Original Article

Capital Adequacy and Bank Stability: A Panel ARDL Analysis of Selected Listed Deposit Money Banks in Nigeria

Christian Müller[1] and Aondoaseer Moses[2]

[1]Department of Finance, University of Frankfurt, Frankfurt, Germany
[2]School of Economics, University of Melbourne, Melbourne, Australia
Email: *christian.muller@uni-frankfurt.de; a.moses@unimelb.edu.au*
DOI: https://doi.org/10.5281/zenodo.13789012

This study examined to examine the effects of capital adequacy on the stability of quoted banks in Nigeria from 2010 to 2022. The study used a panel of eight banks in Nigeria, Access, First Bank, FCMB, Fidelity Bank, GTB, UBA, Union Bank of Nigeria and Zenith bank, all listed in the Nigerian Stock Exchange. The study was based on the expos fato research design and used secondary data sourced from the annual reports of the sampled banks. The study examined a number of significant capital adequacy variables that are difficult to neglect when trying to understudy the effects of capital adequacy. These variables include bank capital to total credit ratio (BCTCA), loan to deposit ratio (LDR), debt to equity ratio (DER) and risk weighted asset (RWA). The study adopted the Panel Autoregressive Distributed Lag (PARDL) technique to estimate our parameters. From the study's findings, it can be concluded that loan to deposit ratio (LDR) and debt to equity ratio (DER) have significant inverse effect on bank stability in Nigeria, while bank capital to total credit ratio (BCTCA) and risk weighted asset (RWA) have significant positive effect on the stability in Nigerian banks. So, in summary, increasing or reducing the capital adequacy indicators matter to bank stability in Nigeria. Based on the findings and conclusions, the study proffers the following recommendations: that Nigerian banks that desire to improve their stability should reduce the ratio of loan to deposit and debt to equity, but increase bank capitalization to total credit ratio and their risk-weighted assets.

Keywords: Capital adequacy, Bank stability, Z-Score, Nigeria, Panel ARDL

Introduction

Insolvency, while Polaris and Access banks took over Sky and Diamond banks. As a result, regulatory authorities revised key supervisory requirements to address the crisis.

The Nigerian banking industry has faced instability and crises throughout its evolution and development. From 1945 to 1952, massive bank failures occurred due to the lack of depositor's funds. Between 1985 and 1995, the Structural Adjustment Programme (SAP) was implemented, leading to serious distress and liquidation of banks. Despite this, the industry still faces threats of continued distress and instability due to unhealthy and unsound banks. The banking system in Nigeria continues to face unimpressive financial conditions due to an increasing

portfolio of non-performing loans (NPLs), which is transferred and written off without sufficient recovery efforts (Oleribe & Taylor-Robinson, 2016). This leads to capital and shareholders' fund erosion, liquidity impairment, poor asset quality, and reduced profitability and solvency levels. The monetary authorities have initiated several banking reforms, with capital reforms being a key reform aimed at addressing these issues.

Capital adequacy ratio (CAR) of banks was in the frontline of amendments because the key role of this ratio is to contain unanticipated damages/shocks resulting from excessive risktaking behaviour of banking institutions (Ashraf et al., 2016). Regulatory capital requirement is strongly believed to improve the banking system stability because it functions as a disciplining mechanism to the way banks behave, particularly their risk-taking behaviour. Wright *et al.* (1996) viewed risk-taking behaviour in banking as the process in which analysis and selection are associated with a variety of uncertainties for anticipated and concerned cash flows. For commercial banks, risk-taking is referred to as the conduct of commercial banks to assume risks or venture capital, which represents the total risk of commercial banks in the process of management.

Theoretically, highly capitalized banks stand a better chance to withstand unanticipated operational losses but practically, the counter-productiveness of continuous requirements of higher capital-base for banks is that it induces widespread and excessive risk-taking (Dias, 2021; Teixeira et al., 2020).Notwithstanding the debate, research studies (Oyetayo et al., 2019; Ikue &Nkoro, 2019; Ajayi et al., 2019; Atuahene et al., 2021) found that higher capital-base banks possess enough liquid assets for cushioning unanticipated shocks emanating from their financial intermediation function. The purpose of which is to ultimately protect customers' deposits. Numerous works (Michael et al., 2018; Igbinosa & Naimo, 2020) found that sufficient capital adequacy is a sine qua non for banking system stability. This justifies the reason regulators (like CBN) closely regulates banks' capital-base.

Currently, in Nigeria, banks' capital regulation is done using the Basel Accord II framework which pegged minimum capital at 8% of risk-adjusted assets, but the CBN pegged it at 10% and 15% for regional/national and international banks. In addition, the CBN, since July 1 2017, requires additional 1% Higher Loss Absorbency (HLA) to be kept by banks designated as Domestic Systemically Important Banks (D-SIBs), thus, making 16% capital adequacy ratio for the D-SIBs. Thus, in 2010, the CBN as part of its effort to enhance the resilience of deposit money banks reviewed the minimum requirement to any such amount that CBN may be prescribed to be eligible for regulatory purposes as per the Basel lll standards. Yet, some banks were still having serious capital and liquidity problems, specifically, Wema bank, Skye bank, Diamond bank, and others that led CBN to step in and approved their acquisition by other stronger banks, and replaced their top management.

However, in 2019, the Central Bank of Nigeria (CBN) increased the minimum requirement for high quality capital to N50 billion to strengthen the resilience of deposit money banks. This allowed banks to absorb losses on a going concern basis and required them to build additional capital buffers for banks with international authorization and D-SIBs (Ofeimun & Akpotor, 2020). The CBN Guidelines mandate banks to maintain a regulatory capital adequacy ratio (CAR) of 15% and 16% for international and domestic-systemically important banks, respectively, and 10% for national banks. This benchmark measures the capital adequacy of Nigerian deposit money banks. Successful recapitalization has led to economic growth and development, but some banks, like Skye, Diamond, and Wema, experienced losses in 2017 that eroded their capital. The focus is on understanding how adequate capitalization has helped deposit money banks achieve stability.

Original Article

Findings from previous studies exposed the division among researchers regarding the capitalstability relationship; while studies conducted by (Salami & Uthman, 2018; Oyetayo et al., 2019) suggested that there was a positive relationship between capital regulation and bank stability; however, studies such as (Igbinosa & Naimo, 2020; Okoi, et al., 2019; Obilikwu, 2018) reported negative (or insignificant) relationship. Clearly, previous works are laced with mix bag of findings. Currently, whether strong capital base – as being clamored for by the CBN – automatically stabilize the banking industry is generating concerns as previous findings appears to be embroiled in empirical controversy. Besides, evidence from published studies show that avalanche of existing studies is devoted to financial performance (mostly profitability) of banks despite the fact that bank stability is of utmost importance to the regulatory authorities. Therefore, it is against this background that this study empirically analyzed the effect of capital adequacy on banking stability of selected listed deposit money banks in Nigeria. In view of the foregoing, this study is poised at examining the effect of capital regulation on deposit money banks' stability in Nigeria, from 2010 to 2022. Generally, this study examined the effect of bank capital adequacy on stability of selected deposits money banks in Nigeria. In specifics, this study seeks:

i. To investigate the effect of loan to deposit ratio on banks' stability in Nigeria. ii. To determine the effect of debt-equity ratio on banks' stability in Nigeria.

iii. To ascertain the effect of bank capitalization to total credit assets ratio on banks' stability in Nigeria.

iv. To assess the effect of risk-weighted asset on banks' stability in Nigeria.

The importance of this research cannot be overemphasized in view of what the banking industry has witnessed before independence and post-independence in the areas of economic recession, distress in the industry, collapse of banks and the inability of Nigerian banks to integrate into the global economy. Specifically, the project was designed to benefit on different grounds. This study aims to provide a comprehensive understanding of the financial interaction between research variables and capital regulation of banks in Nigeria. It will be of great importance to the Nigerian federal government, as it will expose the stability of deposit money banks against the current capital base. The outcomes will be useful for the Central Bank of Nigeria (CBN) in formulating minimum capital requirements for Deposit Money Banks (DMBs) and the Nigerian Deposit Insurance Corporation (NDIC) in safeguarding depositors' interests. The study will also benefit researchers, academicians, financial analysts, economists, and accountants in improving their knowledge base. The research spans from 2010 to 2022, focusing on the stability of Deposit Money Banks in Nigeria due to their financial hegemony in the banking sector. Capital regulation is measured through capital adequacy ratio, liquidity ratio, asset quality, and risk-weighted assets. The study focuses on Domestic Systemically Important Banks (D-SIBs), which are internationally-licensed and control 63.80%, 65.23%, and 66.0% of total industrial assets, deposits, and loans.

2 Literature Review

2.1 Conceptual Review

Capital adequacy which measures the solvency of a bank, shows whether a bank has sufficient capital to support the risks in its balance sheet. Oke and Ikpesu (2022) averred that a bank's capital fund is considered adequate if it is enough to cover the banks operational expenses, satisfy customers with dual needs and protect depositors against total or partial loss of deposits in the event of liquidation or loss sustained by the bank. Accordingly, Soomiyol, Bwuese, & Yua, (2023) Prudential guidelines on capital adequacy sets out the three main elements

that determine a bank's capital adequacy, these are: credit risk associated with exposures; market risk arising from banking activities and the form and quality of capital held to support these exposures. The higher a capital adequacy the stronger the bank and the more protection investors will have. This ratio ensures that banks are capable of taking care of their liabilities and other risk such as operational risk, credit risk and market risk. In Nigeria, the banks are required to maintain a high enough capital adequacy ratio from time to time (Uremadu & Duru-Uremadu, 2018 and Yua, Epor, Ajekwe, & Utor, (2024). This implies that capital adequacy results from the idea of rearranging the existing capital structure of banks in order to restructure the banking industry against widespread distress. This is because, it is firmly believed that having adequate capital enables business establishment to deliver its obligations without being affected by shocks.

Adequate capital is crucial for a bank to meet its business requirements, ensure safe operations, retain public confidence, and acquire necessary infrastructure (Oke & Ikpesu, 2022). Commercial banks in Nigeria are encouraged to maintain a higher level of capital that aligns with their risk profiles. The Basel Accord defines capital constituents, deductions, and restrictions within and between primary and supplementary capital. Tier 2 capital is limited to 100% of Tier I capital (Ogbebor et al., 2020), with a general provision for bad and doubtful debts restricted to a maximum of 1.25 per cent of risk-weighted assets. Commercial banks can be classified into under-capitalized, significantly undercapitalized, critically undercapitalized, and insolvent (Atuahene et al., 2021). The Central Bank of Nigeria (CBN) mandates commercial banks to use a credit rating agency to update their credit daily and disclose their ratings prominently in their annual reports. This ensures banks maintain a sufficient capital level to meet their risk profiles.

On the other hand, survey of related literatures reveal that several definitions of bank's stability exist. For instance, Igbinosa and Naimo (2020) contend that "banking stability is a condition where the banking system is able to withstand shocks without giving way to accumulative processes which impair the allocation of savings to investment opportunities". Sere-Ejembi et al (2014) define bank stability "as the avoidance of disruptions to the banking system that are likely to cause significant costs to real output". It generally means the joint stability of key financial institutions operating within financial markets and the stability of those markets. For the financial institutions, this means that they are sound, i.e., they have sufficient capital to absorb normal and abnormal losses, and have sufficient liquidity to manage operations and volatility (Ozili, 2019). In essence, a stable banking system should focus on financial system risks, as they are easy to understand, quantify, and impact. A stable system is crucial for sustained growth and low inflation. It should have a well-functioning market, key institutions operating without difficulty, and asset prices not significantly affecting fundamental values.

In Nigeria, the CBN is committed to promoting the economic and financial well-fares of Nigerians by actively overseeing a stable and efficient financial system. The CBN promotes this objective by providing central banking services including: liquidity and lender-of-lastresort facilities: overseeing key domestic clearing and settlement systems; conducting and publishing analyses and researcher and collaborating with various domestic and international policy-making bodies to develop policy (Ozili, 2018). The Nigerian economy has experienced domestic and external shocks in recent years, which result into the 2009 banking crises. Following the crisis, the authorities took comprehensive sets of remedial measures. Substantial liquidity was injected - a blanket guaranty for depositors, as well as for interbank and foregoing credits lines of banks was provided – the Assets Management

Company of Nigeria (AMCON) was established to purchase banks' nonperforming loans in exchange for zero-coupon bonds and inject funds to bring capital to zero – regulations and supervision were strengthened and corporate governance enhanced – and the universal banking model was abandoned and banks instructed to established holding companies or divest their non-bank activities (Ozili, 2019).

Z-Score as a Measure of Bank Stability

A common measure of stability at the level of individual institutions is the z-score. It explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to measure a bank's solvency risk. The z-score is defined as $z \equiv (k+\mu)/\sigma$, where k is equity capital as percent of assets, μ is return as percent of assets, and σ is standard deviation of return on assets as a proxy for return volatility. The popularity of the z-score stems from the fact that it has a clear

(negative) relationship to the probability of a financial institution's insolvency, that is, the probability that the value of its assets becomes lower than the value of its debt. A higher zscore therefore implies a lower probability of insolvency. Papers that used the z-score for analysis bank stability include Demirgüç-Kunt, Detragiache, and Tressel (2008); Laeven and Levine (2009); Čihák and Hesse (2010). The z-score is a financial stability measure based on accounting data, but it has limitations. It is based on the underlying accounting framework, which may provide an overly positive assessment of stability. Additionally, it looks at each institution separately, potentially overlooking the risk of default causing loss to other institutions. However, it can be used for institutions without market-based data and allows comparing default risk in different groups of institutions.

Capital adequacy significantly impacts banks' stability, as it directly influences the amount of money available for loans and the level and degree of risk absorption. Bank capital acts as a protective cushion against losses resulting from uncertainties, preventing defaults and protecting fund owners and lenders from losses at operating and liquidation stages. It also helps spread the cost of prudent business conduct and deters criminals. Banks in Nigeria require additional capital to comply with capital adequacy regulations, as the country's financial sector has seen an increase in banks' capital base, facilitating operations and sustaining operations during crises. This aligns with the Basel Accord, which establishes a standardised framework for ensuring sufficient capital reserves to mitigate the likelihood of bank insolvencies. National regulators have established a minimum capital requirement to safeguard banks from the risk of insolvency or bankruptcy, allowing them to assess the Capital Adequacy Ratio of banks. A greater magnitude of equity or capital in a bank signifies a diminished level of risk, ensuring depositor protection and upholding financial system stability.

Apparently moved by the inherent and ostensible weaknesses that characterized the promulgated regulatory framework, the Basel Committee of the Bank for International Settlements (BIS) intensified focus on capital adequacy requirements by strengthening Basel accord framework; moving from Basel I accord (issued in 1988) to Basel II accord (issued in 2004) (Atuahene et al., 2021). The Basel III accord (issued in 2008) specifically suggested strict increase in capital adequacy ratio, for internationally active banks. Observably, right from the banking regulation inception in Nigeria, the CBN (based on Section 9(1) of the Bank and Other Financial Institution Act together with the CBN Act 1958) has been periodically determining the capital-base that a corporate entity needs to have before it acquires a banking license or continue to operate as a bank (Igbinosa & Ogbeide, 2016; Ozili, 2018; Ikue & Nkoro, 2019). From a modest value of ₦1.5million naira minimum paid-up

capital in 1981 to ₦20million in 1990, ₦50million in 1991, ₦1billion in 2000, ₦25billion in 2004/05 and ₦50billion in 2009 (for international banks; while national and regional banks are pegged at ₦25billion and ₦15billion respectively) (Michael, et al., 2018) which remains till date. However, latest reports (Anaeto et al., 2019; Nwagbara, 2020) indicate that plan is underway by the CBN to further increase banks minimum capital-base to ₦35billion, ₦57.3billion and ₦100billion for regional, national and international banks respectively.

Capital regulation is a crucial mechanism for ensuring the stability of banks and the banking industry. However, there is ongoing debate among bankers, regulators, and policymakers about its effectiveness in addressing the recurring instability in Nigeria's banking system. The Basel III guidelines, introduced in December 2010, aim to promote a more resilient banking system by focusing on four vital banking parameters: capital, leverage, funding, and liquidity. The minimum capital adequacy ratio, or CAR, is 8%, which raises the minimum core capital stipulation, introduces counter-cyclical measures, and enhances banks' ability to conserve core capital during stress. The liquidity requirements also bring uniformity in global liquidity standards, benefiting Nigerian banks in managing liquidity pressure in stress scenarios. Banks often hold capital above the minimum legal requirements, but increased equity is essential to prevent erosion of the bank's capital base. Capital adequacy is the amount of capital that can effectively absorb losses and prevent bank failure.

2.3 Theoretical Framework

Theoretically, related and relevant studies have attempted to theorize the relationship between capital adequacy and bank stability. In the first instance, the modern portfolio theory, introduced by Harry Markowitz in 1952, is a portfolio construction theory that determines the minimum level of risk for an expected return. It assumes that investors will favour a portfolio with a lower risk level over a higher risk level for the same level of return. Likewise, given a desired level of expected return, an investor can construct a portfolio with the lowest possible risk (Oyetayo et al, 2019). Based on statistical measures such as variance and correlation, an individual investment's performance is less important than how it impacts the entire portfolio (Konboye & Nteegah, 2018). MPT assumes investors are risk-averse, preferring less risky portfolios for higher returns. In Nigeria, risk management was not central to organizational operations in the 90s, leading to the financial crisis. Public interest theory suggests government regulation helps overcome imperfections in competition and market operations. In banking, the public interest is served by efficient resource allocation. However, regulators lack sufficient information on cost, demand, and quality, making them imperfect in promoting public interest. This theory also applies to other economic agents, such as legislators, voters, and consumers, who may pursue their own interests. Since banks play such an important role in an economy, widespread failures would echo throughout an economy with devastating effects (Igbinosa & Naimo, 2020). By effectively regulating the bank sector, governments can promote bank stability. Some researchers emphasize the naturally monopolistic role of banks. Nwankwo (2019) demonstrate that banks with monopolistic power have stronger incentives to incur the necessary costs associated with overcoming informational barriers which facilitates flow of credit to more worthy enterprises. **The Buffer Theory of Capital Adequacy**

The buffer theory of Calmed and Rob (1996) predicts that a bank approaching the regulatory minimum capital ratio may have an incentive to boost capital and reduce risk in order to avoid the regulatory costs triggered by a breach of the capital requirements. The theory posits that whenever a bank's capital is marginally above the

regulatory minimum ratio, there is a need for the bank to increase the ratio in order to minimize risk and avoid the regulatory cost as a result of a breach of the capital requirements (Ajayi et. al., 2019). Capital adequacy empowers banks to diversify their portfolio in order to mitigate risks and ensure stability (Aroghene & Ikeora, 2022). Low level of capital increases the chances of bank failure while sufficient and adequate capital lead to improved financing activities hence impacting positively on the value of the bank. Igbinosa and Naimo (2020) availed that whenever banks hold adequate capital it forms a basis for trust from shareholders. Highly capitalized-banks confidently embark on risky but high return investments leading to increased value. The assumption of this theory is that capital is one element that determines the level of financial risks that banks can contain in their operations.

This study will be underpinned by the buffer theory which postulates that banks may prefer to hold a "buffer" of excess capital to reduce the probability of falling under the legal capital requirements, especially if their capital adequacy ratio is very volatile. The buffer theory predicts that a bank approaching the regulatory minimum capital ratio may have an incentive to boost capital and reduce risk to avoid the regulatory costs triggered by a breach of the capital requirements. However, poorly capitalized banks may also be tempted to take more risk in the hope that higher expected returns will help them to increase their capital. This is one of the ways risks relating to lower capital adequacy affects banking operations. In the event of bankruptcy of a bank, the risks are absorbed by the bank and Insurance Corporation (NDIC).

Banks in Nigeria hold excess capital buffers to reduce risk of falling under legal capital requirements, especially if their capital adequacy ratio is volatile. The Central Bank of Nigeria (CBN) conducts on-site examinations and delegates this task to external auditors. Banks require more capital if deposits aren't fully mobilized, as it's more reliable and can be used for long-term planning. Poorly capitalized banks take risks to increase capital, affecting banking operations.

2.3 Empirical Review

Previous attempts made to empirically evaluate how capital adequacy requirement drives banks' performance indicators.

Bank Stability

The study conducted by Ezu et al, (2023) examines the influence of capital adequacy on the operational efficiency of deposit money banks with the ordinary least square multiple regression (OLS) analysis, with the findings suggesting that the level of capital adequacy demonstrates both positive and negative linear associations with bank efficiency. Aroghene and Ikeora (2022) examines the impact of Non-Performing Loans, Capital Adequacy, and Corporate Governance on Nigerian banks' stability from 2006-2021. Results show that NonPerforming Loans Ratio, Capital Adequacy Ratio, and Internal Control positively affect the Z-Score of listed deposit money banks, while External Control has a negative effect. The study concludes that these factors have a positive but insignificant relationship with bank stability in Nigeria. Obadire (2022) analyzed the impact of Basel III regulatory requirements on the stability of African banks using panel data from 45 banks across six African countries. Results showed that minimum capital requirements, capital adequacy ratio, and capital buffer premium had a negative association with bank stability. The study conducted by Ogunode et al, (2022) investigates the impact of capital adequacy on the operational effectiveness of Nigerian non-financial companies. It found that

financial indicators like capital adequacy ratio, equity capital to total assets ratio, and cost income ratio negatively affect the performance of these companies. However, debt equity ratio and firm size positively influence corporate performance.

Similarly, Oke and Ikpesu (2022) investigate the impact of capital adequacy and asset quality on the performance of the banking sector in Nigeria with data spanning from 2010 to 2019 and the system generalised method of moments (SGMM). The findings of the study indicate that there is a positive relationship between capital adequacy and asset quality, and the performance of banks in Nigeria. Yusuf and Umar (2021) examined how bank capital regulation on deposit money banks' stability in Nigeria. The study analyzed audited financial statements of five Nigerian banks from 2004-2018, finding that liquidity, loan, and asset turnover significantly impact bank stability, with capitalization being a key driver. Anetoh et al, (2021) focused how capital adequacy risk and liquidity risk of listed banks in Nigeria. Data

(2010-2019) was sourced from the CBN and annual reports and selected banks' audited reports. Analysis was done using Partial Least Squares Structural Equation Modeling. It was found that capital adequacy risk has significant positive effect on banks' value in Nigeria. However, liquidity risk has significant positive effect on listed banks' value in Nigeria. Aliyu et al. (2020) analyzed the impact of capital adequacy on the financial performance of eight Nigerian deposit money banks, finding that loans and advances significantly impacted their performance. Ogbebor et al. (2020) examined the impact of capital adequacy on the returns on equity of quoted deposit money banks using data from 14 banks from 2009-2018. Findings showed a significant positive influence, indicating a significant impact on banks' performance.

Ikue-John and Nkoro (2019) The study examines the impact of dynamic profitability indexes on capital adequacy ratios in Nigerian deposit money banks, finding that asset size significantly influences returns. Similarly, Ofeimun and Akpotor (2019)'s study found that loans and advances positively impact Nigerian deposit money banks' performance, while customer deposits have a negative impact, suggesting that good capital adequacy can enhance these banks' performance. In the same vein, Oyetayo et al. (2019) investigated the impact of capital adequacy on Nigerian bank performance using data from ten banks' financial statements and the CBN Statistical Bulletin. Findings showed a significant positive correlation, despite an undefined measure. Amahalu et al, (2017) examined capital adequacy influence on 14 listed banks' performance using data (2010-2015) with the multiple regression technique and found that capital adequacy has significant positive effects on returns. Tochukwu (2016) analyzed the impact of capital adequacy-risk management on twelve listed banks, finding that risk management significantly affects capital adequacy, with the degree of negative effects varying.

2.4 Gap in Literature

The reviewed studies in the preceding section have clearly shown that extensive studies have been conducted on capital adequacy of deposit money banks in Nigeria. However, the gap uncovered from these studies is that, they generally focused on capital-performance nexus, whereas this study focuses on capital-stability nexus. This marks the uniqueness of our study. Stability is of utmost concern to regulator than performance; only a stable bank can exist to perform. Also, it is observed from these studies that they reported mixed findings, that is, there is no consensus among researchers on the relationship between capital adequacy and banks' performance (or stability) Plausibly, this can be attributed to the use of different empirical methodologies (different research years, data

span and statistical tool) employed. Again, no published study, has to the best of knowledge of the researcher, has focused on bank stability vis-à-vis capital management. Finally, it is observed that most related studies did not make use of the relevant variables as used by this study. Based on the foregoing, this study attempted to empirically examine the effect of capital adequacy on deposit money banks stability in Nigeria.

3. Data and Methodology

Research Design

This study adopts *Ex post facto* 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. The purpose of the *ex post facto* research design of the researcher is to identify aspects of the problem that are vital to a thorough analysis. Furthermore, the research provides a clear view of the problem from other applicable sources with the *ex-post facto* study design and to limit the scope of study on these significant issues.

Population and Sample of the study

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.

Sample size connotes the aspect of population that is actually selected for scientific investigation, (Taherdoost, 2017). Selecting a sample size, sometimes becomes sacrosanct due to population size. Although the population size is not large in this study, nonetheless, having a sample size aligns with the intent of the study. Thus, 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;

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 to be 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 purely a panel (longitudinal) data. In research, panel data connotes a set of repeated observations collected from multiple entities (Baumgartner, 2020).

It usually encompasses time-series ("t") and cross-sectional ("i") data characteristics together. Specifically, the firms' financial statements are used. Data sourced are on Capital Adequacy and Deposit Money Banks' Stability. Capital regulation is measured through capital adequacy ratio (using both Tier 1 and Tier capital framework) as provided for by the Basel II accord, liquidity ratio (using loan-to-deposits ratio), asset quality (using loan-to-asset ratio) and risk exposure level (risk weighted assets), on the other hand, deposits money bank's stability is measured using the z-score which explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to determine a bank's solvency risk. Data is also collected on bank size (measured by total assets) and leverage (measured by leverage) to shed more light on the capital regulation.

Model Specification

To derive a model specification for the relationship between capital adequacy and bank stability, it is essential to consider various theoretical frameworks. One common framework is the Buffer Theory of Capital, which relates to how capital stock influence the rate of return on an asset. In the context of banks, this can be extended to assess how capital adequacy influences the stability of a bank. Following, the relationship between capital adequacy and bank stability is a crucial aspect of financial regulation and risk management in the banking sector. From the literatures, it has been known that capital adequacy influence bank stability through bank performance (Oke & Ikpesu, 2022; Ogunode et al., 2022; Aroghene & Ikeora, 2022; Ajayi et al., 2019; Aliu et al., 2020; Aliyu et al., 2020) refers to the amount of capital a bank must hold as a buffer to cover potential losses arising from its operations. Following the empirical models of the aforementioned scholars, the model for the study is specified thus: $BST = f(BCTCA, LDR, DER, RWA)$

Where,

BST	- bank stability
BCTCA	- bank capitalization to total credit assets ratio
LDR	- loan to deposit ratio
DER	- debt-to-equity ratio
RWA	- risk-weighted assets

Original Article

Technique for Data Analysis

Econometric approach is adopted in this study to analyze collected time-series cross-sectional data. Econometrically, statistical, economical and mathematical techniques will be applied to analyze the longitudinal data so as to validate the formulated hypotheses. Statistically, descriptive and inferential techniques are employed. By these, it means data is first subjected to descriptive statistics check followed by inferential statistics.

The inferential statistics covers different tests, starting with unit-root test (to ascertain data stationarity properties), the co-integration test (to ascertain the variables' long-run relationship) and the panel data estimation technique (Panel Autoregressive Distributed Lag, PARDL).

Once cointegration is established between capital adequacy and bank stability, the conditional P-ARDL long-run model can be specified as:

$BSTt = \omega 0 + \omega 1 BCTCAt{-}i + \omega 2 LDRt{-}i + \omega 3 DERt{-}i + \omega 4 RWAt{-}i + \in t$

Where,

$\omega 0$ = intercept

$\omega 1{-}\omega_5$ = coefficients of long-run estimates $\in t$ = error term of long-run estimates

In the next step, we obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This is specified as follows:

$$\Delta BST_t = \alpha_0 + \sum_{i=1}^{a} \beta_i \Delta BST_{t-i} + \sum_{j}^{b} \gamma_j \Delta BCTCA_{t-j} + \sum_{k}^{c} \delta_k \Delta LDR_{t-k} + \sum_{l}^{d} \theta_l \Delta DER_{t-l} + \sum_{m}^{e} \vartheta_m \Delta RWA_{t-m} + \emptyset ECT_{t-1} + \mu_t$$

Where,

ECT = error correction term derived from equation (3.7), and

$\emptyset$ = the speed of adjustment.

The error correction model shows the speed of adjustment needed to restore the long run equilibrium following a short run shock. The $\emptyset$ is the coefficient of the error correction term in the model and must be negative and significant for the return back to long-run equilibrium to hold.

Table 3.1: Operationalization of research variables and references

Notation	Meaning	Proxy	Sources
Dependent variables			
BST	Bank Stability	RRV	Salami & Uthman, 2018; Anaeto et al., 2019; Atuahene et al., 2021
Independent variables			
LDR	Loan to Deposit Ratio	LDR	Igbinosa & Naimo, 2020; Oyetayo et al., 2019; Nwagbara, 2020
DER	Debt-Equity Ratio	DER	Michael et al., 2018; Ikue &Nkoro, 2019; Atuahene et al., 2021
BCTCA	Bank Capitalization to Total Credits Assets	BCTCA	Igbinosa & Naimo, 2020; Ogbebor et al., 2020

Original Article

RWA Risk Weighted Assets RWA Atuahene et al., 2021; Ogbebor et al., 2020;Salami & Uthman, 2017

Source: Author's Derivation using reviewed literatures, 2023.

3.1.1 Variables and their Measurements

The two main variables of this study are the Independent (that is, the Capital Adequacy) and dependent (that is, Deposit Money Bank Stability) variables. They are explained as follows:

Independent Variable

Capital Adequacy is the independent variable in this study. It refers to the minimum regulatory capital of deposit money banks as determined by the CBN. It will be measured using three proxies, (capital adequacy ratio, debt-equity ratio and Bank Capitalization to Total Credit ratio). These proxies are used to protect depositors and promote stability.

Capital Adequacy Ratio: This indicates bank's healthiness by measuring its capital vis-à-vis risk weighted credit exposures. The rationale is to unveil how sound a bank is despite risk. It is measured using both Tier 1 and Tier capital framework) as provided for by the Basel II accord.

Debt-Equity Ratio: This shows how much debt a company has compared to its assets. It is found by dividing a company's total debt by total shareholder equity. A higher D/E ratio means the company may have a harder time covering its liabilities, and vice-versa.

Bank Capital to Total Credit Assets: This refers to the determination of credit risk associated with bank's capital. It measures how the bank's available capital relates to its riskweighted credit exposure. It will be measured using capital to credit assets. The higher this ratio, the higher the bank's stability.

Risk Weighted Assets: This refers to the minimum capital that a bank must have so as to withstand insolvency risk. In agreement with the Basel Accords, the CBN sets this at 15% for D-SIBs. The higher this variable, the higher the stability of a financial institution, particularly the D-SIBs.

Dependent Variable

Deposit Money Banks' Stability is the dependent variable in this study. It refers to bank's ability to withstand operational (unanticipated or unforeseen) risks while discharging their intermediation function. It will be measured in this study using the Z-score index. The Z-score measures banking system stability and it is computed with three important soundness indicators: Equity/Assets ratio (R/E), the return on assets (ROA) and the standard deviation of return on assets (σ(ROA)) - a proxy for return volatility. Impliedly, Z score measures the distance from insolvency. The Z-score formular as adapted from the Mercieca et al. (2007):

$$Z - score = \frac{ROA + \frac{E}{A}}{\sigma(ROA)}$$

Simply put, Z-score shows by how many standard deviations ROA could change to make the banks total assets fall short of its total debts. The popularity of Z-score is derived from the established inverse relationship it has with the probability of insolvency of financial institutions.

Original Article

4. Analysis and Results

Table 1 reports summary statistics for the variables used in the study. A critical examination of the descriptive statistics for the dependent and explanatory variables reveals several issues. For the purpose of emphasis, it is better to restate the terms of bank stability and capital adequacy. Bank stability (BST), which is the dependent variable is defined by the z-score of banks. The independent variables include loan to deposit ratio (LDR), debt to equity ratio (DER), risk weighted average assets (RWA) and capitalization to total loan ratio (BCTCA). All the variables are expressed as percentages.

Table 4.1: Descriptive Statistics for Dependent and Explanatory Variables

	BST (%)	BCTCA (%)	DER (%)	LDR (%)	RWA (%)
Mean	4.348	39.179	**67.902**	**65.721**	**118.377**
Median	1.190	26.930	63.310	61.810	58.820
Maximum	85.030	292.090	252.190	218.530	949.290
Minimum	0.030	10.300	0.080	24.270	22.970
Std. Dev	10.960	48.018	51.529	23.961	202.227
Skewness	5.354	3.973	0.849	2.657	3.050
Kurtosis	35.170	18.349	3.630	17.801	10.726
Observations	101	101	101	101	101

Source: Researcher's Computation using EViews

A quick review of the measures of bank stability shows that it measures 4.38 on the average, with maximum and minimum values of 85.03 and 1.19. For bank capitalization to loan ratio, the mean value of 39.179 means that the weight of bank capital against total loans is mere 39.18%, a value that means total loans are more than two times the value of equity capital. However, because the range is from 292.09% to 26.93%, it means that there are exceptional cases where capital exceeded total loans, but averagely, loan assets exceeded equity capital. For debt-to-equity ratio, the mean of 67.90% means that debt capital was less utilized by banks when compared to equity capital. For the values of DER to range from 63.31% to 252.19%, means that there are instances when debt use exceeded equity use. The loan to deposit ratio with an average value of 65.72% means that loans were less than the value of deposit. This also means that deposit funds were allocated to other assets other than just credit assets and hence reducing the level of exposure to credit risk.

However, results showed that the risk weighted assets were prone to more changes that any other variable considered for this study. This is revealed by the standard deviation of 202.2267, which is higher than bank stability and any other capital adequacy indicators. Although, the bank stability decisions were highly subjected to changes as strategies unfold in the banks. This is a reflection of how competitive the banking sector is.

Correlation Analysis

The correlation matrix for the variables is reported in Table 4.2 below in order to examine the correlation that exists among variables. The results show that there is a negative relationship between BST and bank capital to total credit ratio. On the contrary, bank stability was positively related to loan to deposit ratio, debt to equity ratio and risk weighted assets. This means that these later variables and bank stability move in the same direction. However, only the corelation relation between bank stability and risk weighted asset was statistically significant.

Table 4.2: Correlation Matrix of the Variables

Probability	BST	BCTCA	DER	LDR	RWA
BST	1				
BCTCA	-0.0177	1			
DER	0.0254	-0.3262	1		
LDR	0.0080	-0.3668	0.0461	1	
RWA	0.2540	-0.1288	-0.1344	0.4082	1

Source: Researcher's Computation using EViews

On the correlational relationship among the independent variables, we will consider the relationship from two perspectives (i) on the basis of direction, (ii) on the basis of significance, and (iii) on the basis of strength of association to identify possible case(s) of multicollinearity/strong linear relationship. In the first instance, bank capitalization to loan ratio is negatively related to debt to equity, loan to deposit and risk weighted assets. As DER and RWA negatively related, DER and LDR are positively related. Finally, loan to deposit ratio and risk weighted assets were related positively. In terms of the significance, the negatively relationship between BCTCA and LDR as well as BCTCA and DER were statistically significant. Besides these, the relationship between RWA and LDR was also statistically significant. On the basis of the strength of relationship, none of the linear relationships among the independent variables exceeded 0.4, a level that suggest there is no scare of possible multicollinearity problem. So, the specification order in chapter three is good for estimation.

Panel Unit Root Tests

In order to retest the capital adequacy-bank stability hypothesis for the selected DMBs, we tested for unit root so as to establish the order of integration for the variables used. In doing so, we adopted the Levin, Lin and Chu (LLC) panel unit root test. The null hypothesis for the LLC panel unit root test is that the variable has unit root (i.e. with individual unit root process).

The results of the unit root tests (in Table 4.3) show that the p-values of BST, BCTCA, LDR, and DER were not greater than 0.05, indicating that the null hypothesis for nonstationarity is rejected at a 0.05 significance level. Thus, it is concluded that bank stability, bank capitalization to total credit ratio, debt to equity ratio and loan to deposit ratio are integrated of order zero or I(0). Since RWA variable was not stationary at levels, this variable (that is, RWA) was differenced and integrated at order I.

Table 4.3: Panel Unit Root Test

Variable	**Levin, Lin & Chu test**	**Levin, Lin & Chu test at levels**		**Levin, Lin & Chu test at first difference**	
		Statistics	**p-values**	**Statistics**	**p-values**
BST	Levin, Lin & Chu test	-8.74353	0.0000***		
BCTCA	Levin, Lin & Chu test	-2.03935	0.0207**		
DER	Levin, Lin & Chu test	-1.77767	0.0377**		
LDR	Levin, Lin & Chu test	-1.64143	0.0504**		
RWA	Levin, Lin & Chu test	-0.10974	0.4563	-6.97319	0.0000***

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

Source: Researcher's Computation using EViews

Given this finding, the variables used in this study are said to be integrated of orders I(0) and I(1). This order of integration enables us to use the autoregressive distributed lags estimation technique (Pesaran et al., 2001). Also with majority of the variables being integrated at order one, I(0), it suggests that there is a high possibility of a long run relationship.

4.2.3 Panel Cointegration Test

Since the panel unit root test result suggests that there is a likelihood of a long run relationship, we used the Pedroni's test for cointegration to establish the truthfulness of this long run relationship. The Pedroni cointegration test is a robust test that has two main dimensions (the within and between dimensions). And these two dimensions present eleven test statistics, all under the null hypothesis of no cointegration. To make inference, the null hypothesis is rejected if the p-value is equal to or less than 5 percent significance level. This cointegration test results are presented in Tables 4.4.

Table 4.4: Pedroni Residual Cointegration Tests

BST = f (LDR, BCTCA, DER, RWA)

Weighted

	Statistic	**Prob.**	**Statistic**	**Prob.**
Panel v-Statistic	-2.6761	0.9963	-2.5624	0.9948
Panel rho-Statistic	1.009707	0.8437	1.372889	0.9151
Panel PP-Statistic	-13.9337	0.0000***	-12.5206	0.0000***
Panel ADF-Statistic	-2.6134	0.0045***	-3.7177	0.0001***
Group rho-Statistic	2.254512	0.9879		
Group PP-Statistic	-17.16547	0.0000***		
Group ADF-Statistic	-2.196182	0.0140***		

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

Source: Researcher's Computation using EViews

With majority of the test statistics rejecting the null hypothesis of no cointegration (that is, 6 out of 11 tests); and with the p-value being lower than 0.05, we conclude that there exists a cointegrating relationship among the variables used. The cointegration and unit root test results led us to estimate the long run panel ARDL (based on the Pooled Mean Group) in this study. It must be noted that 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 and until the error correction model tells us otherwise. So, we now proceed to estimate the error correction model. If the coefficient of the ECT is negative and statistically significant, we can validate our long run relationship from the Pedrini tests.

Long-run Panel ARDL Model Estimation

The panel ARDL results were estimated from the best model, ARDL (1, 1, 1, 1, 1), selected based on Akaike info criterion (AIC). The estimation below presents the long-run relationship between the capital adequacy indicators and the bank stability of deposit money banks in Nigeria.

Original Article

The long run model of the panel autoregressive distributed lag (PARDL) method is given as:

$BST = 0.0083 * BCTCA - 0.0011 * DER - 0.0158 * LDR + 0.0379 * RWA$

From the model estimation above, the coefficients of bank capitalization to total credit ratio and risk weighted asset were positive to bank stability. This means that as the ratios of bank capital to credit and risk weighted assets increases, bank stability tends to increase, and vice versa. On the other hand, the ratios of debt to equity and loan to deposit have negative effects on bank stability. This means that, the ratios of debt to equity and loan to deposit move in different direction with bank stability.

Short-run and Long-run Panel ARDL and Error Correction Model Estimation

Having established the long-run relationship between the capital adequacy variables and bank stability, this section discusses the short-run results of the study. Thus, table 4.5 illustrates the short-run results of the Error Correction Model, estimated by the PMG estimators which the Panel ARDL is framed on. The short-run results for the four models show a significant and negative error correction term (ECT) of -1.3167. This means that 131.67% of deviations from the long-run equilibrium of bank stability model with the capital adequacy positions of Nigerian banks is restored in a high degree. This high Error Correction Term (ECT) shows that there is a stable relationship between bank stability and capital adequacy among Nigerian banks.

Table 4.5: Short-run Error Correction and Long-run Estimation s

Dependent Variable: D(BST)
Method: ARDL
Dynamic regressors (1 lag, automatic): BCTCA DER LDR RWA
Selected Model: ARDL(1, 1, 1, 1, 1)

Short Run Equation				Long Run Equation			
Variable	Coefficient	t-Statistic	Prob.*	Variable	Coefficient	t-Statistic	Prob.*
ECT01	-1.3167	-7.1718	0.0000	BCTCA	0.0083	3.0501	0.0037
D(BCTCA)	-0.3738	-0.8609	0.3935	DER	-0.0011	-2.1291	0.0383
D(DER)	-0.0102	-0.2369	0.8137	LDR	-0.0158	-3.4373	0.0012
D(LDR)	0.0177	0.1288	0.8980	RWA	0.0379	10.6704	0.0000
D(RWA)	0.2386	1.2782	0.2072				
C	1.3557	0.7149	0.4780				

Source: Researcher's Computation using EViews

The study found that loan to deposit ratios (LDR) and debt to equity ratios (DER) have a significant negative impact on bank stability in Nigerian banks from 2010 to 2021. The pvalue for LDR (-0.0012) is less than the significance level (0.05), indicating that these ratios have a negative effect on bank stability. The p-value for DER (0.0383) is also less than the significance level (0.05), indicating that these ratios have a negative impact on bank stability. Therefore, the null hypothesis of no significant effect on bank stability is rejected, indicating that these ratios have a significant negative impact on Nigerian banks.

The study found that the Bank Capitalization to Total Credit Assets ratio (BCTCA) and Riskweighted assets (RWA) have a significant positive impact on bank stability in Nigeria from 2010 to 2022. The p-value for BCTCA

was less than the significance level (0.05), indicating that BCTCA has a positive effect on bank stability. The null hypothesis of no significant effect on bank stability is rejected, indicating that BCTCA and RWA have a positive impact on bank stability. The study concludes that risk-weighted assets also have a positive effect on bank stability in Nigeria.

5. Discussion of findings, Conclusion and Recommendation

Discussion of findings

The first objective was to find the effect of loan to deposit ratio on the stability of Nigerian banks. Recall that the p-value for loan to deposit ratio in the bank stability model was less than the significance level and made us conclude that loan to deposit ratio has a significant negative effect on the stability of Nigerian banks. The Panel ARDL long-run estimates showing that loan to deposit ratio has significant effect on the stability of quoted deposit money banks in Nigeria means that whatever the level of loan to deposit ratio, it will drag bank stability in the opposite direction. This finding disagrees with Amahalu et al, (2017), who after examining the effects of capital adequacy 14 listed banks on their performance, found that capital adequacy (Liquid Asset Ratio, Loan Ratio and Asset Turnover Ratio) has significant positive effects on Returns on Asset, Return on Equity and Capital Employed). The difference in the findings is attributed to the use of different indicators and technique of estimation. Although the findings of this study showed a negative effect from loan to deposit ratio on bank stability, it has however proven that loan to deposit ratio is a significant determinant of bank stability (Ogbebor et al., 2019).

The second objective was to find the effect of debt-equity ratio on the stability of Nigerian banks. The p-value for debt-equity ratio in the bank stability model being less than the significance level made us to conclude that debt-equity ratio has a significant negative effect on bank stability in Nigeria. The Panel ARDL long-run estimates shows that debt-equity ratio has a significant effect on the stability of quoted banks in Nigeria, hence debt-equity ratio has a significant negative effect on the stability in Nigerian banks. The main implication of this finding is that, for banks to increase stability, they should focus on reducing debt-equity ratio. This finding agrees with Ogunode et al. (2022) who revealed that the debt equity ratio was found to have a positive influence on corporate performance. If the bank stability computation was done with the return on asset (which the most popular measure of bank performance), then we can infer that the effective utilisation of debt capital in the capital structure of Nigerian banks are significant determinants that can enhance their overall stability.

The study's third objective was aimed to determine the impact of bank capitalization to total credit assets ratio on the stability of Nigerian banks. The results showed that the ratio significantly positively affects the stability of quoted deposit money banks in Nigeria. This suggests that the positive sign of the ratio coefficient should be considered. The main implication is that increasing the ratio in banks' books will increase their stability, and vice versa. This finding agrees with Oke and Ikpesu, (2022) that there is a positive relationship between capital adequacy and asset quality, and the performance of banks in Nigeria. Therefore, it can be inferred that the presence of sufficient capital and high asset quality positively impact and promote the overall performance of the banking sector within the nation. Furthermore, the study's results suggest that sufficient capital and robust asset quality have a positive impact on the profitability and overall effectiveness of banking institutions. On the contrary, this study’s findings disagreed with Ogunode et al, (2022) who found that certain financial indicators, such as the

capital adequacy ratio, equity capital to total assets ratio, and cost income ratio, had a negative impact on the overall performance of companies listed in Nigeria.

The study's fourth objective was to find the risk-weighted assets on the stability of Nigerian banks and found that risk-weighted assets significantly positively affect the stability of Nigerian banks, particularly quoted deposit money banks. The p-value for risk-weighted assets was less than 0.05, indicating that as commercial banks' risk-weighted assets increase, so do their bank stability positions. This suggests that increased risk-weighted assets can lead to improved bank stability. This finding of this study agrees with that of Obadire, (2022) the minimum capital requirement, capital adequacy ratio, and capital buffer premium exhibited a statistically insignificant and negative association with the stability of banks operating in the African region. Also slightly is negation with that of Aroghene and Ikeora (2022) who found that Capital Adequacy Ratio, and Internal Control have a positive but statistically insignificant impact on the Z-Score of listed deposit money banks in Nigeria.

Conclusion

This study examined to examine the effects of capital adequacy on the stability of quoted banks in Nigeria from 2010 to 2022. The study relied on z-score of banks (BST) as dependent variable, while bank capital to total credit ratio (BCTCA), loan to deposit ratio (LDR), debt to equity ratio (DER) and risk weighted asset (RWA), all representing bank capital adequacy. The study used statistics such as correlation analysis and panel ARDL regression analysis. The study examined a number of significant capital adequacy variables that are difficult to neglect when trying to understudy the effects of capital adequacy. These variables include bank capital to total credit ratio (BCTCA), loan to deposit ratio (LDR), debt to equity ratio (DER) and risk weighted asset (RWA).

From the study's findings, it can be concluded that:

i. loan to deposit ratio (LDR) and debt to equity ratio (DER) have significant inverse effect on bank stability in Nigeria, while

ii. Bank capital to total credit ratio (BCTCA) and risk weighted asset (RWA) have significant positive effect on the stability in Nigerian banks.

So, in summary, increasing or reducing the capital adequacy indicators matter to bank stability in Nigeria.

Recommendation

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

i. Because the loan to deposit ratio of Nigerian banks has significant inverse impact on bank stability position, the study recommends that Nigerian banks that desire to improve their stability reduce the ratio of loan to deposit ratio. This is because worse loan expose banks to capital losses.

ii. According to research findings, debt to equity ratio has a significant and detrimental impact on the stability positions of Nigerian banks. So, it is recommended that banking firms that to seek to increase their stability levels should reduce their leverage levels. Leverage levels expose banks and other forms to bankruptcy risk and this is detrimental to bank stability and continuous existence.

iii. According to the study's findings, bank capitalization to total credit ratio has significant positive effect on bank stability positions. It means any bank that desire to increase their stability should as well increase their capital cover for loan assets. iv. According to the study's findings and conclusions, the attribute of risk-weighted assets of capital adequacy has a significant positive impact on the bank stability positions of Nigerian commercial

banks. As a result, the study recommends that banks' boards of directors and management who intends to manage their stability level should consider increasing the composition of risk-weighted assets.

References

Ajayi, S. O., Ajayi, H. F., Enimola, D. J., & Orugun, F. I. (2019). Effect of capital adequacy ratio (car) on profitability of deposit money banks (dmb's): a study of dmb's with international operating license in Nigeria. *Research Journal of Finance and Accounting,* 10(10), 84-91.

Aliu, A.A., Abdullahi, N.A., & Bakare, T.O. (2020). Capital adequacy and financial performance of deposit money banks with international authorization in Nigeria. *Accounting and Taxation Review,* 4(4): 78-91.

Aliyu, A. A., Abdullyhi, N. A., & Bakare, T. O. (2020). Capital adequacy and financial performance of deposit money banks with international authorization in Nigeria. *Accounting and taxation review*, *4*(4), 78-91.

Amahalu, N., Okoye, E. I., Nweze, C., Chinyere, O., & Christian, O. (2017, July). Effect of capital adequacy on financial performance of quoted deposit money banks in Nigeria. In *Chapter 57 in the proceedings of the 2017 International Conference on African Entrepreneurship and Innovation for Sustainable Development (AEISD).*

Anaeto, E., Komolafe, B. & Ujah, E. (2019; June 25). New capital-base for banks may rise to N230bn. The Vanguard. Retrieved (04/04/2021) from https://www.vanguardngr.com/2019/06/new-capital-base-for-banks-may-riseto-n230bn/,

Aroghene, K. G., & Ikeora, J. J. E. (2022). Effect of non-performing loans (npls), capital adequacy (ca) and corporate governance (cg) on bank stability in Nigeria. *Finance & Accounting Research Journal*, *4*(4), 180-192.

Atuahene, S. A., Yusheng, K., Benturn-Micah, G., & Aboagye, A. K. (2021). Impact of capital adequacy on banks' performance: considering the basel international regulatory framework for banks. *ETIKONOMI,* 20(1), 45-54.

Čihák, M., & Hesse, H. (2010). Islamic banks and financial stability: An empirical analysis. *Journal of Financial Services Research, 38,* 95-113.

Demirgüç-Kunt, A., Detragiache, E., & Tressel, T. (2008). Banking on the principles: Compliance with Basel Core Principles and bank soundness. *Journal of Financial Intermediation*, *17*(4), 511-542.

Dias, R. (2021). Capital regulation and bank risk-taking–new global evidence. *Accounting & Finance,* 61(1), 847-884.

Original Article

Ezu, G., Nwanna, I. O., & Eke-Jeff, O. M. (2023). Effect of capital adequacy on the performance of deposit money banks in Nigeria. *International Journal of Novel Research in Marketing Management and Economics*, *10*(1), 53-63.

Igbinosa, S. O. & Naimo, F. A. (2020). Capital adequacy and bank stability/soundness in subSahara Africa. *European Journal of Accounting, Finance and Investment*, 6(5), 38-54.

Ikue-John, N., & Nkoro, E. (2019). Dynamics of capital adequacy and profitability of internationalized deposit money banks in Nigeria. *Bussecon Review of Finance & Banking),* 1(1), 18-25.

Ingves, S. (2003). Banking crisis from an international perspective, A seminar paper on financial safety nets organized by International Monetary Fund (IMF).

Konboye, l. E. & Nteegah, A. (2018). Banking sector capitalization and deposit money banks' profitability in Nigeria. *Int. J. Soc. Sc. Manage.*, 3(3), 203-213.

Laeven, L., & Levine, R. (2009). Bank governance, regulation and risk taking. *Journal of financial economics*, *93*(2), 259-275.

Michael, E. I., Etukafia, N. I., Akpabio, E. E. & Etuk, M. I. (2018). Capital adequacy and the value of banks in Nigeria: a post-consolidation review. *Journal of Finance and Bank Management*, 6(2), 64-75.

Mishkin, F. S. (1992). *The Economics of money, banking and financial markets* (3 rd ed) (New York: Harper Collins Publishers).

Nwagbara, C. (2020). CBN may announce new recapitalization plan soon. Nairametrics. Retrieved (07/15/2023) from https://nairametrics.com/2020/01/13/cbn-mayannounce-new-recapitalisation-plan-soon/,

Nwankwo, S. N. P. (2019). Effect of capital adequacy on commercial bank's financial performance in Nigeria, 2010-2017. *European Journal of Accounting, Finance and Investment*, 5(4), 1-21.

Obadire, A. M. (2022). Banking regulation effects on African banks' stability. *Journal of Financial Risk Management*, *11*(4), 707-726.

Obilikwu, J. (2018). The impact of capital, concentration, size and liquidity on banking industry performance in Nigeria. *International Journal of Economics and Financial*, 8(4), 54-60.

Ofeimun, G. & Akpotor, V. A. (2020). Effect of capital adequacy on banks' performance in Nigeria: 2010 – 2019. *Economics and Social Sciences Academic Journal*, 2(7), 1-9.

Original Article

Ogbebor, P. I., Oguntodu, J. A., & Osho, L. A. (2020). Capital adequacy and return on assets of deposit money banks quoted in Nigeria. *International Journal of Management Sciences and Business Research,* 9(2), 111-120.

Ogunode, O. A., Awoniyi, O. A., & Ajibade, A. T. (2022). Capital adequacy and corporate performance of non-financial firms: Empirical evidence from Nigeria. *Cogent Business & Management*, *9*(1), 2156089.

Oke, B. & Ikpesu, F. (2022). Capital Adequacy, Asset Quality and Banking Sector Performance in Nigeria. *Acta Universitatis Danubius. Œconomica*, *18*(5). Retrieved from https://dj.univ-danubius.ro/index.php/AUDOE/article/view/1843

Okoi, I. O., Ocheni, S. I. & Orok, A. B. (2019). Impact of banking sector reforms on economic growth in Nigeria. *European Journal of Scientific Research,* 154(2), 230-240.

Oleribe, O. O. & Taylor-Robinson, S. D. (2016). Before Sustainable Development Goals (SDG): Why Nigeria Failed to Achieve the Millennium Development Goals (MDGs). Pan African Medical Journal, 24, 156.

Oyetayo, O. J., Osinubi, T. S. & Amaghionyeodiwe, L. (2019). Capital adequacy and banks performance: a case study of selected banks in Nigeria. *International Journal of Economics, Commerce and Management,* VII(9), 63-78.

Ozili, P. K. (2018). Banking stability determinants in Africa. *International Journal of Managerial Finance,* 14(4), 462-483.

Ozli, P. K. (2019). Determinants of banking stability in Nigeria. Online at https://mpra.ub.unimuenchen.de/94092/ MPRA Paper No. 94092,

Salami, A. A. & Uthman, A. B. (2018). Bank capital, operating efficiency, and corporate performance in Nigeria. Acta Univ. *Sapientiae, Economics and Business,* 6 (2), 61– 87.

Sere-Ejembi, A., Udom, I. S., Salihu, A., Atoi, N. V., & Yaaba, B. N. (2014). Developing banking system stability index for Nigeria. *CBN Journal of Applied Statistics (JAS), 5*(1), 49-77

Soomiyol, M., Bwuese, B. & Yua, H. (2023). Effect of Prudential Guidelines on the Financial Performance of Deposit Money Banks in Nigeria, Journal of Global Accounting, 9(4),118 - 146.

Teixeira, J. C., Matos, T. F., da Costa, G. L., & Fortuna, M. J. (2020). Investor protection, regulation and bank risk-taking behavior. *The North American Journal of Economics and Finance*, 51, 101051.

Taherdoost, H. (2017). Determining sample size: How to calculate sample size, *International Journal of Economics and Management System*s, 2, https://ssm.com/abstract=3224205

Original Article

Tochukwu, O. R. (2016) Capital adequacy and risk management: A study of the Nigerian banking sector, *International Journal of Innovative Science, Engineering &Technology*, 3(7), 342-354

Uremadu, S. O., & Duru-Uremadu, C. E. (2018). A Review of Indices of Capital Adequacy and Performance among Nigerian Banks: A Theoretical Consideration. *Sumerianz Journal of Business Management and Marketing*, *1*(1), 8-17.

Utor, V., Yua, H. and Epor, S.O. (2023). Revisiting the real earnings management and financial performance nexus in Nigeria: A Panel ARDL modeling of listed Oil and Gas companies. UNIZIK Business School (UBS) Journal of Business and Economic Policy, 1(4), 250 - 264.

Yusuf, M. B. & Umar, A. I. (2021). Effect of bank capital regulation on stability of selected deposit money banks in Nigeria: A panel data approach. *Journal of Economics and Finance*, 12(2), 27-34.

Yua, H., Epor, S. O., Ajekwe, T. and Utor, V. (2024). Influence of Firms' Characteristics- Profitability Nexus on Banks in Nigeria: Application of Panel Long-Run and ShortRun Analysis. World Journal of Finance and Investment Research, 8(2), 19-40. DOI: 10.56201/wjfir.v8.no2.2024.pg19.40