristics interact with external oversight mechanisms to shape performance outcomes.

According to the Risk–Return Trade-off theory, banks seek an optimal balance between risk and expected returns to maximize performance. Compared with banking systems characterized by lower volatility, this theory predicts more substantial performance effects of capital adequacy and asset quality in banking systems with higher volatility, such as emerging markets, where risk-absorption capacity is more valuable (Ozili, 2017; Onyenagubom & Nongu, 2024). Higher capital buffers and better asset quality reduce insolvency risk, lower funding costs, and enhance confidence, thereby supporting profitability. However, liquidity exhibits a non-linear relationship with performance: while adequate liquidity enhances operational stability, excess liquidity may weaken returns due to opportunity costs (Gambo et al., 2022; Zaharum et al., 2022).

Agency Theory emphasizes conflicts between shareholders and managers arising from divergent risk preferences and information asymmetries. In banking, such conflicts manifest through inefficient cost structures and poor credit allocation decisions. Comparative evidence suggests that agency problems are more pronounced in weakly governed environments, making management efficiency and asset quality stronger predictors of performance in emerging markets than in developed economies (Maude & Dogarawa, 2021; Olowokure & Abdulraheem, 2023). High cost-to-income ratios and deteriorating asset quality, therefore, signal ineffective managerial discipline and reduced shareholder value.

From a Signaling Theory perspective, internal financial soundness indicators convey information to external stakeholders about bank stability and the quality of risk

management. High capital adequacy and liquidity ratios signal to investors and depositors, while rising non-performing loans and operational inefficiencies signal to the market, inviting market discipline. This signaling function is comparatively more critical in emerging markets, where information asymmetry and institutional trust deficits amplify the market response to observable financial indicators (North, 1990; Maude & Dogarawa, 2021).

The Theory of Regulatory Compliance explains how prudential regulations influence bank behaviour by constraining excessive risk-taking and shaping managerial incentives. Regulatory instruments such as capital and liquidity requirements may strengthen the effectiveness of internal financial soundness indicators by enforcing discipline. However, they may also dampen profitability if compliance costs outweigh efficiency gains. Thus, regulation operates not only as a direct determinant of performance but as a moderating mechanism that conditions how financial stability indicators translate into profitability, consistent with evidence from emerging markets (Ben Naceur et al., 2010; Klomp & de Haan, 2015; Chen et al., 2022).

2.2. Empirical Review

Empirical studies provide mixed but informative evidence on the relationship between financial soundness indicators and bank performance across jurisdictions. Capital adequacy is generally found to have a positive effect on profitability and stability, though the magnitude of this effect varies across institutional contexts. Comparative studies indicate that capital adequacy plays a more stabilizing and performance-enhancing role in emerging markets, where banks face higher systemic risks and regulatory scrutiny (Ozili, 2017; Onyenagubom & Nongu, 2024). Nigerian evidence aligns with this view, suggesting that well-capitalized banks are better positioned to absorb shocks and sustain earnings (Agu & Nwankwo, 2019; Akarogbe et al., 2024).

Asset quality, commonly proxied by non-performing loans (NPLs), consistently emerges as a critical determinant of bank performance. Across emerging economies, higher NPL ratios are associated with lower profitability due to increased provisioning and reduced interest income (Enekwe et al., 2022; Okine & Garr, 2025). However, comparative findings suggest that the strength of this relationship depends on regulatory enforcement and risk management practices, with some studies reporting statistically weaker effects where regulatory discipline is stronger (Barakat et al., 2024). This heterogeneity underscores the importance of considering regulatory context when assessing the linkages between asset quality and performance.

Liquidity management also presents a nuanced relationship with bank performance. While adequate liquidity supports confidence and operational continuity, excessive liquidity holdings may suppress profitability by foreclosing investment opportunities. Empirical evidence from Nigeria and other emerging markets confirms this trade-off: optimal liquidity levels enhance performance, but regulatory-induced excess liquidity constrains returns in the short run (Gambo et al., 2022; Faruk, 2025). Comparatively, banks operating under stricter liquidity regulations tend to exhibit lower short-term profitability but improved resilience, highlighting a stability–profitability trade-off (Klomp & de Haan, 2015).

Management efficiency remains a robust predictor of bank performance across studies. Lower cost-to-income ratios are consistently associated with higher profitability, particularly in emerging economies where cost inefficiencies are more prevalent (Maude

& Dogarawa, 2021; Olowokure & Abdulraheem, 2023). Cross-country evidence suggests that efficient management enhances banks' ability to adapt to regulatory changes and market shocks, thereby strengthening the performance effects of financial soundness indicators (Onyenagubom & Nongu, 2024).

An emerging strand of the literature focuses on the interaction between prudential regulation and bank performance. Studies show that regulatory frameworks can either reinforce or weaken the effects of capital adequacy, liquidity, and asset quality on profitability. Evidence from emerging markets indicates that well-calibrated regulatory pressure enhances the performance benefits of financial soundness indicators, whereas excessive regulation may erode profitability through compliance costs (Ben Naceur et al., 2010; Chen et al., 2022; Michael & Akpabio, 2025). Nigerian evidence similarly suggests that regulatory reforms have improved bank performance, but the interaction effects remain underexplored.

Figure 1 presents a conceptual framework illustrating the direct effects of capital adequacy, liquidity management, and asset quality (non-performing loans) on bank financial performance, reflecting core dimensions of bank soundness. Prudential regulation is positioned as a moderating variable, indicating that regulatory oversight conditions the strength and direction of these relationships. This suggests that effective prudential regulation can enhance the positive effects of adequate capital and liquidity while mitigating the adverse impact of poor asset quality on financial performance. Overall, the framework aligns with financial intermediation and regulatory theories, emphasizing the role of regulation in promoting banking stability and performance.

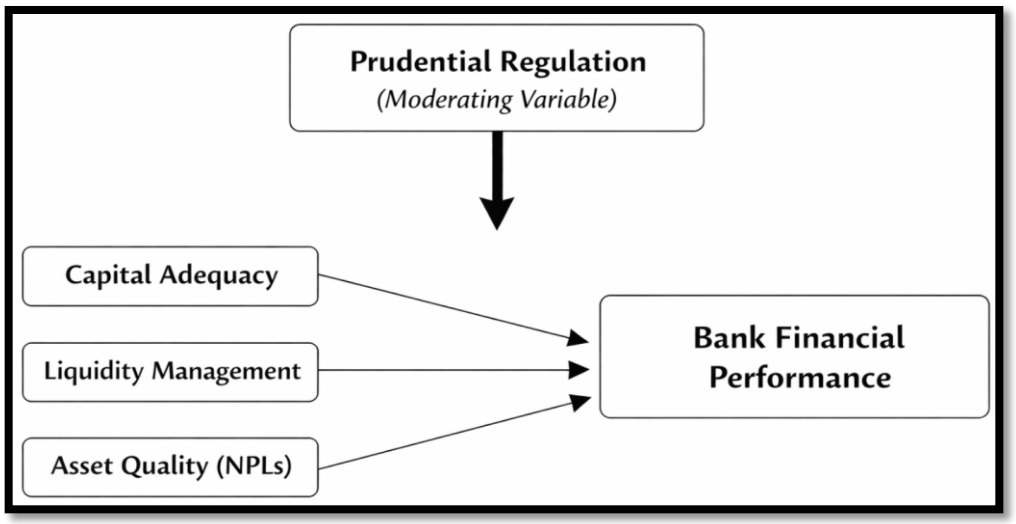

Figure 1: Conceptual Framework Diagram
Source: Author's own elaboration

2.3. Hypotheses Development

Capital adequacy constitutes a vital buffer against financial shocks, enabling banks to absorb losses without compromising solvency. Prior empirical evidence consistently shows that well-capitalized banks are more resilient and perform better, particularly in emerging markets where macro-financial volatility is relatively high. Studies on Nigeria and other developing economies confirm that stronger capital positions enhance profitability by reducing insolvency risk, lowering funding costs, and strengthening depositor confidence (Agu & Nwankwo, 2019; Ozili, 2017; Onyenagubom & Nongu,

2024). These findings suggest that capital adequacy directly enhances bank performance by reinforcing financial stability and investor trust. Accordingly, the study hypothesizes that:

H_1: Capital adequacy has a positive and significant effect on the financial performance of listed deposit money banks in Nigeria.

Liquidity management is equally critical for ensuring banks' ability to meet short-term obligations and sustain operations. Adequate liquidity supports confidence and operational continuity, while excessive liquidity may suppress profitability due to opportunity costs. Empirical evidence from Nigeria indicates that optimal liquidity levels improve bank profitability, whereas inefficient liquidity allocation weakens returns (Gambo et al., 2022; Faruk, 2025; Zaharum et al., 2022). Thus, liquidity exerts a performance-enhancing effect when maintained at optimal levels rather than in excess. Based on this reasoning, the study proposes the following hypothesis: H2: Liquidity management has a positive and significant effect on the financial performance of listed deposit money banks in Nigeria.

Prudential regulation plays a central role in shaping bank behaviour through capital and liquidity requirements designed to curb excessive risk-taking and promote stability. Evidence suggests that regulatory pressure strengthens the effectiveness of capital adequacy and liquidity by enforcing discipline and standardizing risk management practices (Ben Naceur et al., 2010; Klomp & de Haan, 2015). In emerging markets such as Nigeria, regulatory oversight is significant due to weaker market discipline and higher systemic risk exposure (Michael & Akpabio, 2025). However, regulation may also weaken performance effects if compliance costs dominate efficiency gains, indicating a conditional rather than uniform influence. Consequently, this study hypothesizes that: H3: Prudential regulation positively moderates the relationship between capital adequacy and bank financial performance. H4: Prudential regulation positively moderates the relationship between liquidity management and bank financial performance.

Asset quality, commonly proxied by the ratio of non-performing loans, reflects the effectiveness of credit risk management. Poor asset quality undermines profitability by increasing loan loss provisions and reducing interest income. Empirical evidence from emerging markets consistently reports a negative association between non-performing loans and bank performance (Enekwe et al., 2022; Okine & Garr, 2025; Barakat et al., 2024). High asset quality, therefore, enhances profitability, while deterioration in asset quality weakens financial performance. Thus, the study hypothesizes that: H5: Asset quality has a negative and significant effect on the financial performance of listed deposit money banks in Nigeria.

Prudential regulation may alter this relationship by strengthening credit risk assessment standards and loan monitoring requirements. Regulatory enforcement can mitigate the adverse impact of poor asset quality by compelling banks to recognize losses early and improve screening mechanisms (Chen et al., 2022; Klomp & de Haan, 2015). Accordingly, regulatory pressure is expected to weaken the adverse effect of poor asset quality on performance by enhancing risk discipline. Hence, the study further hypothesizes that:H6: Prudential regulation moderates the relationship between asset quality and bank financial performance by reducing the adverse effect of non-performing loans.

3. Methodology

This study employed a quantitative research design to empirically explore how bank-specific financial soundness indicators impact the performance of listed deposit money banks (DMBs), while controlling for regulatory pressure. The population included all DMBs on the Nigerian Exchange Group (NGX) that were purposively sampled into ten (10) banks with ongoing operations and annual financial statements from 2014 to 2023, drawing data from their annual reports, audited corporate disclosures, and the Central Bank of Nigeria Financial Stability Reports. Financial performance is proxied by return on equity (ROE), a widely accepted indicator of shareholder value creation (Demirgüç-Kunt et al., 2021; Akarogbe et al., 2024).

To model the relationship between financial soundness indicators and performance, the study formulates the following panel data model:

$$\mathrm{ROE}_{it} = \beta_0 + \beta_1 \mathrm{CA}_{it} + \beta_2 \mathrm{LM}_{it} + \beta_3 \mathrm{AQ}_{it} + \beta_4 \mathrm{ME}_{it} + \beta_5 \mathrm{RP}_{it} + \epsilon_{it} \quad (1)$$

where ROE_{it} denotes return on equity for bank i at time t; CA_{it} is capital adequacy; LM_{it} is liquidity management; AQ_{it} is asset quality; ME_{it} is management efficiency; RP_{it} is regulatory pressure; and ϵ_{it} is the error term. To assess moderation, interaction terms are introduced:

$$\mathrm{ROE}_{it} = \beta_0 + \beta_1 \mathrm{CA}_{it} + \beta_2 \mathrm{LM}_{it} + \beta_3 \mathrm{AQ}_{it} + \beta_4 \mathrm{ME}_{it} + \beta_5 \mathrm{RP}_{it} + \beta_6 (\mathrm{CA}_{it} \times \mathrm{RP}_{it}) + \beta_7 (\mathrm{LM}_{it} \times \mathrm{RP}_{it}) + \beta_8 (\mathrm{ME}_{it} \times \mathrm{RP}_{it}) + \epsilon_{it} \quad (2)$$

Table 1 shows the description of all the variables. This model facilitates the examination of both direct and interaction (moderating) effects, consistent with prior studies (Ben Naceur et al., 2010; Jesslyn et al., 2025). A potential concern in estimating the relationship between financial soundness indicators and bank performance is endogeneity arising from reverse causality, omitted variable bias, or unobserved heterogeneity. For instance, more profitable banks may strengthen their capital buffers or liquidity positions ex post, leading to simultaneity between ROE and explanatory variables. To mitigate these concerns, the study adopts a Generalized Least Squares (GLS) random-effects estimator, which explicitly accounts for unobserved bank-specific heterogeneity under the assumption that these effects are uncorrelated with the regressors (Hsiao, 2014; Baltagi, 2021).

To estimate the specified models, the study employs the Generalized Least Squares (GLS) random effects estimator. The GLS random-effects estimator was adopted, which indicated a non-significant difference between the fixed and random effects models. This method was chosen because it corrects for heteroskedasticity and serial correlation, which are typical in panel data, and enables control for unobserved individual-specific effects (Hsiao, 2014; Baltagi, 2021). The GLS random effects approach is appropriate when unobserved firm-specific effects are assumed to be uncorrelated with the explanatory variables, thereby improving efficiency over fixed effects under these conditions (Wooldridge, 2010). In matrix notation, the GLS model is:

Table.1.Variable Definition and Measurement

Variables	Parameter Symbol	Expected Sign	Nature of Variable	Scale	Measurement	References	Data Source
$ROE_{i,t}$	β_0		Dependent variable	Ratio	Profit before tax divided by total equity	Alshatti (2020); Onyenagubom & Nongu (2024);Prayitn, 2025	Bank Annual Reports
$CA_{i,t}$	β_1	+	Independent variable	Ratio	Total equity divided by net assets	Kirui & Simiyu (2021); Ozili (2023); Agu and Nwankwo (2019)	Bank Annual Reports
$LM_{i,t}$	β_2	+	Independent variable	Ratio	Cash and cash equivalents divided by total assets	Faruk, 2025 Zaharum et al. (2022) Gambo et al. (2022).	Bank Financial Statements
$AQ_{i,t}$	β_3	−	Independent variable	Ratio	Non-performing loans divided by total loans	Gathara et al., (2023); Enekwe et al. (2022); Okine and Garr (2025)	Central Bank of Nigeria
$ME_{i,t}$	β_4	+	Independent variable	Ratio	Operating expenses divided by total income	Adeusi et al. (2021). Olowokure & Abdulraheem (2023); Abubakar et al. (2022)	Bank Financial Statements
$RP_{i,t}$	β_5	±	Moderating variable	Ordinal	Composite index from compliance ratings and audits	Mashamba et al., 2023; Otuya & Kimani (2023); Michael and Akpabio (2025)	CBN & NDIC Reports

Source: Author's own elaboration

$$\mathbf{y} = \mathbf{X}\beta + \epsilon, \quad \epsilon \sim N(0, \sigma_\mu^2 \mathbf{I}_N + \sigma_\epsilon^2 \mathbf{I}_T) \tag{3}$$

Where: $\mathbf{y}$ is the $NT \times 1$ vector of outcomes, $\mathbf{X}$ is the $NT \times k$ matrix of explanatory variables, β is a $k \times 1$ vector of parameters, ϵ consists of individual and idiosyncratic errors.

Hausman specification tests were performed to justify the random-effects assumption over fixed effects, ensuring the consistency and efficiency of the estimates. Robustness was assessed through multicollinearity diagnostics using Variance Inflation Factors (VIFs), which were acceptable for most variables, except for the sustainability dimensions, which were addressed through separate model specifications. Normality of residuals was evaluated using the Shapiro-Wilk test, and the interaction model in Equation (2) was tested to detect moderating effects. These diagnostics ensure the validity of model assumptions and enhance the credibility of the inferences drawn.

Regulatory pressure (RP) is proxied by a composite ordinal index constructed from banks' compliance with prudential guidelines, the frequency of regulatory sanctions, and the outcomes of supervisory audits reported by the Central Bank of Nigeria (CBN) and the Nigeria Deposit Insurance Corporation (NDIC). This approach aligns with institutional and regulatory theories, which posit that regulatory enforcement intensity shapes bank risk-taking and performance outcomes (North, 1990; Klomp & de Haan, 2015).

The composite index captures variations in supervisory strictness across banks and over time, reflecting differences in capital adequacy compliance, liquidity thresholds, and risk-based supervision. Similar composite regulatory proxies have been employed in prior empirical studies examining the impact of regulation on bank performance in emerging markets (Ben Naceur et al., 2010; Yang et al., 2019; Chen et al., 2022; Michael & Akpabio, 2025). The ordinal scaling ensures comparability across banks while minimizing measurement error associated with single-indicator regulatory proxies.

4. Results and Implications

4.1. Results

Table 2 presents descriptive statistics of the study variables. The mean return on equity (ROE) of 10.8% is accompanied by a high standard deviation of 11.1%, indicating substantial heterogeneity in profitability across Nigerian deposit money banks. Capital adequacy (CA) averages 8.4%, liquidity management (LM) 24.7%, asset quality (AQ) 5.4%, management efficiency (ME) 6.2%, and regulatory pressure (RP) 25.3%. These findings reflect structural variability in financial soundness indicators, consistent with prior evidence in emerging markets (Maude & Dogarawa, 2021; Yang et al., 2019).

Table.2.Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
ROE_(i,t)	0.108	0.111	-0.295	0.810
CA_(i,t)	0.084	0.137	0.005	0.977
LM_(i,t)	0.247	0.138	0.017	0.669
AQ_(i,t)	0.054	0.144	0.000	0.909
ME_(i,t)	0.062	0.099	0.001	0.487
RP_(i,t)	0.253	0.097	0.201	0.881

Source: Author's own elaboration

The correlation matrix (Table 3) shows that RP is positively associated with ROE ($r = 0.398$, $p < 0.01$), suggesting that banks under higher regulatory scrutiny tend to exhibit stronger profitability, potentially through improved market confidence and disciplined management (Onyenagubom & Nongu, 2024). Conversely, AQ is negatively correlated

with ROE ($r = -0.229$, $p < 0.01$), consistent with the literature on the detrimental impact of poor asset quality on earnings (Barakat et al., 2024). Other indicators show weak, mostly insignificant correlations, reflecting the multifactorial determinants of bank performance.

Table.3.Pairwise Correlations

Variable	(1) ROE	(2) CA	(3) LM	(4) AQ	(5) ME	(6) RP
(1) ROE	1.000					
(2) CA	-0.030	1.000				
(3) LM	-0.022	0.281*	1.000			
(4) AQ	-0.229*	0.113	0.086	1.000		
(5) ME	0.038	0.064	0.028	0.098	1.000	
(6) RP	0.398*	-0.069	-0.067	-0.103	-0.080	1.000

Source: Author's own elaboration

Multicollinearity diagnostics (Table 4) indicate VIFs below 5 for all predictors, supporting the reliability of regression estimates (Hair et al., 2019). The Hausman test (Table 5) favors the random-effects GLS model ($p = 0.984$), which is appropriate for panel data characterized by individual heterogeneity and no systematic correlation between regressors and unobserved effects (Baltagi, 2021).

Table.4.Normality (Shapiro-Wilk W) and Multicollinearity (VIF) Test

Variable	W	V	z	Prob > z	VIF	1/VIF
ROE_(i,t)	0.824	18.091	6.515	0.000	–	–
CA_(i,t)	0.534	48.033	8.712	0.000	1.100	0.909
LM_(i,t)	0.922	8.032	4.688	0.000	1.090	0.916
AQ_(i,t)	0.391	62.705	9.312	0.000	1.030	0.968
ME_(i,t)	0.601	41.066	8.359	0.000	1.020	0.980
RP_(i,t)	0.523	49.114	8.762	0.000	1.020	0.983

Source: Author's own elaboration

Table.5.Hausman Test

Chi-square test value	0.685
P-value	0.984

Source: Author's own elaboration

The baseline GLS random effects estimates are presented in Table 6. Capital adequacy ($\beta = 0.126$, $p = 0.009$) is positively associated with ROE, indicating that higher capital buffers may help banks absorb shocks and maintain stakeholder confidence, thereby supporting profitability (Nguyen & Dang, 2022; Kirui & Mugo, 2023). Liquidity management ($\beta = 0.211$, $p = 0.010$) positively affects ROE, consistent with the economic interpretation that prudent liquidity practices enable banks to meet short-term obligations while efficiently exploiting profitable lending opportunities (Gambo et al., 2022; Faruk, 2025). Asset quality ($\beta = -0.169$, $p = 0.007$) negatively impacts ROE, reflecting the economic loss associated with non-performing loans (Maude & Dogarawa, 2021; Enekwe et al., 2022).

Management efficiency ($\beta = 0.034$, $p = 0.565$) is not statistically significant, suggesting that operational efficiency, while theoretically important, may not directly translate into profitability in the Nigerian banking context. Regulatory pressure ($\beta = 0.348$, $p < 0.001$) is positively associated with ROE, indicating that stringent regulation may encourage prudent management practices and enhance market confidence, thereby supporting bank performance (Klomp & de Haan, 2015; Chen et al., 2022).

Table.6.GLS Random Effects Regression (Main Effects)

Variables	Parameter Symbol	Sign	Coeff	Std. Error	z-stat	p-value
CA_(i,t)	β1	+	0.126	0.048	2.625	0.009*
LM_(i,t)	β2	+	0.211	0.081	2.605	0.010*
AQ_(i,t)	β3	−	-0.169	0.063	-2.683	0.007*
ME_(i,t)	β4	+	0.034	0.059	0.576	0.565
RP_(i,t)	β5	±	0.348	0.091	3.824	0.000*
Constant			0.074	0.043	1.721	0.085
Statistics						
R-squared between			0.248			
Overall R-squared			0.195			
R-squared within			0.166			
Chi-square			81.917			
Prob > chi2			0.000			

Source: Author's own elaboration

Table 7 presents the interaction effects of regulatory pressure with financial soundness indicators. The interaction between capital adequacy and RP ($\beta = 0.142$, $p = 0.006$) is positive and significant, suggesting that regulatory scrutiny strengthens the beneficial effect of capital buffers on profitability. The interaction between liquidity management and RP ($\beta = 0.118$, $p = 0.053$) is marginally significant, indicating that regulation may modestly reinforce liquidity practices conducive to bank stability and returns.

The interaction between asset quality and RP ($\beta = -0.226$, $p = 0.001$) is negative and significant, demonstrating that under stricter regulatory environments, the adverse impact of poor asset quality on profitability is amplified. The interaction between management efficiency and RP ($\beta = -0.048$, $p = 0.406$) is not significant, suggesting that regulatory oversight has a limited influence on operational efficiency gains.

Table.7.GLS Random Effects Model of ROE_ (i,t) with Regulatory Pressure as Moderator

Variable	Parameter	Sign	Coefficient	Std. Error	z-value	p-value
CA_(i,t)	β1	+	0.086	0.031	2.774	0.006*
LM_(i,t)	β2	+	0.104	0.049	2.122	0.034*
AQ_(i,t)	β3	−	-0.201	0.072	-2.792	0.005*
ME_(i,t)	β4	±	0.069	0.055	1.253	0.210
RP_(i,t)	β5	±	0.177	0.082	2.159	0.031*
CA × RP	β6	+	0.142	0.052	2.731	0.006*
LM × RP	β7	+	0.118	0.061	1.934	0.053
AQ × RP	β8	−	-0.226	0.067	-3.373	0.001*
ME × RP	β9	±	-0.048	0.058	-0.831	0.406
Constant	β0		-0.039	0.043	-0.907	0.364
Statistics						
R-squared between			0.195			
Overall R-squared			0.228			
R-squared within			0.251			
Chi-square			901.010			
Prob > chi2			0.000			

Source: Author's own elaboration

4.2. Hypotheses Evaluation

The results strongly support the hypotheses of positive relationships among capital adequacy, liquidity management, and financial performance. The positive and significant coefficients of CA and LM are consistent with Basel regulations that promote capital and

liquidity as factors of banking stability and profitability (Nguyen & Dang, 2022; Klomp & de Haan, 2015). The conclusion that these effects are reinforced by regulatory pressure aligns with the claim that effective regulation encourages banks to maximize their capital buffers and liquidity reserves (Onyenagubom & Nongu, 2024). The hypothesis that non-performing assets reduce profitability is supported by the negative relationship between asset quality and performance, a relationship commonly established in the emerging-market banking literature (Maude & Dogarawa, 2021; Barakat et al., 2024).

This null result, which did not identify a significant direct impact of management efficiency on ROE, challenges expectations based on operational efficiency theories (Onyenagubom & Nongu, 2024), suggesting that either measure is a proxy or that contextual factors, such as market competition, are diluting this association in Nigeria. Further, that regulatory pressure is not significantly moderated by management efficiency also shows that regulatory emphasis might be placed on prudential rather than operational regulation, which echoes recent results on African banking regulation (Yang et al., 2019). In general, the hypotheses are substantially supported, providing theoretical and empirical support for the view that indicators of financial soundness and the regulatory environment as a whole shape banking sector performance.

4.3. Policy Implications

First, regulatory pressure, as a moderating factor in the positive relationship between capital adequacy and liquidity management, indicates that policymakers need to sustain or increase the rigour of supervision to strengthen banks' financial buffers. Tighter regulation can encourage banks to maintain healthy capital and liquidity bases, which are essential for absorbing shocks and maintaining system stability (Nguyen & Dang, 2022). Second, due to the harmful effects of poor-quality assets, amplified during regulatory oversight, regulatory authorities need to enhance early warning mechanisms and implement resolution models for non-performing assets to preserve the bank's profits and ensure depositors' confidence (Barakat et al., 2024).

Third, management efficiency is insignificant, underscoring a policy gap in which regulatory systems may not prioritize enhancing operational efficiency. Policymakers should encourage them to modernize their management practices and adopt digital innovations through targeted capacity-building and incentive programs, thereby improving their competitiveness and profitability (Onyenagubom & Nongu, 2024). Fourth, the findings recommend a moderate regulatory model that, in addition to prudential standards, ensures banks' strategic flexibility to be innovative and risk-responsive (Yang et al., 2019). Principles of proportionality and risk sensitivity should then be factored into the regulatory structures.

Lastly, it is essential to conduct continuous monitoring and research. Banking stakeholders and regulators must invest in data analytics and risk assessment technologies to better understand how financial soundness, regulatory pressure, and performance interact with global disruptions and changing technology (Maude & Dogarawa, 2021). The banking sector in Nigeria will be able to sustain a growth-oriented, resilient policy through such forward-looking policies.

5. Conclusion & Recommendations

This study investigates how bank-specific financial soundness indicators relate with return on equity (ROE) for listed deposit money banks (DMBs) in Nigeria using a balanced panel of ten banks over 2014-2023 and finds that capital adequacy, liquidity management, and regulatory pressure positively influence ROE while asset quality has adverse effects;

however, the moderating effect of supervisory oversight suggests that this is likely due to greater regulation with institutional theory (North, 1990), which supports an increasing empirical literature emphasizing governance as well macroprudential regulation in financial intermediation outcomes (Onyenagubom & Nongu, 2024; Nguyen & Dang, 2022).

Several recommendations arise: Policymakers and regulators can continue reinforcing the positive spillovers from capital and liquidity standards for financial stability. At the same time, they need to enhance mechanisms to maintain asset quality, such as stronger credit risk assessment and post-loan monitoring. Regulatory pressure is beneficial but should be balanced to avoid overregulation or stifling innovation or risk-taking; bank managers should focus on operational discipline and governance structures; investors should consider banks' regulatory responsiveness and soundness metrics in their analysis of firm value and sustainability.

Future research can extend this study in several directions. First, comparative analysis across West African economies or other emerging markets could validate the external consistency of the findings. Second, employing dynamic panel estimators (e.g., System GMM) could help mitigate endogeneity concerns and enhance causal inference. Third, the interaction of macroeconomic variables, such as inflation volatility, exchange rate risk, and monetary policy shifts, with bank-specific indicators could offer richer insights into the determinants of bank performance. Finally, qualitative case studies on how banks adapt internally to regulatory mandates could complement the quantitative findings and provide deeper behavioral insights.

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Conflicts of Interest

No conflict of interest.

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