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Risk Effects on Bank Stability Measures in Nigeria: Exploring the Role of Risk Weighted Assets of Selected Deposit Money Banks in Nigeria

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Abstract: *This study analyzed the effects of risky assets on bank stability in Nigerian banks from 2010 to 2022, using capital adequacy (CBST) and Z-score (ZBST) measures of stability. Risk-weighted assets (RWA) were the key independent variable. The analysis employed panel unit root tests (Levin, Lin & Chu) and Pedronicointegration tests, with long-run parameters estimated via the Panel Fully Modified Least Squares (FMOLS) method. Results showed that RWA negatively impacted ZBST, indicating that risky assets undermine bank stability. However, CBST was positively related to bank stability, highlighting the importance of capital buffers. Additionally, banks increased capital adequacy in response to rising risky assets, suggesting a reactive risk management approach. The study recommended stricter capital adequacy regulations for banks with high-risk portfolios and incentives for proactive risk mitigation to balance risk management with financial stability.*

Keywords: *Risk-weighted assets; capital adequacy-based bank stability; Z-score-based bank stability; Nigerian deposit money banks; Panel Fully Modified Least Squares (FMOLS)*

1. Introduction

Bank stability is crucial for maintaining a healthy financial system and overall economic stability. It ensures that banks can withstand shocks, such as financial crises, by preventing liquidity shortages, insolvencies, or systemic collapses(Kharabsheh&Gharaibeh, 2022;Wuave, Yua, &Yua, 2020; Matey, 2021; Zaghdoudi, 2019). Stable banks can continue providing essential services like lending, facilitating payments, and safeguarding deposits, which support economic growth (Stewart, Chowdhury,&Arjoon, 2021; Jayakumar, Pradhan, Dash, Maradana, & Gaurav, 2018).Bank stability is measured through the Z-score index, which evaluates the risk of insolvency by considering a bank's return on assets, leverage, and volatility, with higher scores reflecting increased stability (Zaghdoudi, 2019), and the Capital Adequacy Ratio

(CAR), which assesses the sufficiency of a bank's capital against its risk-weighted assets, where a higher ratio indicates better stability(Usman, 2021; Keneni, 2022).In Nigeria, bank stability assumes greater significance due to the country's economic volatility and sector-specific risks(Chai, Sadiq, Ali, Malik, & Hamid,2022). Sufficient capital reserves help Nigerian banks manage these risks, maintain depositor confidence, and support economic growth through lending and investment, thus contributing to the stability of both the banking sector and the broader economy (Ayinuola&Gumel, 2023; Akwam, &Yua, 2021).

Risk-weighted assets (RWAs) is at the center of bank stability and plays a vital role in determining a bank's capital adequacy and stability, as they establish how much capital a bank must hold to cover potential losses from riskier assets(Gharaibehet al., 2022). As asset risk increases, so does the need for more stable banks and capital to ensure that the bank can endure financial stress while maintaining stability (Abdul-Maliq, Yua.,&Oje, 2024; Yakubu&Bunyaminu, 2023). High RWAs indicate increased risk exposure, necessitating larger capital reserves to mitigate the risk of defaults and losses (Ferri&Pesic, 2017). This relationship is central to maintaining both individual bank stability and the overall stability of the financial system, as insufficient capital for high-risk assets can result in bank failures and systemic crises (Bank for International Settlements, 2011). Effective RWA management, alongside maintaining appropriate capital levels, is essential for promoting robust financial stability and protecting the system from economic shocks.

In Nigeria, the outlook for RWAs, capital adequacy, and banking stability has been shaped by improvements and ongoing challenges. Historically, Nigerian banks have faced high levels of risky assets, such as non-performing loans, which have strained capital reserves and contributed to financial instability,(Usman, 2021). The Central Bank of Nigeria (CBN) has responded with reforms, including increasing capital requirements and adopting stricter supervision to strengthen the banking sector's resilience (Yua, Ogohi, &Epor, 2022; Abiodun *et al.,* 2020). However, economic volatility and fluctuating oil prices continue to challenge bank stability. While improvements in capital buffers and compliance have been observed, Nigerian banks still face difficulties managing risky assets and navigating economic uncertainties ((Yua, Yua, Ogbonna, 2021; Ololadeet al., 2023; Adebisi et al., 2020). Consequently, ongoing reforms and robust risk management strategies are needed to address these persistent risks and ensure long-term stability in the Nigerian banking system.

Managing risky assets and ensuring capital adequacy has long been a challenge for Nigeria's banking sector. High levels of risky assets, such as non-performing loans and investments in unstable sectors, have put pressure on banks' capital reserves and exposed weaknesses within the financial system, Soomiyol, Bwuese, &Yua, (2023). This challenges bear heavily on bank stability and capital adequacy. To address the challenges related to bank capital adequacy and stability, Nigeria has introduced several policies, among which is the CBN established minimum capital requirements and adopted risk-based supervisory framework, which includes regular stress tests to assess the resilience of banks (Soomiyol, Asase, Yua, &Abiodun, 2024;Dalhatu&Sharofiddin, 2021). In addition, the CBN has implemented reforms to enhance corporate governance and transparency, while the Financial Stability Committee monitors systemic risks. The Nigeria Deposit Insurance Corporation (NDIC) also plays a role in bolstering depositor

confidence through deposit insurance. Despite these efforts, banking stability and risky assets, like non-performing loans, remain significant challenges, necessitating continuous search for solutions to a more stable banking sector (Zaghdoudi, 2019).
The reviewed literature reveals several gaps in understanding the effects of risky assets on bank capital adequacy and stability in Nigeria. While studies such as Keneni (2022) and Abiodun et al. (2020) overlooked the specific impact of different types of risky assets on Nigerian banks. Additionally, some of the existing research, including Usman (2021) and Abba, Okwa, Soje, &Aikpitanyi, (2018), are based on data up to 2019 or earlier, necessitating updates to reflect recent economic and regulatory changes. There is also limited focus on how banking sector-specific risks in Nigeria influence the bank stability and capital adequacy. There is also a lack of comprehensive analyses that utilize fully modified ordinary least squares (FMOLS) to capture the long-run relationships between risky assets and bank stability, which may yield different insights compared to the GMM and fixed-effect models typically employed in existing studies. So, this study will adopt the panel FMOLS to examine the effects of risky assets on bank stability, based on capital adequacy and z-score. Addressing these gaps could provide a more comprehensive and current understanding of how risky assets affect capital adequacy and stability in Nigeria's banking sector.

Researching the effect of risky assets on bank capital adequacy and stability in Nigeria is essential for several reasons. Firstly, understanding how these assets influence capital adequacy can help identify vulnerabilities in banks' financial buffers, leading to more effective risk management and policy interventions. Given Nigeria's economic instability and the high presence of risky assets, such studies can offer insights into how these factors affect banks' capacity to absorb losses and maintain stability. Additionally, this research can inform regulatory reforms by pinpointing weaknesses in existing policies and suggesting enhancements to capital adequacy standards and risk management practices. This is crucial for bolstering the resilience of Nigerian banks and preventing financial crises. Furthermore, the findings can assist banks in optimizing their asset portfolios and capital strategies, contributing to the overall stability and growth of the Nigerian financial system. Ultimately, thorough research in this field supports informed decision-making and strategic planning, which are vital for ensuring long-term financial stability and economic resilience in Nigeria.
The paper is organized into four other sections following the introduction. Section two presents a literature review that highlights key theories and empirical reviews in existing research. Section three outlines the methodology, detailing data sources and analytical techniques used. Section four presents the analysis and results, while section five contains discussions of the results and their implications, conclusions with a summary of findings and recommendations for future research and policy.

2 Literature Review

2.1 Conceptual Review

Bank stability reflects a bank's ability to stay solvent and absorb financial shocks (Ayinuola&Gumel, 2023; Ofori-Sasu et al., 2023; Ololade et al., 2023; Gharaibeh et al., 2022; Kharabsheh&Gharaibeh, 2022). It is commonly measured by the Capital Adequacy Ratio (CAR) and the Z-score, which assess different aspects of stability. The CAR

evaluates a bank's capacity to handle losses by comparing capital to risk-weighted assets, while the Z-score measures insolvency risk based on return on assets, equity, and asset volatility. Together, these metrics offer a comprehensive view of a bank's risk management and stability.Bank stability is crucial for sustaining economic growth and ensuring the resilience of financial systems. Stable banks promote efficient capital allocation, facilitate payments, and provide liquidity, which are vital for maintaining investor confidence and supporting economic activities (Kharabsheh&Gharaibeh, 2022). Conversely, instability in the banking sector can trigger systemic crises(Ofori-Sasuet al., 2023), as demonstrated by the 2008 global financial crisis, where the collapse of major banks had significant repercussions worldwide. In emerging economies like Nigeria, where financial markets are still evolving and vulnerable to both internal and external shocks, ensuring bank stability is even more critical to avert economic disruptions(Stewart, Chowdhury, &Arjoon, 2021). Therefore, research into the factors and mechanisms affecting bank stability is essential, offering valuable insights for regulators and policymakers to develop frameworks that protect the banking sector from insolvency risks and bolster its role in fostering economic growth.

The term "risky asset effects" refers to the impact of high-risk financial instruments, such as volatile securities or loans to uncertain borrowers, on a bank's stability (Adebisi et al., 2020). These assets come with a higher likelihood of default, which can lead to financial instability.Bank stability is heavily influenced by a bank’s asset portfolio composition, particularly its exposure to risky assets. Risky assets, such as loans to high-risk borrowers or investments in volatile securities, increase the likelihood of defaults, which can lead to significant financial losses and destabilize the bank’s balance sheet (Ferri&Pesic, 2017). As banks hold more risky assets, they become increasingly susceptible to economic downturns or market shocks, potentially eroding their capital base and raising the risk of insolvency (Igbatayo, 2011). This heightened exposure to risk can negatively affect key stability indicators, such as the capital adequacy ratio (CAR) and the z-score, both used to assess a bank’s resilience. Thus, understanding the relationship between risky assets and bank stability is essential, particularly in emerging markets like Nigeria, where banks encounter unique risks and regulatory challenges.

2.2 Theoretical Review

The Financial Instability Hypothesis, articulated by Hyman Minsky, posits that financial markets exhibit inherent instability due to the behaviour of economic agents who oscillate between optimism and pessimism, ultimately leading to cycles of boom and bust (Minsky, 1992). In this framework, banks are particularly susceptible to the effects of risky assets, as their stability relies on a careful balance between their capital buffers and the riskiness of their asset portfolios (Abbas & Ali, 2022; Gharaibeh et al., 2022). Minsky argued that during periods of economic expansion, banks tend to engage in riskier lending practices, which can inflate asset bubbles. Conversely, during economic contractions, the same institutions become vulnerable due to inadequate capital to absorb losses, leading to potential insolvency (Athari et al., 2023). This cyclical behaviour underscores the necessity of analyzing the relationship between risky assets and bank stability in Nigeria, as the nation experiences volatility influenced by global economic conditions, such as fluctuations in oil prices and currency exchange rates (Igbatayo, 2011).

Complementing the Financial Instability Hypothesis is the Capital Buffer Theory, which emphasizes the importance of banks maintaining adequate capital reserves to absorb potential losses and ensure financial stability. According to Saadaoui and Mokdadi (2023), a well-capitalized bank can withstand economic shocks, thereby contributing to the overall resilience of the financial system. In Nigeria, where banks navigate a complex economic landscape marked by external shocks and domestic challenges, maintaining robust capital buffers is crucial. Regulatory measures, such as the capital adequacy ratio (CAR), serve to enforce these buffers, ensuring banks can withstand potential losses arising from risky asset exposures. Recent studies indicate that capital adequacy is a significant determinant of bank stability, highlighting the need for regulatory frameworks that encourage banks to bolster their capital positions in response to the evolving risk landscape (Usman, Lestari,&Puspa, 2019). The investigation of capital adequacy alongside Z-score measures of stability for selected deposit money banks in Nigeria provides critical insights into the effectiveness of capital buffers in mitigating the negative impacts of risky asset exposure.

The interplay between the Financial Instability Hypothesis and Capital Buffer Theory is particularly salient in evaluating the resilience of Nigerian banks amid the challenges posed by risky assets. By utilizing the Z-score as an indicator of bank stability, the study can illuminate how variations in capital adequacy influence the risk-return profiles of banks in Nigeria (Abba et al., 2018). This relationship is vital for understanding how banks can maintain stability during periods of economic stress, ultimately ensuring their contribution to the broader financial system's stability (Ayinuola&Gumel, 2023; Ololade et al., 2023). Furthermore, insights drawn from this analysis can inform policymakers and regulators in Nigeria, guiding them in devising strategies aimed at strengthening bank stability and resilience against potential financial crises. Such measures are crucial for fostering a robust banking sector that can support economic growth and stability in an increasingly volatile global economic environment (Suleiman &Adegbite, 2024).

2.3 Empirical Review

The empirical studies reviewed collectively illuminate the complex relationships between various risk factors and bank stability across different contexts. Djebali and Zaghdoudi (2020) analyzed a panel of 75 conventional banks across 11 MENA countries, finding non-linear relationships between bank stability and credit and liquidity risks, with critical thresholds at 13.16% for credit risk and 19.03% for liquidity risk, beyond which the effects turned negative. This aligns with Ayinuola and Gumel (2023), who reported significant negative impacts of both risks on bank stability in a study of 12 Nigerian banks, noting a positive correlation between them. Adebisi et al. (2020) highlighted that impairment losses adversely affected operating profit and that macroeconomic factors, like inflation and liquidity, negatively influenced profitability, while the non-performing loan ratio positively impacted return on assets. Various studies emphasize the importance of macroeconomic and country-specific factors in bank stability. Athari et al. (2023) found that reducing country vulnerability enhances banking stability, particularly in higher-income countries. Ofori-Sasu et al. (2023) explored the interplay between monetary and macro-prudential regulations and risks, noting non-linear effects on stability, with optimal thresholds for risk

influences. Ololade et al. (2023) confirmed negative effects of liquidity and capital risk on performance but observed a positive impact from bank size. Kharabsheh and Gharaibeh (2022) indicated that SME loans and capital adequacy positively influenced stability, while financial inclusion, liquidity risk, and credit risk had negative effects.

Research on bank-specific factors and diversification strategies has highlighted their significance in bank stability. Chai et al. (2022) found that in a study of 15 scheduled banks in Pakistan, both credit risk and liquidity risk negatively impacted stability, while return on assets (ROA) had a positive effect. Abbas and Ali (2022) examined US commercial banks, revealing that funding and asset diversification reduced risk, whereas income diversification increased it, adversely affecting stability. Gharaibeh et al. (2022) further established that funding risk and financial concentration positively influenced stability, while credit risk and profitability negatively affected it. Matey (2021) reaffirmed the inverse relationship between liquidity risk and bank stability, advocating for the investment of idle funds into productive assets. Studies by Saif-Alyousfi and Saha (2021) and Zaghdoudi (2019) emphasized the complex interplay of various risks on stability, noting that non-traditional banking activities increased risk while diminishing stability in well-capitalized banks, and that greater loan exposure improved stability. Zaghdoudi's analysis of Tunisian banks indicated that liquidity risk positively correlated with stability, though credit risk effects varied based on the stability metric used. Ali and Puah (2018) examined the influence of bank size and funding risk in Pakistan, finding mixed effects of bank size on stability across different measures. Collectively, these studies advocate for comprehensive risk management strategies that consider both internal factors and external economic conditions to enhance bank stability in varied financial environments.

On the other hand, the strands of literatures relevant to this exploratory study is the one concerned about the factors that drive capital adequacy as an indicator of bank stability. The studies collectively examine the determinants of capital adequacy ratios (CAR) in banking sectors across different countries, utilizing various methodologies and datasets. Keneni (2022) examined financial data from 16 private banks in Ethiopia (2013-2020) using a random-effects model based on the Hausman test, finding that Return on Assets (ROA) and bank size were significant at the 5% level. Usman (2021) analyzed 12 listed Nigerian Deposit Money Banks (2012-2019) through correlational and ex post facto designs with multiple regression analysis, identifying liquidity and loan loss provisions as crucial factors at a 1% significance level. Abiodun, Abdul-Azeez, &Adewale,(2020) focused on ten Nigerian banks (2007-2017), noting that ROA and loan-to-total-assets ratios were impacted negatively by nonperforming loans and bank size. Vu and Dang (2020) studied Vietnamese banks (2011-2018), finding a positive effect of ROA but negative impacts from leverage and loan loss reserves. Usman et al. (2019) employed panel data regression analysis with the General Least Squares (GLS) method on 27 conventional banks in Indonesia (2007-2018), revealing that bank size, leverage, loan loss reserves, net interest margin, and loan asset ratio significantly affected the capital adequacy ratio (CAR), while liquidity had no significant impact. Abba et al. (2018) conducted a balanced panel data analysis of 12 Nigerian Deposit Money Banks (2005-2014), concluding that ROA was the most significant determinant of CAR, which exceeded the regulatory minimums established by the Central Bank of Nigeria and Basel Accord, influenced mainly by risk portfolio, deposit levels, profitability, and asset quality.

The analysis of capital adequacy ratios (CAR) in various banking sectors highlights a complex interplay of determinants essential for financial stability and regulatory compliance, with profitability, particularly measured by Return on Assets (ROA), being central to the discussion. Studies by Keneni (2022) and Abba et al. (2018) identify ROA as a significant indicator of CAR, suggesting that more profitable banks are better positioned to meet capital requirements. Abiodun et al. (2020) further emphasize the importance of asset structure, particularly the loan-to-total-assets ratio, indicating that effective asset management enhances capital adequacy. Conversely, the roles of liquidity and loan loss provisions are critical, as noted by Usman (2021) and Vu and Dang (2020), who highlight that adequate liquidity and sound loan loss provisions are essential for maintaining CAR, with Usman observing their significant positive influence in Nigerian banks. However, challenges such as nonperforming loans and bank size complicate the landscape, with larger institutions potentially facing greater difficulties in sustaining adequate capital ratios amidst higher risk portfolios. Thus, while profitability and effective asset management are vital, banks must navigate the challenges posed by size and asset quality to ensure robust capital adequacy. Overall, the findings advocate for a holistic approach to capital management that balances profitability, liquidity, and prudent risk management practices to enhance financial stability.

3. Data and Methodology

This study adopts*Expostfacto* research design. Ex post facto analysis is a systematic empirical study in which the researcher does not in any way track or influence independent variables because the study situation has already occurred or has taken place. According to the CBN list of deposit money banks in Nigeria December 2022, there are a total of twenty-two (22)interest-based deposit money banks (8 banks with international operating license, 11 banks with national operating license and 3 banks with regional operating license) in Nigeria and two (2) non-interest-based banks (1 bank with national license and 1 bank with regional license) in Nigeria. This puts the total number of banks at twenty-four (24). Thus, this figure becomes the study population. In this study, a mathematical statistical method given by Taro Yamane (1967) for drawing a sample size is used. Taro Yamene is usually for large population, thus, it is modified to achieve the research target. Five deposit money banks with international banking authorization are selected using a Taro Yamene (1967) sample formula:

$$n = \frac{N}{1 + Ne^2} * 3$$

Where:
n = signifies the sample size; N = signifies the total population under study; e = signifies the margin error = 0.05; and 3 = arbitrary number introduced to further reduce the size

$$n = \frac{24}{1 + 24(0.05)^2} \div 3$$

$$n = 22.6415 \div 3$$

$$n = 7.5472$$

$$n \approx 8$$

The sample size above suggests that eight deposit money banks is selected.

Considering the quantitative methodology to be adopted which supports generalizability, the stratified random sampling was used. The choice of this sampling strategy is because it makes use of existing stratum to select the banks. The current strata of banks based on their reported capital based and their grouping as Domestic Systemically Important Banks (D-SIBs) by the CBN due to their size, complexity, systemic interconnectedness and substitutability become the research strata for their selection in this study. This sampling method is considered to be the best standard because it is an existing arrangement by the CBN backed by each bank's reported and validated capital-base (shareholders' funds) as at December 31st 2022. Besides, the selection basis is most natural, mutually exclusive and easily identified group. Thus, the entire D-SIBs are selected. These are Access Bank, Fidelity Bank Plc., First City Monument Bank Plc., Union Bank of Nigeria Plc., United Bank for Africa, First Bank Plc., Guaranty Trust Bank Plc. and Zenith Bank Plc.

Method of Data Collection

Data collected for this study is panel (longitudinal) in nature, and are sourced from the annual reports of the sampled deposit money banks for the study. Capitaladequacy-based bank stability (CBST) is proxied by the capital adequacyratio of the sampled Deposit Money Banks. Capital adequacy ratio is measured using both Tier 1 and Tier capital framework as provided for by the Basel II accord. The risk assets or exposure level of banks is proxied by risk weighted assets (RWA). The z-score bank stability, which explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to determine a bank's solvency risk, is used as another proxy for bank stability.

Model Specification

Based on the Capital Buffer Theory, we derive a model specification for the relationship between risk-weighted assets (RWA) and bank stability (using the duo of capital-based bank stability, CBST, and z-score bank stability, ZBST). From the literatures, it has been known that risk exposures influence bank stability (Athari et al., 2023; Chai et al., 2022; Gharaibeh et al., 2022; Saif-Alyousfi&Saha, 2021; Zaghdoudi, 2019; Djebali&Zaghdoudi, 2020; Abba et al., 2018; Usman, 2021; Vu & Dang, 2020), irrespective of the measure bank stability used. These risks have the ability to erode the capital a bank holds as a buffer to cover potential losses arising from its operations (Abbas & Ali, 2022). Following the empirical models of the aforementioned scholars, the model for the study is specified thus:

$$ST = f(RWA)$$

Where,ST is bank stability and RWA is risk-weighted assets.

However, we have relied on bank stability to be ameasure of capital adequacy-based bank stability (CBST) and z-score bank stability (ZBST), so the determinant equation above will be modified thus:

$$CBST = f(RWA, ZBST)$$

$$ZBST = f(RWA, CBST)$$

By expansion, we get:

$$CBST_t = \omega_0 + \omega_1 RWA_t + \omega_2 ZBST_t + \in_t$$

$$ZBST_t = \emptyset_0 + \emptyset_1 RWA_t + \emptyset_2 CBST_t + \varepsilon_t$$

Where,ω_0 is intercept, ω_1–ω_2 and$\emptyset_1$–$\emptyset_2$ are coefficients of long-run estimates, $\in_t$ andε_t are error terms of long-run estimates, while $\omega_0$and $\emptyset_0$ are intercepts of the two models.

Table 3.1: Operationalization of research variables and references

Notation	Meaning	Sources
Dependent variables		
CBST	Capital Adequacy-based Bank Stability	Keneni, 2022; Usman, 2021; Abiodun et al., 2020
ZBST	Z-score Bank Stability	Saif-Alyousfi & Saha, 2021; Zaghdoudi, 2019
Independent variables		
RWA	Risk Weighted Assets	Atuahene et al., 2021

Source: Author's Derivation using reviewed literatures, 2024

The first indicator of bank stability is the capital adequacy ratio, which assesses a bank's financial health by comparing its capital to risk-weighted credit exposures. The purpose is to reveal how resilient a bank is, even when faced with risks. This measure is based on the Tier 1 and Tier 2 capital framework, as outlined by the Basel II Accord. The second measure of bank stability is the Z-score, which represents a bank's ability to handle operational risks while performing its intermediary role (Bouvatier et al., 2023). In this study, the Z-score index will be used, calculated using three key indicators: the equity-to-assets ratio (E/A), return on assets (ROA), and the standard deviation of ROA (σ(ROA)), which serves as a proxy for return volatility. Essentially, the Z-score measures a bank's distance from insolvency. The formula for the Z-score, as adapted from Bouvatier et al. (2023), will be applied: $Z - score = \frac{ROA + \frac{E}{A}}{\sigma(ROA)}$. In simple terms, the Z-score indicates how many standard deviations the return on assets (ROA) would need to shift for a bank's total assets to fall below its total liabilities. Its widespread use stems from the well-

established inverse relationship between the Z-score and the likelihood of insolvency for financial institutions.

Risk-Weighted Assets, the main independent variable, represent the minimum capital a bank is required to hold to mitigate insolvency risks. In alignment with the Basel Accords, the Central Bank of Nigeria (CBN) mandates a 15% minimum for Domestic Systemically Important Banks (D-SIBs). A higher value of this variable enhances the stability of financial institutions, especially for D-SIBs.

4. Analysis and Results

The descriptive statistics for the Capital adequacy-based Bank stability (CBST), Risk Weighted Assets (RWA), and Z-Score Bank stability (ZBST) in Nigeria reveal significant variations in the banking sector's performance and stability. The CBST has a mean of approximately 19.93, accompanied by a standard deviation of 5.61, indicating that the values cluster closely around the mean. However, the observed range is notable; spanning from a minimum of -9.51 to a maximum of 44.00, suggesting that some banks may experience substantial stress, as reflected in negative values. In contrast, RWA has a much higher mean of 127.17, with a standard deviation of 218.89, highlighting considerable variability in risk-weighted assets among banks. The extreme maximum of 962.01 points to significant discrepancies in asset risk profiles, emphasizing that while most banks may have manageable risk levels, a few hold disproportionately high asset weights.

Table 4.1: Descriptive Statistics for Dependent and Explanatory Variables

Descriptive Statistics			
	CBST	RWA	ZBST
Mean	19.93	127.17	4.34
Median	19.15	58.82	1.19
Maximum	44.00	962.01	85.03
Minimum	-9.51	22.97	0.03
Std. Dev.	5.61	218.89	10.96
Skewness	-0.24	2.86	5.35
Kurtosis	12.28	9.57	35.17
Observations	101	101	101

Correlation			
	CBST	RWA	ZBST
CBST	1		
RWA	-0.1798 0.0720	1	
ZBST	-0.0312 0.7568	0.2260 0.0231	1

Source: Researcher's Computation using EViews

The skewness values for RWA (2.86) and ZBST (5.35) indicate a rightward tilt, suggesting a concentration of lower values with a few banks exhibiting exceptionally high measures. The kurtosis results are particularly telling, with ZBST showing a kurtosis of 35.17, which indicates a sharp peak in stability measures, implying that many banks operate similarly, yet there are outliers with much higher stability scores. Correlation analysis highlights a

weak negative relationship between CBST and RWA (-0.1798), indicating that banks with higher capital buffers do not necessarily correspond to lower risk-weighted assets. Conversely, the positive correlation between RWA and ZBST (0.2260) suggests that as banks increase their risk-weighted assets, their stability also tends to rise, albeit weakly. Collectively, these statistics reflect the diverse landscape of Nigeria's banking sector, where differences in capital adequacy, risk exposure, and stability warrant careful regulatory oversight and targeted interventions.

Panel Unit Root Tests

The results from the Levin, Lin & Chu (LLC) panel unit root tests for Nigerian banks reveal that all three variables; Capitaladequacy-based bank stability (CBST), Risk-Weighted Assets (RWA), and Z-Score Bank stability(ZBST), are stationary at levels, indicating they are integrated of order I(0).

Table 4.2: Panel Unit Root Test

Variable	Levin, Lin & Chu test at levels		Levin, Lin & Chu test at first difference		Order of Integration
	Statistics	p-values	Statistics	p-values	
CBST	-8.7435	0.0000***			*I(0)*
RWA	-2.5142	0.0060***			*I(0)*
ZBST	-3.0997	0.0010***			*I(0)*

Note: *, ** and *** are significance at 10%, 5% and 1% respectively

Source: Researcher's Computation using EViews

The statistics for CBST show a value of -8.7435 with a p-value of 0.0000, which is highly significant, confirming that CBST does not contain a unit root and thus is stationary. Similarly, RWA has a test statistic of -2.5142 and a p-value of 0.0060, further supporting the conclusion of stationarity at levels. ZBST also shows significant evidence of stationarity with a statistic of -3.0997 and a p-value of 0.0010.

The implication of these results is critical for the analysis of the banking sector in Nigeria, as it suggests that the underlying relationships among these variables can be assessed without the concern of spurious regression issues typically associated with non-stationary data. Since all three variables are stationary at levels, the study can employ standard econometric techniques for further analysiswithout needing to first difference the data. This robustness in the data facilitates a clearer understanding of how each of these financial metrics interacts within the context of Nigeria's banking environment, providing a sound basis for subsequent inferential analyses and policy implications.

4.2.3 Panel Cointegration Tests

Having established, from panel unit root tests, that the CBST, ZSBT and RWA are integrated of the same order, there is a likelihood of an impending associated relationship, which we used the Pedroni's test for cointegration to establish the truthfulness of a long run relationship. This cointegration test results are presented in Tables 4.3.

Table 4.3: PedroniCointegration Tests

Pedroni Residual Cointegration Test			Pedroni Residual Cointegration Test		
CBST = f(RWA, ZBST)			*ZBST = f(RWA, CBST)*		
	Statistic	**Prob.**		**Statistic**	**Prob.**
Panel v-Statistic	-1.3539	0.9121	Panel v-Statistic	-1.5464	0.9390
Panel rho-Statistic	1.0002	0.8414	Panel rho-Statistic	-1.0729	0.1417
Panel PP-Statistic	-2.7924	0.0026***	Panel PP-Statistic	-4.9653	0.0000***
Panel ADF-Statistic	1.4287	0.9235	Panel ADF-Statistic	-2.5144	0.0060***
	Weighted Statistic	**Prob.**		**Weighted Statistic**	**Prob.**
Panel v-Statistic	-1.4778	0.9303	Panel v-Statistic	-1.4952	0.9326
Panel rho-Statistic	0.2175	0.5861	Panel rho-Statistic	-0.9425	0.1730
Panel PP-Statistic	-5.0247	0.0000***	Panel PP-Statistic	-6.8562	0.0000***
Panel ADF-Statistic	-1.7352	0.0414**	Panel ADF-Statistic	-3.4997	0.0002***
	Statistic	**Prob.**		**Statistic**	**Prob.**
Group rho-Statistic	1.6150	0.9469	Group rho-Statistic	-0.0510	0.4796
Group PP-Statistic	-5.6042	0.0000***	Group PP-Statistic	-9.4442	0.0000***
Group ADF-Statistic	-1.7806	0.0375**	Group ADF-Statistic	-3.2162	0.0006***

Note: *, ** and *** are significance at 10%, 5% and 1% respectively

Source: Researcher's Computation using EViews

With the capitaladequacy-based bank stability (CBST) as dependent variable, five (5) out of eleven test statistics rejected the null hypothesis of no cointegration; with the p-valueslower than 0.05, we conclude that there exists a cointegrating relationship in the risk-weighted assets and capital-based bank stability nexus among Nigerian banks. On the z-score bank stability (ZSST) as dependent variable, six (6) out of eleven test statistics rejected the null hypothesis of no cointegration; with the p-values lower than 0.05, we conclude that there exists a cointegrating relationship in the risk-weighted assets and z-score bank stability nexus among Nigerian banks. among the variables used.According to Yua et. al. (2024), "the decision for cointegration is more of an art here than science. The logic is that, if at least one test statistic shows the presence of cointegration, it is advisable to reject the null hypothesis of no cointegration".

Long-run Panel ARDL Model Estimation

The results from the Panel Fully Modified Least Squares (FMOLS) estimation for the Z-Score Bank stability (ZBST) in the context of Nigerian banking sector stability reveal significant insights into the relationships among Risk-Weighted Assets (RWA), Capitaladequacy-based Bank stability (CBST), and bank stability. In the first equation, RWA exhibits a negative coefficient of -0.4907 with a t-statistic of -14.0119 and a highly significant p-value of 0.0000.

Table 4.5: Long-run Estimations

Panel Fully Modified Least Squares (FMOLS)							
ZBST = f(RWA, CBST)				*ZBST = f(RWA, CBST)*			
Variable	**Coefficient**	**t-Statistic**	**Prob.**	**Variable**	**Coefficient**	**t-Statistic**	**Prob.**
RWA	-0.4907	-14.0119	0.0000***	RWA	0.7696	57.7343	0.0000***
CBST	0.3658	17.5210	0.0000***	ZBST	0.7100	15.1019	0.0000***

Note: *, ** and *** are significance at 10%, 5% and 1% respectively

Source: Researcher's Computation using EViews

In the second equation, where ZBST is regressed on both RWA and CBST, the results yield a positive coefficient for RWA (0.7696) with a t-statistic of 57.7343 and a p-value of 0.0000. This may indicate that while increased risk-weighted assets negatively impact stability when viewed independently, there might be a threshold effect when considering the overall stability measure. The presence of CBST (0.7100 with a t-statistic of 15.1019 and a p-value of 0.0000) reinforces its significance in explaining variations in ZBST.

5. Discussion of findings, Conclusion and Recommendation

Discussion of findings

The first objective was to find the effect of risk-weighted assets on bank stability as measured by the z-score and found that risky assets are significantly inversely related to z-score bank stability. This finding indicates that an increase in risk-weighted assets is associated with a decrease in bank stability, as measured by the ZBST. This agrees with earlier studies of Athari et al. (2023), Chai et al. (2022) and Matey (2021) who all found that risks have negative effects on bank stability. The result suggests that as banks allocate more assets to higher-risk categories, their overall stability diminishes, which may be a cause for concern for regulators and policymakers focused on ensuring a resilient banking sector.Conversely, the CBST variable has a positive coefficient of 0.3658 and a t-statistic of 17.5210, with a p-value of 0.0000, indicating a strong and significant positive relationship with ZBST. This suggests that as banks improve their capital buffer, their stability increases, reinforcing the importance of maintaining adequate capital reserves to absorb potential losses. The strong statistical significance of this relationship underlines the necessity for banks to prioritize capital adequacy as a strategy for enhancing stability in a volatile financial environment. Together, these findings underscore the critical role of capital buffers in mitigating risks associated with higher-risk asset allocations.

The second objective was to find the effect of risk-weighted assets on bank stability using the capital adequacy measure. It was found that increases in bank risky assets makes bank increase capital adequacy. This is in agreement with Abiodun et al. (2020) who found that effective assetmanagement enhances capital adequacy. Increases in bank

risky assets typically compel banks to raise their capital adequacy to mitigate the heightened financial risk associated with these assets. Risky assets, such as high-risk loans and volatile investments, elevate the likelihood of defaults or significant value fluctuations, which can threaten a bank's stability (Vu & Dang, 2020; Abiodunet al., 2020). Consequently, regulators require banks to hold more capital as a buffer to absorb potential losses, ensuring they remain solvent during economic downturns or financial stress. This regulatory response, framed within the Basel III framework, promotes resilience by mandating higher capital adequacy ratios proportional to the riskiness of a bank's asset portfolio (Matey, 2021). Increasing capital adequacy not only strengthens the bank's financial position but also fosters greater confidence among investors and depositors. In this context, capital adequacy becomes a crucial mechanism to safeguard against systemic risk, particularly in periods of increased market volatility.

The contrasting results between the two equations highlight the nuanced interactions between capital adequacy and risk exposure in the Nigerian banking sector. Policymakers should be mindful of these dynamics, as they illustrate that merely increasing assets without a corresponding focus on capital buffers may jeopardize the stability of financial institutions, thus emphasizing the need for balanced regulatory frameworks that promote both risk management and capital preservation.

Conclusion

This study examined to examine the effects of risky assets on bank stability by using capital adequacy and z-score measures of bank stability of quoted banks in Nigeria from 2010 to 2022. The study relied on z-score of banks (ZBST) and capital adequacy ratio measure of bank stability (CBST), all as dependent variable, while risk-weighted assets (RWA) as the main independent variable. The panel unit root was with the Levin, Lin & Chu (LLC) panel unit root tests while panel cointegration tests was done by the PedroniCointegration Tests. The long-run parameters were estimated with the Panel Fully Modified Least Squares (FMOLS). The study's first objective found that risk-weighted assets are significantly and inversely related to bank stability, as measured by the Z-score. Conversely, capital buffers (CBST) showed a strong positive relationship with bank stability, underscoring the critical role of capital adequacy in enhancing financial resilience.The second objective revealed that increases in risky assets prompt banks to raise their capital adequacy. This is necessary to mitigate risks associated with high-risk loans and volatile investments. The contrasting results between the two equations underscore the importance of a balanced regulatory approach that promotes both risk management and capital preservation in the Nigerian banking sector.From the study's findings, it can be concluded that risk-weighted assets was detrimental to z-score measure of bank stability but beneficial to capital adequacy of deposit money banks in Nigeria.

Recommendation

Based on the findings and conclusions, the study proffers the following recommendations:

i. Given the inverse relationship between risk-weighted assets and bank stability, regulatory authorities should enforce stricter capital adequacy requirements, especially for banks with high-risk asset portfolios. This will ensure that banks maintain robust capital buffers to absorb potential shocks and maintain financial stability, enhancing resilience as indicated by the positive correlation between capital buffers and stability.
ii. To address the tendency of banks to increase capital adequacy in response to higher risk exposure, regulators could introduce incentives for proactive risk management. This might include preferential regulatory treatment or reduced capital surcharges for banks that demonstrate effective risk mitigation strategies, encouraging stability without over-relying on post-exposure capital adjustments.s

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